amateur radio

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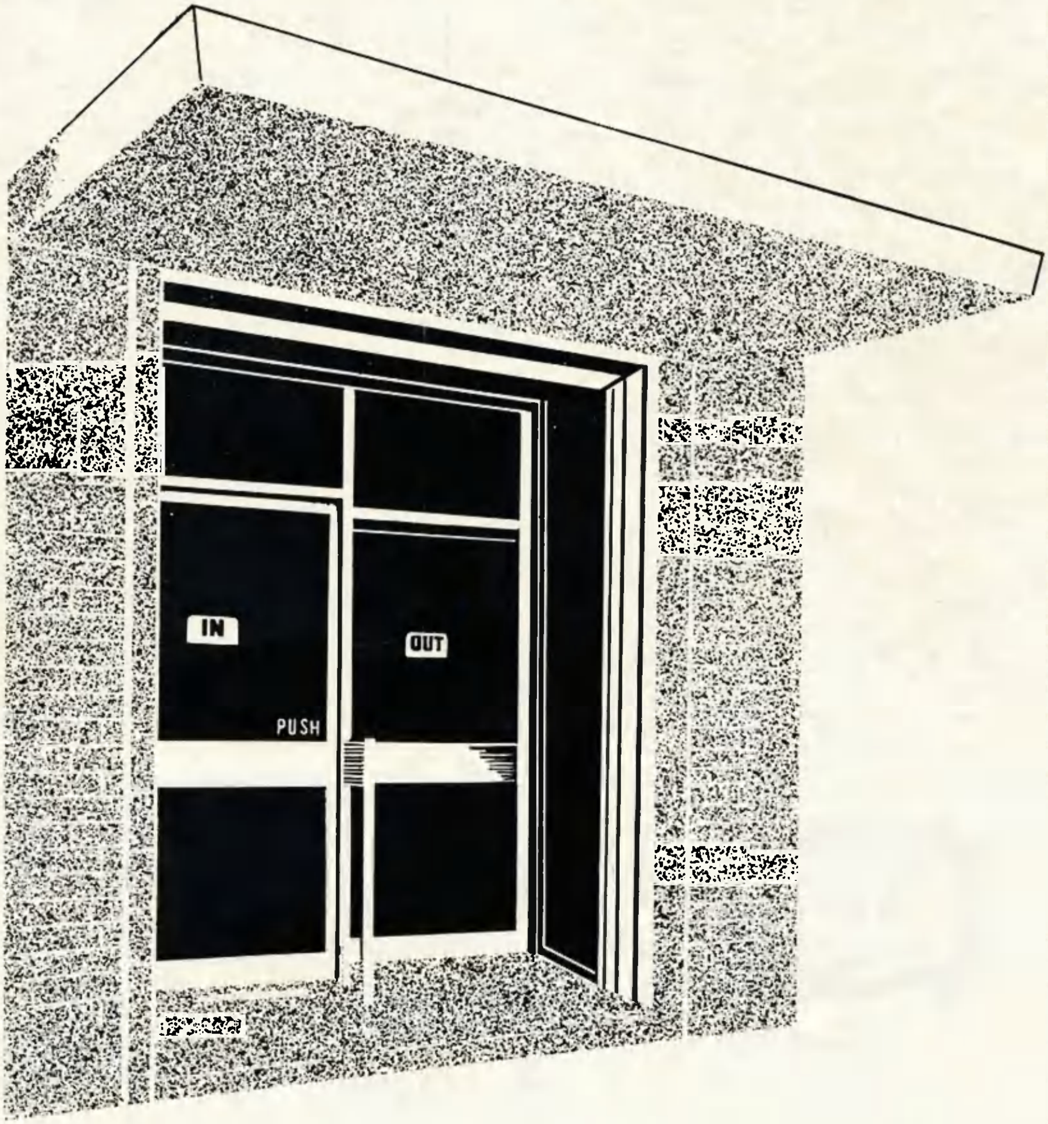

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1, 5, 10, 25, 50, 100, 250, and 500 mA.	$5.75	300 volts a.c.	$5.75
		"VU" Meter	$8.25

P25 2¼ inch square, clear plastic face, 2⅛ inch mounting hole, ¾ inch deep:

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100 uA.	$5.75	25 volts d.c.	$5.50
500 uA.	$5.25	300 volts a.c.	$5.50
1, 5, 10, 20, 50, 250, and 500 mA.	$5.00	"S" Meter	$5.75
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D51/35 Stereo Diamond (D35SR). Suit B.S.R. TC8/S, etc. Normal Price $5. Special $3.25.

D188/88 Stereo Diamond (D88SR) L.P. Stereo/78. Suit B.S.R. C1, etc. Normal Price $7, Special $4.75.

D258 Stereo Diamond (D96SR) L.P. Stereo/78. Suit Dual DN5, CDS630. Normal Price $7, Special $4.75.

MULTIMETER—Model OL64

20,000 ohms per volt D.C., 8,000 ohms per volt A.C.
D.C. Voltage: 0-0.3, 1, 10, 50, 250, 500, 1,000, 5,000.
A.C. Voltage: 0-10, 50, 250, 1,000.
D.C. Current: 0-30 uA., 1, 50, 500 mA., 10 A.
Resistance: 0-5, 500K ohms, 550M ohms.
Decibals: minus 20 to plus 22 db., plus 20 to plus 36 db.
Capacitance: 250 pF. to 0.02 uF.
Inductance: 0-500 H.
Load Current: 0-0.06, 0.6, 60 mA.
Self contained Batteries: 22.5v. (BL015) x 1: 1.5v. (UM3) x 2.
Size and Weight: 6 in. x 4-1/5 in. x 2 in.; 650 g.
Meter Movement Fundamental Sensitivity: 30 uA. F.S.D.
Meter Movement Internal Resistance: 3,100 ohm plus or minus 3 per cent.
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For D.C. Voltange range, plus or minus 3 per cent. of specified value.
For D.C. Current range, plus or minus 3 per cent. of specified value.
For A.C. Voltage range, plus or minus 4 per cent. of specified value.
For Resistance range, plus or minus 3 per cent. of scale length.
For Decibel range, plus or minus 4 per cent. of specified value.

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CM500 Magnetic Stereo Diamond, 4 mV. at 1 Kc., 20-20,000 c/s., 3 grams tracking weight	$8.25
Spare Stylus	$5.00
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Spare Stylus	$6.20

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amateur radio

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★

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Cover Story

"Open the door to 1969" is our theme for the first of "A.R's" new editorial style front covers. The illustration is an artist's impression of Radio Parts' Melbourne showroom main entrance, recently reconstructed as part of their "new look" for 1969. "A.R.," too, "opens the door" to all Amateurs with the promise of more technical news and articles during 1969.

SIDEBAND ELECTRONICS ENGINEERING

If you like to keep informed on the latest developments and are also interested to hear what I have to say, just get on the mailing list for my monthly NEWS-SHEET.

For the Christmas shopping period these are SPECIAL BARGAINS and premiums on package deals.

★ **GALAXY V. Mark III. Transceivers**, using a pair of final tubes that were recently tested in Sydney under laboratory conditions, providing 360W. PEP **output**, the smallest powerhouse with the best receiver of the lot. $550.

★ **SWAN**: SW500C Transceivers, $650; SW350C Transceivers, $525; VX-2 Vox Units, $40; Model 14-230 AC/DC Combination Power Supplies, $150; Model 14C DC Supply Module, $75.

★ **HY-GAIN** TH6DXX Master Tri-band Beams, with BN-86 balun, still only $200.

★ **HY-GAIN** TH3JR Junior Beams, $105. **MOSLEY** TA33JR Junior Beam, $98; next year the senior brother of the Mosley Junior, the MP-33, 3 element Tri-band Beam, $125.

★ **HAM-M** CDR heavy duty Antenna Rotator, with 230V. indicator unit, $180. CDR AR-22 Rotator for light beams, also with 230V. control unit, $60.

★ **NEWTRONICS** Hustler, 4-BTV 10-40 M Vertical, $55. (Top loading coils for 80 M expected again later on.)

★ **GONSET** two-metre SSB/AM/CW Sidewinder Transceiver, $350, including 115V. AC clip-on power supply-speaker unit.

★ **MOBILE SUPPLIES**, 12V. DC, negative or positive ground, extra heavy duty design with four 35 ampere transistors, Australian made, $105.

★ **WEBSTER** Bandspanners, all-band centre-loaded Mobile Whips, with swivel mounting and spring, $55.

★ **MARK** 10-15-20 M Tri-band Helical Whips, $27.50; MARK 40 M Helical Whip, $16. German W3DZZ all-band Dipole, 110 ft. inverted V span, balun with traps, $25.

★ **SPARE VALVES** for all Transceivers. CETRON 572B/T160L 150W. Triodes, $18.

★ **TRIO** TS-500 Transceiver with PS-500 Speaker-Supply unit, spotless, demonstration units, $450.

★ **GELOSO** 209R Receiver, with speaker, good condition, $125.

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U50/225	240V.	225-0-225V.	50 mA.	6.3V.2A.	5V.2A.	.. ..	$1.00
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U60/285	"	285-0-285V.	60 mA.	"	"	.. ..	$1.25
U60/325	"	325-0-325V.	60 mA.	"	"	.. ..	$1.25
U60/385	"	385-0-385V.	60 mA.	"	"	.. ..	$1.25
U80/285	"	285-0-285V.	80 mA.	"	"	6.3V.2A.	$1.50
U80/385	"	385-0-385V.	80 mA.	"	"	"	$1.75
F100/285	"	285-0-285V.	100 mA.	"	"	"	$2.00
U125/385	"	385-0-385V.	125 mA.	"	"	"	$2.50
E30/80	30 Henry 80 mA. Choke						$1.00
F15/150	15 Henry 150 mA. Choke						$1.00
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11353	"	6V. 0.5A.					$0.50

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—Arie Bles

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SIDEBAND ELECTRONICS ENGINEERING

proudly presents the latest addition to the line of

YAESU-MUSEN Amateur Transceivers

the FT-200

SPECIFICATIONS—

- Band Coverage: 3.5-4.0, 7.0-7.5, 14.0-14.5, 21.0-21.5, and 28.0-30.0 Mc.
- Operating Modes: SSB, AM (A3h), CW.
- Power Limits: 240W. PEP on SSB/CW, 75W. on AM.
- IF and Crystal Filter: 9 Mc.
- VFO Frequency Range: 5.0-5.5 Mc.
- Maximum VFO Drift: Under 100 c.p.s. after 20 minutes warm-up.
- Output Impedance: 50 to 120 ohms, non-reactive.
- Carrier Suppression: Better than —40 db.
- Sideband Suppression: Better than —50 db. at 1,000 c.p.s. modulation.
- Distortion Products: Better than 25 db. down.
- Audio Range: 300-2,700 c.p.s. ± 3 db.
- Receiver Sensitivity: 0.5 microvolt for 10 db. S/N ratio.
- Filter Characteristics: —6 db. at 2.3 Kc., —60 db. at 4.0 Kc.
- Audio Output, Receiver: 1 Watt into 8 or 600 ohm load.
- Power Supply: External, 12V. DC or 240V. AC.
- Size: 13" x 5½" x 11".
- Weight: 16 lbs.
- VOX and Calibrator: Internal, standard equipment.
- Further Details: R.I.T. receiver incremental tuning, and built-in speaker.
- Valve Line-up: 12AX7 mic. amp., 7360 bal. mod., 12AU7 carrier osc., etc., 12BY7 driver, two 6JS6s final amp.

It will be a few more months before this beauty will be available ex stock, but no doubt worth waiting for at the estimated total landed cost, S.T. included, of only $375. What is more, the set is also planned to be available in KIT FORM!!! A copy of the circuit diagram of the FT-200 is already available for one dollar, postpaid.

Other YAESU MUSEN units now in stock:

FL-DX-2000 Linear, $250. FR-DX-400 Receiver, $375. FL-DX-400 Transmitter, $375. FT-DX-400 and the FT-DX-100 Transceivers: New supplies of these are sailing, but at my prices they are already sold before they have landed!

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TRIO

2 METRE TRANSCEIVER

TR-2E

FEATURES:

SEPARATE V.F.O. FOR TRANSMITTER AND RECEIVER

- CRYSTAL CONTROL
- SQUELCH
- NUVISTOR FRONT END
- TRIPLE CONVERSION RECEIVER
- NOISE LIMITER
- A.C.-D.C. OPERATION
- INBUILT POWER SUPPLY

SPECIFICATIONS:

RECEIVER	
Frequency Range:	144-148 Mc AM
Sensitivity:	1 microvolt for 10dB S/N at 145.5 Mc (0.05 W Audio Output)
Image Ratio:	50 dB at 145.5 Mc
IF Frequency:	1st IF 44-45 Mc 2nd IF 10.7 Mc 3rd IF 455 Kc
Noise Limiting:	Automatic
Squelch:	1 microV-300 microV.
Selectivity:	20 dB down at 10Kc
Audio Output:	3W 8 ohms
Input Impedance:	50 ohms (Unbalanced)
TRANSMITTER	
Frequency Range:	144-148 Mc AM
Power Input to Final:	22 to 26 Watts
RF Output Power:	10W 144-146 Mc AC 240V Operation 9W 144-146 Mc DC 12.8V Operation
Crystal Type:	FT-243
Crystal Frequency:	8-8.222 Mc
VFO Frequency:	8-8.222 Mc
Microphone Input:	High Impedance w/Push to Talk
Frequency Response:	—3 dB at 300 and 3,000 c/s
Output Impedance:	50-100 ohms w/Coaxial Connector
POWER SUPPLY	
AC Operation:	117/230V 60/50 c/s Receive Power Drain 106 VA Transmit Power Drain 146 VA
DC Operation:	DC 12.8V (12/14V) Receive Power Drain 90 VA Transmit Power Drain 120 VA
Tubes and Transistors used:	16 Tubes 1 Nuvistor, 8 Diodes, 4 Power Transistors
Dimensions:	H: 6⅝"; W: 11⅞"; D: 12¾"
Weight:	22.2 lb

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A General Coverage High Frequency Converter

R. A. MURPHY, VK5ZDX, and R. S. GURR,† VK5RG*

THE authors have for some time been entirely satisfied with the various converters they have built for the high frequency bands—a multiplicity of these units, used in conjunction with Command Receivers, etc., with a 3 to 6 Mc. tuning range, have proved so satisfactory that it was decided to build two composite converters that would include all the desirable features of the originals. An article in "A.R." for April 1960 describes one of these converters. The composite versions would eliminate plugging co-axial cables in and out each time a band was changed, and produce an overall economy of power supplies.

Deliberation over the proposed development confirmed that the most suitable basic receiver to accompany the converter was one with a range of 3 to 6 Mc., as both possessed this version of the Command series, and if the idea was of interest to any other Amateur, the construction or duplication of a tuner covering this range would not be difficult. In each case the Command Receivers have been considerably modified to provide additional selectivity, s.s.b. detection, etc.

* 274 Diagonal Road, Oaklands Park, S.A., 5046.
† 9 Richmond Avenue, Daw Park, S.A., 5041.

Two similar cabinets were constructed and both units, when completed, achieved the same results but by alternative means. The final range possible with the original combination was 3 to 30 Mc., however VK5ZDX has now expanded his range to cover 0.5 to 30 Mc.

CRYSTAL OSCILLATOR

During development serious consideration was given to an idea offered by VK5KS of using one 6 Mc. crystal and its harmonics as the local oscillator in the converter. Tests confirmed the loss of far too much spectrum in the immediate vicinity of 6 Mc. on all ranges, although the use of higher grade shielding and double tuned circuits in the frequency multiplier section may have reduced this considerably.

This problem was overcome with the use of alternative harmonics of crystals that were not in the tuning range of the main receiver. These were chosen to allow the progressive ranges 3-6, 6-9, 9-12, . . . 27-30 Mc.

R.F. TUNING CIRCUITS

For economy of coils, two basic preselector tuning ranges are used prior to the mixer, and the approx. 2 to 1 tuning range of these is accomplished by two entirely different methods as

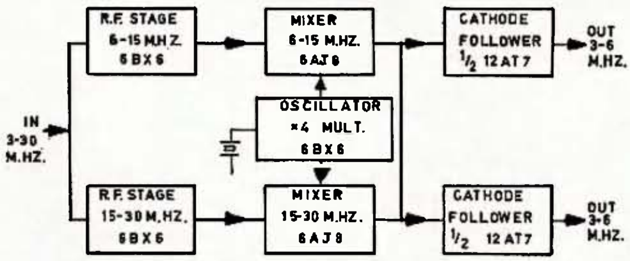


FIG. 1. BLOCK DIAGRAM VK5RG CONVERTER.

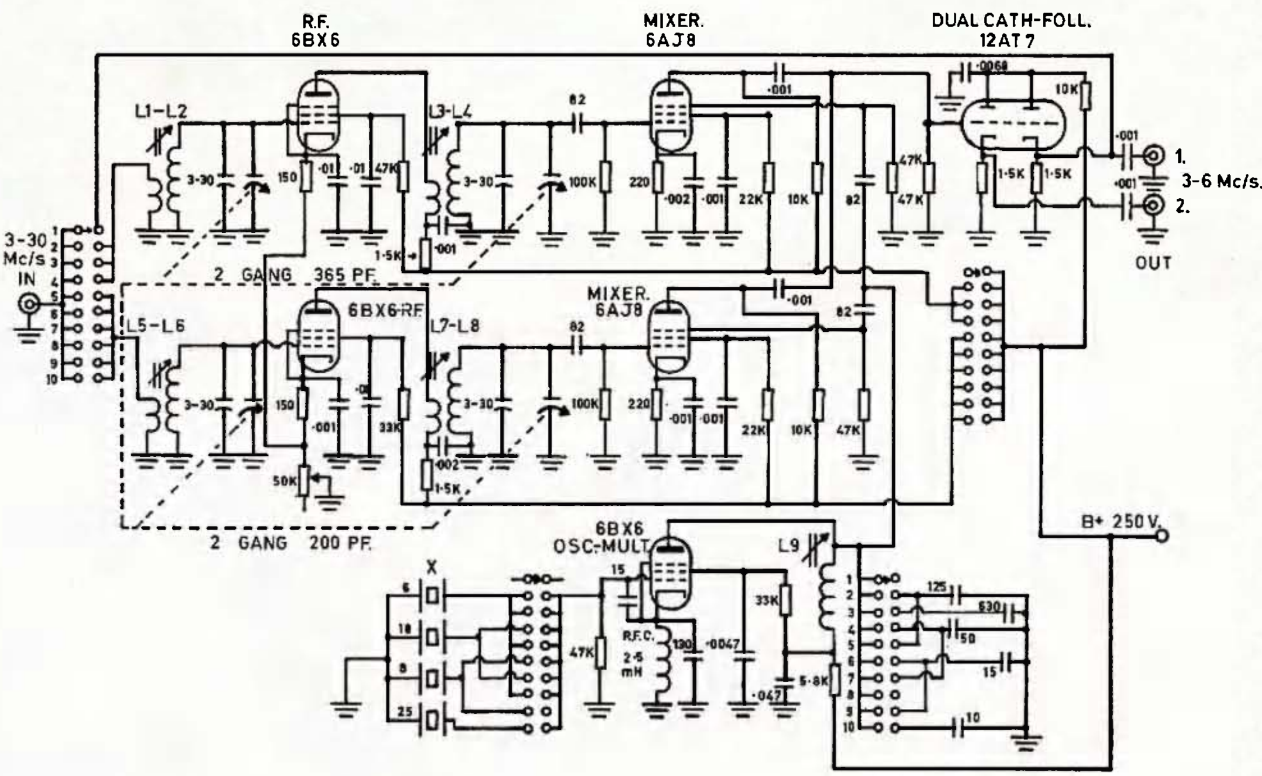


FIG. 2. 3-30 M.HZ.- CONVERTER - VK5RG.

detailed in the following description. The novel method of mounting the switch wafers and using a detachable long shaft was stolen from "A Sideband Package" by W6TEU in "QST" June 1958.

VK5RG CONVERTER

Two entirely separate r.f. and mixer stages are used, with the crystal oscillator feeding both mixers. The outputs of the mixers are fed to a cathode follower which feeds to the low impedance output sockets. Each front end has its own two-gang condenser and associated coils, slugs and trimmers, and covers 6-15 and 15-30 Mc. respectively. Aerial input, oscillator and output switching are arranged via a 4-bank 12-position wafer switch. High tension to the unused mixer/r.f. section is disconnected on one wafer.

Valve types and circuitry used were due to these being the most satisfactory in the developmental converters, besides being on hand, and resort to "like new" mixers and cascode r.f. stages was not therefore considered. The inclusion of the power supply as an integral part of the converter was considered desirable, as the unit could then be used in conjunction with any receiver desired, and thus demonstrated in any shack of those interested in its duplication.

The basic block diagram is shown in Fig. 1 and the circuit in Fig. 2.

The main dial of this converter tunes only the 15-30 Mc. condenser, and for dial economy the 6-15 Mc. gang is driven by a "Meccano" chain and sprocket set, so in effect we have a four-gang condenser, each two gangs beings dissimilar in capacity. Obviously, since we have two separate r.f. ends it is not necessary to track all four gangs.

Coil details are not supplied as the later version (VK5ZDX) uses similar types. Fig. 3 indicates the ranges, oscillator frequencies, etc.

Pos.	R.F. Range Mc.	Crystal Mc.	Oscil-lator Mc.	Rx Tuning Range Mc.
1	3-6	—	—	3-6
2	6-9	6	12	6-3
3	9-12	6	6	3-6
4	12-15	18	18	6-3
5	15-18	6	12	3-6
6	18-21	8	24	6-3
7	21-24	18	18	3-6
8	24-27	6	30	6-3
9	27-30	8	24	3-6
10	{ 22-21	8.333	25	4-3
	{ 28-29	8.333	25	3-4

Fig. 3.—Crystal and Oscillator Frequencies, VK5RG Converter.

OPERATION

Operation is simple—the range switch is set as required, the receiver set to the appropriate i.f., and the r.f. circuits peaked up for maximum signal. This technique is similar to that required in "Racal" and similar receivers and the "two hand" tuning technique is no worse than the "Racal" method, where four separate knob rotations are required for any major frequency change. As the 3-6 Mc. receiver at VK5RG has instant switching of series and shunt padders to allow 3-4 Mc. bandspread, a tenth band position allows a greater bandspread on 10 and 15 metres.

Two outputs which are isolated from each other are available to allow tuning two frequencies on the one range, e.g. WWV on 15 Mc. and the 14 Mc. Amateur band; or 21.54 Mc. Radio Australia and the 21 Mc. Amateur band. This feature is handy when working Americans above 14.2 Mc. and monitoring of your transmit frequency below 14.2 Mc. is desired. Of course it is necessary to possess a second 3-6 Mc. receiver to do this.

VK5ZDX CONVERTER

Lessons learned with construction of the VK5RG converter showed that the following specifications could be incorporated in a more refined version:—

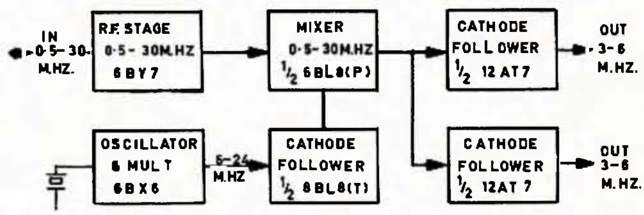
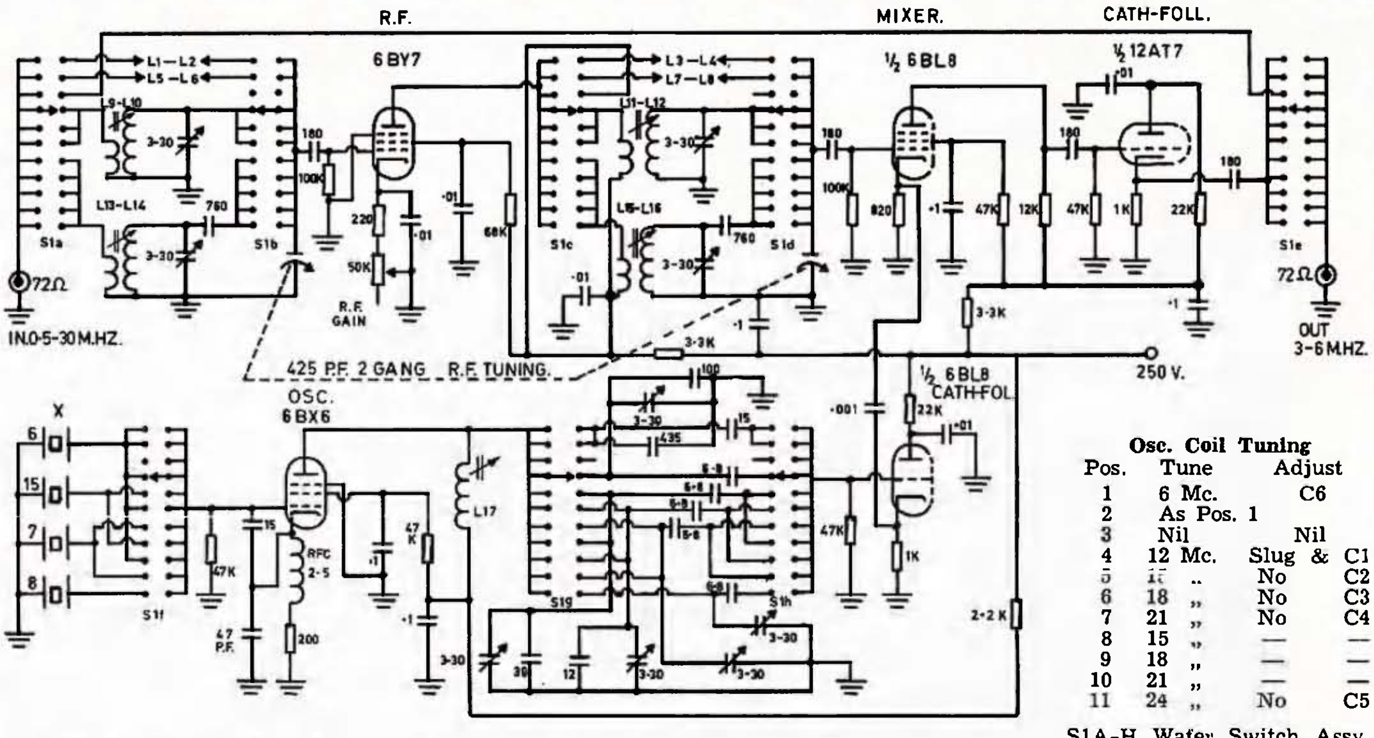


FIG. 4. BLOCK DIAGRAM VK5ZDX CONVERTER.



Osc. Coil Tuning

Pos.	Tune		Adjust	
1	6 Mc.		C6	
2	As Pos. 1			
3	Nil		Nil	
4	12 Mc.		Slug &	C1
5	15	,,	No	C2
6	18	,,	No	C3
7	21	,,	No	C4
8	15	,,	—	—
9	18	,,	—	—
10	21	,,	—	—
11	24	,,	No	C5

S1A-H Wafer Switch Assy. 8 Bank x 11 Position

FIG. 5. 0·5-30 M.HZ.- CONVERTER. - VK5ZDX.

1. Expansion to include ranges lower than 3 Mc.
2. Single two-gang condenser using switched multiple coils and trimmers in the r.f. tuner.
3. Provision for adjusting oscillator injection for optimum.
4. Use of alternative valves.

The only apparent disadvantage is the need for a number of additional 12-position wafer switch banks. The block diagram is shown in Fig. 4.

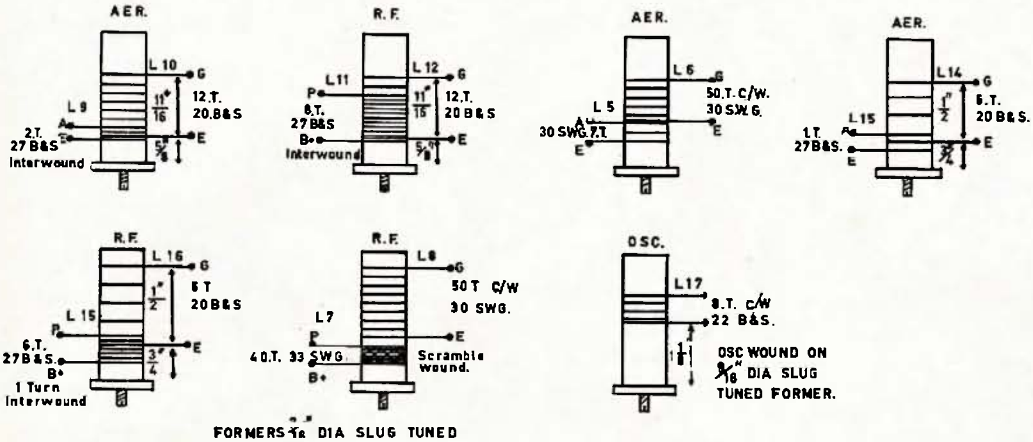


FIG. 6. COIL ARRANGEMENT.

OSCILLATOR CIRCUIT

Direct capacitive coupling from the oscillator/multiplier valve to the mixer grid was used initially, but the detuning effect when the mixer gang was tuned throughout its range made the level of injection unreliable, which resulted in varying sensitivity over the bands. The final solution was to incorporate one of the manufacturers' recommendations and use cathode injection to the mixer, and this required the inclusion of the 6BL8 triode as an impedance transformer.

Selection of the oscillator coupling condensers was at first by trial and error, but when finally completed and operational it was found that it was not necessary to have the multiple 6.8 pF. coupling condensers—one only plus the elimination of the extra switch wafer would be in order.

R.F. MIXER CIRCUIT

The coupling between aerial and r.f. grid coils, and plate and mixer coils, was given many hours of attention and the values shown are the best to date. Suggestions as detailed by G2DAF in his R.S.G.B. "Communications Receivers" for the interstage coupling techniques were studied, but as the preselection required in this article only covered Amateur bands, the inductive coupling method which has been universally accepted, was used. In determining coupling values, any compromise between gain and selectivity was always decided in favour of selectivity, as further protection against spurious responses.

These responses are minimal, and the repeated need for re-peaking of the preselector dial is perhaps onerous to those accustomed to wide range general coverage receivers, but gives one an assurance that the front end is actually selective. The inclusion of a 3 to 1 vernier drive in each converter makes this adjustment simpler.

Full details of circuit, coil details and chassis layout are given in Figs. 5, 6 and 7 respectively.

GENERAL

Cabinets are simple aluminium chassis with front and back panels of same material—flanges on these panels allow use of expanded aluminium sheet to form sides and top covers and give the structure a measure of mechanical stability.

Muting is possible by a switch on the front panel which opens the power transformer centre tap (circuit not shown, but standard).

Since the normal two-gang condenser was never intended for use on common r.f. frequencies, watch out for the earthing fingers that are normally situated between the gangs. These must be good and thoroughly clean so that the rotor shaft is kept at earth potential otherwise instability will result.

Crystals are standard DC11 and FT243 types and no trouble was encountered in getting any of them going. The 15 pF. feedback condenser between the cathode and the grid of the 6BX6 may need to be modified in value depending on the quality and size of the r.f.c. in the cathode. We used in one case a standard 2.5 mH. size and the other a 150 microhenry. A tip here is to use a standard 1 watt high value Philips resistor and wind to about twice the diameter with about 30 s.w.g. enamel wire, soldering the ends of the wire on to the brass caps of the resistor; a much cheaper r.f.c. for this class of service than obtainable over the counter.

CONCLUSION

The writers believe they have constructed two complete and useful pieces of equipment that could be duplicated by any S.w.l. or Amateur. Parts are conventional and can be varied to suit the particular junk box. Correspondence from those interested in duplicating will be welcomed. Where a reader may have a junk box with the basic parts, practical assistance in the form of suggested layout, alternative valves, etc., is also offered, should this be required.

L1-L2, L3-L4:
Tunes 0.5 to 1.5 Mc. (Standard b.c. aerial and r.f. coils).

L5-L6, L7-L8:
Tunes 1.5 to 3.0 Mc.

L9-L10, L11-L12:
Tunes 6 to 15 Mc.

L13-L14, L15-L16:
Tunes 15 to 30 Mc.

Tuning Ranges

Switch Pos.	Command Rx Mc.	Xtal Freq. Mix. Mc.	R.F. Tune Mc.
1	5.5-4.5	6	0.5-1.5
2	4.5-3	6	1.5-3.0
3	3-6	straight thru	3-6
4	6-3	12	6-9
5	6-3	15	9-12
6	6-3	18	12-15
7	6-3	21	15-18
8	3-6	15	18-21
9	3-6	18	21-24
10	3-6	21	24-27
11	3-6	24	27-30

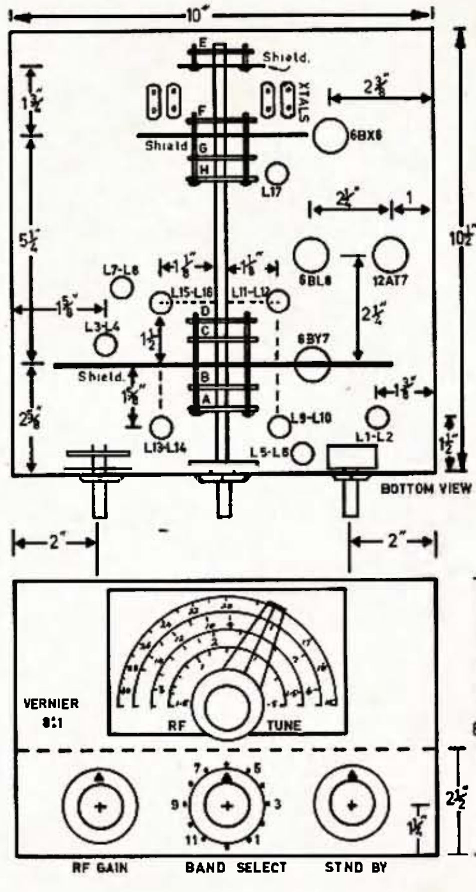


FIG. 7 COMPONENT LAYOUT - VK5ZDX.

PROJECT—SOLID STATE TRANSCEIVER

PART THREE

H. L. HEPBURN, VK3AFQ, and K. C. NISBET,† VK3AKK*

ORGANISATION

Before proceeding to the detailed description of another module, time will be spent on some non technical aspects of the project. At the time of writing (last November 1968) well over a hundred enquiries about the project have been received—and answered. Since the rate of receipt of these enquiries has not slackened, it is probable that the number will have doubled by the time this article appears in print. The following points appear to be those on which additional information has been sought.

PARTICIPATION

Once a module has been described in these pages—and not before—it is available by writing to one of the authors (VK3AFQ's address below) stating the requirements and enclosing the appropriate remittance. The cost of each module, or, if applicable, the various options, is given in the text as that module is described. The project is open to anyone.

In view of the size of the project, and, further, that development and organisation are spare (!!) time activities for those concerned, it was not possible for all circuit boards to have been drawn up and available, for all instructions to have been written, typed and duplicated, or for all circuit diagrams to have been printed before the first article in the series appeared. It is anticipated that the complete basic project will have been covered by the April/May 1969 issue of "A.R." and, at that time, all units will be available.

CABINET WORK

More than enough people have indicated their requirement for the cabinet and associated metal work to be made available. Accordingly, this is being organised and it is anticipated that by mid March next full details of the cabinet, and the cabinets themselves, will be ready—watch "A.R." for this.

TIME SPAN OF PROJECT

One of the fundamental points of a project such as this is that it be kept "open" for as long as possible. This ensures that participants can make up modules as time and money permit without any fear of missing out because of any restriction on the life of the project.

It is the present intention to keep this project open for at least two years. Even after this time, latecomers may be assured that kits and boards can be obtained.

DELIVERY

Delivery of kits not containing crystals is normally a week. Where kits contain crystals, delivery is normally 3-4 weeks since crystals are only ordered as required.

* 4 Elizabeth Street, East Brighton, Vic., 3187.
† 25 Thames Avenue, Springvale, Vic., 3171.

In the event that temporary "out of stock" situations arise with suppliers (and this might well be the case during this holiday period), which cause major variations from the stated delivery times to occur, then participants affected will be notified individually.

TESTING FACILITIES

Notwithstanding that the whole project needs but a minimum of test equipment to get it going properly, it has been decided that a lining up and checking service will be organised. Apart from the postage involved, there will be no charge for this service. But there must, in all fairness, be some stipulations attached to it. It is felt reasonable to confine this free service to **complete** transceivers, transmitters or receivers that have been made exactly to specification using kits obtained through the project. A moments reflection will suffice to show that it would be very difficult to include hybrid jobs (part project, part commercial module, part junk box type!) or modified jobs or those containing "improvements".

QUERIES

If, prior to taking part in the project, or at any time during it, there are any points which are obscure, or require assistance, then it is hoped that would-be or actual participants will write, putting the problem to the writers. Every effort will be made to assist.

THE I.F. MODULE

Only one module will be described this month—the i.f. module—but, since it contains at least three functions, some time and space will be devoted to its operation.

Reference to Fig. 9, the circuit diagram, shows that the module contains a two-stage amplifier using integrated circuits, a diode detector for a.m. and a.g.c. feed, an a.m. noise limiter and an a.g.c. voltage generator.

I.F. AMPLIFIER

T1 is a tuned circuit on 9 Mc. which feeds a Motorola MC1550G integrated circuit. The I.C. is used as a series cascode amplifier in a common emitter, common base configuration. A.g.c. is applied to this stage but the current sinking a.g.c. facility of the chip is not used.

T2 is a double tuned circuit on 9 Mc. whose prime function is to reduce the overall noise bandwidth of the i.f. amplifier. Whilst taps are used on the two halves of T2 to present the correct input and output impedances to the two I.C's, it would have been possible, with an increase in overall noise level, to take the output of the MC1550G straight into the second I.C.—a Fairchild uA719C.

As a matter of interest the Fairchild uA703 can be used in the same circuit as the MC1550G if the difference in base configuration is accommodated.

The second I.C.—the uA719C—uses triple cascoded emitter coupled amplifiers in a high gain circuit. An additional amplifier on the chip is not used, but its associated connections are brought out to P.C.B. pins on the board for use, if needed, at a later stage.

The gain of the amplifier is such that a 1 microvolt signal is detectable. A.g.c. action commences at approximately 8-10 microvolts input to give an a.g.c. rail which swings between 9-10 volts under small signal conditions and 1 volt at maximum signal input.

SIGNAL RECTIFICATION

Before proceeding with the detail of operation of the detection/a.g.c. systems, readers are asked to bear in mind that in any silicon transistor or silicon diode there is a voltage drop between base and emitter or between anode and cathode. With silicon devices this drop approximates to 0.5v. and, in the description that follows, will be called V_{BE}. (Perhaps this terminology will make the purist frown a bit when applied to diodes, but it's much simpler to use the one description.)

Output from the uA719C is applied to the detector diode D1 via the 0.01 uF. coupling capacitor. D1 is forward biased to approximately 2.6 volts positive with respect to earth by the 22K tab. pot and the two 10K resistors associated with it.

Under no signal conditions the V_{BE} drop across D1 gives a cathode voltage of about 2.1 volts positive, which is also the base voltage of Q1. Again the V_{BE} drop across Q1 brings its emitter potential to about 1.6 volts positive.

When an unmodulated signal is applied to D1, it is rectified and filtered by the combination of the 1K resistor and the two associated capacitors. The resulting DC voltage is then effectively in series with the fixed anode voltage of D1. Thus the base of Q1 will be at some new voltage above that obtaining under no signal conditions, the actual increase being proportional to the signal applied to D1. If now modulation is added to the signal the base of Q1 will vary around the new mean DC level at an audio rate.

The emitter of Q1 will also vary around a mean DC level at an audio rate, but, because of V_{BE} the mean DC level will be about 0.5 volt under that at the base of Q1.

Note that the mean DC levels at all these points will be proportional to the carrier level applied to D1.

Having thus explained the conditions obtaining at the emitter of Q1, let us follow the three separate paths which branch out from it:

(a) The a.m. (with N/L) path.
(b) The a.m. (no limiting) path.
(c) The a.g.c. system feed path.

NOISE LIMITER PATH

Assume that there is an a.m. signal at the emitter of Q1—that is that the emitter is varying around some mean

DC level at an audio rate. Let this mean DC potential be "e" volts. Assume further that the N/L diode, D5, is not in circuit. Audio cannot go through the N/L path since it is effectively bypassed to ground by the 50 uF. capacitor. The DC potential at point "X" will, however, be the same as at the emitter of Q1, i.e. "e" volts. Assume further that the slider of the 1.5K tab pot is adjusted to give it a voltage slightly less than 0.5 below "e" volts. If D5 is now replaced, it will be suitably forward biased into conduction and an a.m. signal path now exists through D5 to the "audio N/L out" point.

Now let a noise spike come from the emitter of Q1. It will be positive going (the negative going pulse having been stopped by D1) and will **instantly** reverse bias D5 into non conduction. The delay introduced by the 50 uF. condenser and the two associated 6.8K resistors will prevent the voltage at the anode of D5 rising at the same rate. The effect is thus to block off D5 for the duration of the spike.

The above explanation takes certain liberties and ignores secondary effects, but does serve to explain the action of the noise limiter.

THE A.M. (UNLIMITED) PATH

As before, the emitter of Q1 is varying at an audio rate and straight capactive coupling will give an audio output at the off-take point.

To give roughly the same a.m. audio output at both the limited and unlimited output points, the 2.2/2.2K divider network has been introduced, since the loss across the noise limiter circuitry is approximately 50%.

THE A.G.C. SYSTEM

The a.g.c. system used in this design is somewhat unconventional and, apart from its application in this project, may be of a more general interest.

Conventional a.g.c. systems derive a voltage which is proportional to the signal level and apply it back to the emitters or bases of individual transistors with each path being individually engineered.

In the system to be described, which has been used very successfully by the authors and others in the Melbourne area, the method used is to derive an "h.t." voltage which is inversely proportional to the signal. Application of a.g.c. thus becomes simply a matter of feeding individual stages, or a whole board, from a common rail. Within limits, simple transfer of an h.t. feed point from an uncontrolled rail to the controlled rail is all that is required to apply a.g.c.

Reverting to the circuit diagram and assuming no signal conditions, Q2 and Q3 are turned off and the collector of Q3 is at supply rail potential. Q4 is an emitter follower and, again under no signal conditions, its emitter is about 0.5 volt below the supply rail because of the V_{BE} drop.

The 47 ohm resistor in the collector of Q4 has been included to prevent the sudden demise of the device should the emitter be accidentally shorted to ground. A side effect of this resistor is slightly to upset the DC voltage conditions assumed in this description, but this secondary effect will be ignored in the interests of simplicity.

Note too that the V_{BE}'s of D2, D3, D4, Q2 and Q3 are effectively in series and amount to some 2.5 volts.

If now a signal appears at the emitter of Q1 (no matter whether it be a.m., s.s.b., c.w. or any other mode), the mean DC level of the Q1 emitter will rise as explained above. When this DC level exceeds the V_{BE}'s of D1, 2, 3, Q3 and D4, then Q2 and Q3 will be switched on, Q3 will start to draw current, its 4.7K collector load will drop voltage and the collector DC voltage will drop to a value below the h.t. supply rail. The emitter of Q4 will follow this drop and, in fact, because of V_{BE} again, will be about 0.5 volt less than Q3's collector. Thus the a.g.c. rail connected to the emitter of Q4 will rise and fall according to the strength of the signal applied to the diode detector D1.

The "threshold" of the a.g.c. system is adjusted by means of the 22K tab pot which sets the DC conditions of D1.

The preferred "instant attack—slow decay" characteristics of a present day a.g.c. system are conferred by Q2 and the three large capacitors in its emitter circuit.

Q2 is used as an emitter follower and, when switched on by a signal, provides a low impedance path instantly to charge up whichever of the three large condensers (50 uF., 320 uF. or 1,000 uF.) are earthed. When the signal is removed, these condensers cannot discharge back through Q2 but must discharge (relatively slowly) through Q3 and its emitter resistor.

The 50 uF. condenser is permanently connected to earth to provide the quickest decay rate and the 320 uF. or 1,000 uF. condensers can be selected by a front panel control to give two additional decay rates.

If a.g.c. "on/off" facilities are required a simple switch, which transfers the device feed point between the controlled and uncontrolled rails, is all that is required.

Like all high gain circuits, the layout of the i.f. strip herein described is critical. Considerable experimental work has gone into this particular unit to evolve a layout which is both reproducable and free from instability.

(Continued on Page 25)

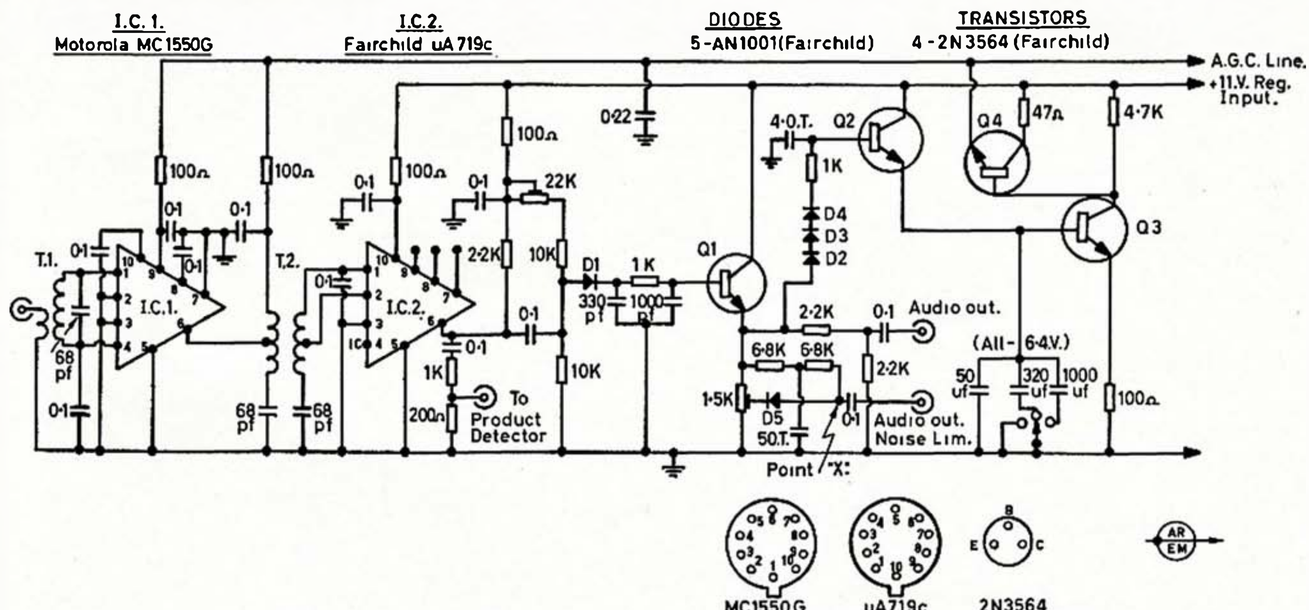


FIG. 9.-4 BAND TRANSISTOR RECEIVER-I.F. STRIP.

SEMI CONDUCTOR BASE CONNECTIONS.

T1—Secondary is 40 turns of 33 B. & S. wire on Neosid type former, fitted with F29 slug. Primary is 10 turns of 33 B. & S. wire over cold end of secondary.

T2—Primary and secondary, 40 turns of 33 B. & S. wire, tapped 10 turns from cold end, on Neosid type formers, fitted with F29 slug. Coils mounted 15/32 inch apart.

S.S.B. Transmitter—An Amateur Engineering Project

PART FOUR *H. F. RUCKERT,* VK2AOU*

ADDITIONAL DESIGN FEATURES

Cooling Blower: One can use a protective cover which has more holes than metal to allow air flow and cooling of under and above chassis components, but it does not take long for a dust layer to cover everything. Together with high air humidity, this dust can cause considerable trouble and sets which are just about filled with components are difficult to clean effectively.

A good fan or blower costs money and takes some chassis room. The blower motor should have no brushes, which cause radio interference, must be large enough to move sufficient air without having to run too fast, which would cause too much running and hissing air noise. Excessive noise in the shack would mask weak signal reception, causes a modulation background, and may even trigger the vox circuit, putting the transmitter on the air.

The blower installed fulfills the mentioned requirements. Air enters the blower through a three-layer fly wire mesh screen and fills the below chassis compartment of the p.a. From here one third of the air goes through a number of holes in the bottom cover of the p.a. housing, guided by a sponge plastic ring with whistle noise preventing wire mesh in between, and through correspondingly placed holes of the underneath standing exciter lid. The exciter cover has holes at the sides and rear and also in the bottom plate.

Two thirds of the air is forced from the p.a. under chassis room up through three rings of holes which surround the valve holders of the p.a. valves. Corresponding holes are in the p.a. lid top. In this way a strong air flow goes along the valve envelopes. Additional holes are in the side and rear of the p.a. housing cover. This blower keeps the transmitter temperature at about half the temperature (°C.) it would reach without the blower. This means that sensitive components like diodes, electrolytic capacitors, mains transformers and valves will last much longer in summer.

A.L.C. Circuit: This is actually a voltage level delayed a.g.c. circuit operated by a portion of the r.f. voltage taken from the exciter output terminal. An adjustable diode counter bias can be set in such a way that the a.l.c. will only become effective if the drive voltage exceeds a certain value. With the 100K ohm resistor this level can be from no a.l.c. action to a value which allows only 60% of the maximum drive to be applied.

The a.l.c. is not used to compensate the gain differences which occur when the bands are changed, in order to prevent distortion, it is more a means to prevent overdriving the p.a. Working on four valves, the action is very effective with only a few volts applied.

Netting: The transmitter can be tuned up on a received frequency without turning the p.a. on. The netting switch S2a unbalances the ring modulator resistors via a small relay to obtain a carrier signal on the desired frequency. Audio is disconnected from the ring modulator by a stand-by relay contact pair. The —50v. blocking voltage is removed from the a.l.c. line with switch S2b, and the gain of the four valves can be manually selected with the 100K ohm netting level control.

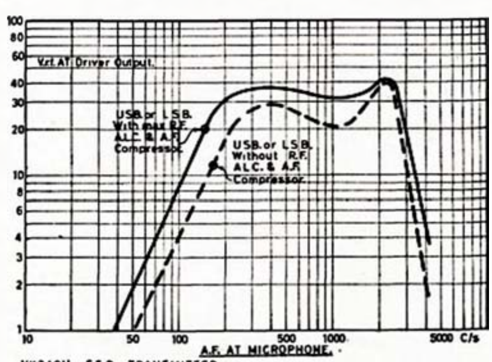
Some r.f. is getting into the receiver first mixer via the commonly used crystal oscillator and the v.f.o. can be tuned to zero beat the received frequency. The tuning has to be made from one side, or the sharp receiver crystal filter makes the beat note inaudible. The p.a. remains off with the screen grid voltage disconnected by an aerial relay contact.

Driver Tuning and Output Meter: It was found very handy to have a tuning indicator for the exciter during experiments with the exciter and when tuning the exciter after far-going frequency changes, before the p.a. is turned on and tuned. A small voltage is taken from the exciter output terminal, rectified and fed to a transistor. The power was insufficient to operate and match the 1 mA. 50 ohm meter, but the transistor d.c. amplifier solved this problem. With the help of this meter, one can see the detuning and driver loading effect the grid to cathode space charge of the p.a. valves has on the driver and its tank circuit.

Other Meters: The combined grid current, if some should occur, of the p.a. valves is always monitored by a 1 mA. meter, which is useful when conducting experiments and to check the operating conditions to prevent flat topping.

One meter was installed to act as multimeter to measure all other p.a. operating conditions:

(a) Cathode current of each of the three valves separately.
(b) The screen grid voltage (two selectable values).



VK2AOU. S.S.B. TRANSMITTER.

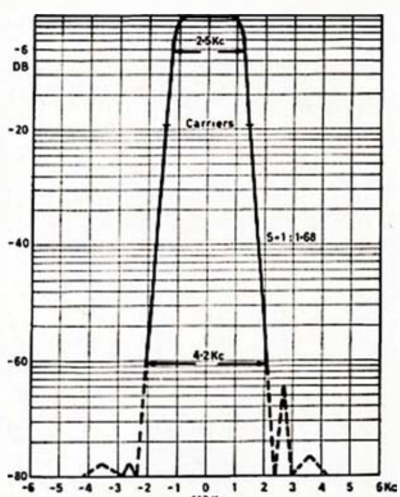
(c) The control grid bias (adjustable).
(d) The combined screen grid current and stabiliser action.
(e) The h.t. plate voltage.

The switch S6a and S6b selects also the necessary shunts and dropping resistors.

FINAL TESTS

The exciter was set up with a 1:4 capacitive voltage divider of 60 pF. total capacity, taking the place of the p.a. input circuit. The capacitive loading mentioned earlier may be substituted by a resistor causing a similar r.f. voltage drop at the exciter plate.

An audio signal generator was used to obtain the a.f. input voltage (replacing the mike) and the resulting s.s.b. exciter output voltage was measured with the r.f. probe of a v.t.v.m. The graph shows the result for l.s.b. and u.s.b. operation, both with and without 50% compressor action. The a.l.c. was turned off to avoid a lift of the lower a.f. frequencies by limiting the stronger higher a.f. frequencies.



INPUT AT FILTER Vs. EXCITER (DRIVER) OUTPUT.

We see that the compressor had—as intended—very little effect on the a.f. response. The 2 Kc. wide flat top of the crystal filter shows up, and the a.f. response is practically the same for l.s.b. and u.s.b. transmission.

It appears from these curves that the bass part is too much suppressed, but playing back the operator's voice of a recorded transmission showed clearly that the earlier used carrier frequencies, which were closer to the crystal filter pass band, resulted in less intelligibility due to the rather low pitched voice of the operator and the strong bass response of the dynamic microphone. These effects, together with a slight bass lifting action of the a.l.c., made it necessary to adjust the carrier crystals to be 500 c/s. outside the —6 db. filter frequency points, as shown on the abovementioned filter response curve.

One can also pick up with the mike a voice radio transmission which is re-broadcast by the s.s.b. transmitter, received with the station receiver and the b.c. signal is compared with the s.s.b. signal. This shows quickly how much intelligibility is lost in the s.s.b. rig. For this test, a suitable dummy load has to be used.

Next the complete transmitter was tested, working into a low s.w.r. dummy load of 52 ohms (Heath Cantenna). The output can be measured with a series connected r.f. thermocouple amp. meter,[8] but one should remember that many of these amp. meters are only correct within a limited frequency range not necessarily 3.5 to 30 Mc.

The other way is to connect a suitable r.f. volt meter to the dummy load[9] ($P = 0.5\ E_{DC}^2 \div R$). The audio source was the tape recorder playing back a pre-recorded 800 and 1,800 c/s. steady signal (double tone) from the speaker to the transmitter mike. The new legal maximum power of 200 watts average = 400w. p.e.p. output was obtained without grid current on the 80 to 15 metre bands and slightly less on 10 metres. The mains voltage has some effect as will be expected.

This transmitter can be left running under these conditions for several hours which permits many experiments to be made. With the steady input signal (double tone) flat topping occurs as soon as grid current flows, because a higher average screen grid current causes the U[illegible] regulator to cut out. This does not happen with speech modulation and occasional grid current pulses of 0.7 mA. The a.l.c. and a.f. compressor can keep things under control very easily.

With the transmitter working into the dummy load and transmitting the pre-recorded voice of the op., it is interesting to check with the station receiver (r.f. overload must be carefully prevented) the transmitted bandwidth, the carrier and unwanted sideband suppression. The suppression of the unwanted sideband is mainly a function of the filter curve and the a.f. frequencies which are transmitted. 200 c/s. are far less suppressed than 2 Kc. This transmitter needs between —60 db. points a 4.2 Kc. bandwidth, as already indicated by the filter curve.

COMMENT

There are many different approaches or circuits available to achieve similar results or better ones. Finer points will be changed and more refinements added as time goes on, because re-sale value has not to be considered. This Amateur engineering project taught the writer many interesting and useful details about electronics. With a small financial outlay, a considerable amount of time—reserved for a home study hobby—and with mainly those parts collected over the years, a fine piece of equipment was completed.

[8] W3HTF, "QST," December 1965.
[9] "Amateur Radio," December 1966.

THE 122—SSB AND POWER SUPPLIES

R. D. CHAMPNESS, VK3UG*

Many Amateurs probably have an old trusty 122 gathering dust in the corner of the shack. This set, built during the Second World War, before s.s.b. became really known, and hence isn't a dream to use in an s.s.b. net, as probably many may have found out. Many of the shortcomings of this set in this regard can, however, be minimised and I find my set now is quite pleasant to operate with s.s.b. stations as well as a.m. stations.

Many articles on 122s have been published in "A.R." over the years and reference to these is most enlightening. I have done the various modifications as seen fit and did a few of my own. An increase of power never goes amiss and with the power supply described in May 1967 issue of "A.R." I was able to increase a.m. input from 12 watts to 28 watts on 240 volts. This supply works well and I have included in this article a modified version of the l.t. section which I find very effective and with replacement of the 120 ohm and 180 ohm resistors in the AC128 base supply with a potentiometer of 500 ohms, the voltage can be varied between about 5 volts and 15 volts at up to 2 amps. A simple effective supply with low ripple and fairly good regulation. For use in the 122, the l.t. d.c. supply should put out 12.5 volts.

Having solved the power supply problem, the in-built problems of the 122 had to be solved. The b.f.o. control, as any operator of a 122 knows, is a horrible concoction. This was replaced with a single moving plate condenser connected to the grid of the b.f.o. valve. Operation is now very smooth and only a slight touch up of the b.f.o. slug is necessary. The leads which went to the rheostat are taped out of the way.

The tuning of the 122 is pretty direct, so a 5:1 reduction drive was fitted and now it tunes like one of the latest s.s.b. rigs.

For some aerials there is not enough capacity switched in by the aerial selector switch, so in B position I wired another 140 pF., and in C I added another 100 pF., and it is now much easier to load on some aerials.

* 24 O'Dowds Rd., Warragul, 3820.

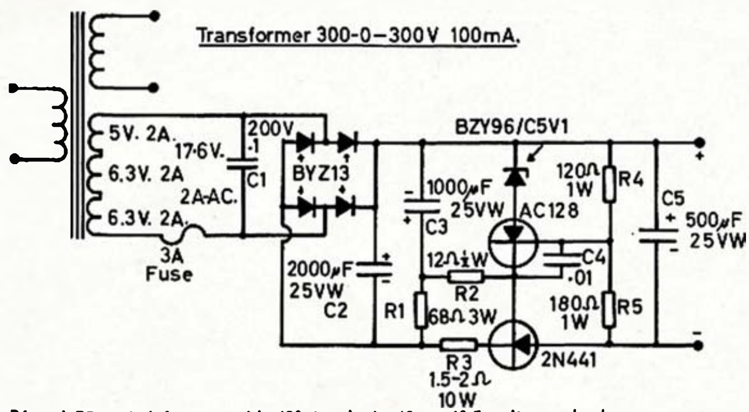
To do this mod. involves removing the r.f. transformer and then the switch assembly, fitting wires to the various switch lugs and in my case extending them to a tag strip on the side of the r.f. transformer so that any additional capacity wired in can be easily altered to suit the aerial.

Now having completed all that, the nastiest problem of them all had to be solved—that of getting accurate netting. The 122 has an in-built arrangement which switches in a compensating trimmer to correct any difference in frequency caused by the difference in operating conditions of the v.f.o. in net and transmit conditions. The h.t. is about 50 or so on net and about 250 on transmit. Unfortunately, in my case, the compensating capacitors C31A and C31B, even at minimum capacity, were too large and I had to cut them out of circuit. I changed the value of the 6U7G screen resistor and with no compensation I can net to within about 200 cycles. Not as close as I would like, but not too bad. The screen resistor in my case was increased to 47K ohms.

Having completed these modifications, I find the set quite good in its performance, considering what it is and the standards demanded these days. The only defect still left is the very broad i.f. response, which on mine means strong stations spread over about 17 Kc. I am attempting to obtain a 4 kc. filter for the i.f. which could give the old girl even longer life yet.

There is a certain amount of frequency shift with modulation and some s.s.b. transmitters are not free of this either, but the amount is not excessive. C.w. on 40 does, however, get reports of chirp, but even so, it isn't the worst c.w. signal on the band.

If you're not overloaded with the chips and have a 122, well why not join the s.s.b. boys with an a.c.-ised and s.s.b.-ised version?



R4 and R5 varied for use with 122 to obtain 12 to 12.5 volts on load.
Replace R4 and R5 with a 500 ohm potentiometer for variable voltage.
BYZ13s need 1½ inch sq. heat sink each. 2N441 a Ferris 7000 heat sink. AC128 a flag type heat sink.

Trade Review

H.M.V. "KIMBERLEY"

This review is the result of a suggestion received from one of our readers. The "Kimberley" is a transistor portable receiver and the fact that it covers from 525 Kc. to 30 Mc. decided us to approach E.M.I. (Australia) Ltd. and request that a unit be made available for our evaluation. This they did, and also supplied a service manual and other literature. Our findings are based on intermittent use over a fortnight.

The receiver as received by us was in original factory packing, the outer container being a strong fibre-board carton, the unit itself being sealed in a polythene envelope. The carton also contained about 20 feet of wire complete with plug for use as an external aerial, and about 4 feet of wire for earthing purposes. A guarantee and instruction book were also included.

An earpiece was in a leather pouch strapped to the carrying handle of the receiver.

The overall dimensions of the receiver are 12" long, 7" high and 3¼" deep. Front panel controls are dial light switch, tone, earpiece socket, fine tuning control and band switch. A combined on/off switch and volume control are on the left hand end while the main tuning knob is on the right hand end. The sloping top panel accommodates dials for the broadcast band with Australian stations all marked and a frequency scale.

A separate dial covers the three high frequency bands calibrated in megacycles with 500 Kc. points marked. A separate logging scale is incorporated and the various bands in which small ships and Flying Doctor services can be found are colour coded.

The telescopic aerial projects through the right hand end of the top panel. The general appearance of charcoal grey plastic with aluminium tril is extremely attractive.

Removal of the back panel reveals a 7" x 4" oval speaker, a most impressive bandswitch assembly and a 6" x 2" printed circuit board holding the i.f. and audio sections. A good sized battery (Eveready type 276-P) supplies the necessary 9 volts. The tuning mechanism is cord driven, the cord also driving the pointers for the dials. A circuit diagram and layout sketch is attached to the inside of the back panel.

On our unit, both pointers were approximately 1/8" away from the zero point on the dials, and checking b.c. stations showed the error to be present over the whole dial. Checking the s.w. bands against a 500 Kc. crystal oscillator showed the same error to be present, indicating the driving drum to be incorrectly located on the tuning capacitor. The service manual does not give any information on this adjustment, so we left it as it was found.

The frequency ranges are:

525 to 1620 Kc.
1.6 to 4.8 Mc.
4.6 to 14.0 Mc.
14.0 to 30.0 Mc.

The intermediate frequency is the normal 455 kc. Battery drain at zero audio output was found to be 12 mA., well within the manufacturer's specification. The audio output is quoted at 500 mW. approximately, and although not checked, we found it adequate for normal listening.

Nine transistors and two diodes are used as follows: BF115 r.f. amp., 2N3646 osc., SE1010 mixer, AX1202 1st i.f., BF185 2nd i.f., AY1110 a.f. amp., SE6002 audio driver, AC187 AC188 matched pair audio output, OA90 audio detector and an AB1101 a.g.c. detector.

The service manual suggests that sensitivity and distortion tests be made by listening, and this was the method we adopted. Performance on the broadcast band was more than adequate, in fact staggering in the evenings, many country and interstate stations being heard at comfortable level using the in-built loopstick as the only aerial. Using the telescopic aerial, a quick run was made over the Amateur bands. 160 metre portables 80 miles away were copied without trouble. Interstate stations on 80 and 40 metres were readable with the gain turned well up. A large amount of illegal 27 Mc. activity was monitored at good strength, but as these types do not make their locations public knowledge, they were of little help in our tests. No outpost services (i.e. Flying Doctor, etc.) were heard, but considering their low power and locations this was not surprising. Overseas commercials were easy copy.

Further tests were run, using a 50 ft. length of wire for an aerial. As a comparison the station receiver (an American communications job) was also fitted with a long wire. Anything audible on the station receiver was also audible on the "Kimberley", but the problem was to resolve the sideband stations. This was overcome by using the transmitter v.f.o. to supply a carrier, not ideal but effective. As was expected, the bandpass of the i.f. strip is too broad to separate the stations in the Amateur bands, but even so a large number could be copied. The fine tuning (a 1-3 pF. capacitor across the oscillator) was essential to resolve the sideband. Without an r.f. control, some overloading was noticed on s.s.b. signals, and it was necessary to reduce the coupling to the aerial.

Purely from curiosity, the "Kimberley" was operated alongside two imported receivers of similar specifications, but lacking the tuned r.f. stage. The r.f. stage really showed its worth, many stations being copied which were barely audible on the receivers lacking this facility.

In summing up, we give high marks for appearance and finish, the use of a speaker of reasonable size, and a battery of large capacity. For the purposes for which the receiver was designed the performance is first class. The instruction book is well written in language "the man in the street" can understand, and includes a list of Australian broadcasting stations, domestic shortwave services and a list of times and frequencies of overseas stations transmitting programmes in English to Oceania. The guarantee is usual for this type of equipment.

Years of experience with all geared tuning mechanisms and slow motion vernier dials, has left us with a jaundiced view of cord-driven systems. While no doubt adequate for the broadcast band, they leave a lot to be desired on the higher frequencies. Undoubtedly the designer had similar ideas, and added the fine tuning facility. It was money well spent.

If any low marks are to be awarded, they go to the fact that tuning and volume control knobs have to be removed before the back cover can be taken off, but this is a minor point.

The "Kimberley" is not a communications receiver, and no claims are made in that direction. It does what it was designed to do and does it well. W.I.C.E.N. operators wishing to monitor fire-fighting frequencies and S.w.l's in particular will be interested in this receiver. A small outboard b.f.o. is easily and cheaply constructed, and with the projected change to s.s.b. by Flying Doctor and maritime services to commence in 1970, to say nothing of the vast number of Amateur stations using this mode of transmission, such an accessory is highly desirable.

We suggest that anybody contemplating the purchase of a portable receiver would be well advised to have a look at the "Kimberley". It retails at $96.

SILENT KEYS

It is with deep regret that we record the passing of the following Amateurs:

VK2DE—Phil Renshaw.
VK5QT (ex VK2BM)—
H. F. (Fred) Treharne.
VK2 Associate—
W. H. (Bill) Clark, Ll.B.

NEW STANDARDS FOR B.C. STATIONS

The Australian Broadcasting Control Board has determined new standards for the technical equipment and operation of medium frequency broadcasting stations.

Mr. Myles Wright, Chairman of the Board, said that the new standards have been framed in the light of technical developments in the broadcasting field and experience in the application of the original standards.

Mr. Wright added that prior to determining the new standards, the Board took into consideration comments on the draft of the standards invited from a wide range of interested parties in the broadcasting industry—both Government and commercial sections. The draft had been the subject of favourable comment from many quarters.

The new standards are considerably more comprehensive than the previous standards and particular attention has been given to their form of presentation and layout with a view to simplifying reference to them in day to day operations. The outstanding feature of the new standards is the greater detail in which requirements in respect of equipment performance and operation are treated, including the addition of new material concerning methods to be observed in setting up equipment for the conduct of performance measurements as well as explanatory notes relevant to the actual measurement of equipment performance. The Board believes that the new standards represent a valuable contribution towards the further improvement of the technical quality of the medium frequency broadcasting service.

The standards have been issued to broadcasting stations and other sections of the industry directly concerned with them.

AUSTRALIAN DX CENTURY CLUB AWARD

OBJECTS

1.1 This Award was created in order to stimulate interest in working DX in Australia and to give successful applicants some tangible recognition of their achievements.

1.2 This Award, to be known as the "DX Century Club" Award, will be issued to any Australian Amateur who satisfies the following conditions.

1.3 A certificate of the Award will be issued to the applicants who show proof of having contacted one hundred countries, and will be endorsed as necessary, for contacts made using only one type of emission.

REQUIREMENTS

2.1 Verifications are required from one hundred different countries as shown in the Official Countries List.

2.2 The Official Countries List will be published annually in "Amateur Radio" and will be amended from time to time as required. Should a country be deleted from the Countries List at any time, members and intending members will be credited with such country if the date of contact was before such deletion.

2.3 The commencing date for the Award is 1st January 1946. All contacts made on or after this date may be included.

OPERATION

3.1 Contacts must be made in the H.F. Band (Band 7) which extends from 3 to 30 Mc., but such contacts must only be made in the authorised Amateur Bands in Band 7.

3.2 All contacts must be two-way contacts on the same band. Cross band contacts will not be allowed.

3.3 Contacts may be made using any authorised type of emission for the band concerned.

3.4 Credit may only be claimed for contacts with stations using regularly-assigned Government call signs for the country concerned.

3.5 Contacts made with ship or aircraft stations will not be allowed, but land-mobile stations may be claimed provided their specific location at the time of contact is clearly shown on the verification.

3.6 All stations must be contacted from the same call area by the applicant, although if the call sign is subsequently changed, contacts will be allowed under the new call sign providing the applicant is still in the same call area.

3.7 All contacts must be made when operating in accordance with the Regulations laid down in the "Handbook for the Guidance of Operators of Amateur Wireless Stations" or its successor.

VERIFICATIONS

4.1 It will be necessary for the applicant to produce verifications in the form of QSL cards or other written evidence showing that two-way contacts have taken place.

4.2 Each verification submitted must be exactly as received from the station contacted, and altered or forged verifications will be grounds for disqualification of the applicant.

4.3 Each verification submitted must show the date and time of contact, type of emission and frequency band used, the report and the location or address of the station at the time of contact.

4.4 A check list must accompany every application setting out the details for each claimed station in accordance with the details required in Rule 4.3.

APPLICATIONS

5.1 Applications for membership shall be addressed to the Federal Awards Manager, Box 2611W, G.P.O., Melbourne, Vic., 3001, accompanied by the verifications and the check list with sufficient postage enclosed for their return to the applicant, registration being included if desired.

5.2 A nominal charge of 25c, which shall also be forwarded with the application, will be made for the issue of the certificate to successful applicants who are non-members of the Wireless Institute of Australia.

5.3 Successful applicants will be listed periodically in "Amateur Radio". Members of the D.X.C.C. wishing to have their verified country totals, over and above the one hundred necessary for membership, listed will notify these totals to the Federal Awards Manager.

5.4 In all cases of dispute, the decision of the Federal Awards Manager and two officers of the Federal Executive of the W.I.A. in the interpretation and application of these Rules shall be final and binding.

5.5 Notwithstanding anything to the contrary in these Rules, the Federal Council of the W.I.A. reserves the right to amend them when necessary.

AUSTRALIAN V.H.F. CENTURY CLUB AWARD

OBJECTS

1.1 This Award has been created in order to stimulate interest in the V.H.F. bands in Australia, and to give successful applicants some tangible recognition of their achievements.

1.2 This Award, to be known as the "V.H.F. Century Club" Award, will be issued to any Australian Amateur who satisfies the following conditions.

1.3 Certificates of the Award will be issued to the applicants who show proof of having made one hundred contacts on the V.H.F. bands, and will be endorsed as necessary, for contacts made using only one type of emission.

REQUIREMENTS

2.1 Contacts must be made in the V.H.F. Band (Band 8) which extends from 30 to 300 Mc., but such contacts must only be made in the authorised Amateur Bands in Band 8.

2.2 In the case of the authorised bands between 30 and 100 Mc., verifications are required from one hundred different stations at least seventy of which must be Australian. The Amateur Bands 50 to 54 Mc. and 56 to 60 Mc. will be counted as one band for the purposes of the Award.

2.3 In the case of the authorised Amateur Band between 100 to 200 Mc. and any authorised band between 200 to 300 Mc., verifications from one hundred different stations for each band is required.

2.4 It is possible under these rules for one applicant to receive three certificates, one for each of the authorised Amateur Bands nominated in Rules 2.2 and 2.3.

2.5 The commencing date for the Award is 1st June, 1948. All contacts made on or after this date may be included.

OPERATION

3.1 All contacts must be two-way contacts on the same band, and cross band contacts will not be allowed.

3.2 Contacts may be made using any authorised type of emission for the band concerned.

3.3 Fixed stations may contact portable/mobile stations and vice versa, but portable/mobile station applicants must make their contacts from within the same call area.

3.4 Applicants, when operating either portable/mobile or fixed, may contact the same station licensee, but may not include both contacts for the same type of endorsement.

3.5 Applicants may only count one contact for a station worked as a limited licensee with a Z call sign who is subsequently contacted as a full A.O.C.P. holder.

3.6 All stations must be contacted from the same call area by the applicant, although if the applicant's call sign is subsequently changed, contacts will be allowed under the new call sign providing the applicant is still in the same call area.

3.7 All contacts must be made when operating in accordance with the Regulations laid down in the "Handbook for the Guidance of Operators of Amateur Wireless Stations" or its successor.

VERIFICATIONS

4.1 It will be necessary for the applicant to produce verifications in the form of QSL cards or other written evidence showing that two-way contacts have taken place.

4.2 Each verification submitted must be exactly as received from the station contacted, and altered or forged verifications will be grounds for disqualification of the applicant.

4.3 Each verification submitted must show the date and time of contact, type of emission and frequency band used, the report and the location or address of the station at the time of contact.

4.4 A check list must accompany every application setting out the following details:—

4.4.1 Applicant's name and call sign, and whether a member of the W.I.A. or not.

4.4.2 Band for which application is made, and whether special endorsement is involved.

4.4.3 Where applicable, the date of change of call sign and previous call sign.

4.4.4 Details of each contact as required by Rule 4.3.

4.4.5 The applicant's location at the time of each contact if portable/mobile operation is involved.

4.4.6 Any relevant details of any contact about which some doubt might exist.

APPLICATIONS

5.1 Applications for membership shall be addressed to the Federal Awards Manager, Box 2611W, G.P.O., Melbourne, Vic., 3001, accompanied by the verifications and the check list with sufficient postage enclosed for their return to the applicant, registration being included if desired.

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5.5 Notwithstanding anything to the contrary in these Rules, the Federal Council of the W.I.A. reserves the right to amend them when necessary.

AUSTRALIAN D.X.C.C. COUNTRIES LIST

	Phone	C.W.
AC3—Sikkim		
AC4—Tibet		
AC5—Bhutan		
AP—East Pakistan		
AP—West Pakistan		
BV—Formosa		
BY—China		
CE—Chile		
CE9AA-AM, FB8Y, KC4AA-US, LA, LU-Z, OR4, UA1, VK0, VP8, ZL5, 8J—Antarctica		
CE0A—Easter Is.		
CE0X—San Felix		
CE0Z—Juan Fernandez		
CM, CO—Cuba		
CN2, 8, 9—Morocco		
CP—Bolivia		
CR3, 5—Portuguese Guinea		
CR4—Cape Verde Is.		
CR5—Principe, Sao Thome		
CR6—Angola		
CR7—Mozambique		
CR8, 10—Portuguese Timor		
CR9—Macao		
CT1—Portugal		
CT2—Azores		
CT3—Madeira Is.		
CX—Uruguay		
DJ, DK, DL, DM—Germany		
DU—Philippine Is.		
EA—Spain		
EA6—Balearic Is.		
EA8—Canary Is.		
EA9—Ifni		
EA9—Rio de Oro		
EA9—Spanish Morocco		
EA0—Spanish Guinea		
EI—Rep. of Ireland		
EL—Liberia		
EP—Iran		
ET3—Ethiopia		
F—France		
FB8W—Crozet Is.		
FB8X—Kerguelen Is.		
FB8Z—Amsterdam & St. Paul Is.		
FC—Corsica		
FG7—Guadeloupe		
FH8, FB8—Comoro Is.		
FK8—New Caledonia		
FL8—French Somaliland		
FM7—Martinique		
FO8—Clipperton Is.		
FO8—French Oceania		
FO8M—Maria Theresa		
FP8—St. Pierre and Miquelon Is.		
FR7—Glorioso Is. (from 25/6/60)		
FR7—Juan de Nova (from 25/6/60)		
FR7—Reunion Is.		
FR7—Tromelin		
FS7—Saint Martin		

	Phone	C.W.
FW8—Wallis and Futuna Is.		
FY7—French Guiana and Inini		
G, GB—England		
GC—Guernsey and Deps.		
GC—Jersey Is.		
GD—Isle of Man		
GI—Northern Ireland		
GM—Scotland		
GW—Wales		
HA, HG—Hungary		
HB—Switzerland		
HB0, HE—Liechtenstein		
HC—Ecuador		
HC8—Galapagos Is.		
HH—Haiti		
HI—Dominican Rep.		
HK—Columbia		
HK0—Bajo Nuevo		
HK0—Malpelo Is.		
HK0—San Andres & Providencia		
HL, HM—Korea		
HP—Panama		
HR—Honduras		
HS—Thailand		
HV—Vatican		
HZ, 7Z—Saudi Arabia		
I, IT—Italy		
IS1—Sardinia		
JA, JH, KA—Japan		
JT—Mongolia		
JY—Jordan		
K, KN, W, WA, WB, WC, WN—United States of America		
KB6—Baker, Howland and American Phoenix Is.		
KC4—Navassa Is.		
KC6—Eastern Caroline Is.		
KC6—Western Caroline Is.		
KG4—Guantanamo Bay		
KG6—Guam		
KG6I, KA1—Bonin & Volcano Is.		
KG6I, KA1—Marcus Is.		
KG6R, S, T—Mariana Is.		
KH6, WH6—Hawaiian Is.		
KH6—Kure Is.		
KJ6—Johnston Is.		
KL7, WL7—Alaska		
KM6—Midway Is.		
KP4, WP4—Puerto Rico		
KP6—Palmyra Group, Jarvis Is.		
KR6, 8—Ryuku Is.		
KS4—Swan Is.		
KS4B, HK0—Serrana Bank and Roncador Cay		
KS6—American Samoa		
KV4, WV4—Virgin Is.		
KW6—Wake Is.		
KX6—Marshall Is.		
KZ5—Canal Zone		
LA—Norway		

	Phone	C.W.
LA-G, 3Y—Bouvet Is.		
LA-P, JW—Svalbard		
LA-P, JX—Jan Mayen		
LU—Argentina		
LX—Luxembourg		
LZ—Bulgaria		
MP4B—Bahrein		
MP4D, T—Trucial Oman		
MP4M, VS9O—Sultinate of Muscat and Oman		
MP4Q—Qatar		
OA—Peru		
OD5—Lebanon		
OE—Austria		
OH, OF—Finland		
OH0—Aland Is.		
OK, OM—Czechoslovakia		
ON—Belgium		
OX, KG1, XP—Greenland		
OY—Faroe Is.		
OZ—Denmark		
PA, PE, PI—Netherlands		
PJ—Netherlands Antilles		
PJ—Sint Maarten		
PX—Andorra		
PY—Brazil		
PY0—Fernando de Noronha		
PY0—St. Peter and St. Paul's Rocks		
PY0—Trinidade and Martim Vaz Is.		
PZ1—Surinam		
SK, SL, SM—Sweden		
SP—Poland		
ST2—Sudan		
SU—Egypt		
SV—Crete		
SV—Dodecanese		
SV—Greece		
TA—Turkey		
TF—Iceland		
TG—Guatemala		
TI—Costa Rica		
TI9—Cocos Is.		
TJ, FE8—Cameroun		
TL—Central African Rep. (from 13/8/60)		
TN—Congo Rep. (from 15/8/60)		
TR—Gabon Rep. (from 17/8/60)		
TT—Chad Rep. (from 11/8/60)		
TU—Ivory Coast (from 7/8/60)		
TY—Dahomey Rep. (from 1/8/60)		
TZ—Mali Rep. (from 20/6/60)		
UA, UV, UW1-6, UN1—European Russian S.F.S.R.		
UA, UV, UW9, 0—Asiatic R.S.F.S.R.		
UA1—Franz Josef Land		
UA2—Kaliningradsk		
UB5, UT5, UY5—Ukraine		
UC2—White Russian S.S.R.		
UD6—Azerbaijan		
UF6—Georgia		
UG6—Armenia		
UI8—Uzbek		
UJ8—Tadzhik		
UL7—Kazakh		

	Phone	C.W.
UM8—Kirghiz		
UO5—Moldavia		
UP2—Lithuania		
UQ2—Latvia		
UR2—Estonia		
VE, VO, 3B, 3C—Canada		
VK—Australia		
VK2—Lord Howe Is.		
VK4—Willis Is.		
VK9, ZC3—Christmas Is.		
VK9—Cocos Is.		
VK9—Nauru Is.		
VK9—Norfolk Is.		
VK9—Papua Territory		
VK9—Territory of New Guinea		
VK0—Heard Is.		
VK0—Macquarie Is.		
VP1—British Honduras		
VP2A—Antigua, Barbuda		
VP2D—Dominica		
VP2G—Grenada and Deps.		
VP2K—Anguilla		
VP2K—St. Kitts, Nevis		
VP2L—St. Lucia		
VP2M—Montserrat		
VP2S—St. Vincent and Deps.		
VP2V—British Virgin Is.		
VP5—Turks and Caicos Is.		
VP6, 8P—Barbados		
VP7—Bahama Is.		
VP8—Falkland Is.		
VP8, LU-Z—South Georgia Is.		
VP8, LU-Z—South Orkney Is.		
VP8, LU-Z—South Sandwich Is.		
VP8, LU-Z, CE9AN-Z—South Shetland Is.		
VP9—Bermuda Is.		
VQ1—Zanzibar		
VQ8—Agalega and St. Brandon		
VQ8—Mauritius		
VQ8—Rodriguez		
VQ9—Aldabra		
VQ9—Chagos Is., Nelson's Is.		
VQ9—Desroches		
VQ9—Farquahar		
VQ9—Seychelles		
VR1—British Phoenix Is.		
VR1—Gilbert & Ellice Is., Ocean Is.		
VR2—Fiji Is.		
VR3—Fanning and Christmas Is.		
VR4—Solomon Is.		
VR5—Tonga Is.		
VR6—Pitcairn Is.		
VS5—Brunei		
VS6—Hong Kong		
VS9A, P, S—Aden and Socotra		
VS9K—Kamaran Is.		
VS9M—Maldive Is.		
VU—India		
VU4—Laccadive Is.		
VU5—Andaman and Nicobar Is.		
XE, XF, 4A—Mexico		
XF4—Revilla Gigedo		
XT—Voltaic Rep. (from 6/8/60)		

	Phone	C.W.
XU—Cambodia		
XW8—Laos		
XZ2—Burma		
YA—Afghanistan		
YI—Iraq		
YJ, FU8—New Hebrides		
YK—Syria		
YN, YN0—Nicaragua		
YO—Rumania		
YS—Salvador		
YU—Yugoslavia		
YV—Venezuela		
YV0—Aves Is.		
ZA—Albania		
ZB2—Gibraltar		
ZD3—The Gambia		
ZD5, ZS7—Swaziland		
ZD7—St. Helena		
ZD8—Ascension Is.		
ZD9—Tristan da Cunha & Gough Is.		
ZE—Rhodesia		
ZF1, VP5—Cayman Is.		
ZK1—Cook Is.		
ZK1—Manahiki Is.		
ZK2—Niue		
ZL—Auckland and Campbell Is.		
ZL—Chatham Is.		
ZL—Kermadec Is.		
ZL—New Zealand		
ZM7—Tokelaus		
ZP—Paraguay		
ZS1-6—South Africa		
ZS2—Prince Edward & Marion Is.		
ZS3—South-West Africa		
ZS8, 7P8—Lesotho		
ZS9, A2—Botswana		
1M—Minerva Reefs		
1S—Spratly Is.		
3A—Monaco		
3V8—Tunisia		
3W8, XV5—Vietnam		
3X, 7G—Rep. of Guinea		
4S7—Ceylon		
4U—I.T.U. Headquarters Geneva		
4W—Yemen		
4X, 4Z—Israel		
5A—Libya		
5B4, ZC4—Cyprus		
5H3, VQ3—Tanganyika		
5N2, ZD2—Nigeria		
5R8, FB8—Malagasy Rep.		
5T—Mauritania (from 20/6/60)		
5U7—Niger Rep. (from 3/8/60)		
5V—Togo Rep.		
5W1, ZM6—Samoa		
5X5, VQ5—Uganda		
5Z4, VQ4—Kenya		
6O1, 2, 6—Somali Rep.		
6W8, FF8—Senegal Rep. (from 20/6/60)		
6Y5, VP5—Jamaica		
7Q7, ZD6—Malawi		
7X, FA—Algeria		

	Phone	C.W.
8F, PK, YB—Indonesia (fr. 1/5/63)		
8R, VP3—Guyana		
8Z4—Saudi Arabia/Iraq Neut. Zone		
9A1, M1—Rep. of San Marino		
9G1, ZD4—Ghana (from 5/3/57)		
9H1, ZB1—Malta		
9J, VQ2—Zambia		
9K2—Kuwait		
9K3, 8Z4—Kuwait/Saudi Arabia Neut. Zone		
9L1, ZD1—Sierra Leone		
9M2, 4—West Malaysia (fr. 16/9/63)		
9M6, 8—East Malaysia (fr. 16/9/63)		
9N1—Nepal		
9Q5, OQ5, 0—Rep. of the Congo		
9U5—Burundi (from 1/7/62)		
9V1, VS1, 9M4—Singapore (prior to 16/9/63 or after 8/8/65 only. From 16/9/63 to 8/8/65 Singapore counts as 9M2—West Malaysia)		
9X5—Rwanda (from 1/7/62)		
9Y4, VP4—Trinidad and Tobago		
*—Blenheim Reef		
*—Geyser Reef		

* Since there is no apparent claim by any country to these reefs, no prefix will be shown. Confirmations for contact only after 4th May, 1967, will be accepted for D.X.C.C. credit.

DELETED COUNTRIES LIST

	Phone	C.W.
C9—Manchuria (prior 16/9/63)		
CN2—Tangier (prior 1/7/60)		
CR8—Damao, Diu (prior 1/1/62)		
CR8—Goa (prior 1/1/62)		
ET2—Eritrea (prior 15/11/62)		
FF8—Fr. West Africa (pr. 7/8/60)		
FI8—Fr. Indo China (pr. 21/12/50)		
FN—Fr. India (prior 1/11/54)		
FQ8—Fr. Eq. Africa (prior 17/8/60)		
I1—Trieste (prior 1/4/57)		
I5—It. Somaliland (prior 1/7/60)		
PK1, 2, 3—Java (prior 1/5/63)		
PK4—Sumatra (prior 1/5/63)		
PK5—Neth. Borneo (prior 1/5/63)		
PK6—Celebes & Molucca Is. (prior 1/5/63)		
UN1—Karelo Fin. Rep. (pr. 1/7/60)		
VO—Newfoundland (prior 1/4/49)		
VQ6—Brit. Somaliland (pr. 1/7/60)		
VS4—Sarawak (prior 16/9/63)		
VS9H—Kuria Muria Is. (prior 29/11/67)		
ZC5—Br. Nth. Borneo (pr. 16/9/63)		
ZC6—Palestine (prior 2/7/68)		
ZD4—Gold Coast, Togoland (prior 6/3/57)		
9M2—Malaya (prior 16/9/63)		
9S4—Saar (prior 1/4/57)		
9U5—Ruanda-Urundi (between 1/7/60 and 1/7/62 only)		

JOHN MOYLE MEMORIAL NATIONAL FIELD DAY CONTEST, 1969

SATURDAY, 1st FEBRUARY, 1969, TO SUNDAY, 2nd FEBRUARY, 1969

The Federal Contest Committee of the Wireless Institute of Australia invites all Australian Amateur and Short Wave Listeners to participate in this Annual Contest, which is held to perpetuate the memory of John Moyle, whose efforts advanced the Amateur Radio Service.

There are two divisions of this Contest, one of 24 hours continuous duration, and one of 6 hours continuous duration. The six-hour period has been included to encourage the operator who is unable to participate for the full 24-hour period.

Operators using 25 watts or less input to the final stage will be considered for a certificate where his activity warrants its issue.

DATE

From 0600 GMT, 1st February, 1969, to 0800 GMT, 2nd February, 1969.

OBJECTS

The operators of Portable and Mobile Stations within all VK Call Areas will endeavour to contact other Portable/Mobile and Fixed Stations in Australia and Overseas Call Areas.

RULES

1. There are two divisions, one of six (6) hours, and one of twenty-four (24) hours duration. The six-hour period for operating may be chosen from any time during the Contest. but the six-hour period so chosen **must** be **continuous.** In each division, there are six sections:—

   (a) Portable/Mobile Transmitting, Phone.
   (b) Portable/Mobile Transmitting, C.w.
   (c) Portable/Mobile Transmitting, Open.
   (d) Portable/Mobile Transmitting, Multiple Operation, open only.
   (e) Fixed Transmitting Stations working Portable/Mobile Stations, open only.
   (f) Reception of Portable/Mobile Stations.

2. All Australian Amateurs are encouraged to take part. Operators will be limited to their licensed power. This power shall be derived from a self-contained and fully portable source.

(a) Portable/Mobile Stations shall not be situated in any occupied dwelling or building. Portable/Mobile Stations may be moved from place to place during the Contest.

No apparatus shall be set up on the site earlier than 24 hours prior to the Contest.

All Amateur bands may be used, but no cross band operating is permitted. Cross mode operation is permitted.

Entrants in Section (d) for Multiple Operator Stations can set up separate transmitters to work on different bands at the same time. All such units of a Multiple Operator Station must be located within an area that can be encompassed by a circle not greater than half a mile diameter.

For each transmitter of a Multiple Operator Station a separate log shall be kept with serial numbers starting from 001, and increasing by one for each successive contact. All logs of a Multiple Operator Station shall be submitted by the operator under whose Call Sign the transmitters are working. No two transmitters of a Multiple Operator Station are permitted to operate on the same band at any time.

3. Amateurs may enter for any section.

4. One contact per station for phone to phone, also one for c.w. to c.w. per band is permitted. Cross mode operation will be accepted for scoring.

5. Entrants must operate within the terms of their licences and in particular observe the regulations with regards to portable operation.

6. Serial numbers consisting of RS or RST report plus three figures commencing with 001 and increasing by one for each successive contact shall be exchanged.

7. **Scoring—**

(a) **Portable/Mobile Stations:**

For contacts with Portable/Mobile Stations outside entrant's Call Area .... **15 points**

For contacts with Portable/Mobile Stations within entrant's Call Area .... **10 points**

For contacts with Fixed Stations outside the entrant's Call Area .... **5 points**

For contacts with Fixed Stations within the entrant's Call Area .... **2 points**

(b) **Fixed Stations:**

For contacts with Portable/Mobile Statons outside entrant's Call Area .... **15 points**

For contacts with Portable/Mobile Stations within entrant's Call Area .... **10 points**

8. The following shall constitute Call Areas: VK1, VK2, VK3, VK4, VK5, VK6, VK7, VK8, VK9 and VK0.

9. All logs shall be set out under the following headings: Date/Time (G.M.T.), Band, Emission, Call Sign, RST/No. Sent, RST/No. Received, Points Claimed. Contacts must be listed in numerical order.

In addition, there shall be a front sheet showing the following information:—

Name.......................... Address........................

Call Sign.................. Section........................

Division.................... (6-hour or 24-hour)

Points Claimed..

Call Sign of other op./s (if any)...........

Location of Portable/Mobile Station.....

From................. hours to.................. hours

A brief description of equipment used, and points claimed, followed by the declaration:

"I hereby certify that I have operated in accordance with the rules and spirit of the Contest."

Signed.................. Date.................

10. The right is reserved to disqualify any entrant who, during the Contest, has not observed the Regulations and the Rules of this Contest, or who has consistently departed from the accepted code of operating ethics.

11. The decision of the Federal Contest Manager of the Wireless Institute of Australia is final and no disputes will be entered into.

12. Certificates will be awarded to the highest scorer of each section of each division. Additional certificates may be issued at the discretion of the F.C.C. The six-hour certificates cannot be won by a 24-hour entrant.

13. **Return of Logs:**

All entries must be postmarked not later than **28th February, 1969**, and be clearly marked "John Moyle Memorial National Field Day Contest, 1969," and addressed to:—

Federal Contest Manager, W.I.A.,
Box N1002, G.P.O.,
Perth, W.A., 6001.

RECEIVING SECTION

14. This section is open to all Short Wave Listeners in VK Call Areas. The Rules shall be the same as for the Transmitting Stations, but may omit the serial numbers received.

Logs must show the Call Sign of the Station heard, the serial number sent by it, and the Call Sign of the Station being worked.

Scoring will be on the same basis as for Transmitting Stations. It will not be sufficient to log a station calling CQ. A station may be logged once only for phone and once for c.w. in each band.

Awards: Certificates will be awarded for the highest scorer in each Call Area.

Detecting V.h.f. Signals too Weak to be Heard*

PRACTICAL EQUIPMENT FOR MOONBOUNCE AND OTHER HIGH-LOSS PATHS

ALAN PARRISH, K1KKP

GIVEN the Amateur power limit, there are two principal ways of overcoming the path loss on very marginal v.h.f. circuits. The more common of these is the use of large-aperture high-gain antennae. The second is to take advantage of unorthodox receiver designs, to obtain an effective bandwidth below the approximate limit of 100 cycles set by limitations on the human hearing mechanism and practical considerations of stability. From time to time mention is made in some Amateur journals of clever designs that claim to do this, usually under the name of "synchronous detection". The seemingly amazing claim is made that an effective bandwidth is achieved that is much smaller than the actual bandwidth of the receiver i.f., which normally determines the system stability requirements.

● Working with signals that are inaudible with normal v.h.f. receiving techniques has been a matter of long-time interest to the author of this article. In the hope of clarifying the somewhat vague information that has been available to Amateurs in the v.h.f. field, he presents details of a practical system capable of resolving signals at least 15 db. below the minimum that is detectable by aural methods.

Such claims are not unfounded, nor is the principle of the system new. It has been employed in various scientific measuring instruments for some time. Here we will show how this principle is applied to a practical receiver that has been used to obtain moon echoes on 144 Mc. at K1KKP, using nothing more in the way of an antenna than two 10 element Yagis on 12-foot booms.

Many systems for detecting small signals in the presence of noise follow a development by R. Dicke in 1946.[1] This is based on comparing the total power (signal plus noise) in a narrow band containing the signal, with the noise power in the same band shifted so that the signal is not in it. In a superhet receiver this is done conveniently by shifting the local oscillator back and forth a few kilocycles. The comparison is made in a "synchronous" or phase-sensitive detector, following the envelope detector in the receiver. This amounts to nothing more than a reversing switch, operated periodically along with the frequency-shifting mechanism. A generalised representation of this system is shown in Fig. 1. Further discussion of the principles can be found in H. D. Olson's article in December, 1965, "QST".[2] An advantage of this approach is that it eliminates, on the average, any variations in the noise level, such as transients and variations in receiver gain.

The block diagram of a synchronous v.h.f. receiver is shown in Fig. 2. Here the frequency shifting is shown applied to the oscillator of a crystal controlled converter, although it can be done equally well at the main receiver oscillator. If it is done at the converter, the system can use a standard communications receiver, without modification, for most of the r.f. circuitry. This means that only the outboard equipment, shown in Fig. 3, need be built to make a synchronous receiver. In my case, this was largely built of junk box parts, and it could be transistorised easily.

PRACTICAL CIRCUIT DETAILS

There are a few special precautions that must be taken in construction, or in any re-design. At the top of the list is the need to keep any signal that is common to the reference and signal circuits at as low a level as possible, for it will register as a d.c. output, just like a received signal. Such d.c. "noise" can be balanced out in the d.c. amplifier, but its instability (resulting from line voltage variations, etc.), can be very troublesome when high d.c. gain and long integration times are used. It is best to eliminate this trouble at the source, with heavy decoupling of the plate supply leads and care in wiring heater circuits, to keep hum down. Otherwise no special care is called for in construction.

The phase sensitive detector performs the task of the reversing switch of Fig. 1, and is nothing more than a diode-ring balanced modulator. The 6AL5 diodes shown in Fig. 3 could be replaced with good grade semiconductors, if desired. To adjust the circuit, set R1 so that the voltages at J1 and J2 are equal, referred to ground. R2 and R3 are adjusted for minimum voltage from their arms to ground. These adjustments interact somewhat, and may have to be repeated a few times. Final balance is obtained by setting R1 for zero output from the d.c. amplifier, as read on the output meter, M1. A reference is obtained by shorting the d.c. amplifier input. Because of the high gain of the d.c. amplifier, this is the most sensitive indicator of balance. The adjustment is made with zero signal input from the receiver.

The 6AC7 pentodes were chosen for the d.c. amplifier in order to get high gain in a single stage, and avoid the inevitable problems associated with d.c. coupling of several triode stages. With this amplifier, integration times (T =

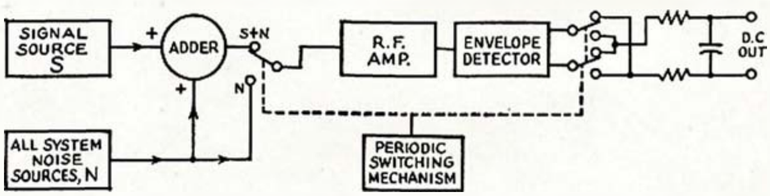


Fig. 1.—Basic principles of a Dicke-type receiver for weak-signal reception.

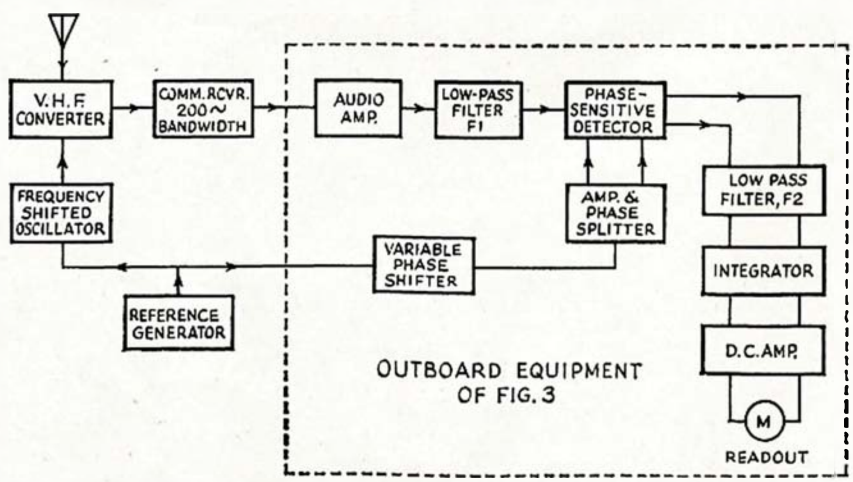


Fig. 2.—Block diagram of the weak-signal receiving system for v.h.f. work.

* Reprinted from "QST," January, 1968.

1 Dicke, "Measurement of Thermal Radiation at Microwave Frequencies," Rev. Sci. Inst., 268-275, July, 1946.

2 Olson, "Weak-Signal V.h.f. Reception," December, 1965, "QST," p. 25.

RC, where R and C are the integrator values) of up to half a minute can be used, if M1 is a 1 mA. meter or an Esterline Angus recorder. The stability of the system is such that it should be possible to use a 100 μA. meter and longer integration times, if desired. The r.f. filtering shown is needed only if the system is to be used for receiving your own echoes, to keep things from "running wild" when the transmitter is on, due to rectification in the grid circuit.

Relay K1 serves to isolate the integration capacitor, C7, during transmitting periods, allowing integration over several moon echoes. It is a normally closed type, opened during transmit periods by the same voltage that actuates the antenna relay. It is not needed except in "radar" service.

Constants of the LC filter in the input of the d.c. amplifier, preceding the integrator, are chosen to cut off sharply at a few cycles, in order to pass slow-speed c.w. No RC integrator is used following the filter in c.w. work. The 100 henry inductors, L1-L4, are large surplus high impedance audio transformers, with all windings connected in series-aiding. Some scrounging was needed to find these. If similar units cannot be obtained a cascaded RC filter could be made up instead, or it can be left out entirely if only long integration times are going to be used. Capacitors C1-C4 reduce the common mode noise present in the phase detector output. This will not show up in the readout if the d.c. amplifier is balanced, but this is not the case in practice.

The signal voltage applied to the phase detector (measured at J3) must be less than one-fourth of the reference voltage (measured at J1 and J2) to prevent overload. The output level from the phase detector can be maximised by limiting the bandwidth of the signal voltage from the receiver. This is done by the low-pass filter between the 6AV6 and 6J5 stages in Fig. 3, shown as F1 in Fig. 2. It should be possible to get about 20 volts across J1 and J2 without serious distortion of the waveform.

To get maximum signal-to-noise ratio, the signal and reference inputs to the phase detector must be exactly in phase. To adjust this a moderately strong signal is applied to the receiver, and the signals present at J1 and J3 are displayed in Lissajous-figure form on a scope. If zero phase shift cannot be obtained by adjustment of the phase control, it will be necessary to change the values of the coupling capacitors in the reference circuits, to obtain the proper range of phase control. Once this is done, adjustment can be obtained simply by adjusting the phase control for a peak in the output indicator.

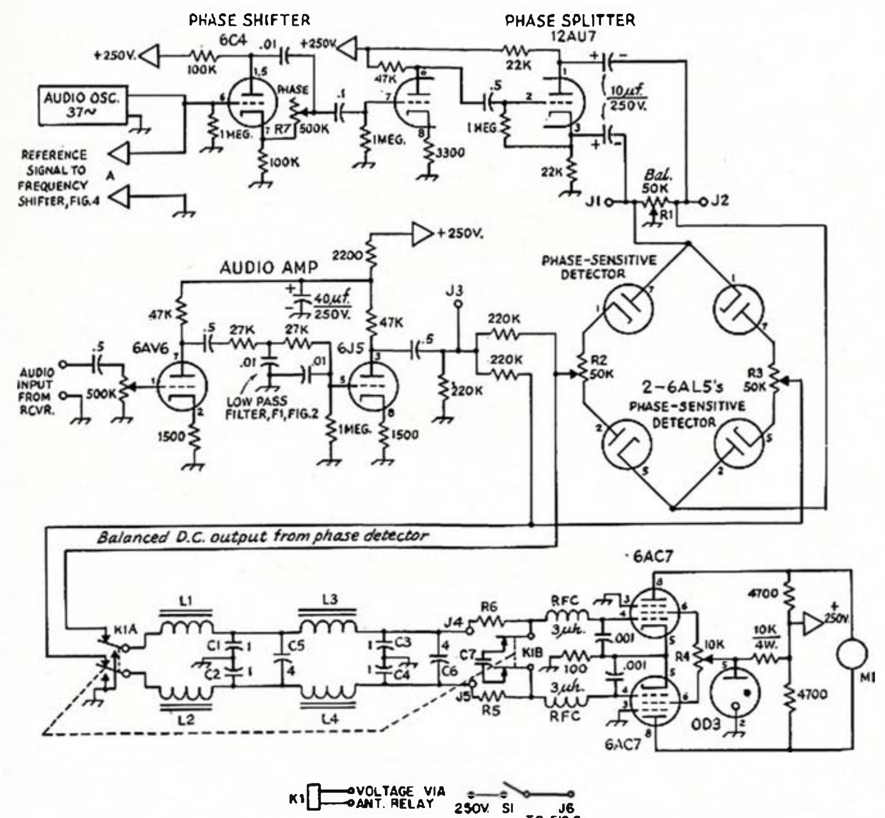


Fig. 3.—Schematic diagram of outboard equipment used to adapt a conventional v.h.f. receiving system for synchronous detection. Unless otherwise specified, decimal values of capacitance are in uF., others in pF. Capacitors with polarity marked are electrolytic. Resistors are ½-watt.

C1, C2, C3, C4—1 uF., 200 volts, paper.
C5, C6—4 uF., 200 volts, oil.
C7—Integration capacitor; for 10-second time constant 4 uF., 200 volts, oil. See text.
J1 to J6, incl.—Tip jack.
K1—4PDT relay, coil rating same as station antenna relay. Contacts are shown in the receive position.
L1, L2, L3, L4—100 hy.; see text.
M1—1 mA. meter, or chart recorder.
R1, R2, R3—50,000 ohm control, linear taper.
R4—10,000 ohm control, linear taper.
R5, R6—1.2 meg., for 10-second time constant; see text.
R7—0.5 meg., log taper.
S1—External contacts on antenna relay.

FREQUENCY SHIFTING

Details of frequency shifting circuits for variable and crystal oscillators are shown in Fig. 4. The upper circuit is used on my receiver, where the frequency shifting is done at the main variable oscillator. It cannot be used with a crystal oscillator. When the diode is forward-biased, the trimmer is effectively shorted across the tank,

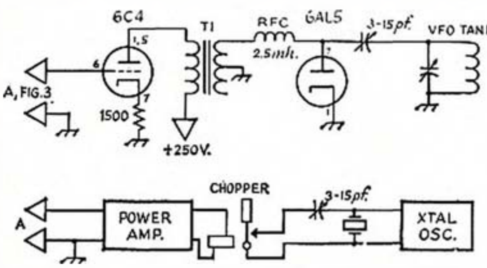


Fig. 4.—Typical frequency shifting arrangements for a variable oscillator, A, and crystal oscillator, B.

lowering its resonant frequency. Unfortunately the series resistance of the diode is enough so that it would lower the Q of a crystal, reducing the amplitude of oscillation; thus electromechanical switching must be used with a crystal oscillator, as in the lower circuit of Fig. 4. The Q of an LC tank is low enough so that the reduction due to the diode is not appreciable.

With the crystal oscillator a small audio amplifier drives a chopper (such as an Airpax No. 175) to handle the capacitor switching. Any amplifier should do, as only a few milliwatts of power are needed. This arrangement is used in the circuit blocked out in Fig. 2.

If the frequency shifting is done in the tunable oscillator of the receiver, the r.f. circuits in the receiver should be adjusted so that their response will be the same on both channels. Otherwise, slope detection of the noise will occur, and the balancing out of gain and noise-level variations will not be achieved. This point applies when shifting is done at the converter crystal oscillator, but the problem is not nearly as critical, for v.h.f. circuits are broadband by nature.

Some difficulty might be encountered as a result of changing drive level to the v.h.f. mixer, as frequency shifting occurs. This can be minimised by using a high crystal frequency to begin with. All these problems are aggravated if a large degree of frequency shift is used, and the optimum value seems to be around one or two kilocycles, for a 200-cycle i.f. bandwidth.

The fact that the post detection bandwidth in this system is very small does not mean that the predetection (or i.f.) bandwidth can be any desired value. Ideally it should be the same as the signal bandwidth, but this is not practical for c.w. signals. A bandwidth of the order of 200 cycles is probably about optimum, if stability problems are considered.

DETECTION AND READOUT

The only other special precautions concerning the communications receiver have to do with the detector. First, the r.f. drive level to the a.m. detector must be quite high, on the order of 10 volts, so that the detector nonlinearities in the forward region do not degrade the signal-to-noise ratio. At the same time, the drive level must not be so high that the last i.f. stage is saturated, as this would wipe off the amplitude information we are looking for. Also, since the desired signal is a low frequency (the same as the reference frequency) the audio coupling circuitry must be able to pass it. This means that the audio to the 6AV6 stage in Fig. 3 should be coupled directly from the a.m. detector in the communications receiver, and not taken from the headphone jack.

The ideal readout device for this type of receiver is obviously a chart recorder. If one cannot be borrowed or scrounged, a meter can be used, but there is a tendency for the observer to apply wishful thinking when he is taking readings! I used a meter readout, and a 20-second integrator following the filter for moon-echo observations during the summer of 1965. For this work, a timer cycled the system between receive and transmit at 2½-second intervals, and disconnected the integration capacitor, C7 in Fig. 3, from the rest of the system while transmitting, so that any signal stored in it would not be lost. With this system it was possible to watch the sum of the echoes build up over many successive transmit-receive cycles.

Some sense of "just because the meter's moved over doesn't necessarily mean that there is a signal in there" remained; an ambiguity that could be resolved by coding the transmitted signal and then seeing if the code used is observed on a set of received echoes, which are combined together in the readout. The readout here is an oscilloscope intensity-modulated by the receiver output. The scope has a slow sweep initiated at the time the leading edge of the echo is expected. The combining is done by means of a time-exposure photograph of the scope face.

The synchronous receiver is sensitive to two frequencies separated by the amount of the local-oscillator frequency shift. A signal on one of these frequencies produces a net positive output of the phase detector, while a signal on the other results in a net negative ooutput. Thus, when the receiver output is fed to an intensity-modulated scope, a signal on one frequency makes the trace brighter, and on the other darker. This implies that the optimum way to code the transmitter output is by frequency-shift keying. In the case of Fig. 5 the transmitter was on the bright frequency at the beginning of the 2½-second transmit period, the dark frequency in the middle, and on the bright frequency again at the end of the period. Consequently, the readout time exposure is expected to be bright-dark-bright, from left to right.

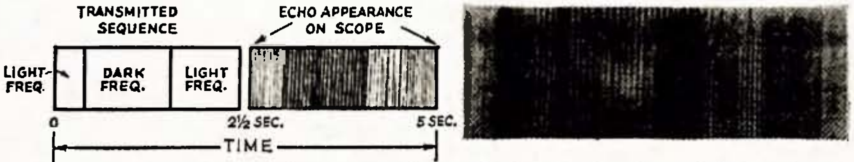


Fig. 5.—The trick in observing the presence of moon-reflected signals, when each individual echo is obscured by noise, is to code the transmitted signal, send a large number of identically-coded 2½-second pulses, and then "stack" the echoes electronically. Random noise is reduced by this averaging process, while the coded characteristics of the echo show through. The sketches at the left show the timing process. Stacking is done by intensity-modulating a scope with the receiver output. The scope has a 2½-second sweep triggered at the beginning of the echo. Actual moon echoes well below the audibility threshold are seen at the right. The transmitter is frequency-shift keyed, as described in the text.

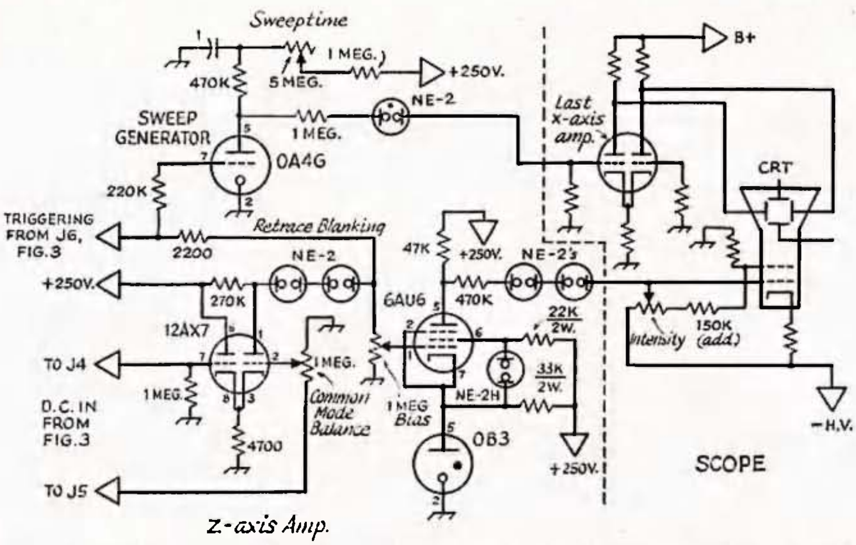


Fig. 6—Schematic diagram of the scope readout circuits. Actual circuit details of the scope, right side of broken line, depend on the scope used. Triggering and d.c. voltages taken from Fig. 3, are indicated at the left.

The coding and the transmit-receive cycle are controlled by a timing wheel, similar to the familiar "CQ wheel", and the code can be changed easily. It could be set up so that letters or words appeared on the readout in Morse code, and the system could be used for very slow-speed weak-signal communications, providing that the timing of the coding and the readout at the other end were properly synchronised.

The special circuitry needed to convert a standard scope to do this is shown in Fig. 6. This consists of a d.c. amplifier connected to the first grid of the c.r. tube through a string of neon bulbs, to effect the intensity modulation. The number of neons needed (only two shown in Fig. 6, for clarity) depends on the amount of high voltage used and the characteristics of the bulbs, and must be determined by experiment. The necessary slow sweep is obtained by the old fashioned gas-tube circuit, using an OA4G, also coupled into the scope.

In many scopes the last horizontal amplifier stage is directly coupled to the deflection plates. The output of the sweep circuit can be fed into the grid of this stage, through a single NE-2, as shown. The scope used here is an old Heath OL-1, which is representative of many inexpensive manufactured and kit instruments. The input to this equipment is taken from J4 and J5 in Fig. 3, and the retrace triggering from J6. This also provides retrace blanking, by forward-biasing the 6AU6 stage when the transmitter is on. A 60-cycle signal is applied to the vertical deflection plates, so that the sweep will be a wide band, instead of a narrow line.

A sample of the moon-radar results, as photographed from the scope, is shown in Fig. 5. The exposure was f5.6 for 250 A.S.A. film and 20 sweeps. The transmitter used was a 4CX250B amplifier, essentially as described by W0MOX in December, 1961, "QST," running 900 watts input. The converter was a Nuvistor job with a noise figure of about 3 db. The antenna system was small, by moonbounce standards, being only a pair of 10 element Yagis on 12-foot booms, fed with home-made open-wire line.

During all the observations, a Collins 75A1 with 200-cycle bandwidth, and a tape recorder, were used, in case there were audible echoes. None were heard during the whole observation period, though occasional bursts have been heard on a similar set-up in the past.

VERIFYING PERFORMANCE

The actual performance of the synchronous receiver is more easily checked in the laboratory than by moonbounce tests, though it is still difficult because of the very weak signals involved. I did not have access to a calibrated signal generator with adequate stability, so the device shown in Fig. 7 was constructed as a test source. It uses a 500 kc. crystal oscillator feeding a tuned circuit at 144 Mc. via a 1N34 as a harmonic generator. Output from the harmonic generator is coupled to another tuned circuit in the other compartment of a 5" x 7" x 3" chassis by two triangular capacitor plates, 1" x 1½" in size.

The output connector is tapped half way down on the second tuned circuit, as shown in Fig. 8. The degree of coupling, and hence the output signal level, can be adjusted by moving the aluminium plate that separates the two compartments. The plate is held in position by a leaf spring arrangement, barely visible in the right portion of Fig. 7. The generator has no leakage, is very stable, and its output level can be adjusted smoothly down to zero, making it very useful in any kind of weak-signal receiver development work.

Tests with the generator indicate around 10 db. signal-to-noise ratio with 10 seconds integration time, when the signal has been reduced to the point where it can no longer be found in the receiver operated in the normal way with 200 cycles bandwidth. This serves to show what receiving equipment of this type will do, in terms of eliminating transients and variations in gain and noise level from the net output, allowing one to observe a very weak signal under less than ideal conditions. A 3 db. price is paid for this, as the signal is observed only half the time. This must be accepted when weak signal work is done with long integration times, as otherwise a slight change in noise will mask the signal.

A receiver of this type is obviously not an ordinary hamshack device, as it comes into its own only as the signal approaches inaudibility, yet its circuitry is no more complex than other modern equipment. Its chief usefulness is in propagation studies on e.m.e. or other high-loss paths. For such communications experiments it will indicate whether there is any signal coming in at all, when the signal is below audible level, and it will serve as a visual aid in copying very slow, weak c.w.

APPENDIX

The signal-to-noise ratio expected for the receiver described here can be calculated using the method developed by Dicke. The resulting formula is:

$$\frac{\text{signal deflection}}{\text{RMS noise deflection}} = \frac{P_{SIG}\sqrt{\gamma}}{K\,T_N\,\sqrt{B}\;2}$$

where—

P_{SIG} = coherent signal power at the antenna terminals.

K = Boltzmann's constant, $1.38 \times 10^{-23} \frac{\text{joules}}{\text{deg. Kelvin}}$

B = receiver i.f. bandwidth.

γ = RC, the integrator time constant.

T_N = system noise temperature, which is (N–1) 290° plus the antenna temperature. N is the noise figure expressed as a power ratio.

The factor of 2 in the denominator appears because the signal is observed only half the time. The formula also works for an ordinary receiver followed by an integrator, if the effects of gain variation, etc., are neglected. In this case, the factor of 2 is dropped.

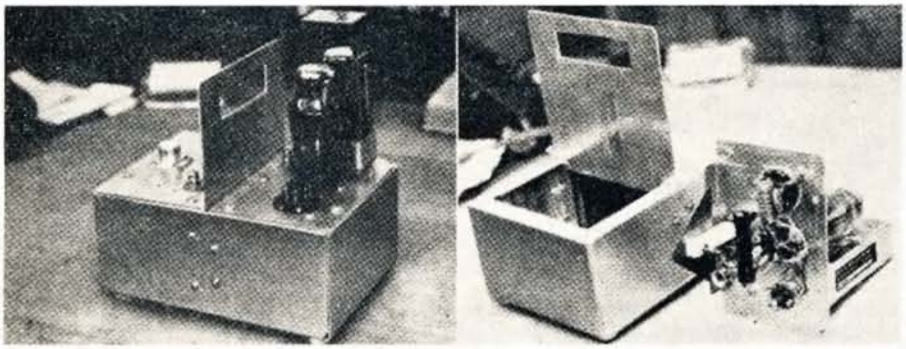


Fig. 7.—Weak-signal generator used for testing the receiving equipment. Output is varied by moving the vane shown at the centre of the assembly. The 500 kc. oscillator and voltage regulator tube are at the right side of the vane in the assembled view, left. The interior is shown at the right.

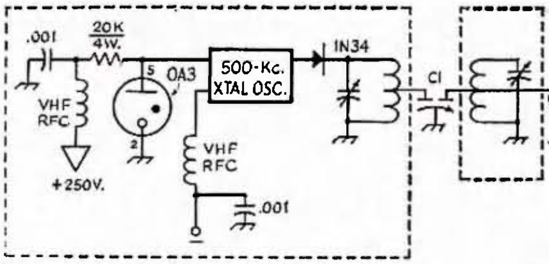


Fig. 8.—Schematic diagram of the signal generator of Fig. 7. The two tuned circuits should be set up for the frequency band to be used. Taps are at the approximate mid-points. Fixed plates of C1 are the two triangular coupling plates described in the text. The movable plate is the vane seen in Fig. 7.

Overseas Magazine Review

"QST"

October 1968—

Increasing the Accuracy of Frequency Measurement; VE3CUS. Roy Golding continues the subject begun in previous issues of "QST". I can hardly agree wholeheartedly with one of his statements regarding measurement accuracy in that one can begin with a modest 100 kc. or 1 Mc. crystal which is not fitted in an oven to control the dividers and end up with a very sophisticated oven controlled crystal with an aging rate better than 5x10¹¹/day.

Solid State Mobile/Fixed Converter for 1.8 Mc.; W1CER. This article follows on naturally from the article in September "QST" in which Doug described a 7-8 watt tx for this band.

Touch to Talk; KH6CU. The author obviously has something which suits his situation very well. I think I still have a couple of OA4s in the junk box. They are not OA4Gs though so I will not be able to appreciate the lavender glow.

A Simple Transmitter for the Beginner; W1TS. Using a 6C4 and 5763, Don runs 12-15 watts to the final on c.w. Perhaps a triode pentode such as one of those used so commonly in t.v. and audio work would allow only one tube to be used.

"Stovepipe"; WA8COT. Transmitting converters for 50 and 144 Mc. They start off from a transceiver on 28 Mc. and convert to the v.h.f. bands.

Perfect Teletype at Your Finger Tips; W2QYW. The author describes modifications to the keyboard morse machine he described in "QST" for August 1965.

Radiation Resistance of Inverted V Antennas; K4GSX. Covers the theory and practice of inverted vees (droopy dipoles) at various heights above ground and with included angles from 180 (no droop) to 90 degrees (45 degrees droop).

IVI; W0IP describes his transceiver which has been modified to give "instantaneous voice interruption". Phone break-in at its best!!!

Matching With Home Made Baluns; W5KTR describes modifications he made to his Hy-Gain beam to give him better performance. May have applications to beams other than Hy-Gain.

Recent Equipment. Hallicrafters SR-400 and HA-20 are reviewed.

"CQ"

September 1968—

Phones and Phone Patches; W5LHG. Discusses the development of telephone circuits and means of connection of radio equipment to telephone circuits. So far as is known this practice is illegal in Australia.

Signals from Satellites; W3ASK. Discusses earth satellite transmitting frequencies and methods of receiving their signals in the Amateur shack.

Vertical Antennas; W3JM. Capt. Lee continues the discussion which has been carried on in "CQ" in previous issues.

A Six Element Wire Yagi for 20; W8CLD. A fixed beam for 20 mx with figures for element lengths for various sections of the band.

Monolithic Crystal Filters; W2EEY/1. Discusses the latest crystal filter techniques, methods of obtaining various shape factors, etc. This type of filter does not lend itself to Amateur construction.

The Care of Ni-Cad Batteries; K6MVH. This type of power source is becoming very popular for portable equipment.

The SB-34 Transceiver—Expanded Coverage and Convenience; W2EEY/1. This article describes methods of modifying the transceiver to cover the whole of all bands, if required.

Antenna Theory in Practice; VE6TW. A useful article to have by for antenna experiments.

"CQ" Reviews the Knight Kit Solid State Signal Generators; W2AEF. So far as is known this range of equipment is not available on the Australian market.

"CQ" World Wide DX Contest C.w. and Phone Records. Could be of interest to DXers.

AMATEUR FREQUENCIES:
ONLY THE STRONG GO ON—
SO SHOULD A LOT MORE
AMATEURS!

THE QUESTIONNAIRE

Some Preliminary Observations

We firstly extend thanks to all those who have so far returned their questionnaires. The results are better than we had expected, the return so far exceeding 25%. Returns from the various States are approximately

VK1-2	22%	VK5-8	28%
VK3	34%	VK6	23%
VK4-9	30%	VK7	25%

Returns have been received from a wide cross-section of the Amateur fraternity if we can go by their spending, occupations and interests, and we believe our final analysis will prove to be accurate.

Many people answered the questions in much greater detail than we sought, but although this will involve us with extra work, it will add to the accuracy of our findings. Whilst many of the suggestions made are completely impracticable, we have, nevertheless, gained a lot of very useful information and proposals, some of which we are already acting on.

Two points have emerged most clearly, the first of these being the fact that some of our readers are still under the impression that they are paying 30 cents per copy, despite all the material that has been published on this matter since last Easter. For their benefit, and at the risk of boring others, we re-iterate that we receive **17 cents per copy** from the Divisions, this being the amount only since last May after the 2 cent increase was applied.

The second point is the fact that Divisional Councils and Federal Councillors were out of touch with the thoughts of the members when they refused the requested increase in the price of "A.R."

It is obvious from the questionnaire that members in general realise the necessity of paying a reasonable amount to get what they want in the magazine, and practically everybody wants a larger magazine. In 1933 the magazine cost 6d. Now 35 years later, the magazine is twice the size and the price is equal to a little over three times the price paid in 1933. Had the cost of "A.R." risen in proportion to all other costs in the last 35 years, well—you do your own calculations. The foregoing may appear irrelevant, but read on.

A frequent comment is that we should make payment, if only a token amount, for articles published. This is a matter that has been frequently discussed (see last month's Publications Committee report) and passed over through lack of funds. Another frequent suggestion is the appointment of a full-time paid staff. As the unpaid staff now spend nearly 200 hours a month on the magazine, it is obvious that at least a staff of two would be needed. The accumulated profits for the last 35 years, which supplies our present working capital, would not pay a man for six months. In short, to maintain the present standard, pay even a token amount for articles published, and have only one full-time employee for the magazine would add at a bare minimum of 10 cents to the price of each copy. Would it not be better to pay the extra for a larger magazine now. The final decision is yours, through your Federal Councillor's vote next Easter.

But back to the questionnaire. On first count, 65% or more of Amateur equipment is home-brew, obviously a good market for component manufacturers. By far the greatest number consider that advertising space should be in the range of 30% to 40%, much the same as we have now. Whilst we would wish to maintain this percentage, the economics of the proposition will have to be studied in detail before a final decision can be made.

The order of preference for technical articles looks like being a photo finish between antennae, transmitters and receivers. A very bad last will be audio equipment, which has polled well under 1% of the first preference votes.

The wanted features have supplied many surprises, not the least being the fact that some readers do not want technical articles. Divisional notes, always a bone for contention, are wanted by about 50% of readers, many stipulating conditions under which they are wanted. Those against, are in the main vehemently against.

The final portion of the questionnaire asked the name and address of anybody you would wish a copy of "A.R." to go to. We had expected possibly a hundred or so, but the result has proved overwhelming. Please do not expect us to get these away too soon. We will have many hours of work, just addressing wrappers, so this part of the project will have to wait until more urgent matters are finalised.

These have been preliminary observations only, the next few weeks will see much analysing of the answers and a more comprehensive report will be forthcoming next month. To those few who indicated their willingness to assist us in some manner, please do not despair. We will contact you early in 1969.

Additions to our Library

AMATEUR RADIO TECHNIQUES
J. Pat Hawker, G3VA.
Published by R.S.G.B.

The first edition of this book was published in 1965 under the title "Technical Topics for the Radio Amateur". This, the second edition, has only recently been published and undergone a change of title. The book contains 160 pages with a wealth of information supported by over 350 diagrams. Most of the main items have been drawn from the original edition, but there has been some re-writing and additions.

The book includes the following sections: Semiconductors, components and construction, receiver topics, oscillator topics, transmitter topics, audio and modulation, power supplies, aerial topics, fault-finding and test units.

Also incorporated is a list of i.f. frequencies of practically every communications receiver in common use. A comprehensive index completes the book.

We have no indication of the local price, but we estimate it to be about $2 a copy, and at a price in that vicinity it is a bargain too good to be missed.

Our copy direct from the publishers.

TRANSISTOR CIRCUIT GUIDEBOOK
Byron G. Wels
Published by Tab Books, U.S.A.

Here's a handy reference and guide to all types of solid-state circuits—how they work, where they're used, unusual features, etc.

This is definitely not a primer on the solid-state art, but a collection of basic and advanced circuits, covering the principal fields of electronics. Each circuit is accompanied by a brief description of how it works, pointing out unusual features and applications. For experimenters and construction-minded readers there is enough information, parts lists, component specifications, coil data, etc., to enable them to actually build the circuit and get it operating. Amateurs and hobbyists will find many made-to-order circuits for the shack and home.

This big collection of 104 circuits includes AM/FM tuners and receivers employing transistors, FETs, and MOS FETs; amplifiers for stereo, telephone, public address; timers, time delays, temperature indicators, grid dip oscillators, special signal generators; power and speed controls, servo controls, heat controls; light flasher, SCR light switches and dimmers, light-activated switch; transceiver, wireless phono oscillator, sonobuoy transmitter, marine band transmitter, frequency doubler, FET VFO, linear RF amplifier; stereo balancer, intercom system, audio mixer; BFO, short-wave converter, noise limiter; automotive transistorised ignition system, battery charger; differential amplifier, shift register or ring counter, bistable multivibrator, decimal counter; power converters, inverters; electronic flash; and a complete color TV receiver circuit and parts list. 224 pps.

Our copy direct from the publishers. Price $US4.95 plus postage.

WIRELESS INSTITUTE OF AUSTRALIA
FEDERAL EXECUTIVE

The Institute can now offer annual subscriptions to the following Amateur Journals:—

★ **"QST"—Associate membership and renewals, $6.40.**

★ **R.S.G.B. "Radio Communication" (ex "The Bulletin") is only sent with membership of the Society. Send for application form and FREE sample copy of the R.S.G.B. "Radio Communication," $5.50.**

★ **"CQ" Magazine, $5.70; Three Years, $13.50.**

★ **"73" Magazine, $5.50; Three Years, $11.50.**

★ **"Ham" Magazine, $4.50.**

R.S.G.B. Publications and A.R.R.L. Publications available.

Send remittance to Federal Executive, C/o. P.O. Box 36, East Melbourne, Vic., 3002.

New Equipment

VERSATILE MULTIMETER

"RAPAR" TESTER
Model YT68A

A pocket size multitester branded "Rapar" has a meter sensitivity of 1,000 o.p.v. A magnet is mounted in the back of the case which enables the instrument to adhere to all steel surfaces. Carrying case and test prods are provided.

Specifications: DC volts: 0 to 10, 50, 250, 1,000. AC volts: 0 to 10, 250, 500. DC current: 0 to 250 mA. Resistance: 0 to 100K. Weight: 7 oz. Battery: 1.5v. Prince inc. sales tax: $9.

Further information from Radio Parts Pty. Ltd., Melbourne.

ADJUSTABLE GROUND PLANE AERIAL

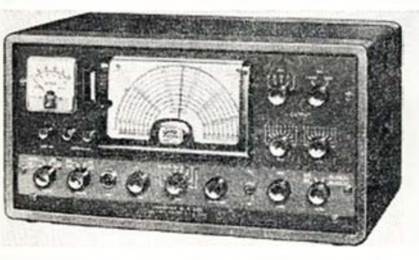
New from Belling & Lee is a series of adjustable ground plane aerials,
AGP1 adjustable from 70 to 85 Mc.;
AGP2 adjustable from 116 to 136 Mc.;
AGP3 adjustable from 149 to 172 Mc.

By simple adjustment of the ground plane radials, spacing from the base of the unipole, a precise match at any frequency within the specified bands can be obtained.

Constructed throughout from high grade aluminium alloy, and coated with polyurethane for weather protection.

Further information and technical leaflet from Belling & Lee (Australia) Pty. Ltd., Kilsyth, Vic.

GELOSO AMATEUR TRANSMITTER



Model G4/225 is a complete transmitter providing all the facilities for modern Amateur communications for c.w., s.s.b., d.s.b., and a.m. modes.

Features include crystal stabilised v.f.o., 160-200 watts p.e.p. on s.s.b., 80 metres through to 10 metres, 16 tubes with a pair of 6146 in p.a., 100% a.m. modulation, break-in keying for c.w., vox operation, netting switch, pi coupler output, and modualtion meter incorporated.

Amateur Prices: G4/225 transmitter, $310; companion power supply, G4/226, $124.50. Sales tax applicable on both units.

A companion receiver is the G4/216.

For further information write for Technical Bulletin No. 96 to the Australia agents: R. H. Cunningham Pty. Ltd., 608 Collins St., Melbourne, Vic.

INEXPENSIVE AMPLIFIERS

National Semiconductors have released a family of inexpensive amplifiers containing separate controls and amplifier functions which allow for adding squelch, voice-operated transmit-receive (vox), automatic audio gain control, and speech compression. These may be incorporated in radio transceivers, intercom systems or tape recorders.

Information will soon be released (Application note AN-II presently indicates some of these applications):

(1) An audio amplifier whose gain may be remotely controlled by a d.c. voltage, or switched on and off by readily available IC logic elements.

(2) A speech compressor, capable of maintaining constant audio output or transmitter modulation level, regardless of the operator's distance from the microphone.

(3) A squelch preamplifier which turns itself off in the absence of a signal, and on when a signal appears. The circuit includes fast attack, to catch first speech syllables, slow release, to avoid frequent turn-off between words, and hysteresis, to minimise uncertain action when signals appear.

(4) A simple vox/mike preamp., similar to the squelch system, in which using a relay, the circuit can turn on a transmitter or tape recorder when a signal appears.

(5) A twin tee audio oscillator, with regulated output voltage.

(6) A modulated, 455 kc. signal generator, usable for aligning a.m. radios.

For further information contact Mr. J. J. Rutherford, Rutherford Electronics Pty. Ltd., 833 Doncaster Road, Doncaster, Vic., 3108. Phone 848-3033.

RESULTS OF VK3 DIVISION 160 METRE CONTEST

VK3 SECTION

	Number of Contacts with							Total	
	VK2	VK3	VK4	VK5	VK6	VK7	ZL	Contacts	
VK3APN	5	73	1	9	3	1	3	95	935 Points
VK3ATN	4	39	3	9	3	1	6	65	925 „
VK3XB	3	70	1	7	3	2	2	88	835 „
VK3RZ	3	67	–	8	2	–	3	83	765 „
VK3NW	1	38	–	3	1	1	2	46	615 „
VK3RJ	1	42	–	3	2	1	2	51	525 „
VK3ACA	–	43	–	–	–	1	3	47	345 „
VK3OW	–	40	–	–	–	–	3	40	300 „
VK3ANH	2	20	–	5	–	–	–	27	270 „
VK3YQ	–	33	–	–	–	–	–	33	165 „
VK3KS	–	18	–	–	–	–	1	19	125 „
VK3TB	–	2	–	–	–	–	3	5	115 „
VK3AOW	–	21	–	–	–	–	–	21	105 „
VK3ARL	–	20	–	–	–	–	–	20	100 „
VK3BA	–	12	–	–	–	–	–	12	60 „

Award for highest score in VK3 Section: VK3APN
Award for second-highest score in VK3 Section: VK3ATN

"DX" SECTION

	Number of Contacts with							Total	
	VK2	VK3	VK4	VK5	VK6	VK7	ZL	Contacts	
ZL1PL	1	11	–	–	1	–	–	13	455 Points
VK2GJ	–	11	2	3	–	–	–	16	400 „
VK5KO	–	6	–	–	2	–	1	9	235 „
VK7MR	–	7	–	–	–	–	–	7	175 „
VK5BS	–	6	–	–	–	–	–	6	150 „
VK5JG	–	6	–	–	–	–	–	6	150 „
VK4QW	2	3	3	–	–	–	–	7	115 „
VK7RY	–	4	–	–	–	–	–	4	100 „

Award for highest score in contacts with VK3 stations: ZL1PL

CHECK LOGS

Check logs were submitted by VK-3XZ and VK3ANG.

LISTENERS' SECTION

D. Milway (Vic.)	730 pts.
E. Trebilcock (Vic.)	610 „
P. Harris (Vic.)	510 „
P. Mill (Vic.)	200 „
P. Vernon (N.S.W.)	130 „

Award for highest Listener's Score: D. Milway.

NOTES

(a) In some cases the points awarded are not the points claimed. The above results are corrected for errors, but such corrections have made no difference to placings.

(b) No logs were received from portable or mobile stations.

(c) A number of stations have made suggestions for future contests and these will receive due consideration.

DX

Sub-Editor: PETER NESBIT, VK3APN
32 The Grange, East Malvern, Vic., 3145
(All times in GMT)

ASSORTED

First up, news on coming VK0 activity from Rodney VK3UG (ex VK0CR): During 1968 the only Amateur on Macquarie Is. was David VK0IA, who has volunteered to remain there until March 1969. From late December '68 until March '69, Greg VK0KJ (VK7KJ) will also be active on s.s.b. Throughout this year until late December, Bill VK0MI will be active with 150w. of a.m. and c.w. Bands used will be from 80 to 10 mx. The QSL manager for all these stations is VK7KJ, who will be able to reply to any cards when he returns in mid-March. The exact operating times are not yet known, but Greg hopes to transmit on 14195 and receive on about 14210, so look out for him. (Thanks Rod.)

Zen XW8BX is operating just out of Vientiane and expects to be there a year or two more. He has had several offers from bods interested in being his QSL manager, but still prefers to QSL direct—his XYL likes collecting the stamps!

The VE6AJT/APV DX-pedition: Don and George hope to operate from CR8, VS5, Indonesia; then on to AC3, 4, 5 early in 1969, then on to West Africa where they hope to include EA9, 0. All QSLs and financial support (much needed) via VE6AO.

Ed KH6GLU is reported to be going to FW8 land, departing Jan. 29. Operation will be for 10 days on 80 through 10 mx. QSLs via Ed's home QTH.

8QALK (not a misprint) is Dave VU2OLK/GM3OLK, who is QRV from Male. Resident stations are 8QAWA (ex 4S7WA) and his XYL 8QAYL (ex 4S7YL). (Male is in the main group of the Maldives, north of the equator and in zone 22. It may count as separate from Gan (VS9MB) which is in zone 39.

George ZL2AFZ reports that he is going to Chatham Island for 3-4 weeks from Jan. 5. Other operators will be ZL1DS, ZL1IL and ZL1TU. Each operator will use his own call sign/C. Frequencies will be: 3525, 7015, 14025, 21025 and 28025 on c.w.; and 3825, 7090, 14125, 14250, 21350 and 28550 on s.s.b. All QSLs via ZL2AFZ.

Mick VP8KH will be going to Deception Island (South Shetland Group) for four months until early March. While he is there he will look for the logs of VP8IY who left there in a hurry when the Base was abandoned due to volcanic eruption.

Sint Maartin: The operators of the recent PJ0CC DX-pedition were W1BGD, W1BIH, W1EOB, W1FJJ, W1TX, K1ANV, W2ADE, K3NPV, W4GF, W4KFC, W4YWX, W4ZM and W6RR (certainly no shortage of operators). QSL via W2ADE, pse s.a.e./IRC.

Again from No Man's Land, W7ZFY aboard the USCG Cutter "South Wind", says his ship will join the VK expedition to Heard Island in March, and the team expects to be ashore for about one week.

KH6ZBF was unable to get a permit to visit Kure Island, but says he is going to try again next year.

Jack VK9RJ says that VK4HR, 4KS or 4PX may help arrange skeds. He should have his new quad in action soon and be QRV on 15 and 10 mx as well as 20 mx. Look for him 14160/170 Tuesdays from about 06z.

Up to date (Sept. '68) Prefix/Country/Zone lists, Country/Prefix/Zone lists, together with a complete list of International Prefixes may be had by sending 9d. and IRC to Short Wave Magazine, 55 Victoria St., London, SW1.

Nice Call Sign Department: 4M4AJ and 4M7AV were the contest calls of YV4QG and YV7AV. Other special contest calls were U1A, UP2A, UR2A, UV4H. 4A0IEC (WB2IEC) and XE0LOW (WB2GQK) were QRV last May/June, and will be there again this January.

Timor CR8: After 18 months of trying, VK8HA still expects not to make it until February or March.

BAND NEWS

OR4ES skeds DL0MB daily 21150 at 12z. Apparently operates from Jabal al Uwaynat in the Libyan Desert; will return late Feb. and reply to QSLs then.

BV2A makes a special lookout for VK/ZL stations daily 14025/030 at 09/10z. His QSL manager is WB2UKP.

TA3X is the second call sign of Lamar K7SAD/TA3AR who skeds his brother and QSL manager WA7GQA on 14210 Fridays and Sundays at 22z.

EA6AR skeds DL7FT and 3A2CN Sundays 14220 at 08z; also 21290 0830z if condx okay.

South Shetland Isls.: CE9AT is on 14185 every Friday at 2115z.

CR5SP and CR6IV have a sked 14170 Sats. 1415 ; also Suns. at 0530/0730z.

QSL MANAGERS

BV2A—WB2UKP	VK0MI—VK7KJ
EP2GI—GI3HXV	VP8DJ—VP8HZ
FB8WW—W4MYE	VP8HS—W2CTN
FG7TI/FS7—VE3EUU	VP8IA—VP8HZ
FK8BG—W5IXQ	VP8JB—VP8HZ
FY7YQ—WA4GQM	VP8JC—VP8HZ
HK0BKX—WA6AHF	VP8JN—VE2AGH
HS3TD—WA6CPI	VP8JT—VE1ASJ
KC4USX—K3UZM	VP8JX—GD3HQR
MP4TBO—G3YBO	VP8JZ—G3LEO
OK8AAE—OE1WO	VP8KD—K2JXY
OX5AY—VE3DLC	VP8KE—W4NJF
PJ3CC—W3AYD	VP8KF—G3TWV
PJ0CC—W2ADE	VP8KI—VP8HZ
PY0OK—PY2SO	VQ9GA—WA6AHF
PY0OM—PY2SO	XW8CS—VE6AO
UA0K1P—UW3FD	ZD9BL—WA6AHF
VK4EV—VK3AEJ	ZE5JJ—W6BAF
VK9XI—W2GHK	7Z3AA—K8YBU
VK0IA—VK7KJ	9U5CR—WB6HGU
VK0KJ—VK7KJ	9U5HI—WA2CRD

ZF1EP—SAE/IRC to Box 1647, Fort Meyers, Fla., 33902.

EP2BQ—New QTH: H. McQuillan, C/o. Dept. of Geology, Pahlavi University, Shiraz, Iran.

PY0DX via PY7ACQ QTH; PY0SP via PY-7AOA QTH. All times in GMT. Pse SAE/6IRCs.

8QALK—Box 53, Bangalore 1, India.

VP8s FL, JG, JH, JI via BRS-26222, E. R. Chilvers, 1 Grove Rd., Lydney, Glos., U.K.

ACTIVITIES

As most of us know, David VK3QV is an enthusiastic 10 mx man. In an interesting letter he reports working KV4FA via long path at 13z, also hearing a W4 on long path at 1350z (see last month's 10 mx Band News for a description of 10 mx conditions). He says, "Before working KV4FA it was interesting to hear him working CT2AA, and the CT2 coming in both long and short paths. Under such conditions working these stations is difficult because of the strong QRM they are getting from both Europe and North America." David submits a list of many stations worked on 10 mx, including most call areas of Europe, plus many Asian and Pacific countries, and one very rare contact: VK7AB via short skip.

Welcome back to Al VK4SS. Al has also been busy on 10 mx, and sends in a list of countries worked in the past few weeks. All continents have been worked. Al says that this summer will see the best of 10 mx, although 15 mx should remain okay for a couple more seasons. Judging from the comments in Al's letter, and after a talk with David 3QV, it appears that anyone who plans to go for the five-band DXCC (described below) had better hop to it smartly, as 10 won't be good for DXCC much longer.

After reading the rules for the five-band DXCC, I know many of the 15 and 20 metre DX men will throw up their hands and say "it can't be done in VK." Why not? "Because you'd never have a hope of making DXCC on 40 or 80." Admittedly one would need to be a pretty hot shot operator to do it on 80, but it's quite possible on 40. Trevor VK2NS sent a list typical of what he has been working on 40 mx lately, containing some real beauties: Europe, Africa; you name it, he's worked it. While perusing the calls, one had to keep reminding oneself that they were worked on 40, not 20. Keep up the good work Trev.

A NEW AWARD—
THE A.R.R.L. FIVE-BAND DXCC

A brand new challenge for DXers comes into being on the 1st January, 1969—the Five-Band DXCC Award. This does not supersede the DXCC Award, but is in addition to it. All contacts must be made on or after 1/1/69.

The idea is to start from scratch and work at least 100 countries on each Amateur band from 80 to 10 mx, or any five other Amateur bands. (Active repeaters or translators may not be used.)

The rules are the same as for the basic DXCC award. Only QSL card confirmations will be accepted; and cards must not be for cross-band or cross-mode contacts. All legal modes may be used; there will be no mode endorsements.

Applications will be accepted only on the official entry form available from the A.R.R.L. at 225 Main Street, Newington, Conn., 06111, U.S.A. Each such form costs $10. This charge covers the cost of the award: a handsome engraved plaque, and the cost of forwarding the plaque and returning the 500 cards by first class registered mail. So, get those antennae up for 40 and 80 metres, and get cracking. Good luck!

SUMMARY

From this month on, the DX Notes will be slightly different; shorter, and with more emphasis on DX-peditions, etc. Activity reports are still (as always) welcome, but the type preferred are interesting experiences or reports of unusual conditions, not the long and generally repetitive lists of DX worked. All items should be received by the end of each month.

Acknowledgments to DX News, LIDXA, ZL-2AFZ, G3UGT, VK3UG, VK3QV, VK3AQP, VK4SS and VK2NS. 73, Peter VK3APN.

CONTEST CALENDAR

7th Dec., 1968, to 12th Jan., 1969: **Ross A. Hull VHF Contest (W.I.A.).**
1st and 2nd Feb., 1969: **John Moyle Memorial National Field Day (W.I.A.).**
1st and 2nd Feb., 1969: 35th A.R.R.L. DX Test (Phone Section), first week-end.
1st and 16th Feb., 1969: A.R.R.L. Novice Round-up.
(C.w. Section), first week-end.
15th and 16th Feb., 1969: 35th A.R.R.L. DX Test
1st and 2nd Mar.: 35th A.R.R.L. DX Test (Phone Section), second week-end.
8th and 9th Mar.: 32nd B.E.R.U. Contest (R.S.G.B.).

SOLID-STATE AIRBORNE TRANSCEIVER

A combined h.f./v.h.f. solid-state airborne transceiver with a total system weight of 44 lbs., developed by Marconi Co. Ltd., provides 40w. output on 28,000 discrete channels between 2.0 and 29.999 Mc. and 10w. f.m. output between 30.0 and 99.975 Mc. with either 25 kc. or 50 kc. bandwidth. Switches select d.s.b. or s.s.b. operation on the h.f. band and narrow or broad-band operation on v.h.f. Complete transceiver circuitry is housed in a short 3/4 ATR case.

(From Aviation Week and Space Technology, 5th June, 1967.) (Could make a popular "disposals" item.—Ed.)

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OBITUARY

PHIL RENSHAW, VK2DE

On 16th November, 1968, there passed from the ranks of Wireless Pioneers one who did much to build up the world of Amateur Radio Experiments—Phil Renshaw.

I first met Phil Renshaw about 1912 when the Wireless Institute of N.S.W. was formed and through his efforts Wireless Amateurs became a united body. He was not very active on the air, but he did much to make the Wireless Institute an active organisation.

In 1922, when the Institute was formed into the N.S.W. Division of the Wireless Institute of Australia, he was the first Secretary of the N.S.W. Division, and was one of the signatories to the Articles of the Association.

In 1923 the Wireless Institute N.S.W. Division held an Exhibition in the Sydney Town Hall, and as Secretary of the Division he was largely responsible for the success of the enterprise.

He continued as Secretary of the N.S.W. Division until he became its President and in 1926 became Federal President of the Institute.

Some may remember him in the early days as a motor bike enthusiast, riding a big Red Indian cycle. In later years he was often heard on the air using his call sign VK2DE.

In early 1930, when the Wireless Institute was attracting Professional Radio men, it was decided to revive the Institute of Radio Engineers, which, at the time, was not functioning. In this, with others, Phil Renshaw played an important part and the Institute of Radio Engineers was re-born.

Phil will always be remembered, not so much for the noise he made on the air, but for his energy and his personality, which endeared him to all who knew him. His bright and cheerful nature made it a pleasure to work with him. His interest in radio continued until business pressure forced him to leave the hobby he so much loved.

He did not enjoy good health in later years, although he carried on as a Consulting Engineer in the city. So his passing removes yet another pioneer Radio identity to whom, we as Amateurs, owe so much.

—H. A. Stowe.

H. F. (FRED) TREHARNE, VK5QT

The death occurred recently of Fred Treharne, VK5QT, ex-VK2BM.

Fred's first contact with Radio dated back to the days of the crystal set and loose couplers, honeycomb coils, bright emitters, peanut valves, "Attwater-Kents" and the like, all well known to old timers in Amateur Radio.

In order to get on the air, Fred sponsored his sons Ross, who passed his A.O.C.P. exams at the age of 14, and, with the correct operation of his station guaranteed by his father, was licensed as VK2IQ, and commenced operation in 1934. Another son, Elgar, was also licensed soon after as VK-2AFQ.

During World War II., Fred Treharne was active in the Civil Defence field as an instructor and as a warden.

When both Ross and Elgar showed signs of marrying, it became necessary for Fred to obtain his own licence. So at the age of 60 years, he decided to learn the Morse code, and having sat for the exam, was licensed as VK2BM and became a well known a.m. operator.

Fred was an active member of the W.I.A. in N.S.W., served on Divisional Council, and was President of the Division in 1947.

Interested in community affairs, a Justice of the Peace, recipient of a Medal from the King in celebration of the Sesqui-Centenary of N.S.W., H. F. Treharne will be remembered for his work in many fields. Among his other activities he found time to take an interest in the work of the Police-Citizens Boys' Clubs in N.S.W.

Prior to his retirement, Fred had been a school teacher after graduating in Arts from the University of Sydney, was at one time Secretary of the Sydney Conservatorium and was Superintendent of Music to the N.S.W. Education Dept. for many years.

After the death of his wife, Fred moved from N.S.W. to South Australia where his sons Ross (VK5IQ) and Elgar (VK5ED) were now living. At the age of 85, Fred (now VK5QT) was still active, visiting frequently, and still with his faithful old "Buick" with an unrestricted driving licence.

On 3rd September, 1968, he went to the local newsagent to buy a newspaper and was accidentally knocked down by a motor car while crossing the road, suffering injuries from which he died a few hours later.

Members of the W.I.A. and his many friends extend their sincere sympathy to his sons Elgar and Ross and their families.

W. H. (BILL) CLARK, LI.B.

The N.S.W. Division suffered the loss of its Honorary Legal Officer recently with the death of William H. Clark, Ll.B., on 20th October, 1968, at the age of 56 years.

Bill Clark, an Associate Member of the Division for many years, had been its Honorary Legal Officer since 1957. During this period he had rendered invaluable service to the Division on constitutional and general legal matters. His advice to the Divisional Constitution Committee had resulted in a number of changes being made to the recently adopted Federal Constitution.

Bill was principal of the legal firm of W. H. Clark & Co., Sydney, and was a graduate of Sydney University.

The N.S.W. Division is very appreciative of the service rendered over the years by Bill Clark, and extends its sincere sympathy to Mrs. Clark and her three sons.

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SOLID-STATE TRANSCEIVER

(Continued from Page 9)

AVAILABILITY

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Boards alone are $2 each, while instructions, layout diagrams and circuit diagrams are $1 per set.

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— . . . —

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(From Aviation Week and Space Technology, 5th June, 1967.)

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A.c. input: 105-130v. or 210-260v., 50-60 cycles.

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FOR SALE: AR7 Receiver, complete with power supply and speaker in original rack. Boxes B, C, D and expanded E, $60. VK3VM, Ph. 211-7370.

FOR SALE: FL-100B five-band Tx, u.s.b., l.s.b., with spare 6DQ5, excellent condition, $275. Apache Tx, five-band, with SB-10 s.s.b. Adaptor, $130. National NC-183 Communications Receiver, 15 tubes, 540 Kc. to 31 Mc. and 48-56 Mc., $100. VK5OD, 2 Claring Bould Rd., Christies Beach, S.A., 5165.

FOR SALE: Lafayette HE-30 Rx, with product det., 2-speed AVC, Q-mult., stab. osc. voltage, $85; Leader LSG-11 signal generator, $19; xtals FT243: 7200, 8006.667, 8106.667 Kc., vacuum 7-pin min. 3985 kc., $2 each; new min. butterfly trimmers, 6.4 pF., 75c each. C. Hagoort, 1 Larkdale Ave., Paradise, S.A., 5075.

FOR SALE: Swan 240 Transceiver, alternator, spare, 12 volt battery with changeover system. 20, 40, 80 metre Neutronics Mobile Antennas. Kyoritsu SWR Bridge. A.W.A. RC Bridge. Advance Signal Generator. Taylor Square and Sine Wave Generator. Grundig GDO. Sundry microphones. Dozens of valves. Best offers any item. Wal Middleton, VK3IT, 22 Belmont Road, Croydon South, Vic., 3136. Phone Croydon 72-34673.

SELL: Contax Base Station on 53.032 Mc., complete, $40. K. Pincott, VK3AFJ. Phone 25-5775 (Melb.).

SELL: Kit only, Heath Solid State Voltmeter, Model 1M16, $65. K. Pincott, VK3AFJ. Phone 25-5775 (Melb.).

SELL: Pye Low Band Base Station. Good condition, 3/20 in final, 25w., ideal for 6 mx net. Must sell. $50 o.n.o. Terry Mitchell, VK3ZZO, 4 Grant Street, Newtown, Geelong, Vic. Phone 213920.

SELL: Re-built AMR200 receiver complete with 6 ft. x 19 inch rack. One piece 40 ft. oregon mast. Also many parts/tubes. M. Relper, VK3DT, 29 Victor St., Beaumaris, Vic. Phone 99-1221 (Melb.)

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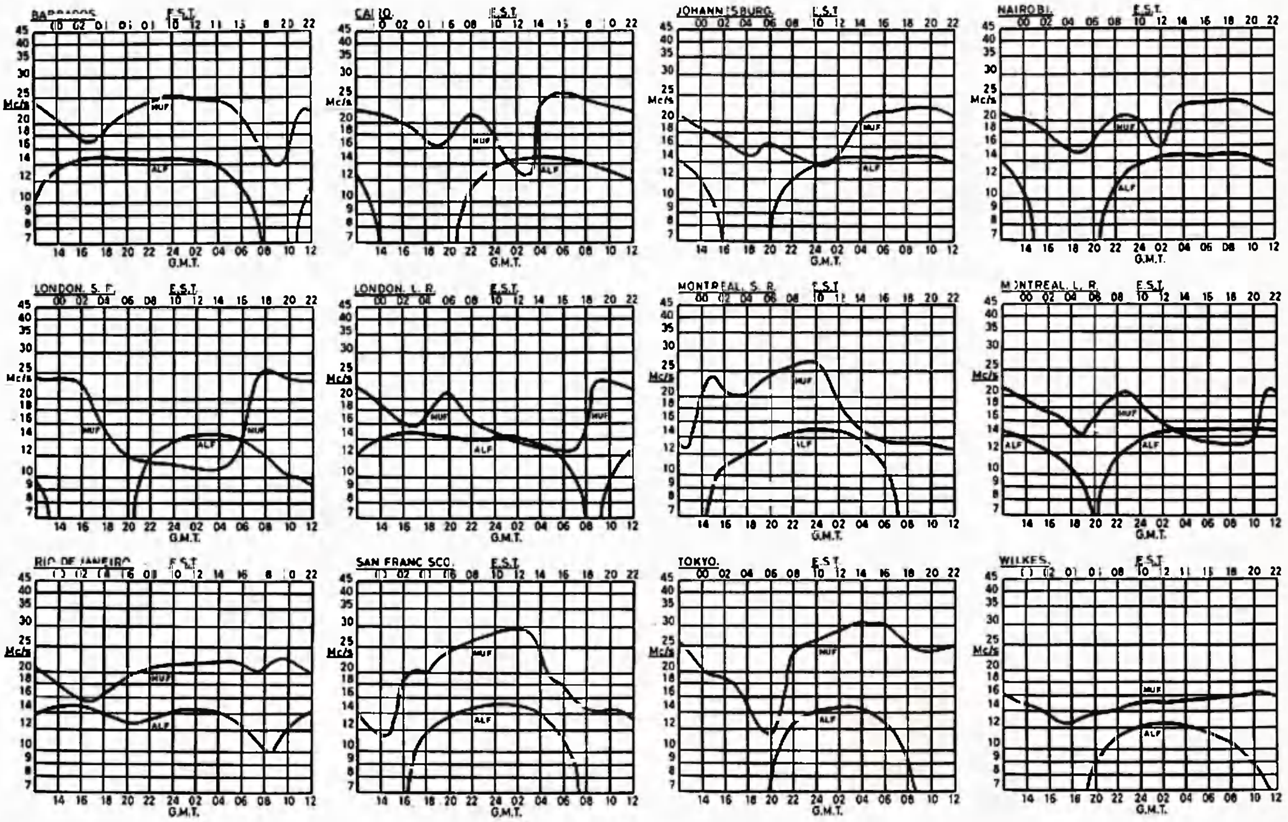
(Prediction Charts by courtesy of Ionospheric Prediction Service)



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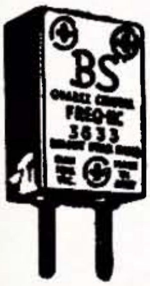

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VHF COMMUNICATIONS also features information regarding the development of electronic equipment, measuring methods, as well as technical reports covering new techniques, new components and new equipment for the Amateur.

VHF COMMUNICATIONS is a quarterly, published in February, May, August and November. Each edition contains roughly sixty pages of technical information and articles.

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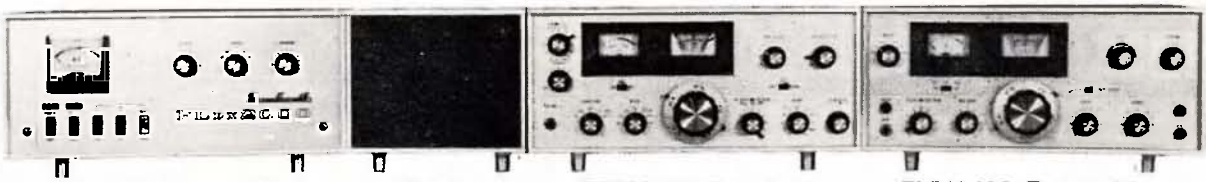

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FRDX-400 Receiver
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FLDX-400 Transmitter
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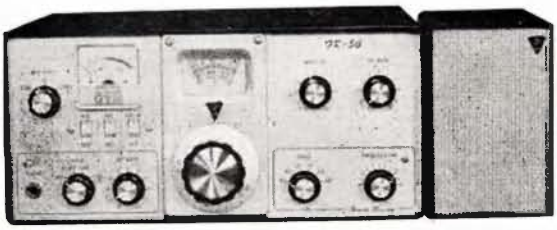

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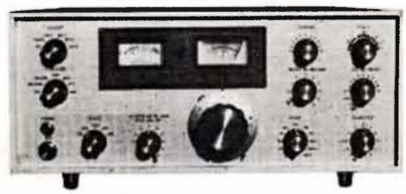

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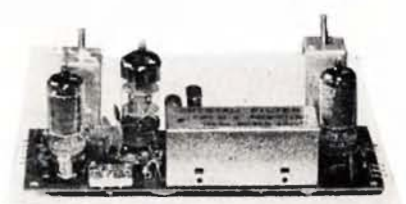

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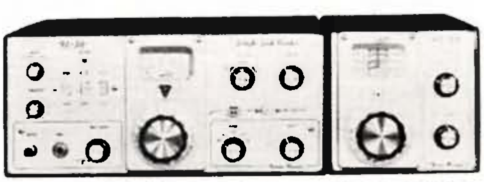

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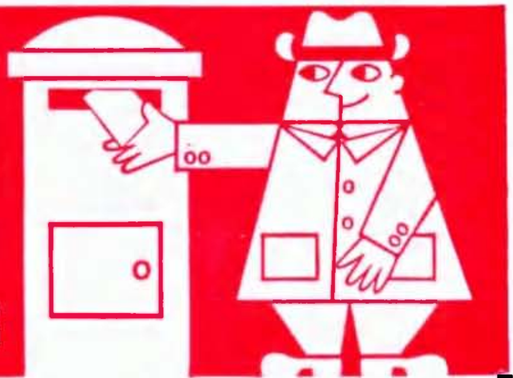

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Vol. 37, No. 2

FEBRUARY, 1969

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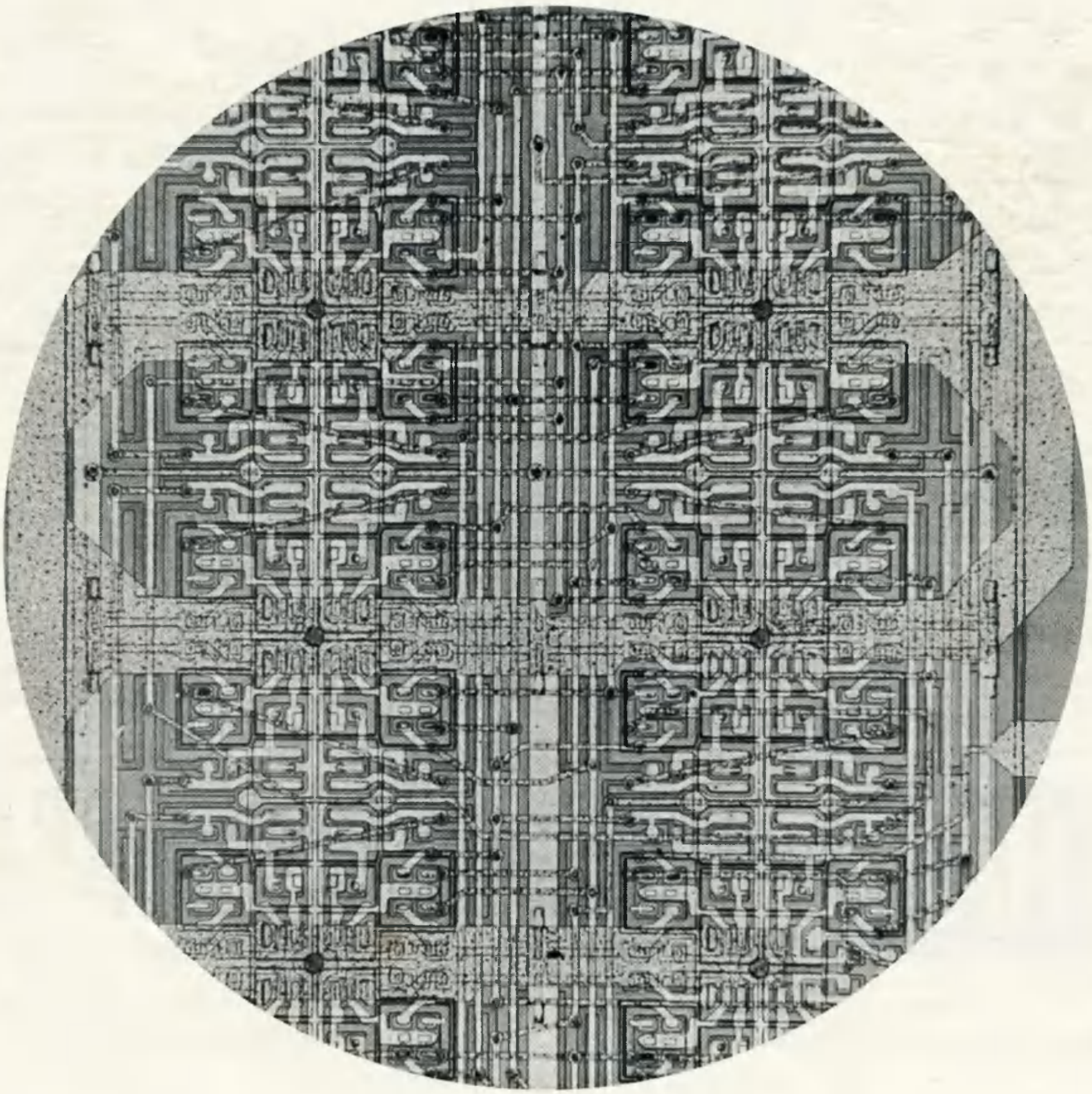

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1 mA., 5 mA., 10 mA., 25 mA., 50 mA., 100 mA., 150 mA., 250 mA., 500 mA.	$4.50
1 amp. D.C.	$4.50
5 amp. D.C.	$4.50
10 amp. D.C.	$4.50
30-0-30 amp. D.C.	$5.25
15v. D.C., 30v. D.C., 300v. D.C.	$4.50
300 volts A.C.	$5.50

CLEAR PLASTIC PANEL METERS

MR1P 1¼ inch square, clear plastic, 1 inch round mounting hole, 1¼ inch deep:

1 milliampere (mA.)	$3.50
500 microamperes (uA.)	$3.75
5 amperes (A.)	$4.75

Also other types available.

MR2P 1¾ inch square, clear plastic face, 1½ inch round mounting hole, 1½ inch deep:

50 uA.	$5.50	1-0-1 mA.	$4.00
50-0-50 uA.	$5.75	1, 5, 10 A.	$3.75
100 uA.	$5.40	15, 30 A.	$4.50
100-0-100 uA.	$5.50	15 volt d.c.	$3.75
500 uA.	$4.00	30 volt d.c.	$3.75
1 mA.	$3.75	300 volt a.c.	$4.25
5, 10, 25, 50, 100, 250, 500 mA.	$3.75	1000 volt a.c.	$4.50

"S" Meter (1 mA. f.s.d.) cal. 0-9 (with additional scale in 10 db. steps over S9) $5.25

"VU" Meter, scale: minus 20 to plus 3 VU (0 to plus 3 VU in bold red arc). Accuracy: within plus or minus 0.5 db. (at 0 VU) $5.00

Stereo Balance Meter (1-0-1 mA. f.s.d.) $4.50

Also other types available.

MR3P 3⅜ inch square, clear plastic face, 2¾ inch round mounting hole, 1½ inch deep:

50 uA.	$7.00	50-0-50 uA.	$5.75
100 uA.	$6.75	15 volts d.c.	$5.75
500 uA.	$6.50	25 volts d.c.	$5.75
1, 5, 10, 25, 50, 100, 250, and 500 mA.	$5.75	300 volts a.c.	$5.75
		"VU" Meter	$8.25

P25 2¼ inch square, clear plastic face, 2⅛ inch mounting hole, ¾ inch deep:

50 uA.	$5.75	15 volts d.c.	$5.50
100 uA.	$5.75	25 volts d.c.	$5.50
500 uA.	$5.25	300 volts a.c.	$5.50
1, 5, 10, 20, 50, 250, and 500 mA.	$5.00	"S" Meter	$5.75
		"VU" Meter	$6.50

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Mono Ronette 105 Crystal Turnover ½ in. mounting	$4.50
Ronette 105 Stereo Diamond Turnover ½ in. mounting	$7.00
8TA Ceramic Sonotone, ½ in. mounting	$6.50
9TA Ceramic Diamond, ½ in. mounting	$7.00
B.S.R. Type C1, Stereo Ceramic Turnover, ½ in.	$7.50
B.S.R. Type TC8M Mono Ceramic Turnover, ½ in.	$4.75
B.S.R. Type TC8S Stereo Ceramic Turnover, ½ in.	$7.50

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300 ft.	Mylar	3 in.	2 for	$1.75
600 ft.	Acetate	5 in.	2 for	$3.25
900 ft.	Acetate	5 in.	2 for	$3.75
1200 ft.	Acetate	7 in.	2 for	$5.20
1800 ft.	Acetate	7 in.	2 for	$6.50
1800 ft.	Mylar	7 in.	2 for	$8.50
2400 ft.	Mylar	7 in.	2 for	$9.25
3600 ft.	Mylar	7 in.	2 for	$13.50

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Head-Kleen Tape, 225 ft. on 3 in. Reel	$1.75
"Tape-Clean" Cloth Tape, 3 in. Reel	$1.75
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Available separately, all colours per reel	$1.00
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D51/35 Stereo Diamond (D35SR). Suit B.S.R. TC8/S, etc. Normal Price $5, **Special $3.25.**

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20,000 ohms per volt D.C., 8,000 ohms per volt A.C.
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D.C. Current: 0-30 uA., 1, 50, 500 mA., 10 A.
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Meter Movement Fundamental Sensitivity: 30 uA. F.S.D.
Meter Movement Internal Resistance: 3,100 ohm plus or minus 3 per cent.
Allowance:
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For D.C. Current range, plus or minus 3 per cent. of specified value.
For A.C. Voltage range, plus or minus 4 per cent. of specified value.
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amateur radio

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CONTENTS

Cover Story

Our front cover this month depicts portion of a recently introduced integration system developed by Fairchild, known as the 4500 "Micromatrix". Designed for large and medium scale integration, the 4500 "Micromatrix" is the first in a series of cellular arrays. It consists of an array of eight identical cells arranged by a 4 x 2 pattern. Each cell contains four, 4-input DTL NAND gates; interconnecton of the gates is performed with a two-layer metalisation to meet various requirements. More about "Micromatrix" elsewhere this issue.

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VHF COMMUNICATIONS

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VHF COMMUNICATIONS, the International Edition, printed in English, of the well established German Publication UKW-BERICHTE, is an Amateur Radio magazine catering especially for the VHF, UHF and Microwave enthusiast.

VHF COMMUNICATIONS will follow the same path as UKW-BERICHTE, by specialising in the publication of exact and extensive assembly instructions for VHF, UHF and Microwave transmitters, receivers, converters, transceivers, antennas, measuring equipment and accessories, which can be easily duplicated. The latest advances in semiconductors, printed circuits and electronic technology are described in great detail. For most articles, all the special components required for the assembly of the described equipment, such as epoxy printed circuit boards, trimmers, coil formers, as well as metal parts and complete kits will be available from the Australasian Representative.

VHF COMMUNICATIONS also features information regarding the development of electronic equipment, measuring methods, as well as technical reports covering new techniques, new components and new equipment for the Amateur.

VHF COMMUNICATIONS is a quarterly, published in February, May, August and November. Each edition contains roughly sixty pages of technical information and articles.

VHF COMMUNICATIONS' subscription rate (air mailed direct from the publisher) is $5.50 per year. Every copy is dispatched in a sealed envelope to ensure that it arrives in perfect condition.

Some copies of the German edition UKW Berichte are available free for perusal. Subscriptions, either cheque or money order/postal note should be forwarded to the Australasian Representative, Mr. Gordon Clarke, 2 Beaconview St., Balgowlah, N.S.W., 2093, Australia.

UKW BERICHTE

ZEITSCHRIFT FÜR DEN VHF-UHF-AMATEUR
ULTRAKURZWELLEN- UND DEZIMETERWELLENTECHNIK

VHF-UHF OSCILLATORS

FAIRCHILD DIGEST
Number 1 of a series

Presented below, for readers of Amateur Radio is a list of Fairchild Semiconductor devices and circuit diagrams for use in the construction of VHF and UHF oscillators. At the foot of the page there are brief specifications for the recommended devices taken from the Fairchild Short Form Catalogue.

2N915-6 NPN Silicon Planar Transistors designed specifically for **Low Noise** VHF Amplifier and Oscillator applications.

2N918 NPN Silicon Planar Transistor for use **in 1 K MHz Oscillator Circuits** with rise and fall time of less than 2.5 nSecs.

SE1001-2 NPN Silicon Planar Transistors designed for use in **high power gain,** VHF Amplifier and Oscillator Circuits.

SE1010 NPN Silicon Planar Transistor designed specifically as **Low Noise** VHF Amplifier and Oscillator.

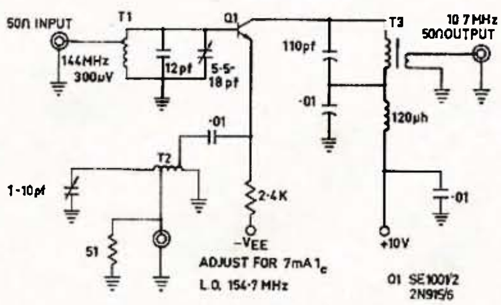
SE3001-2 NPN Silicon Planar Transistors for use in UHF Oscillator Circuit applications, featuring high power gain, low leakage and typical **fT of 900 MHz.**

SE5022 NPN Silicon Planar Transistor designed for use as VHF Oscillator and Amplifier, featuring **high power gain at 200 MHz.**

AY7101 NPN Silicon Planar Transistor designed for **wide band** RF application and VHF Oscillator application.

AY7104 NPN Silicon Planar Transistor for use in Low Power **non-saturating switching circuits** and VHF Amplifier and Oscillator Circuits.

144 MHz TO 10.7 MHz CONVERSION GAIN TEST CIRCUIT
Ic=70mA Vc=10V



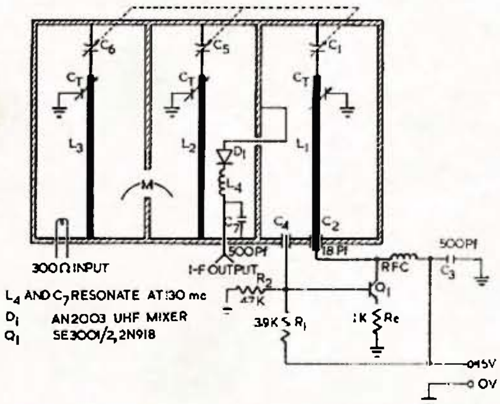
TYPICAL CONVERSION GAIN = 17dB

T1 2.5 turns #16 tinned copper wire tapped 2 turns from Gnd. Coil dia 3/8 (inside dia)

T2 4 turns # 16 tinned copper wire tapped 3/4 turn from Gnd. and 1 1/4 turns from Gnd. Coil dia 1/4 (inside dia)

T3 Miller Coil Form
Miller Core #30-106
Primary..10 turns #38 enameled wire
Secondary...1/3 turns #28 enameled wire

SILICON TRANSISTOR UHF TUNER INCLUDING UHF LOCAL OSCILLATOR AND A DIODE MIXER



ELECTRICAL CHARACTERISTICS @ 25°C.

TYPE No.	LVCEO @ ICmA Volts. min.	hFE min.-max. @ ICmA/VCE Volts.	VCE (sat.) @ ICmA/IBmA Volts. max.	ICBO @ VCB nA	fT min. MHz	Pwr. Total @ 25°C Free Air mW
2N915	50 @ 10	50 @ 10/5	1 @ 10/1	10 @ 60	250	360
2N916	25 @ 10	50 @ 10/1	0.5 @ 10/1	10 @ 30	300	360
2N918	15 @ 3	20 @ 3/1	0.4 @ 10/1	10 @ 15	600	200
SE1001	45 @ 10	40 @ 10/10	2.0 @ 10/1	500 @ 30	200	200
SE1002	45 @ 10	100 @ 10/10	2.0 @ 10/1	500 @ 30	200	200
SE1010	15 @ 10	20 @ 2/10	0.3 @ 10/1	500 @ 15	200	250
SE3001	12 @ 3	20 @ 8/10	0.6 @ 10/1	500 @ 15	600	200
SE3002	12 @ 3	20 @ 8/10	0.6 @ 10/1	500 @ 15	600	200
SE5022	20 @ 1	20-200 @ 4/5	3 @ 10/5	50 @ 10	300	175
AY7101	15 @ 10	20 @ 2/10	0.3 @ 20/2	50 @ 15	400	300
AY7104	45 @ 10	40 @ 10/10	1.2 @ 10/1	50 @ 35	250	300

For further information, data sheets and application bulletins, write or phone the Marketing Services Department, Fairchild Australia Pty. Ltd. Prices on application.

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FEI 8

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FTDX-400 Transceiver: 80/10 mx, 400-500w., built-in AC power supply, VOX, ALC, off-set tuning, calibrator . . . the lot!

FLDX-2000 Linear Amplifier: AB2 grounded grid, built-in power supply and SWR indicator. Forced-air cooling. A real signal booster for any Amateur exciter or transceiver. Officially approved for Australian Amateur use at 400w. p.e.p. output.

FTDX-100 Transceiver: Low current drain, transistorised, AC/DC power supply built-in. Many additional features; ideal for portable/mobile, 150w. peak input.

FTV-650 Six Metre Transverter: Converts your 28 Mc. SSB to VHF, includes receiving converter.

FT-200 NEW Transceiver . . . Available shortly. (Circuit: 50 cents plus 5 cents postage.)

Also available: Transceiver FT-50, Transmitter FL-50, Receiver FR-50, Low Pass Filter FF-30DX, Type "F" SSB Generator Assembly, SWR Meter K-109, Yaesu valves and spares, Co-ax. Connectors, Hy-Gain (U.S.A.) Beams.

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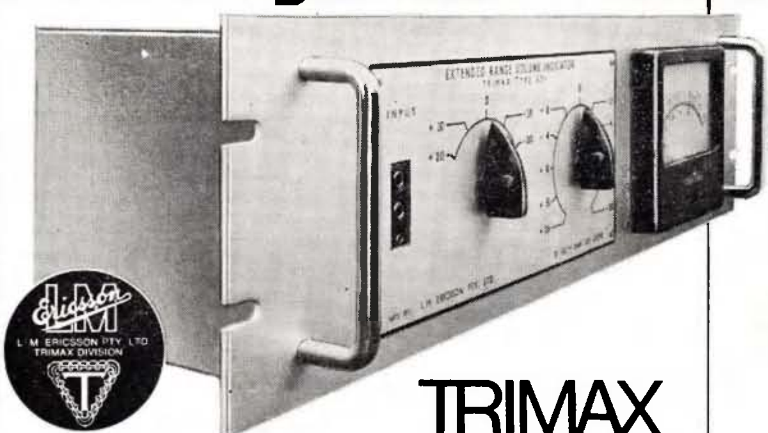
dynamic!



TRIMAX
extended range volume indicator

The Trimax G54 Solid State Volume Indicator has been specifically designed for dynamic programme level measurements, with a meter having the fast rise time required to detect the peaks of programme material. Its application, however, extends to the entire field of level measurement in the audio frequency range. The accuracy of calibration and small attenuator increments (2 db steps) also make it particularly suitable for the lining up and transmission testing of an entire system.

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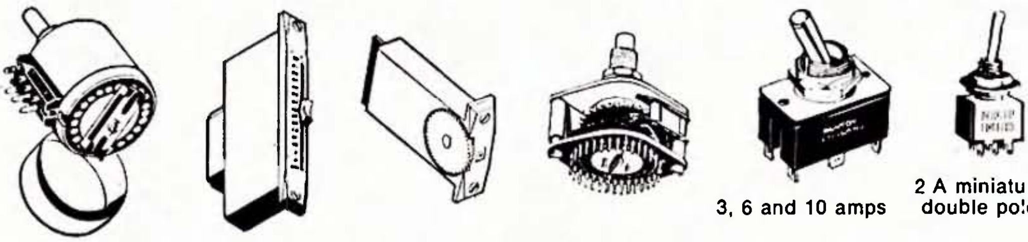

3, 6 and 10 amps

2 A miniature double po!e

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PA100

VK3 V.H.F. GROUP TWO METRE CONVERTER

BY THE PROJECTS COMMITTEE OF THE VK3 V.H.F. GROUP

SINCE the development of a successful 6 metre converter by the then Converter Committee of the VK3 V.H.F. Group, a 2 metre converter has been developed. Design of a 432 Mc. converter is continuing. The design objectives for the 2 metre converter were:

(a) Best noise figure possible consistent with reasonable cost.
(b) Sufficient gain to allow use with tunable i.f. receivers of relatively low sensitivity, such as car radio receivers.
(c) Good cross-modulation characteristics.
(d) Adaptable to a wide range of i.f. output frequencies.

DESIGN CONSIDERATIONS

Semiconductor devices that will outperform the best vacuum tubes are readily available at very attractive prices. Semiconductors are, therefore, the logical choice. There is little to chose between bipolar transistors and field effect transistors on the basis of noise figure. Noise figure is generally regarded as being the most useful figure of merit for devices to be used for v.h.f.-u.h.f. amplifier applications.

A brief discussion of noise may be in order. Any generated signal has associated with it an amount of noise. This noise is unavoidable, since it is generated by thermal agitation in the source impedance of the generator, for example the radiation resistance of an antenna. The theoretical limit to reception is the ratio of signal power to noise power, i.e. the signal to noise ratio.

Just what constitutes a minimum usable signal to noise ratio cannot be specified, since this depends on the type of signal and to a very large extent the person receiving the signal.

Noise figure is the amount by which signal to noise ratio is degraded after passing through an amplifier, and is given by the formula:

$$NF = 10 \ \mathrm{Log}_{10} \frac{S_1N_1}{S_2N_2}$$

Where S_1N_1 is the input signal to noise ratio.
S_2N_2 is the output signal to noise ratio.

In general, while the lowest possible noise figure is desirable at 144 Mc., there is a limit to the minimum useful noise figure. In addition to noise due to thermal agitation in the radiation resistance of the antenna and the input stages of the receiver, external noise is also received by the antenna. At 144 Mc. external noise is made up of man-made electrical noise, atmospheric noise and cosmic noise. In quiet locations cosmic noise is the limiting factor.

As the noise figure is lowered, noise introduced by the receiver becomes insignificant in relation to external noise, and further reducing the noise figure brings no real benefit.

In the practical case, lower noise figures may be necessary to overcome unusually high feeder losses.

The noise figure below which cosmic noise is the limiting factor is considered to be 2-2½ db. at 144 Mc.

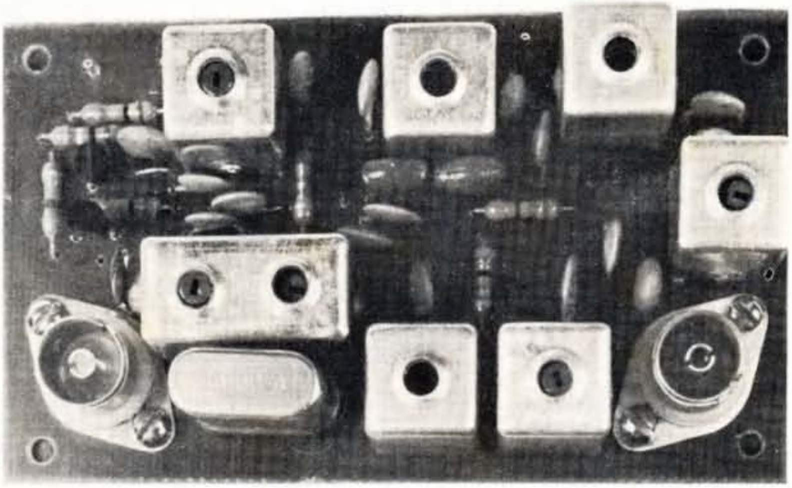
Accurate measurement of noise figure is quite difficult and the many pitfalls can give rise to conflicting or exaggerated claims about receiver performance. Noise figure is generally measured indirectly, by determining the amount of extra noise necessary to double the noise output of the receiver. The technique used must not rely upon assumed linearity of the receiver.

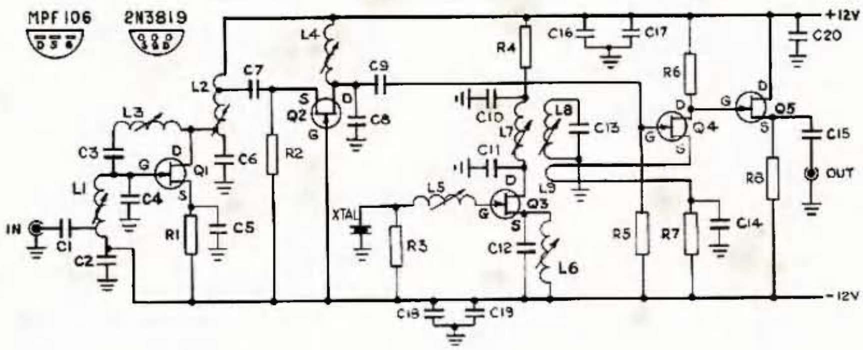
Equipment used to obtain noise figures quoted for prototypes was:

(a) Hewlett Packard noise source, diode type, HP343A.
(b) Hewlett Packard noise figure meter type HP340B (22 Mc. i.f.).

Converter gain must be sufficient to override noise generated by the tunable i.f. and in addition must provide sufficient signal so that the total amplification makes any signal above the noise audible. Approximately 20 db. gain is quite adequate for use with any communication receiver, however since car radios and other less elaborate receivers are likely to be used, considerably more gain than 20 db. is desirable. One microvolt into a converter with 35 db. conversion gain will produce an output of 87 microvolts at the i.f. frequency.

Susceptability to cross-modulation is determined by the shape of the transfer characteristic of the device concerned. Because of the approximate square law characteristics of FETs, their use significantly reduces cross-modulation problems.





Circuit of VK3 V.H.F. Group 2 Metre Converter

R1—220 ohms.	C1—470 pF.	C11—3.3 pF.	Q1—MPF106.
R2—2.2K ohms.	C2—1000 pF.	C12—22 pF.	Q2—MPF106.
R3—390 ohms.	C3—470 pF.	C13—3.3 pF.	Q3—2N3819.
R4—470 ohms.	C4—3.3 pF.	C14—1000 pF.	Q4—MPF106.
R5—100K ohms.	C5—1000 pF.	C15—4700 pF.*	Q5—2N3819.
R6—10K ohms.	C6—3.3 pF.	C16—1000 pF.	Xtal—See text.
R7—10K ohms.	C7—470 pF.	C17—0.047 uF.*	Coil Data—See Table.
R8—3.9K ohms.	C8—3.3 pF.	C18—0.047 uF.*	Capacitors marked *
Resistors ¼ watt.	C9—470 pF.	C19—1000 pF.	Red Cap, others
	C10—1000 pF.	C20—1000 pF.	Disc Ceramic.

For optimum performance, the lowest intermediate frequency is limited by the bandwidth of the converter. Noise is additive on a power basis and if the first image band falls within the bandwidth of the converter, image noise will add to noise already associated with the signal, reducing the signal to noise ratio. For the worst possible case signal to noise ratio may be degraded by 3 db.

DESCRIPTION

In view of the above considerations, it was decided to use field effect transistors in the design. Evaluation of the specifications of available FETs resulted in the use of the MPF106 N-channel junction FET (Motorola) for r.f. amplifier and mixer functions. The 2N3819 N-channel JFET (Texas Instruments) was chosen for oscillator and source follower.

The first amplifier stage uses an MPF106/2N5485 (Q1) in neutralised common source configuration. Neutralisation could have been avoided by the use of dual gate metal oxide insulated gate FETs (MOS-FETs), however consideration of noise figure and the ease of neutralisation with the circuit used led to the choice of the MPF106 JFET. Neutralisation is accomplished by adjustment of L3, which resonates with the drain to gate feedback capacitance to form a high impedance parallel resonant circuit at 144 Mc.

Signal is taken from L2 in the drain circuit of Q1 via C7 to the source of Q2, a second MPF106. The second stage is in grounded gate configuration, forming with Q1 a shunt fed cascode r.f. stage. Signal is taken from L4 in the drain of Q2 via C9 to the gate of Q4, the mixer. Oscillator injection is via a link on L8 into the source of Q4.

Intermediate frequency output appears across R6 in the drain circuit of the mixer, while a direct coupled source follower (Q5) transforms the i.f. band to a low impedance for use with coaxial cable.

The crystal oscillator circuit requires some comment. A single FET is used as both oscillator and multiplier. The circuit is designed for use with third overtone crystals in the range 38-48 Mc. Adjustment of oscillator to exact frequency is possible with adjustment of L5. If this facility is not required, L5 may be replaced by a link and the value of R3 increased to 56K ohms.

The third harmonic of the crystal frequency is selected by L7. The double tuned circuit coupling of L7, L8, L9, results in a "clean" injection waveform at the source of the mixer. Fifth overtone crystals of about 61 Mc. have been used, with doubling in Q3, but insufficient information is available for success with this range to be guaranteed. No changes to coil dimensions were required.

A supply of 9-15v. at 10-20 mA. d.c. is required. The design voltage is 12v. Positive and negative supply rails are d.c. isolated from earth, giving greater flexibility in application. Should this not be required, the appropriate bypass capacitors may be replaced by short wire straps.

The converter is constructed on an epoxy fibre-glass printed circuit board 4" x 2½", which is the same size as the VK3 V.H.F. Group 6 metre converter. All capacitors below 100 pF. are NPO disc ceramics. Above 100 pF. Hi-K disc ceramics are used. Resistors used must be of small physical dimensions. Ratings up to ¼ watt are suitable. The coil formers used are Neosid type A (single assembly) and the type B (double assembly) with screening cans. The bases usually provided have not been used, so as to maintain high unloaded tuned circuit Q. Instead, the boards are drilled 7/32" and the formers glued in. F29 v.h.f. slugs are used throughout. Coil dimensions are given.

PERFORMANCE

All prototypes were measured with noise figures in the vicinity of 2 db. The minimum noise figures of two of the prototype converters were 1.6 db.

The gain of the converter is adequate for all reasonable applications, with protoypes having measured conversion gains in excess of 35 db. With all tuned circuits peaked for 144.25 Mc., 3 db. bandwidth was 540 Kc. The noise figure was substantially constant over this range. The 10 db. bandwidth was 1.4 Mc. The bandwidth is quite adequate for operation in the normally used part of the band, and allows the use of i.f's down to the broadcast band. Greater bandwidths may be obtained by stagger tuning, with some sacrifice in gain and noise figure.

No measurements of cross-modulation have been performed. Qualitative tests indicate that cross-modulation performance is very good. No diode protection at the input of the converter was found necessary, even when used with transmitters of over 100w. input.

CONSTRUCTION

Complete construction details will be supplied with the kits which will be made available. For those not wishing to obtain the kit, a few hints may be helpful.

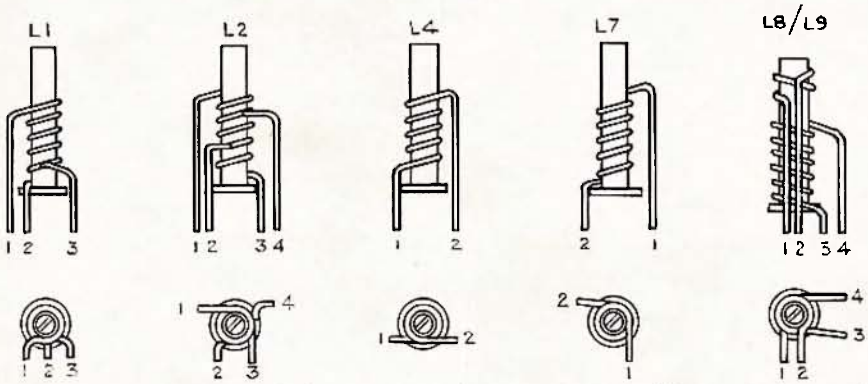
First, all minor components should be soldered in. Locating lands on the Neosid formers should be filed off and the formers glued in place with Araldite, making sure that the former lines up correctly with the position of the can.

Care must be taken when soldering in the FETs, to prevent damage due to excessive leakage current from soldering iron tip to earth if a Scope soldering iron is used. The board should be isolated from earth while soldering the FETs in place. No special precautions are necessary when handling the FETs used, however for best performance they should be pushed down to within 1/8" of the board. The FETs are guaranteed by the manufacturer to sustain 260°C. lead temperature 1/16" from the body for 10 seconds. A Scope soldering iron with clean, pointed instrument tip is suitable.

ALIGNMENT

With supply connected to the completed converter, L5 and L6 should be tuned for maximum voltage across R4. The 5 volt range of a multimeter is suitable. Approximately ½ volt change should be evident. With the voltmeter connected across R7, L7 and L8 should be adjusted for maximum reading (approximately ½ volt change). Some particularly inactive crystals may be made to work by increasing the value of R3 from 390 ohms to 1K ohms.

COIL DATA



L1: 1—Gate Q1. 2—Minus 12v. 3—Aerial.

L1—5¼ turns 22 s.w.g. T.C. tap (3) ¾ turn from cold end.

L2: 1—3.3 pF. (C6) 2—470 pF. (C7) 3—Plus 12v. 4—Drain Q1.

L2—5½ turns 22 s.w.g. T.C. Tap (2) 1¾ t. from cold end, tap (4) 1¼ t. from hot end.

L4: 1—Drain Q2. 2—Plus 12v.

L4—4¼ turns 22 s.w.g. T.C.

L7: 1—470 Ω (R4) 2—Drain Q3.

L7—5½ turns 22 s.w.g. T.C.

L8/L9: 1—Source Q4. 2—10K Ω (R7) 3—3.3 pF. (C13) 4—Earth.

L8—6½ turns L9—1¾ turns spaced 1/16" from L8. Both 22 s.w.g. T.C.

L3—15 turns of 30 gauge B. & S. enamel, close wound.
L5—18 turns of 30 gauge B. & S. enamel, close wound.
L6—13 turns of 30 gauge B. & S. enamel, close wound.

All coils are wound on Neosid formers with type F29 cores.

L1, L2, L3, L4, L5, L6 are in single cans. L7, L8, L9 in one double can.

The turns on L1, L2, L4, L7, L8 are spaced to cover ¼" winding to commence at base of former.

Connect antenna to converter and output of converter to the tunable i.f. Using a suitable signal source—signal generator, early stages of own transmitter or a strong local signal—adjust the other coils in order L4, L2, L1. If the converter oscillates adjust L3 to restore stability. Re-peak all coils and neutralising for best results. Final alignment may be carried out with a simple noise generator if available.

A number of kit sets have been made available to members of the VK3 V.H.F. Group. A further limited number of kits will be made available by post at a price of $12.50 including postage. The kit is complete except for the crystal.

Because of the large number of specialised components, it was decided to make available the full kit comprising drilled board, resistors, capacitors, FETs, co-axial and crystal sockets, coil former assemblies and incidental bits.

Inquiries should be addressed to:

"Two Metre Converter,"
W.I.A., Vic. Div.,
P.O. Box 36, East Melbourne,
Vic., 3002.

OBITUARY

MAX FOLIE, VK3GZ

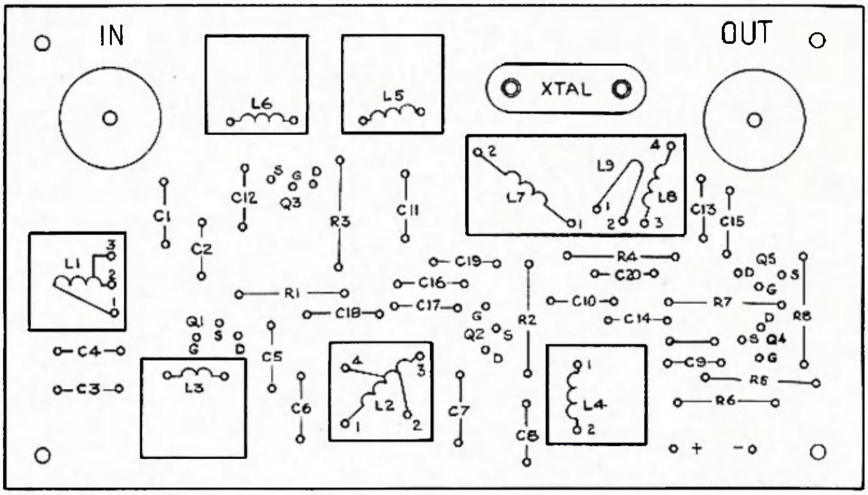
The death occurred on 28th December of Max Folie, VK3GZ, at the age of 59.

Born in Richmond, Victoria, in 1909, he was educated at Surrey Hills State School, Scotch College and the Royal Melbourne Technical School. He studied Radio Engineering and was an associate member of the Institute of Radio and Electronic Engineers of Australia. He joined the Wireless Institute of Australia in February 1948.

Max had many interests and although he had only limited time to devote to Amateur Radio, was at the time of his death trying to organise a radio club in Mildura.

Max entered the field of commercial radio in 1932 when he was appointed engineer to 3YB, when he installed a station in a railway carriage which visited and transmitted from many country towns. He built the first equipment for 3MA Mildura when the station was formed in 1933. At the time of his death he was managing director of Sunraysia Television Ltd. STV8, with which company he had been for the last four years.

Members of the Wireless Institute of Australia regret the passing of another of our pioneers and extend their sympathy to his family.



Layout of the VK3 V.H.F. Group 2 Metre Converter

Modified Printed Circuit Board of the VK3 V.H.F. Group 2 Metre Converter

VK3 VHF GROUP

2 METRE CONVERTER

KITS AVAILABLE FOR THIS CONVERTER, $12.50 each, post paid.

Cash with Order to:
Victorian Division, W.I.A.,
P.O. Box 36, East Melb., Vic., 3002.

May be some slight delays depending on arrival of components from overseas.

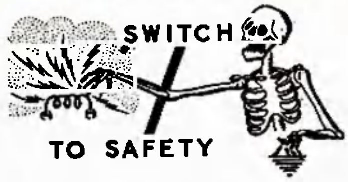
FAIRCHILD WINS TOP AWARD

An advanced integrated circuit array developed by Fairchild Semiconductor was acclaimed as one of the 100 most significant technical products of 1968 in the Annual National Research Week competition held recently in New York.

Fairchild's winning entry was the 4500 Bipolar "Micromatrix" Array, a monolithic semiconductor device that provides the electrical equivalent of 352 transistors, resistors, diodes and other components, all interconnected to provide a desired function. "Micromatrix" is a new design technique that utilises computer aided design facilities to achieve low production costs and fast deliveries on order.

The 4500 "Micromatrix" Array is a highly complex unit, which incorporates a standard semiconductor base with unique two-level wiring interconnections, designed to a customer's specifications. It consists of eight distinct cells on a silicon chip, and, apart from its package, is no larger than the head of an ordinary pin.

The only integrated circuit among the 100 products selected, the 4500 features exceptional reliability and a high degree of logic compatibility with other circuits.



VK3 VHF GROUP

6 METRE CONVERTER

Transistorised Basic Kit, as detailed in "A.R." November, 1967.

FETs, Transistors, Coil Formers and Printed Circuit Board. No capacitors, resistors or crystal:

Basic Kit .... **$6.50**, post paid
P.C. Board .. .. **$1.50**, post paid
2 FETs for modified output, $2 extra

SOLID STATE COUPLING METHODS*

The whys and wherefore of coupling circuits in solid state i.f. amplifier design

JOSEPH TARTAS, W2YKT

ABOUT seven years ago, I made a prediction in some material I was writing about t.v. servicing, that, "Undoubtedly transistors will eventually replace tubes in all of the t.v. circuits but the c.r.t. itself." Not only has this prediction come true, but at some future date, this may well be remembered, not as the Space Age, but as the **Semiconductor Age.** Each new development in the transistor line presents a different problem to the circuit designer; the bipolar transistor, the FET and the IC.

As the usable frequency spirals upwards, the input and output circuits must be altered to compensate for different input and output impedances. Input, output and feedback capacitances (by whatever the name) and methods of coupling to achieve the desired gain and bandpass characteristics also change.

COMPARISON TO VACUUM TUBE I.F. CIRCUITS

The transistor has been considered as essentially a current amplifier. As an i.f. amplifier, however, its sole purpose is to provide a sufficiently high **voltage** level at the detector input. It may be regarded, except for the considerations to follow, to be similar to vacuum tube voltage amplifier circuits.

Tubes have relatively high input **and** output impedances. Bipolar transistors, in the more useful configurations, have **high output** impedances (although considerably lower than that of tubes), but, unfortunately, have quite low input impedances. FETs on the other hand, have semiconductor characteristics, but with impedances higher even than vacuum tubes.

Because the transistor is basically a power amplifier, the maximum transfer of power occurs when the coupling network is matched, both to the output of one stage and input of the next stage. In addition to impedance matching., the resonant frequency of any tuned circuit connected to the transistor must be considered. The output capacity of most transistors is low, but the input capacity is often higher than those of tubes, as much as 30 pF. in some types. These capacities must be considered since they are part of the total tuning capacity across the coils in i.f. amplifiers.

Of the three possible circuit configurations, common-base, common-emitter, and common-collector, the common-emitter circuit is almost exclusively used for i.f. circuitry. It is the common emitter circuit that produces a high voltage gain as well as the greatest power gain of the three configurations.

Another advantage in using the common emitter circuit is the possibility of isolation due to the physical layout of the transistor terminals. Reference to Fig. 1 shows that a shield partition may be used to completely isolate the input circuit consisting of the base circuit (which is also the collector or output circuit if another stage precedes it) and the emitter circuit, from the output, or collector circuit. In tetrode transistors the additional lead does not prevent use of the shield, but also provides a separate element for a.g.c. control that is completely isolated from the active r.f. circuit elements.

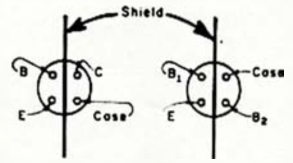


Fig. 1.—Basing diagrams of most transistors are alike except for the ground lead or the extra base connection in the tetrode.

Until recently, the collector of a triode transistor was tied to the case and presented a problem in shielding. Now, many r.f./i.f. types have the case isolated from the transistor elements and it can be grounded through a fourth lead connected to the case.

OUTPUT CIRCUITS

The output impedance of the transistor in an L-C tuned amplifier is sufficiently high that the tuned circuit could be represented as in Fig. 2, and is essentially the same configuration as for a vacuum-tube circuit. The value of R would be higher than the impedance of the L-C circuit or omitted, depending upon the desired loading, the loading effect of the collector, and the means by which it is coupled to the following base.

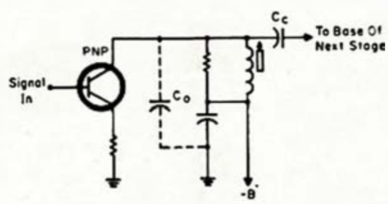


Fig. 2.—Output circuit of a transistor I.f. stage. The output capacity is identified as C_O.

INPUT CIRCUITS

In order that the low impedance input of the transistor does not excessively load the tuned circuits, thereby reducing the gain, some means of impedance matching must be resorted to.

There are three ways in which the proper match may be achieved. To better understand these methods, consider the various relations of the parallel tuned resonant circuit shown in Fig. 3.

At Resonance:

$X_L = 2\pi FL = X_C = \frac{1}{2}\pi FC$

Unloaded $Q = X_L/R = X_C/R$

$Z_{Resonance} = X_C I_C / I_G = X_L I_L / I_G$

$Z_{Resonance} = QX_L = QX_C$

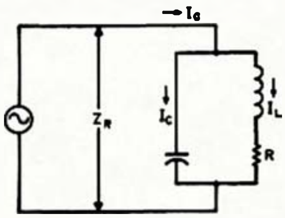


Fig. 3.—A parallel tuned circuit and its various current, voltage and impedance relationships.

At resonance, the inductive and capacitive reactances are equal and the resonant impedance, Z_R, is the product of the coil Q (determining the bandwidth) and the reactance of **either** element since they are equal at resonance. The Q is the ratio of the tank current (I_L or I_C) to the total current from the generator. Since the current I divides, the ratio of the currents in each branch depends upon the ratios of reactance and resistance present in the tank circuit. If the generator is considered to have a very high impedance, then the signal may be injected between the common terminal and terminal 1, 2, or 3 in Fig. 4, without affecting the resonant frequency, unloaded Q, or resonant impedance of the tuned circuit, since $Z_T = Z_1Z_2/Z_1 + Z_2$ as in parallel resistance.

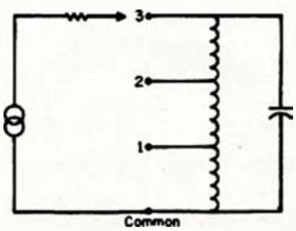


Fig. 4.—Impedance matching by means of a tapped inductor. The tap impedance equals Z_R $(N_T/N)^2$ where N_T is the number of turns from common and N is the total turns.

Since the inductance of a coil varies as the square of the number of turns, the inductance, and hence the reactance and impedance at points 1, 2, and 3, will be one ninth, four ninths, and the total impedance respectively. Other arrangements are equally possible, i.e. a centre tap gives one-fourth the total impedance, etc.

The tuning capacity (where used) may be employed in a similar way to divide the total impedance, as shown in Fig. 5A. If the resultant capacity is the tuning capacity, the r.f. voltage across the tuned circuit is divided in the ratio of capacitive reactance, or the inverse of the capacity ratios, since:

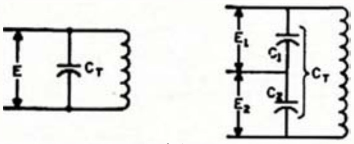
* Reprinted from "CQ," July 1968.

$$\frac{IX_{C1}}{IX_{C2}} = \frac{E_1}{E_2},$$

$$\frac{X_{C2}}{X_{C1}} = \frac{\dfrac{1}{2\pi f_{C2}}}{\dfrac{1}{2\pi f_{C1}}} = \frac{C_1}{C_2}$$

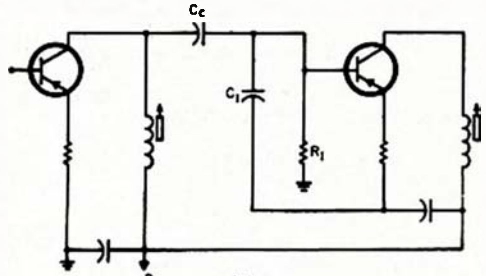
Stagger tuned i.f's, as found in t.v. circuits, use the tube capacity (plus strays) as the only resonating capacity. In transistor circuits the input capacity is often much higher, but as seen in Fig. 5B, this capacity may be used as part of the impedance divider. If this capacity is too small, additional capacity may be used across the input, or the coupling capacitor that forms the other part of the divider may be made sufficiently small to give the proper division. When the tuning capacity consists mostly of a large fixed capacitor across the coil, this divider has little effect on the tuning if a small coupling value is used. See Fig. 6 for typical values.

$$E = E_1 + E_2$$



(A)

Fig. 5A.—Impedance matching by means of a capacitive divider.



(B)

Fig. 5B.—Typical circuit uses the coupling capacitor. C_C and the input capacity C1 to form the impedance divider.

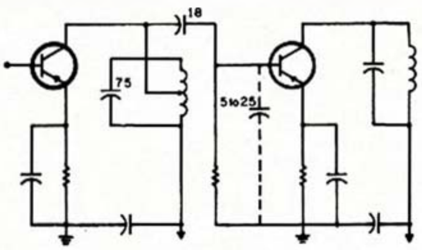


Fig. 6.—Typical capacitor divider circuit and values.

DOUBLE-TUNED CIRCUITS

Basically, the tuning and coupling of tuned pairs are accomplished the same way as for tube circuits. The only difference in their application to transistor circuitry is in the means of loading.

Fig. 7 shows the way in which a transistor with output impedance R_o and capacitance C_o is connected by means of a tap to the primary. The secondary is connected to another transistor stage with equivalent parallel input resistance R_i and capacitance C_i. The primary tap is usually at or near the top, due to the fairly high value of R_o. The secondary tap will normally be placed well below the middle of the coil to provide the desired amount of loading, since R_i is low, compared to R_o. The coupling may consist of either capacity or mutual inductance.

SINGLE-TUNED TRANSFORMER COUPLING

An alternate method of matching a single tuned circuit to the input impedance of another transistor is by means of transformer coupling where the secondary and primary are tightly coupled but has a step down ratio. The step down ratio of the transformer should be equal to the square root of the ratio of output to input impedance of the transistors. This, in turn, gives the number of turns for the secondary, if the number of primary turns is already known. In this case the secondary is untuned, as shown in Fig. 8.

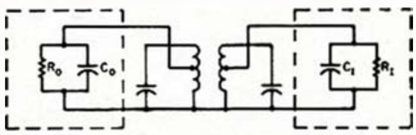


Fig. 7.—Equivalent circuit of input and output matching with a tuned pair. The coupling between the two coils is discussed in the text.

NEUTRALISATION OR UNILATERALISATION

Unlike the vacuum tube, the transistor is not a unilateral device, i.e. current can flow in both directions, even though small. Because it can do this, the output voltage variations cause variations at the input of the same transistor. The result is a feedback voltage that is, unfortunately, in phase and therefore **regenerative.** If this feedback voltage is large enough, the amplifier goes into oscillation. Just as in tube amplifiers, the feedback is large at higher frequencies, and if the frequency is low enough, the feedback voltage is too small to be of consequence. The equivalent feedback circuit of the common emitter circuit of Fig. 9A is shown in Fig. 9B.

The capacity of the base-collector junction, C_{CB}, is small and of little consequence at low frequencies. The resistor it shunts, R_{CB}, is very high and is of little consequence under normal operation when reverse bias is applied to the base-collector junction. As the frequency increases, the capacitive reactance decreases, until such a frequency is reached where the impedance becomes lower than the value of R_{CB} and feedback occurs. The base spreading resistance R_B, produces a positive feedback voltage due to the collector current passing through C_{CB}.

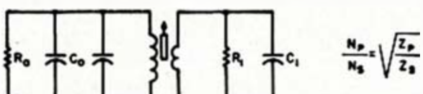


Fig. 8.—Transformers with untuned secondaries are often used for impedance matching. The formula governing the relationship between the primary and secondary impedances is shown above.

Since we are interested in the use of these circuits at reasonably high frequencies some means must be used to prevent the occurrence of regeneration and oscillation. This method is known as **unilateralisation** when **all** the input changes due to feedback, **both resistive and reactive** are cancelled. If only the reactive changes are cancelled, they are said to be **neutralised.**

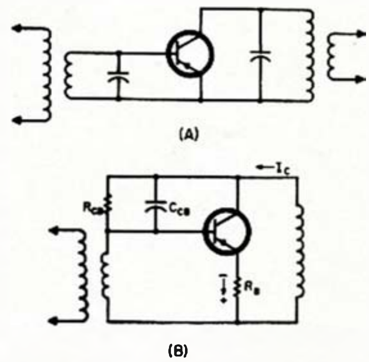


Fig. 9A.—Simplified common emitter amplifier.
Fig. 9B.—Common emitter equivalent high frequency circuit showing the elements that produce feedback.

To some readers who are familiar with transmitter circuitry, the methods used for unilateralisation and neutralisation will be familiar. For reasons previously given, the common-emitter amplifier only will be discussed, although the following methods will apply equally to the common-base amplifier.

Fig. 10 shows a typical i.f. stage using transformers with untuned secondaries for the input and output circuits. The input signal is a.c. coupled by means of the step down secondary winding, through the d.c. blocking capacitor, C_B, to the base. The transistor is forward biased by means of the resistor R_B and the supply voltage. This provides the proper bias voltage between the base and emitter. The

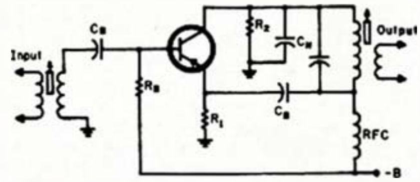


Fig. 10.—Typical i.f. amplifier stage unilateralised by partial emitter degeneration. Components R1, R2 and C_N form the unilateralising network.

unbypassed resistor, R1, in the emitter provides degeneration and reduces the positive feedback produced in the base spreading resistance within the transistor structure itself. Resistor R2, in conjunction with C_N, the neutralising capacitor, produces an additional negative feedback due to collector current that is directed back to the emitter.

(Continued on Page 15)

PUTTING THE GELOSO G222 ON 160 METRES

J. A. ADCOCK, VK3ACA*

IN view of the general acceptance of sideband and the prospect of the Geloso becoming obsolete. it was decided to carry out modifications to make it more versatile. Rather than shelve or sell a useful piece of equipment, it can be adapted to perform a function not normally covered by the s.s.b. transceiver. Although modifications were carried out to a complete Geloso transmitter, the information should be of equal interest to people with the Geloso v.f.o. only. The observations on stability should be of interest together with others recently appearing in this magazine.

The aim of the modifications were:

1. Introduce coverage of the 160 metre band without altering the existing coverage of six bands or the v.f.o. calibration.
2. Improve the general stability of the v.f.o.

It might be considered unnecessary to preserve operation on the 27 Mc. band, however it was found practical to retain this band without introducing an extra switch position. Under the re-arranged scheme both band switches, exciter and final, have been altered as follows:

Band	Old Scheme	New Scheme
1	80 mx	160 mx
2	40 mx	80 mx
3	20 mx	40 mx
4	15 mx	20 mx
5	11 mx	15 mx
6	10 mx	11 & 10 mx

MODIFICATIONS TO THE FINAL TUNING

It is quite simple to cover 10 and 11 metres on the one tap of the final tuning tank. The 11 metre tap was removed completely. In this case it was found desirable to re-locate the 10 and 15 metre taps at points indicated in Fig. 1.

An extra coil must be wound for the 160 metre band. With the existing tuning capacitance, the L/C ratio was found to be too high and thus an extra capacitance must be switched in parallel. To achieve this, an extra switch wafer was added to the final range change switch. This is fairly easy to do if one has an old two-bank 6 or 12 position Oak switch. I was fortunate in having such a switch with a ceramic wafer which was ideal for the purpose.

Having the spare switch and using some of the parts of the existing switch, including the tap shorting wafer, it is not difficult to engineer the new switch (Fig. 3). It will probably be necessary to use the new clicker plate and shaft because of the unusual driving shaft on the original switch. To engage the original wafer a double flat should be filed on the switch end of the shaft.

The extra coil was wound on a 1½" diam. bakelite tube (Fig. 2) and this was mounted vertically between the 6146, the tuning capacitor and the filter capacitor. It was attached to the chassis by means of a right angle brass bracket. The actual winding was close to the top end of the former and mounted so that it was close to the end of the existing coil.

Having made coil, obtained the extra capacitors and re-modelled the switch, one should proceed as follows (see Fig. 1).

Remove all taps from the switch except the 10 metre tap. Discard the 11 metre tap and shift all remaining taps around one position on the switch. Connect the lower end of the new coil to the 80 metre end of the old coil and the free end of the new coil to the shorting wiper of the switch. Connect the ceramic capacitors so that they are switched in parallel with the tuning capacitor in the 160 metre position.

It should also be noted that the variable coupling capacitor may have to be considerably greater on 160 metres. In this case the extra capacitance was included in the aerial tuning unit.

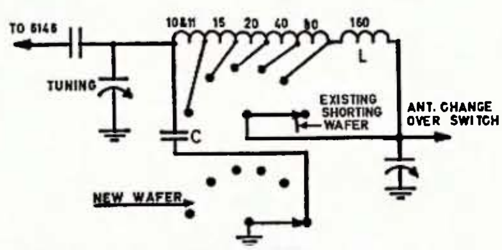


FIG.1 SWITCH IN 160 METER POSITON

C—New capacitor, 200 pF. low K high voltage ceramic.
Tapping points:
10 and 11 metres—turn 4.
15 metres—turn 6.
20 to 80 metres—no change.
L—New coil, 25 turns of 22 B. & S., close wound, on a 1½ inch bakelite former.

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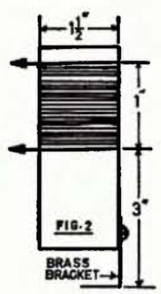
ALTERATIONS TO EXCITER

At first sight it might appear necessary to provide a completely new oscillator section, however if the 3.5 to 4 Mc. coil is removed and replaced by one of four times the inductance, without changing any capacitance values, exactly half the frequency and range will be covered, namely 1.75 to 2 Mc. It is now possible to cover the 80 and 160 metre bands with the same oscillator coverage, using the "intermediate" tuned circuit as either a straight amplifier or doubling to 3.5. (The terminology used here is that used in the Geloso manual.) The same scale can still be used for 3.5 to 4 Mc. and an extra scale can be marked below this scale from 1.8 to 1.9 Mc., exactly half 3.6 to 3.8 Mc.



EXTRA TANK COIL

In the new arrangement two extra coils must be introduced; one to cover 1.8 Mc. at the driver stage and an extra tuned circuit for 3.5 Mc. at the intermediate tuning position. At this position resistance coupling was tried, but this was inadequate at 3.5 Mc. In the original circuit, this stage is tuned by internal capacitance of the coil only. It was found to be impossible to make the new coil for 3.5 Mc. resonate in this way, but the non resonant coil was found to be quite adequate

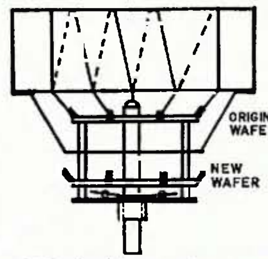


FIG. 3 EXISTING TANK COIL

The new oscillator coil for 1.75 Mc. was wound on a fairly large diameter former, and after some experiment, with a slug. In this case it was found to be best in the interests of stability. The absence of a slug does introduce some difficulty in tuning and to this end one turn may have to be either added or removed to obtain the correct scale law in conjunction with the trimmer. Having settled on the new coil. the trimmer should be satisfactory for frequency adjustment.

Table 1 is a tabulation of original and new circuit tuning ranges.

Band Mx	Oscillator Mc.	Intermediate Self Reson. Mc.	Driver Mc.
Old arrangement:			
80	3.5-4.0	resistance	3.5-4.0
40	3.5-3.65	7.0-7.3	7.0-7.3
20	„ „	„ „	14.0-14.6
15	„ „	„ „	21.0-21.9
11	6.74——	13.48-13.6	26.96-27.23
10	——-7.425	14.0-14.85	28.0-29.7
New arrangement:			
160	1.75-2.0	resistance	1.75-2.0
80	„ „	3.5-4.0	3.5-4.0
40	3.5-3.65	7.0-7.3	7.0-7.3
20	„ „	„ „	14.0-14.6
15	„ „	„ „	21.0-21.9
11, 10	6.74-7.425	13.48-14.85	26.96-29.7

Table 1.

EXCITER MODIFICATION PROCEDURE

Wind the coils as described in Fig. 4. First let us deal with the driver tuning and switch wafer No. 3. Remove the 11 metre connection to the switch and shift all connections around one step, leaving the first position vacant. It will be noticed that the shorting sector does not bridge position No. 5 (now 15 metres), but this is of little consequence. Place the new coil L12 in a position between L10, the frame and wafer No. 3. The coil will be found to work satisfactorily although there is only ½" space. (Note position 1 is taken as the 160 metre end of the switch.)

Next let us deal with the intermediate tuning position and switch wafer No. 2. The 11 metre tap on L4 must be disconnected. Some attention must be paid to the shorting sector on the back of the switch. Although not shown in the circuit diagram, this section is used to short out L5 when not in use. In the new circuit this would short out L5 in the 15 metre position. It is easily disconnected by bending the contact clip back out of the road on the shorting side of the switch. This is most important. (It is the only contact clip in use on this side.)

Shift connections from L5 around one step, the circuitry remaining unaltered, and leave the resistor in position 1 intact. This leaves the second position vacant.

The 3.5 Mc. oscillator coil occupies the position in front of the coil line up and this should be removed in order to wind L11. Shift coils L1 and L3 along one position, leaving a gap between L3 and L4. Into this gap is placed the new L11 which has been wound on L2 former. L1 and L3 may both be replaced as discussed in the section on stability. L11 is wired into the circuit with its associate resistor to the vacant position 2 on bank 2.

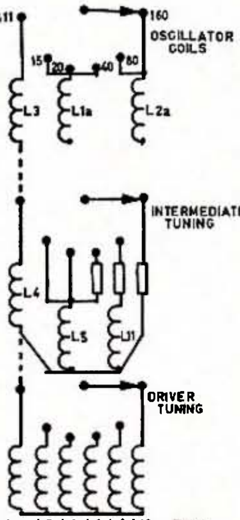


FIG 4
3 BANK RANGE CHANGE SWITCH

Refer to manual for details.

COIL DATA (Coils not listed remain unaltered):

L2A replaces **L2**.—Wound ¼ in. from the top of ¾ in. diam. polythene former; total height 1½ in., wind. ½ in.; close spaced, 34 B. & S. enamel wire. Remove turns as required.

L1A (optional, see notes on stability),replaces L1.—Wound ¼ in. from the top of ¾ in. diam. polythene former; total height 1½ in.; wind 36 turns of 28 B. & S. enamel wire. Remove turns as required.

L11.—Wound on former of old L2, retain slug tuning. Fill winding space with a single layer of close spaced 34 B. & S. enamel wire.

L12.—Wound on a 7/16 in. diam. slug tuned former. Wind 1⅛ in. of a single layer of close spaced 34 B. & S. enamel wire.

L4.—Leave off 11 metre tap.

OSCILLATOR CONVERSION

Lastly, let us deal with the oscillator conversion and switch wafer No. 1. It is necessary to locate the new oscillator coil as far from the sides of the shield box as possible and as close to all associate circuitry as possible. The earth point of the 1,000 pF. mica capacitor must be moved to the tag strip directly across N555 to make extra space.

In this case the new L2A coil is placed directly in front of the cord drive spindle and close to L3 and the 6CL6 socket. There is still room for two new coils, L1A and L3A if required. L1A next to L2A and between the 1,000 pF. mica capacitor and the cord drive shaft, and L3A somewhere in between the old position of L1 and L2.

Connections to No. 1 wafer of the switch: The 11 metre connection is removed and connections to L1 are moved around one position, the new L2A is connected to positions 1 and 2 of switch wafer.

STABILITY

There has always been some problem of stability in this unit and the following points were noted. The new coil L2A was much more stable than the old L1 coil, especially when using no slug. This latter effect could have been a characteristic of the coil former and slug type used. However, the larger the diameter of the coil the more stable the results. It was decided to try a new coil L1A and a similar improvement was observed.

It was also observed that there was considerably more erratic drift with the shield box in place. This defect was found to be due to intermittent contact around the perimeter of the shield. This problem was overcome by lining all contact surfaces with cellulose tape so that it only made contact with the two attaching screws.

TUNING

The intermediate and driver tuning is quite straight forward and can be carried out with slug adjustment. There was some lack of drive at the ends of the range 27 to 29.7 Mc. and if it is necessary to fully cover this range, a two-coil resonant circuit could be tried at the intermediate position. With L4 peaked on 28 Mc. there was sufficient drive between 27 Mc. and 29 Mc.

There are some problems in tuning the new oscillator coils without a slug. The tuning range on each band is dependent on a balance between the inductance of the coil and the capacitance of the variable trimmer. The simplest way to correctly tune the coils is, before removing the old coil, correctly adjust the variables to give the correct scale calibration. Wind the new coil and remove turns until the frequency at the bottom end of the scale is the same as before. Final check must be made with the cover in place.

It is not possible to get the frequency exactly as before and any small error can be corrected for with the trimmer.

If it is found that the tuning range is either longer or shorter than the calibrated scale, further adjustments must be necessary. Starting with the low end frequency adjusted correctly with the trimmer, if the top end frequency falls short of the calibration mark. turns must be removed from the coil and the trimmer re-adjusted. Conversely, if the top end frequency falls past the calibration mark, turns must be added. This is a tedious job and must be carried out with patience. If adjustments as described in the previous paragraph are carried out, these extra adjustments should be unnecessary.

This article should be of interest to most people with Geloso's, so good luck with your conversions and see you on 160 metres.

AMATEUR FREQUENCIES:

ONLY THE STRONG GO ON—SO SHOULD A LOT MORE AMATEURS!

CHANGE OF ADDRESS

W.I.A. members are requested to promptly notify any change of address to their Divisional Secretary —not direct to "Amateur Radio."

W.I.A. D.X.C.C.

Listed below are the highest twelve members in each section. Position in the list is determined by the first number shown. The first number represents the participant's total countries less any credits given for deleted countries. The second number shown represents the total D.X.C.C. credits given, including deleted countries. Where totals are the same, listings will be alphabetical by call sign.

Credits for new members and those whose totals have been amended are also shown.

PHONE

VK5MS	315/338	VK5AB	298/314
VK3AHO	312/326	VK4FJ	285/304
VK6RU	308/333	VK4TY	275/278
VK4HR	304/322	VK3TL	271/277
VK6MK	304/323	VK2APK	269/274
VK2JZ	303/320	VK2AAK	268/273

New Member:
Cert. No. 93 VK4XY 115/119

Amendment:
VK3ZE 197/200

C.W.

VK2QL	300/322	VK3YL	266/283
VK3AHQ	292/306	VK3ARX	266/275
VK4FJ	290/314	VK6RU	266/289
VK3CX	289/312	VK2APK	265/273
VK2AGH	282/296	VK3NC	264/277
VK4HR	276/299	VK3XB	263/277

New Member:
Cert. No. 94 VK4XJ 124/130

OPEN

VK2AGH	311/331	VK4TY	301/315
VK6RU	310/335	VK4FJ	298/322
VK4HR	309/333	VK3ARX	289/298
VK6MK	305/324	VK3TL	287/293
VK2VN	304/321	VK2APK	286/296
VK2EO	302/325	VK3XB	286/274

New Member:
Cert. No. 115 VK4XJ 166/173

PROJECT—SOLID STATE TRANSCEIVER

PART FOUR

H. L. HEPBURN, VK3AFQ, and K. C. NISBET,† VK3AKK*

This month's article will deal with five separate functions:

(a) The filter pre-amplifier.
(b) The transmitter mixer pre-amp.
(c) The carrier oscillator/BFO.
(d) The product detector.
(e) The balanced modulator.

Although these functions will be described separately, they are in fact combined on to three printed circuit boards. One board contains the filter pre-amplifier and the transmitter mixer pre-amplifier, a second p.c.b. houses the carrier oscillator/b.f.o. and an amplifier while the third board contains the product detector and balanced modulator.

The second and third boards are housed in a 6½" x 4½" die cast box to prevent radiation into the rest of the circuitry of the transceiver.

THE FILTER PRE-AMPLIFIER

The prime function of this module is to raise the output of the balanced modulator to a reasonable level prior to the filter. However, the unit performs several quite important secondary duties in that it provides a suitable point at which to carry out TX/RX diode switching and, also, provides additional gain on receive.

While the amplifier is certainly necessary on transmit, it is possible that, when constructing only a receiver, it would not be required. However, since it was needed for the transmitter it has been used on receive as well.

The circuit is given in Fig. 10 and uses an R.C.A. dual gate 3N140 FET as a 9 Mc. amplifier. It does not require neutralisation.

Gate 2 of the 3N140 is held at half rail potential by the 6.8/6.8K divider, but is earthed for r.f. by the 0.1 uF. by-pass.

Output to the filter board at low impedance is taken from the junction of the 68 pF. and 270 pF. capacitors which, in series, tune the drain coil L23 to 9 Mc.

The function of D6 is explained later in this article, but D7 and D8 need comment.

When in the "receive" mode the amplifier gets its h.t. from the a.g.c. rail and its gain is thus controlled by the a.g.c. system. The a.g.c. rail, however, is only operative on receive. On transmit the amplifier is fed from the transmit h.t. line and is not a.g.c. controlled.

On receive diode D7 gates the a.g.c. "h.t." voltage to the amplifier while D8 prevents excitation of any transmit functions through the supply line.

On transmit, the situation is reversed with D8 conducting and D7 blocking off the a.g.c. rail.

THE TRANSMITTER MIXER PRE-AMPLIFIER

This stage is used to raise the 9 Mc. s.s.b. output from the filter board to a suitable level for the various transmitting mixers.

Two courses of action were available. Either the low level s.s.b. output from the filter could be mixed to signal frequency and then amplified or it could be amplified first and then mixed to signal frequency.

The latter course was chosen on the grounds of economy for, since there is a separate mixer/pre-amplifier for each Amateur band, it would otherwise have been necessary to use four additional amplifier stages rather than one. It is also simpler to provide gain at 9 Mc. than at the higher Amateur frequencies.

As shown in Fig. 11 the amplifier consists of a Motorola 1550G integrated circuit and a 2N3564 emitter follower.

Input from the filter board is "gated" by D9 to a low impedance link on T4. The secondary of T4 is tuned to 9 Mc. by the 68 pF. parallel capacitor.

Output from the i.c. is capacitively coupled to the base of the 2N3564 emitter follower, the collector of which is earthed for r.f. by the 5 uF. tantalum capacitor.

Output is approximately 1.5 volts peak to peak into a 100 ohm load.

When h.t. is applied to the unit on transmit, diode D9 is switched on, allowing signal to get to the i.c. On receive, this h.t. is removed, D9 is switched off and the i.c. effectively isolated.

THE CARRIER OSCILLATOR/BFO

Fig. 12 gives the circuit diagram from which it can be seen that each carrier crystal has its own circuitry, the outputs from the two oscillators being combined and fed to a simple resistance coupled amplifier. Each oscillator output is independently adjustable and, at maximum settings, is sufficient to give 6 volts peak to peak output from the amplifier. In this design only a portion of this output is used but is mentioned in view of the

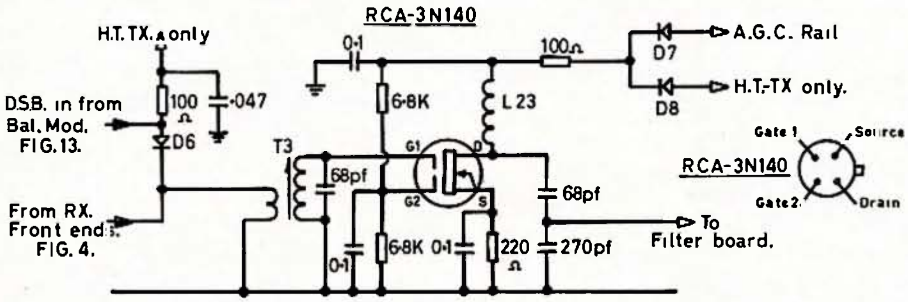


FIG. 10. 4 BAND TRANSISTORISED TRANSCEIVER - FILTER PRE-AMPLIFIER.

T3—Secondary is 40 turns of 33 gauge B. & S., close wound on Neosid 722/1 coil form and F29 slug.
L23—40 turns of 33 gauge B. & S., close wound on Neosid 722/1 coil form and F29 slug.

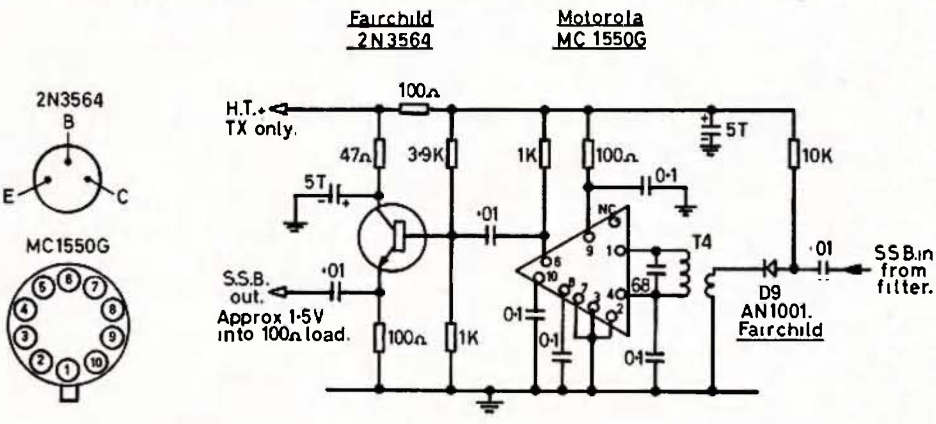


FIG. 11. 4 BAND TRANSISTORISED TRANSCEIVER.- 9 mHz TX AMPLIFIER.

T4—Secondary is 40 turns of 33 gauge B. & S., close wound on Neosid 722/1 coil form and F29 slug. Primary is 10 turns of 33 gauge B. & S., close wound over cold end of secondary.

* 4 Elizabeth Street, East Brighton, Vic., 3187.
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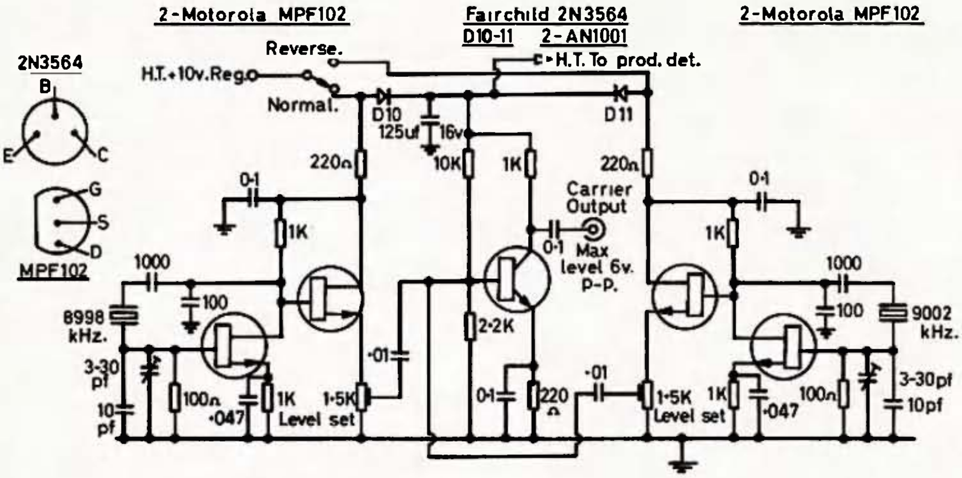

FIG. 12. 4-BAND TRANSISTORISED SIDEBAND TRANSCEIVER-CARRIER OSCILLATOR.

possibility of using the board as the basis of, say, a 7 Mc. crystal controlled transmitter.

The 3-30 pF. trimmers associated with each carrier crystal allow some adjustment of the carrier frequency so that it may be correctly placed on the skirt of the filter. This adjustment, incidentally, is very simple. A signal is tuned in on the receiver and the trimmer adjusted for best speech quality.

Each oscillator consists of a MPF102 FET direct coupled to a second MPF102 used as a source follower. The source follower acts both as a buffer stage and as a means of presenting a suitably low output impedance to the 2N3564 amplifier. The crystal is used in its parallel mode with the feedback path being provided by the 100 pF. capacitor and the parallel combination of the 3-30 pF. trimmer and the fixed 10 pF. capacity.

In other applications, using crystals of different type and frequency, it may be necessary to adjust the fixed parallel capacity.

The amplifier calls for little comment except to point out the absence of any tuned circuits. The switching involved does, however, need explanation.

As stated earlier in this series of articles, the upper sideband crystal on 8998 Kc. is the one normally used on all bands, the correct sideband for the frequency in use being automatically selected by the correct choice of the hetrodyning frequency in the injection chain. The "other" sideband for the band in use is selected by changing the carrier oscillator frequency.

H.t. is fed to either of the diodes D10 and D11 by the sideband selector switch. This switch thus chooses either the "normal" or "other" sideband for the frequency in use. If the "normal" sideband is selected then D10 will conduct and energise the 8998 Kc. oscillator while D11 blocks off voltage from the 9002 Kc. oscillator. The position is reversed if the "other" sideband is selected.

The anodes of D10 and D11 are common and from this common point h.t. for the 2N3564 amplifier and the product detector is taken.

Direct switching of the two carrier crystals could have been used but this would have meant that the physical location of the carrier oscillator/BFO would have been fixed by the switch shaft and the flexibility of this design—and the ability to set the correct output levels would have been lost. As described, all switching is done in the h.t. line and, being "cold", the switch can be placed anywhere.

THE PRODUCT DETECTOR

The circuit of the product detector is shown on the right hand side of Fig. 13.

A 9 Mc. signal from the carrier oscillator (Fig. 12) is applied to the junction of two 0.01 uF. capacitors. The right hand path takes this signal to gate 2 of the 3N140 dual gate FET detector.

The 9 Mc. s.s.b. signal from the i.f. strip (Fig. 9, Jan. 1968 "A.R.") is applied to gate 1 of the device via an 0.01 uF. capacitor.

Audio output is developed across the 2.2K drain load and unwanted products are filtered out by the 2.2K/1000 pF./2200 pF. combination.

H.t. filtering is provided by the 100 ohm resistor and 100 uF. condenser. This h.t. is applied only on receive and only when receiving sideband or c.w.

THE BALANCED MODULATOR

The circuit of the balanced modulator is shown on the left hand side of Fig. 13.

9 Mc. from the carrier oscillator/BFO is applied to a 2N3564 phase splitter to

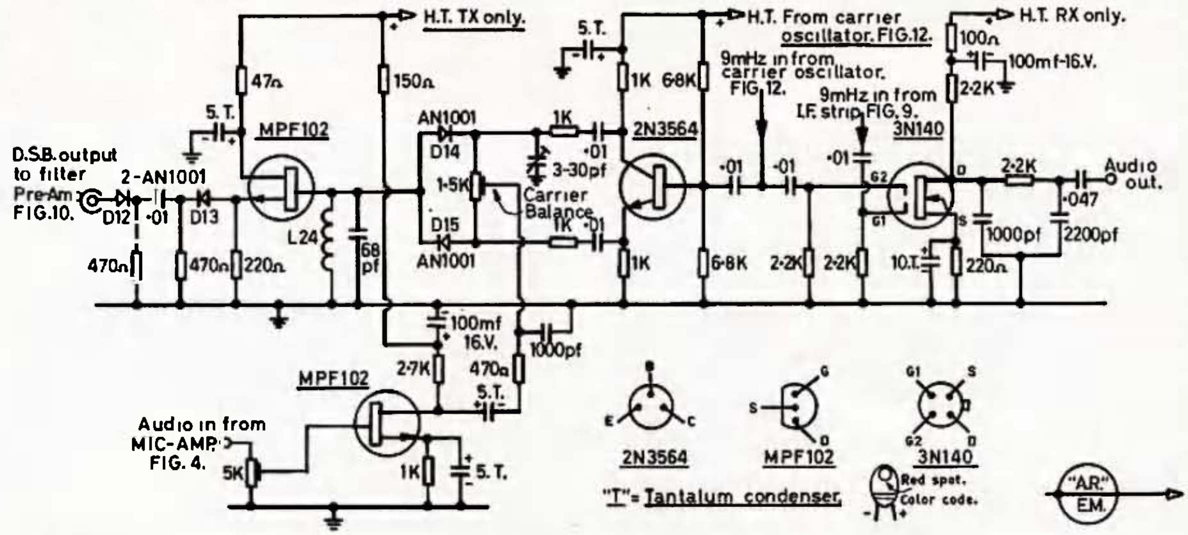

FIG. 13. PRODUCT DETECTOR & BALANCED MIXER.- 4 BAND TRANSISTORISED TRANSCEIVER.

L24—40 turns of 33 gauge B. & S. enamel, close wound on Neosid 722/1 former, F29 slug.

give two equal, but 180° out of phase, signals to the balanced modulator. The balanced modulator itself consists of two Fairchild AN1001 silicon diodes.

Audio from the microphone pre-amplifier board is applied via the 5K pre-set level control to a resistance coupled MPF102 amplifier, the output of which is filtered and applied to the slider of the 1500 ohm carrier balance control.

When audio is applied to the balanced modulator it becomes unbalanced for r.f. at an audio rate and the resultant, carrier free, double sideband signal passed via the MPF102 source follower to the filter pre-amplifier.

Diodes D6 (Fig. 10), D12 and D13 are used as isolating switches.

On transmit, h.t. is applied to D6 causing it to conduct and pass signal from the balanced modulator to the filter pre-amplifier. Because a d.c. path exists to D12, it also switches on and passes signal from the source follower to D6. As h.t. is applied to the source follower on transmit only, it is acting as a further gate. D13 prevents signal from the receiver from reaching the source follower on receive.

This long chain of diode gates is necessary to prevent any signal from the balanced modulator or carrier oscillator finding its way into the i.f. strip on receive. In view of the high gain of the whole i.f. chain it was not considered that the simpler (but probably more costly) approach of switching by relay would have been successful due to leakage across the relay contacts.

If the circuitry of the carrier oscillators, the product detector and the balanced modulator are viewed outside the context of the transceiver being described, it will be seen that they represent a fairly flexible series of "packages" which can be used on their own for incorporation in other end products.

It was mentioned above that one side of the carrier oscillator could be used, with or without the amplifier, as a basis for a simple crystal controlled transmitter. Use of both sides of the board would extend this possibility to a dual frequency transmitter.

The product detector could be used on its own in other equipment and the balanced modulator could also be used in other circuits—with or without the source follower and/or switches and/or audio pre-amplifier.

AVAILABILITY

The above units are available in kit form, or as p.c.b's only, from 4 Elizabeth St., East Brighton, Vic., 3187. Prices are as follows:

(a) Filter pre-amp. and tx pre-amp., $17.50 plus 13c postage.
(b) P.c.b. only, $2.00 plus 5c postage.
(c) Carrier oscillator, balanced modulator and product detector complete in die cast box, $26.50 plus 30c postage.
(d) Carrier oscillator and amp. p.c.b., $2.00 plus 5c postage.
(e) Product det. and balanced mod. p.c.b., $2.00 plus 5c postage.
(f) Any set of instructions, $1.00 plus 5c postage.

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SOLID STATE COUPLING METHODS

(Continued from Page 10)

The blocking capacitor C_B in the emitter circuit keeps the supply voltage off of the emitter, and the r.f. choke keeps the emitter above a.c. ground. As a result, the positive feedback is just equal to the negative feedback, and the net result is zero, or unilateralisation.

BRIDGE NEUTRALISATION

The use of bridge neutralisation for transmitter amplifiers is well known, and has been applied without difficulty to transistor amplifiers. The equivalent resistance and capacitance of the feedback circuits have already been shown in Fig. 9. If these elements are made part of a bridge circuit, and other circuit elements are used as the other arms of the bridge, the entire circuit becomes balanced (as far as the feedback voltages are concerned) and the result is unilateralisation. A typical amplifier using such a bridge circuit is shown in Fig. 11A. The components that make up the bridge circuit are shown in Fig. 11B.

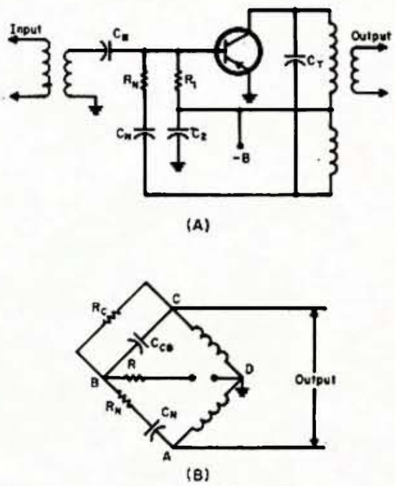

Fig. 11.—(A) Bridge unilateralisation and its equivalent circuit shown in (B).

When the ratio of the voltages in the arms A-B, B-C equal the ratio in arms C-D, D-A, no output voltage appears between B-D and the bridge is balanced. Because the phase shift is also balanced, the circuit is **unilateralised**. If a capacitor alone was found to be sufficient (C_B in the bridge arm) it would be **neutralised.**

LOCALLY AVAILABLE V.H.F. FIELD EFFECT TRANSISTORS

Number	Type of FET	Package	Cost*	Noise Figure (db.)			Gain (db.)			Forward Transfer Admittance Y_{fs} (mmhos) Freq. 1 Kc.	Reverse Transfer Capacitance (pF.) C_{rss}
				Freq.	Typical	Max.	Freq.	Min.	Typical		
2N3819	Junction	Plastic	$1.60							2 to 6.5	4 pF. max.
MPF102	Junction	Plastic	$1.13							2 to 7.5	3 pF. max.
2N4224	Junction	Metal	$3.00	200 Mc.		5 db	200 Mc.	10 db.		2 to 7.5	2 pF. max.
TIS34	Junction	Plastic	$2.00							3.5 to 6.5	2 pF. max.
2N3823	Junction	Metal	$5.38	100 Mc.		2.5 db.				3.5 to 6.5	2 pF. max.
MPF106/ 2N5485	Junction	Plastic	$1.40	100 Mc.	1.6 db.	2 db.	100 Mc.	18 db.	23 db.	2.5 to 6	1.2 pF. max.
				400 Mc.	3.3 db.	4 db.	400 Mc.	10 db.	14 db.		
MPF107/ 2N5486	Junction	Plastic	$1.50	100 Mc.	1.6 db.	2 db.	100 Mc.	18 db.	23 db.	4 to 8	1.2 pF. max.
				400 Mc.	3.3 db.	4 db.	400 Mc.	10 db.	14 db.		
TIS88/ 2N5245	Junction	Plastic	$3.20	100 Mc.		2 db.	100 Mc.	18 db.		4.5 to 7.5	1 pF. max.
				400 Mc.		4 db.	400 Mc.	10 db.			
3N140	Dual Gate MOS FET	Metal	$2.13	200 Mc.	3.5 db.	5 db.	200 Mc.	15 db.	19 db.	6 to 18	0.03 pF. max.

* Single unit price including sales tax. (Prices believed to be correct at time of compiling table.)
This table was compiled from manufacturers' data by Eric Gray, VK3ZSB.

B.A.R.T.G. SPRING RTTY CONTEST

1969 RULES

When: 0200 G.M.T., Saturday, 15th March, until 0200 G.M.T., Monday, 17th March, 1969.

The total contest period is 48 hours, but no more than 36 hours of operation is permitted. Times spent in listening counts as operating time. The 12-hour non-operating period can be taken at any time during the contest, but "off periods" may not be less than two hours at a time. Times on and off the air must be summarised on the Log and Score Sheets.

Bands: 3.5, 7, 14, 21 and 28 Mc. Amateur bands.

Stations may not be contacted more than once on any one band. Additional contacts may be made with the same station if a different band is used.

Country Status: A.R.R.L. Country List, except KL7, KH6 and VO to be considered as separate countries.

Messages exchanged will consist of: (a) Message number, (b) Time G.M.T., (c) Country and continent.

Points:
(a) All two-way r.t.t.y. contacts with stations within one's own country will earn TWO points.
(b) All two-way r.t.t.y. contacts with stations outside one's own country will earn TEN points.
(c) All stations will receive a bonus of 200 points per country including their own.

Scoring:
(a) Two-way exchange points times total countries worked.
(b) Total country points times number of continents worked.
(c) Add (a) and (b) together to obtain your test score.

Sample score:
(a) Exchange points (302) times countries (10) equals 3020.
(b) Country points (2000) times continents (3) equals 6000.
(c) (a) and (b) added to give a score of 3020 plus 6000 equals 9020.

Logs and Score Sheets: Use one log for each band and indicate any rest periods. Logs to contain band, message number, time G.M.T. and continents. Exchange points claimed. **All Logs must be received by 5th May, 1969, to qualify.**

Awards: Certificates will be awarded to: The two top scorers in each country. The judges' decision will be final and no correspondence can be entered into in respect of incorrect entries. This is to enable the scores to be worked out more quickly and should result in more speedy publication of the results.

Send your Logs to: Ted Double, G8CDW, B.A.R.T.G. Contest Manager, 338, Windmill Hill, Enfield, Middx., England.

1968 RESULTS

The results of this contest have been received, but in view of the limited Australian participation, we will not publish the list.

Suffice to say, VK3KF finished 28th in the single operator section with a score of 26,600 points, and VK3DM was 1st in the multiple operator section with a score of 32,784 points.

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AUSTRALIAN RESULTS OF 34th A.R.R.L. DX COMPETITION

C.W. SECTION

	Score	Multiplier	Contacts
VK2EO	1,862,900	225	2908
VK3APJ	1,271,411	199	2133
VK3AXK	528,372	156	1129
VK5FM	274,701	127	721
VK4FH	223,587	117	637
VK2VN	140,784	112	419
VK5FH	100,332	54	620
VK4QM	68,100	50	454
VK2AND	30,912	56	186
VK5KO	4,950	33	50
VK3QV	3,940	20	66
VK3APN*† (VK3s APN, OP, QK)	179,760	105	571
VK9GN	233,376	136	572

PHONE SECTION

	Score	Multiplier	Contacts
VK2APK	1,132,950	182	2075
VK3ATN	1,074,780	210	1708
VK3AXK	270,072	121	744
VK4JE	188,340	86	730
VK4FH	105,444	87	404
VK3QV	104,331	83	419
VK5WO	33,264	48	231
VK3SM	11,523	23	167
VK2FU*† (VK2s FU, 2BKM)	2,269,716	219	3455
VK2AND* (Multi-op.)	186,888	104	599
VK9GN	655,860	170	1286

* Denotes multi-operator stations.
† Denotes Oceania champions.

N.B.—Rules for the 1969 Contest are as for 1968. See page 19 of Jan. 1968 "A.R."

Closing date for logs is 21st April, 1969, and the Contest dates are given in the Contest Calendar.

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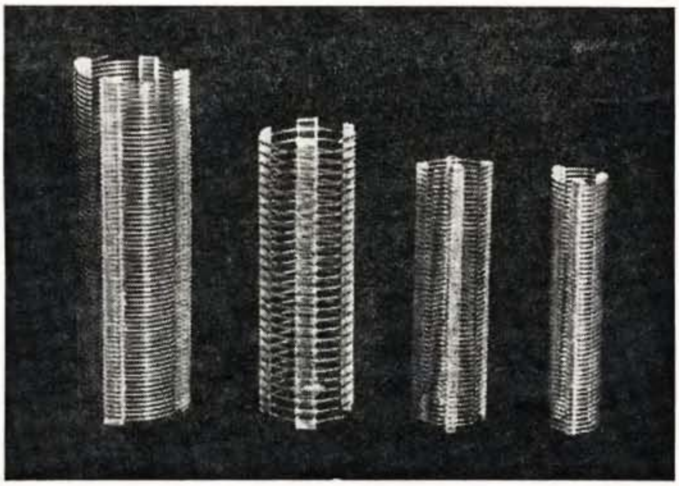
AUSTRALIAN RESULTS OF 1968 WPX SSB CONTEST

Call	Band	Score	Contacts	Multiplr.
VK2AND	A	119,973	472	87
VK2APK	14	567,418	961	202
VK2FU	7	15,066	99	54
VK3QV	28	41,454	226	63
VK3SM	21	30,195	181	61
VK4FH	A	122,820	453	92
VK4PJ	A	8,200	60	50
VK5LC	14	23,200	128	90
VK6RU	A	317,920	682	160
VK9GN*	A	1,285,842	1787	246
VK9KS	A	133,665	366	133

* Winner of KW6EJ Trophy for highest Oceania single operator all-band classification.

AIR-WOUND INDUCTANCES



No.	Diam.	Turns per Inch	Length	B. & W. Equiv.	Price
1-08	1/2"	8	3"	No. 3002	66c
1-16	1/2"	16	3"	No. 3003	66c
2-08	5/8"	8	3"	No. 3006	76c
2-16	5/8"	16	3"	No. 3007	76c
3-08	3/4"	8	3"	No. 3010	91c
3-16	3/4"	16	3"	No. 3011	91c
4-08	1"	8	3"	No. 3014	$1.04
4-16	1"	16	3"	No. 3015	$1.04
5-08	1 1/4"	8	4"	No. 3018	$1.28
5-16	1 1/4"	16	4"	No. 3019	$1.28
8-10	2"	10	4"	No. 3907	$1.68

SPECIAL ANTENNA ALL-BAND TUNER INDUCTANCE

(equivalent to B. & W. No. 3907-7")

7" length, 2" diameter, 10 turns per inch, **$3.00**

References: A.R.R.L. Handbook, 1961; "QST," March 1959; "Amateur Radio," December 1959.

Take the hard work out of Coil Winding— use "WILLIS" AIR-WOUND INDUCTANCES

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Amateur Radio and the 1968 Blue Mountains Bushfires

KEN MOORE, VK2AVN*

FOLLOWING previous disastrous bushfires in 1957, the Amateurs in the Blue Mountains area examined the problem of providing the then non-existent bushfire emergency communications system. For several years the problem remained unsolved although many enthusiasts had attempted to launch such a system. By 1962 a small group of 2 metre mobile/portable stations emerged, mostly due to the driving force of Wal VK2MZ, whose energetic efforts provided portable equipment for others to operate. These mobile stations, VK2MZ, VK2NK, VK2AVN and VK2ASZ, accompanied fire tankers into the bush, while portable stations were operated by VK2QA, VK2HZ, VK2RM and VK2ABK at local fire stations. Occasionally home stations gave assistance, and the network which operated on 146.6 Mc. a.m. for a time was quite effective though limited.

Soon afterwards, however, the Blue Mountains City Council obtained low-band f.m. mobile equipment for its tankers, and there appeared to be no further need for Amateurs to provide the communication facility previously offered. From 1957 to 1968 the bushfires in the Blue Mountains were only comparatively mild outbreaks, but last year saw the culmination of a tremendous build-up of dry fuel plus long weeks of hot drying winds—an impending situation of extreme danger.

A fire which originated in September 1968 on the Kurrajong side of the Grose River, in fairly inaccessible country, built up to huge proportions in the Grose Valley until it jumped the river and crept up behind Springwood. Even though local brigades burnt back on this fire at North Springwood in the White Cross area, conditions were so bad at the time that three men caught on a section of the fire trail between two hot updrafts were burnt to death. The first was not completely extinguished and one smouldering pocket continued for weeks in Linden Gorge. This was the source of the outbreak which arose with freshening winds on Thursday, 21st November, 1968, and commenced to climb out of the gorge and move towards Faulconbridge.

By Saturday, 23rd November, this fire had crossed Grose Road and was threatening Faulconbridge and North Springwood. A strong south-westerly wind was carrying the fire towards already burnt country in the White Cross area and it was thought that it was safe at this stage. Unfortunately, although the south-westerly caused the head of the fire to move very rapidly towards the burnt ground, the terrain which was encountered by its long tail allowed it to "whip" into unburnt country to be quickly fanned into fresh paths. It was at this time that Amateur Service participation commenced.

Danny VK2ZDE had proposed that a network on 146 Mc. f.m. could be used as a back-up watch for the local brigade. Thus on Saturday, 23rd, VK2ASZ, VK2AVN and VK2ZDE moved into the fire area at North Springwood and, moving from point to point, provided communication back to local bushfire stations in the villages. To clarify this, it should be noted that the normal system available to these brigades is from their mobile unit (tanker or jeep) to a control centre—normally at Katoomba, this time at Springwood. No contact is provided with the village fire centres, so that except by telephoning the control centre, no township knows the whereabouts of its men, arrangements for relief, feeding, etc., and it is difficult for relatives to obtain information. The Amateurs' first effort was therefore to fill this gap.

On Sunday, 24th, one tongue of the fire carried across Hawkesbury Road, North Springwood, and allowed it to run wild along the ridges to Yellow Rock and on to the Nepean River near Castlereagh. Several more "whips" of this leg brought the fire close to the townships of Warrimoo and Blaxland East. At this stage two homes in the North Springwood area had been destroyed, but hundreds had been saved. About this time, the VK2 W.I.C.E.N. organisation was placed on a "standby" condition, anticipating a request to assist the Blue Mountains Amateurs. During this day, VK2ZDE and VK2AVN were joined by VK2AQX from Kingswood.

On Monday, 25th, there was not much movement of the fire, but towards evening some hot pockets had crept in close to Springwood and began to flare, causing some concern. VK2ZFZ and Associate Gerry Vale from Katoomba joined the team, together with VK2MZ from Blaxland. Allan VK2ZFZ provided a base station and with permission from the fire control officer of the local bushfire brigades, Mr. B. Dowling, the base was set up at Springwood alongside the bushfire network's own base. Stations operating that day included VK2AQX, VK2ZDE, VK2MZ, VK2ZFZ, VK2AVN and G. Vale assisted with base operation.

Communication was still provided with the villages, but a more important link was now established—a direct back-up to the Springwood control centre had been provided. From that night on, at 2000 hours, a conference was held, partly on the air, to plan the next day's operations. About that time, on Monday evening, Alf VK2ZMV called the 146 Mc. control station to advise of a bad outbreak of fire behind his house which was threatening it and other houses in the vicinity. This was the first news received of this outbreak and the fire control centre was quick to follow up. Numerous tankers and men converged on Alf's QTH (including Amateur operators with knapsacks) and the fire was brought under control.

By Tuesday, 26th, some of the pockets close to Springwood had become very dangerous and several outbreaks along the perimeter, now stretching from Faulconbridge to Mt. Riverview and Blaxland East, refused to stay contained. By mid afternoon properties in the Mt. Riverview area were in grave danger and a very hot fire somehow passed them and into the region of the Eastern escarpment near Emu Plains. On this day base control was taken over by VK2HZ, VK2ZDE having succumbed to a large intake of smoke, necessitating a day off. VK2ZLX journeyed from Sydney for the afternoon and evening and joined the crew consisting of VK2MZ, VK2AQX and VK2AVN. At this stage, the Sydney W.I.C.E.N. stations were asked to provide relief for the Mountains operators.

Wednesday, 27th, was an ominously quiet day with freshening winds and temperature on the rise. Mopping up operations around the great semicircle of the fire during the day left two remaining hot points by nightfall, one on the Eastern Escarpment and one near the top of Linden Gorge. During this day, VK2HZ manned the base station whilst other local operators had a day off to go to work! Mobile operation was carried on by Sydney stations VK2GN, VK2VL, VK2AXJ, VK2ZZD, VK2ZLX and Keith L2222 who had proceeded to the Springwood Control Centre to relieve the local operators. These operators from Sydney, although strangers to the area, were able to keep communications open from areas such as the Eastern Escarpment where normal channels failed through lack of an effective relay system.

Thursday, 28th, dawned hot. Threatening gusts of wind from the west fanned the Linden Creek end of the fire across the highway and railway line above Faulconbridge. A new path was now open, through the south side of Springwood, Valley Heights, Warrimoo, Blaxland and Glenbrook, through the new village of Lapstone to Emu Plains. The fire took only a matter of hours to cover this path, pushed by a series of strong swirling fire winds of up to 60 m.p.h. About 80 homes were destroyed and scores of properties damaged. About 50 square miles of country were burnt black as this fire swept clear off the mountains to Emu Plains, still destroying property in this area. Three more lives were lost that day.

Amateur operation for the day started normally with VK2HZ and VK2EX sharing base operation with VK2MZ, VK2ZZD, VK2ZSA and VK2ZDD in the field. However it was quickly realised that this was the "blow-up" day! VK2ZDE, VK2ZFZ, VK2AVN and VK2AQX left work and re-joined the net as quickly as possible as mobiles, whilst VK2WX joined in at the base. At intervals during the week, operators would leave their sets to help in fire fighting operations. On Thursday, this became even more imperative and VK2HZ, VK2MZ, VK2AVN and VK2ZDE all stopped transmission for a period to fight successfully for their homes. Later VK2ASZ joined the expanding group and provided a trickle charger which helped to keep the bushfire control station on the air, and also a motor generator when the mains supply failed at the Springwood control centre.

When telephone services failed due to lines being destroyed by the fires, VK2HZ and VK2ZDE set up a 6 metre link to the local "metropolitan" fire station from the Springwood control centre, thus providing a very valuable service as this was the only link at the time between the two fire fighting networks.

Shortly after 1700 hours on the Thursday, VK2AWI was brought into action in Sydney—unfortunately the 146 Mc. channels at Crows Nest were rendered unusable due to some technical problems being encountered by local t.v. transmitters. Some hastily obtained cavity filters were, however, successful in removing the trouble, and while this was going on, calls for volunteers were being made and offers of assistance were causing the phone to run hot at W.I.A. Centre. The State Civil Defence Communications Officer, Mr. C. Allen, requested W.I.C.E.N. to set up a link from the Penrith-St. Marys area to assist in sorting the chaotic traffic situation on the Western Highway—blocked at some place unknown. After three Amateurs battled their way by devious routes to St. Marys C.D. Hdq., a link on 53.866 Mc. was established at the Warrimoo fire centre by VK2DU, from VK2BAU at Penrith, to the Springwood control and to VK2AWI in Sydney. The members of the Nepean Radio Club operated the 6 metre base at Penrith, using VK2BAU's equipment, and a 146 Mc. base was also set up at Penrith by VK2AWW. Others who assisted in this area were VK2ADF, VK2ZNS, VK2ZJN, VK2BGP, VK2BRL and Associate G. Drew. Civil Defence authorities also used 3732 Kc. for a network in which VK2AMY and VK2AVA gave assistance.

Mobile patrols were established in this Warrimoo area, and duties included the relaying of "all okay" type messages from Mountains residents to relatives in Sydney, "wife to husband" type messages where they had been separated, and location of missing or evacuted persons and children. This was done because all normal telecommunication channels were reserved for urgent official traffic.

Late on the Thursday afternoon, Bob Pinning, VK2CT, who had been fighting fires in the Warrimoo area, collapsed and died. He had not been active in the Amateur net operation, but was acting as a fire-fighter in which service he unfortunately gave his life. News of this tragedy caused a noticeable hush in the Amateur net operations.

Operations on Thursday continued well into the night and took many forms, and the versatility of the Radio Amateur Service was very evident. Most of us did some evacuating of persons in danger areas, but Roland VK2AQX, in his VW bus, was very valuable in this regard. Many "quick fixes" were performed by the Amateurs on malfunctioning bushfire radio equipment, and our mobility and technical know-how gave us a very elastic usefulness.

By 0100 hours on the Friday morning the situation had eased, and W.I.C.E.N. reverted to a standby condition in these areas. Sydney Amateurs who assisted included VKs 2VL, 2AXJ, 2LL, 2GN, 2ZXD, 2ZIM, 2ZDD, 2ZSA, 2ZGB, 2BAV, 2BGP, 2ZIA, 2ZDR, 2ZRZ, 2ZTM, 2ZDD, L2121 and VK6ZAY. Most of the active fire was now at the top of Linden. It burnt steadily in this area for two more days, sometimes endangering property before it was finally contained.

The Amateurs in the mountains areas maintained bases at Springwood, Penrith and Warrimoo and mobile units were still active in the Regentville Mulgoa area, and around Linden and Springwood.

(Continued on Page 19)

* 24 Rickard Rd., Warrimoo, N.S.W., 2775.

NEW CALL SIGNS

JUNE-AUGUST, 1968

VK1CG—G. J. Cashion, 51 Ainsworth St., Mawson, 2607.
VK1FT—J. F. Tilley, 65 Collings St., Pearce, 2607.
VK1MR—R. I. Spencer, 7 Macarthur Ave., O'Connor, 2601.
VK1NW—N. J. Watling, 103 Antill St., Downer, 2602.
VK1ZUM—J. R. Messner, 148 Miller St., O'Connor, 2601.

VK2BW/T—W. J. Dockrill, 65A Brians Rd., Northmead, 2152.
VK2FW—R. L. Davies, 35 Belford St., Ingleburn, 2565.
VK2II—A. W. Adams, 52 East St., West Dubbo, 2830.
VK2IQ—J. A. J. Waugh, 4 Astley St., Waratah, 2298.
VK2LL—P. R. Gibson, 9 Railway Pde., Eastwood, 2122.
VK2SX—R. J. Linsket, Sergeants' Mess, R.A.A.F. Base, Bankstown, 2200.
VK2VK/T—C. R. Coverdale, 18 Sorrell St., Parramatta, 2150.
VK2AAU—K. P. A. Persson, 30 Dudley St., Pagewood, 2035.
VK2ADC—R. Shuetrim, 19 Stirling Cres., Lilli Pilli, 2229.
VK2AWF—B. J. Foster, "Avoca," Baila, via Gunning, 2581.
VK2AYH—J. A. Howie, 6 Kembla Ave., Chester Hill, 2162.
VK2BAN—R. R. Pisani, 99 The Kingsway, Cronulla, 2230.
VK2BAS—A. W. Sullivan, 32 Valentia Ave., Lugarno, 2210.
VK2BAU—K. Woodward, 28/48 Morehead St., Redfern, 2016.
VK2BEA—B. Nicholson, 80 Pringle Ave., Bankstown, 2200.
VK2BGA—G. A. Aitkin, 63 Wamboin St., Gilgandra, 2827.
VK2BGS—G. E. Sheeran, 7 Albion Ave., Pymble, 2073.
VK2BHO—J. P. Hodkinson, 11 Burge Pl., Warilla, 2528.
VK2BJY—B. B. Jones, 23 Armarna Pde., Roseville, 2069.
VK2BKL—K. Laws, 33 Roger St., Lakemba, 2195.
VK2BMA—Macquarie Radio Club, Station: 160 Bultye St., Dubbo, 2830; Postal: Lot A, Warrigal Rd., Wongarbon, 2742.
VK2BMP—P. P. Morrow, 81 Benelong Rd., Cremorne, 2090.
VK2BMV—M. F. Veevers, 46 Haig St., Wentworthville, 2145.
VK2BRA—D. R. Avery, 2 Northcote Rd., Waitara, 2077.
VK2BRG—R. G. Gibson, 142 Connels Point Rd., South Hurstville, 2221.
VK2BRS—R. D. Stephenson, 29A Cloucester Rd., Epping, 2121.
VK2BSM—S. T. Marr, 69 Brand St., Dundas, 2117.
VK2BTU—R. G. Turner, 32 Railway St., Wentworthville, 2145.
VK2ZAU—J. L. Edwards, 28 West Ave., Cessnock, 2325.
VK2ZAW—D. G. Allen, 56 Wardell Rd., Petersham, 2049.
VK2ZBK—C. B. Dein, 23 Bareena St., Strathfield, 2135.
VK2ZBU—W. S. O'Donnell, 5/114 Victoria Ave., Chatswood, 2067.
VK2ZCS—A. Pollock, 15 Matthew Pde., Blaxland, 2774.
VK2ZEK—C. W. Harrison, 6 Neerim Ave., Kotara South, 2288.
VK2ZGL—P. C. Kloppenburg, 6/185 Lakemba St., Lakemba, 2195.
VK2ZHM—J. H. Mitchell, 20 Murranar Rd., Towradgi, 2518.
VK2ZIS—I. S. Miller, 77 Rae Cres., Kotara South, 2288.
VK2ZOE—P. W. Bowers, 28 Thorne St., Wagga Wagga, 2650.
VK2ZPA—L. B. Payne, 12 Seamans Ave., Speers Point, 2284.
VK2ZTG—K. W. Close, C/o. Central School, Walgett, 2385.
VK2ZVE—B. J. Evans, 1/146 Kurraba Rd., Neutral Bay, 2089.
VK2ZWY—D. R. Ashton, 1 Headland Rd., Dee Why, 2099.
VK2ZZJ—D. J. Barrett, 85 Killeaton St., East St. Ives, 2075.
VK2ZZZ—G. F. Cross, 2 Wales St., Charlestown, 2290.

VK4BJ—J. L. Cartmill, 4 Elwood St., Kenmore, 4069.
VK4PY—P. E. Barker, M.S. 1505, Bli Bli Rd., Nambour, 4560.
VK4QV—D. H. Lane, 14 Fordham St., Wavell Heights, 4012.
VK4SE—S. S. St. George, 13 Murray St., Rockhampton, 4700.
VK4UG—D. J. Richards, 12A Savannah St., Redcliffe, 4020.
VK4VV—Wireless Institute of Australia, Station: Mt. Mowbullan; Postal: G.P.O. Box 638, Brisbane, 4001.
VK4WR—W. M. Ryan, 72 Netherton St., Nambour, 4560.
VK4ZC—H. E. Davies, 993 Gold Coast Highway, Palm Beach, 4221.
VK4ZGT—G. T. Ryan, 95 Railway Pde., Norman Park, 4170.
VK4ZKA—E. K. J. Adams, 92 High St., Rockhampton, 4700.
VK4ZRO—E. Robinson, Station: Menso's Rd., Maidavale, via Ayr; Postal: P.O. Box 491, Ayr, 4807.
VK4ZSR—G. R. Sallaway, 74 Gordon St., Hawthorne, 4171.
VK4ZVZ—V. Richards-Smith, Flat 1, 5 Woolcock St., Red Hill, 4059.
VK5AG—A. M. Miers, 13 Hill St., Seacliff Park, 5049.
VK5CI—M. S. Lang, Station: Cr. Hall and Pridmore Sts., McLaren Vale, 5171; Postal: P.O. Box 46, McLaren Vale, 5171.
VK5FZ—W. B. Johnson, 10 Hutton St., Vale Park, 5081.
VK5JD/T—G. R. Pope, 81 Leabrook Dr., Rostrevor, 5073.
VK5OI—G. N. Allen, 2 Nestor St., Hillcrest, 5086.
VK5UC—W. B. R. Brooks, 22 Catherine St., Clapham, 5062.
VK5VL—L. A. M. Voskulen, 26 Bakewell Rd., Evandale, 5069.
VK5ZBG—G. J. Hambling, 39 Hobart Rd., Henley Beach South, 5022.
VK5ZDN—P. J. Leonard, 53 Scott Ave., Flinders Park, 5025.
VK5ZEU—N. G. Scott, 35 Ann St., Salisbury, 5108.
VK5ZFE—N. H. E. Weste, 20 Farmer St., Barmera, 5345.
VK5ZIB—K. R. Zietz, 13 Fourth Ave., Everard Park, 5035.
VK5ZRE—O. W. Einicke, 20 Drysdale Cres., Campbelltown, 5074.
VK5ZWR—W. R. Chapman, 30 Hatch St., Nuriootpa, 5355.
VK5ZZX—C. J. Heath, 3 Rutland Ave., Brighton, 5048.
VK6AT—C. A. Page, The Rectory, Gnowangerup, 6335.
VK6BI—W. R. Ion, 265 Robinson Ave., Cloverdale, 6105.
VK6CB—C. E. Berg, 160 Canning H'way, South Perth, 6151.
VK6CH—J. C. Hulse, 135 Wordsworth Ave., Yokine, 6060.
VK6DM—D. M. McGlinsey, Station: U.S. Navcomsta, Exmouth, 6707; Postal: P.O. Box 20, Exmouth, 6707.
VK6DX—D. L. Smithdale, 87 Cotherstone Rd., Kalamunda, 6076.
VK6KM—K. M. Moore, 191 Ninth Ave., Inglewood, 6052.
VK6RZ—R. K. Philstrom, U.S. Navcomsta, Exmouth, 6707.
VK6ZGM—E. B. McAndrew, 2 Danby St., Doubleview, 6018.
VK6ZRR—K. E. Reeves, 5 Allen St., South Perth, 6151.
VK8CM—C. H. Wall, Professional Officers' Quarters, Darwin Hospital, Darwin, 5790.
VK9AR—J. K. McCarthy, Station: Aboard deisel yacht "Pandemonium"; Postal: C/o. P.O., Port Moresby, P.
VK9BA—A. Buchanan, Station: House 14, 6th St., Lae, N.G.; Postal: P.O. Box 723, Lae, N.G.
VK9DT—A. T. G. Hanson ,Station: Minihi Ave., Section 4, Lot 3, Boroko, P.; Postal: P.O. Box 1373, Boroko, P.
VK9LD—R. Drinkrow, Station: June Valley, Port Moresby, P.; Postal: C/o. Box 1144, Boroko, P.
VK9RD—R. Doty, Station: Nukui Village, Siwai, South Bougainville, N.G.; Postal: Landmark Baptist College, via Konga, Free Bag, Buin P.O., South Bougainville, N.G.
VK9VG—G. W. Van Galen, Station: No. 68, Fifth St., Lae, N.G.; Postal: P.O. Box 723, Lae, N.G.

CANCELLATIONS

VK1RS—R. D. Stephenson. Now VK2BRS.
VK1TW—T. E. Woolley. Not renewed.
VK1WB—W. B. Brooks. Now VK5UC.
VK1ZCG—G. J. Cashion. Now VK1CG.
VK1ZGX—P. G. M. Bruer. Transferred Interstate.
VK1ZJY—B. B. Jones. Now VK2BJY.
VK1ZRX—J. F. Tilley. Now VK1FT.
VK2BZ—H. E. Davies. Now VK4ZC.
VK2DT—A. R. Harrison. Deceased.
VK2GQ—E. Barlow. Deceased.
VK2OE—W. M. Allworth. Deceased.
VK2SB—R. W. Chaplin. Not renewed.
VK2SE—A. E. Wright. Deceased.
VK2WL—L. R. Hodge. Now VK1WL.
VK2XJ—F. Broome. Not renewed.
VK2AAC—G. Cochrane. Not renewed.
VK2AAN—M. Butler. Transferred Interstate.
VK2AET—Kogarah Evening College Radio Club. Not renewed.
VK2AFQ—R. E. McIntosh. Deceased.
VK2AIL/T—D. E. Law. Overseas.
VK2AJU—M. G. Burleigh. Now VK6JU.
VK2AQD/T—R. B. McPhee. Not renewed.
VK2ATM—T. W. Marks. Transferred Interstate.
VK2AVY—W. Rogers. Transferred to U.S.A.
VK2AWT—N. J. Watling. Now VK1NW.
VK2BFB—F. B. Crum. Overseas.
VK2BSA—Boy Scouts' Assoc. (N.S.W. Branch). Not renewed.
VK2ZAU—K. Woodward. Now VK2BAU.
VK2ZCC/T—C. R. Coverdale. Now VK2VK/T.
VK2ZCM—J. Linden. Transferred Interstate.
VK2ZCS—A. W. Sullivan. Now VK2BAS.
VK2ZDO/T—W. J. Dockrill. Now VK2BW/T.
VK2ZEH—G. D. L. Armstrong. Now VK6ZEV.
VK2ZEY—A. A. Campbell. Not renewed.
VK2ZHX—J. P. Hodkinson. Now VK2BHO.
VK2ZJO—J. A. J. Waugh. Now VK2IQ.
VK2ZKK—K. J. Callaghan. Not renewed.
VK2ZNV—M. F. Veevers. Now VK2BMV.
VK2ZPG—P. R. Gibson. Now VK2LL.
VK2ZRN—R. L. Davies. Now VK2FW.
VK2ZSN—R. Shuetrim. Now VK2ADC.
VK2ZTE—R. G. Gibson. Now VK2BRG.
VK2ZTR—R. G. Turner. Now VK2BTU.
VK2ZUF—P. J. Ford. Not renewed.
VK2ZVL—K. Laws. Now VK2BKL.
VK4ZAV—J. L. Cartmill. Now VK4BJ.
VK5VK—W. P. Kempster. Ceased operation.
VK5YF—L. F. Sawford. Deceased.
VK5ZAP/T—G. R. Pope. Now VK5JD/T.
VK5ZDL—J. M. Shaw. Transferred to Victoria.
VK5ZIK—D. W. Carr. Ceased operation.
VK5ZKN—N. K. Kohler. Now VK5DV.
VK5ZUL—L. A. M. Voskulen. Now VK5VL.
VK6OB—D. B. O'Brien. Not renewed.
VK6SG—S. S. St. George. Now VK4SE.
VK6ZAB—H. Iffla. Not renewed.
VK6ZBT—K. M. Moore. Now VK6KM.
VK6ZCC—M. L. O'Rourke. Not renewed.
VK6ZEM—B. M. McDonald. Ceased operation.
VK6ZFC—R. J. Campbell. Leaving country.
VK6ZGK—P. C. Kloppenburg. Now VK2ZGL.
VK8AD—A. M. Miers. Now VK5AG.
VK8AU—D. D. Tanner. Now VK3AUU.
VK8NM—M. S. Lang. Now VK5CI.
VK9AG—A. G. Nunn. Transferred to Victoria.
VK9GW—G. K. Williamson. Not renewed.
VK9HI—I. C. Raebel. Transferred to Q'land.
VK9RJ—R. J. Wirth. Transferred to Nauru.
VK9ZGW—G. W. Van Galen. Now VK9VG.

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THE QUESTIONNAIRE—A PROGRESS REPORT

All replies received up to and including 24th December have been taken into account. The final returns were better than we had really expected, the returns representing 30.3% of our circulation. The individual State results were:

VK1-2 26.6%	VK5-8 30.8%
VK3 .. 37.3%	VK6 .. 27.25%
VK4-9 35.9%	VK7 .. 28.6%

In addition, replies were received from U.S.A. and New Zealand.

We believe we have a fairly accurate cross-section of the Amateur ranks and interests, so feel reasonably confident that the figures we will produce will be an accurate indication of our readers' interests. At this time we have not processed the answers to all the questions, hence our report will be spread over several issues.

MONEY SPENT

During the last two years the break-up of money spent shows:

29.3% spent less than $100.
28.2% spent between $100 & $200.
12.7% spent between $200 & $300.
6.32% spent between $300 & $400.
6.18% spent between $400 & $500.
4.8% spent between $500 & $600.
11.75% spent over $600.

Just on 1.5% did not answer this question.

In order to make an estimate of what money is spent on Amateur Radio per year, we took the middle figure of each range, i.e. $150, for $100 to $200 range, etc., but this left us with the problem of what to use as a realistic figure for those in the "over $600" bracket. We, therefore, spoke to a few of those who had spent over $600 and asked what they estimated they had spent. From their replies we estimated that $850 would be a fair average, so used this figure in our calculations. On these figures we estimate that Amateurs are spending in the vicinity of $560,000 per year in Australia, or an average of $132 each.

The State averages came to:

VK1-2 $131	VK5-8 $108½
VK3 .. $132½	VK6 .. $165
VK4-9 $147½	VK7 .. $136

Indications are that the spending will be much the same over the next couple of years as to the question on future spending, 41.7% said they would spend the same, 28.4% will spend more, and 26.4% less. When broken down into brackets, we get future spending as follows:

	Spend Same	Spend More	Spend Less
Under $100	47.0%	42.5%	10.5%
$100-$200	52.5%	33.8%	13.7%
$200-300	35.5%	34.0%	30.5%
$300-$400	37.0%	16.1%	46.9%
$400-$500	38.0%	16.5%	45.5%
$500-$600	35.2%	—	64.8%
Over $600	26.3%	5.75%	67.0%

Although we did not ask what those contemplating extra spending had programmed, quite a number indicated what they had in mind and comments such as "going s.s.b." and "contemplating a transceiver" were frequent. We hope that at a later date to find time to analyse the future spending on a "per State" basis.

TYPE OF EQUIPMENT

On the subject of type of equipment, 53.2% are mainly "home-brew", 30.6% mainly commercial, and 16.2% reported 50/50. The findings on a State by Sate basis are:

	Home-Brew	Commercial	50/50
VK1-2	51.0%	30.5%	18.5%
VK3	52.0%	34.2%	13.8%
VK4-9	48.5%	32.3%	19.2%
VK5-8	70.4%	19.3%	17.3%
VK6	49.5%	39.2%	11.3%
VK7	65.8%	20.7%	13.4%

Undoubtedly the high percentage of commercial gear in VK6 accounts for their high "per capita" spending, and by the same token the small percentage of commercial gear in VK5 explains their low per capita expenditure. It would be interesting to know why VK5 and VK7 have so much more home-brew equipment than the other States, and we hope this may be revealed as we analyse the figures on operating modes and bands.

ADVERTISING SPACE

The question regarding what space should be allocated to advertising presented the main problem. Where two amounts were ringed, we have taken the higher figure. Those who wrote such comments as "as much as you can get", etc., have been listed as no opinion, giving the following results:

20% advertising space	8.2%
30% ,, ,,	33.0%
40% ,, ,,	24.8%
50% ,, ,,	16.7%
60% ,, ,,	7.6%
No opinion	9.9%

The State by State voting was reasonably even as the following table shows:

Space	VK 1-2 %	VK3 %	VK 4-9 %	VK 5-8 %	VK6 %	VK7 %
20%	9.7	7.75	7.9	7.0	4.5	12.0
30%	32.8	31.4	31.8	35.6	41.0	30.0
40%	23.8	25.0	25.2	24.4	26.8	26.9
50%	16.25	16.5	19.8	16.3	8.9	17.9
60%	8.9	7.5	6.0	8.75	5.5	6.0
No opinion	8.7	11.8	9.0	8.1	13.3	7.2

These findings confirm our opinion that 30% to 40% of space allocation to advertising was what the majority wanted, and this was the range we have aimed at in previous years. This is contrary to the policy of most magazines which appear to aim at a figure between 60% and 70%. How long we can maintain the lower space allocation is a matter of economics and the final decision cannot be reached until we know wat we are going to get for the magazine after our new approach for a price increase is considered at Easter next.

EMPLOYMENT IN THE ELECTRONICS INDUSTRY

To wind up this month's progress report we shall briefly cover the matter of employment in the electronics industry. The national average is 38.8%. Again the States show fairly consistent figures as can be seen from the following table:

VK1-2 44.25%	VK5-8 36.6%
VK3 .. 35.4%	VK6 .. 44.5%
VK4-9 34.7%	VK7 .. 37.4%

We should mention the reason for grouping certain call areas together is to conform with our circulation figures which are grouped the same way.

Next month we will deal with the readers' preferences.

☆

VK2 BUSHFIRES

(Continued from Page 17)

Networks were officially closed at Springwood on Friday night and at Penrith on Saturday morning. All members remained on call, however, for several days, but the situation was relieved by rainfall.

A de-briefing was scheduled for 11th December at St. Marys for participating groups to enumerate lessons learnt and enable preparation for the next time to be undertaken.

I feel that the general result of this operation was a wonderful shot in the arm to relations between the Amateur Service and the fire-fighting organisations in N.S.W. The Bushfire Committee Radio Officer, Mr. H. Freeman (VK2BHF), Inspector W. Hodder, the Blue Mountains District Inspector N.S.W. Fire Brigades, the Blue Mountains Fire Control Officer (Mr. B. Dowling) and many others associated with the control centre at Springwood were all very generous in their praise of our efforts.

A lot of the traffic we passed, e.g. fire reports, personnel movements, etc., were duplicates of messages passed on other networks, but nevertheless essential in our "back-up" function. However, in many instances the Amateur networks were the primary conveyors of messages and information and the fire controllers soon learnt our value! I also feel that the guys involved require a really good pat on the back for their part in an unrehearsed net operation which proved to be very successful.

Before concluding, let me quote a wise comment from Bill VK2HZ: "It is practically impossible to get a full picture of all activity and assistance rendered by the many Amateurs, some of whom journeyed from Sydney to assist. Everyone was so busy in net operations that an individual story of each Amateur's work could never be recorded. I should only like to thank all those involved for their excellent co-operation and assistance." To these remarks I should like to add my own personal thanks and to say that due largely to my own involvement in this operation I may have done some inaccurate reporting, or omitted a call sign. If I have, please accept my apologies and understand that the residents of the mountains have undergone a severe crisis in recent weeks. We wish to say to all . . . your help was wonderful.

(Acknowledgments to VK2HZ and VK2ZJN who helped me by filling in gaps and with helpful comments, and to VK2GN for additional information.)

☆

CONTEST CALENDAR

1st/16th Feb.—A.R.R.L. Novice Round-up.
15th/16th Feb.—35th A.R.R.L. DX Test (c.w. section, 1st week-end).
1st/2nd Mar.—35th A.R.R.L. DX Test (phone section, 2nd week-end).
8th/9th Mar.—32nd B.E.R.U. Contest (R.S.G.B.).
15th/16th Mar.—35th A.R.R.L. DX Test (c.w. section, 2nd week-end).

—D. Rankin, VK3QV, F.E.

DX

Sub-Editor: PETER NESBIT, VK3APN
32 The Grange, East Malvern, Vic., 3145

(All times in GMT)

ASSORTED

It is reported that I stations will shortly use location prefixes as follows: I1 Special services, 12 Milan, 13 Venice, 14 Bologna, 15 Florence, 16 Bari, 17 Naples, 18 Reggio Calabria, 19 Piedmont, 10 Rome. The islands will remain as IT1, IS1, etc. (Good news for the prefix hunters.)

While on the subject of prefixes, DX1 is a new one that has just been issued. DX1AAV (ex W3JTC), who works for the American Embassy in Manila, says that the prefix will be used by visitors to the Philippines. At present there are no others using DX1, but there should be three more on shortly. As yet there is no reciprocal licensing arrangement, but the matter is being looked in to. Larry says he will be there until June. His QSL address is given below.

Earl WA6UZB plans to make a DX-pedition to Clipperton Is. and Monaco this May. He is particularly interested in making contacts with VK/ZL.

Those OM prefixes that everyone was talking about a couple of months ago were allotted to about 300 OK stations, to celebrate the 50th Anniversary of the Independence of Czechoslovakia. The prefix was due to expire last December—the 15th.

U.K. Amateurs are now permitted to send their call signs at 20 words per minute instead of 12!!!

VE6AJT/VE6APV DX-pedition: Don and George are reported to have signed /KB6 for a short while from Canton Is. prior to their departure for KS6. Don is said to have plans to link up with KH6GLU when the latter goes to FW8 about 1st Feb. for 10-14 days of operation on all bands including 160 mx (hi).

VE2BUJ/SU QSLs: VE2NV asks stations not to QSL via the VE2 Bureau, as he has not heard from Gerry for 15 months, and no logs are available.

Malpelo Island, HK0: K4PHY, K6JGS, W4IBA and TI2CMF are reported to be going there for one week in February.

BAND NEWS

Rolf HC8RS is said to operate 21275 s.s.b. daily at 22/24z.

WB4GCL/YB0 is reported QRV since Dec. 12, 14203 s.s.b. daily at 10/15z. QSL information below.

Carlos 7G1CG is said to sked WA3HUP on 21300-320 s.s.b. about 21z, with WA3HUP on earlier to arrange skeds.

Sid 5N2AAX is QRV daily 7040 at 0600-0630z. This would be a real challenge for long path; a sked for about 07z might be the best shot.

ZS2MI (Marion Is.): Ron is generally QRV Mondays/Wednesdays/Fridays about 14180 a.m. at 0300-0330z. He skeds Dennis ZS6DP most days 14315 s.s.b. at 04z. If you work Dennis he will arrange a sked for you.

HL9WK: Rod (ex W7YBX) is QRV all bands 80-10 mx c.w.-s.s.b. He skeds his QSL manager K7CHT on 14215 s.s.b. at 14z Sats. and 03z Suns., QRV for other stations before/after the skeds. Skeds can also be made via K7CHT.

QSL MANAGERS

CE9AT—CE3ZN.
CR6LF—W3HNK.
EA6AR—DL7FT.
ET3REL—W5LEF.
FB8XX—FR7ZD.
FM7WV—F3KK.
FO8AA—W5IXQ.
HC8RS—SM5EAC.
HK0BMO—WA6AHF.
HL9WK—K7CHT.
HS3VV—W1ETU.
HV3SJ—W6KNH.
JX5CI—LA5CI.
KV4FA—K3AHN.
MP4MBJ—G3POA.
OY5NS—K1QLT.
PJ2MI—VE3EUU.
SK2AZ—SM2BHX.
TA2EM—W0DAK.
TA2SC—K4EPI.
TA3AB—W1MQT.
TA3X—WA7GQA.
TF2WLN—WA3BZO.
TG9RN—DL3RK.
TL8GL—VE2DCY.
TU2AZ—DL7FT.
VP2GBR—WA5IEV.
VP2VY—KV4EY.
VG8CG—G3APA.
VR1P—VE6AO.
VR2FS—9V1OS.
VS5MH—DL3RK.
VS5RCS—9M2NF.
VS9MB/Colin—W2CTN.
VS9MB/John—G3KDB.
VU2JA—W2CTN.
XW8CAL—VE6AO.
ZB2AY—K3RLY.
ZB2VY—G3VCN.
ZD8RK—W9VNG.
ZD9BE—W2GHK.
ZS2MI—ZS6OB.
ZS3BS—WB2RLK.
ZS3LU—W2CTN.
3A0AV—I1ZBS.
3A0EK—DL2WB.
4S7DA—W6FJ.
4W1ADO—HB9ADO.
5N2NAS—G3VIS.
5U7AN—W4WHF.
5W1AR—W4ZXI.
6O1GB—W1YRC.
6W8DQ—W2MES.
7X0AH—VE3DLC.
8QALK—VU2OLK.
8QAYL—4S7YL.
9F3USA—VE3IG.
9H1M—K2GGN.
9K2BV—W5EGR.
9M2DW—W6CUF.
DX1AAV—C/o. American Embassy, A.P.O., San Francisco, U.S.A., 96528.
EA8CF—Box 860, Las Palmas, Canary Is.
EA8FF—Box 860, Las Palmas, Canary Is.
KA1IJ—Via K8WXV/1, D. Janicki, 161 First Ave., South Portland, Maine, U.S.A., 04106.
KV4FZ (ex W0VXO)—Box 310, Christiansted, St. Croix, U.S. Virgin Is.
M1I—Fast QSL via Ivo Grandoni, Rep. of San Marino.
PJ0CC—Via W2TA (ex W2ADE), J. Doremus, Pocono Rd., Mountain Lakes, N.J., 07046.
VS6DO—P. Bailey, C/o. Police Hdq., Arsonal St., Hong Kong.
WB4GCL/YB0—C/o. American Embassy, A.P.O., San Francisco, 96346.
YB0AR—Gunungsari 51, Djakarta, Indonesia.

ACTIVITIES

The new 5B DXCC Award has certainly given a much needed boost to the ailing sport of DXing. Overseas stations are quite enthusiastic about the award, and there has been plenty of the clean crisp operating that makes DX hunting so enjoyable. (To clear up any misconceptions about the rules, DXCC can be worked on any five Amateur bands. The rules in last month's issue did not make this completely clear.)

Reg VK4VX has been stacking up DX after DX in his log book over the past few months. He has averaged more than 60 countries per month on 20 mx c.w./s.s.b. Reg says that conditions are so good at the moment that it should be possible to work 100 countries on 20 mx within one month. A whole foolscap page listing stations worked supports this. The list abounds with DX, perhaps the best being AC5CP at 1045z on c.w. Also one 6Z0AA at 1023z (??).

Al VK4SS says that 10 mx is beginning to fall off now, but 15 mx should remain good for another season or two. Al sent a list of stations worked on 15 mx c.w. and a few on 20 mx, and it appears that most parts of the world are workable on 15 mx between 8 and 11 p.m. E.A.S.T. The main activity is in the first 50 Kc. Al says that 20 mx is excellent to South Africa around 17z. Can anyone please help with the QRA of 6W8AW?

Fred VK4RF also sent in a huge list of DX worked, all 20 mx s.s.b. The most apparent feature of the list is the large numbers of African and Middle East stations worked. There are plenty of rare ones, including 7X0AH, TU2AY, 4U0TIC and so on. Unfortunately space does not allow us to print the full list, but be assured that now is the time to pick up countries on 20 mx.

George L6042 has been maintaining an almost nightly check on three African c.w. stations: KPH, WNU and WCC, which are just above 2 Mc. The idea behind this investigation has been to see how many times per month these stations could be heard, and use the information to predict openings on 160 mx. George has just completed an analysis covering the last 14 months on the above stations, and a definite pattern emerges showing peak conditions at the equinoxes and a very definite low at our winter solstice. There is a null in our summer soltice as well, but not as low as one would expect. (Evidence of one-way skip?—Ed.)

George says it is pretty obvious that the short path to W6/7 on 160 is open quite often and Amateur QSOs would have been possible on a number of dates were it not for the fact that local time there would be around 03/04. Latest heard:

Dec. 7—1116-1124z, 1805 Kc. W1BB.
„ 14—1342-1442z, 1992 Kc., W6QHQ, W6GEN (trans-pacific test).
„ 15—1126-1203z, 1802//4 Kc., W8ANO, VE3QU.
„ 15—1155-1203z, 1990 Kc. VE3QU.

DXCC AWARD AMENDMENT

(Not 5B DXCC). Issued free of charge to A.R.R.L. members; others remit $4.00 for DXCC Award, and $1.00 with each endorsement. In addition, send sufficient postage for return of QSLs, preferably sufficient for 1st class regd. mail.

SUMMARY

I would like to thank the gang of ever helpful VKs who keep this column supplied with information. Remember, news is always needed. Acknowledgments to DX News, LIDXA, FLADXA, ZL2AFZ, G3UGT, VK4SS, VK4RF, VK4VX and last but not least L6042. Good hunting chaps. 73, Peter VK3APN.

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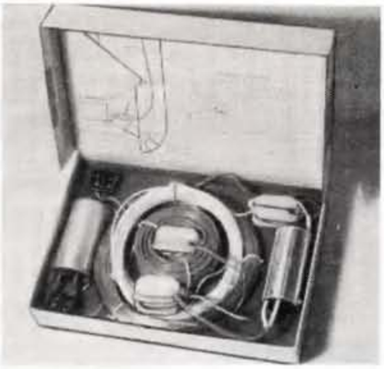

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SILENT KEY

It is with deep regret that we record the passing of the following Amateurs:

VK2CT—R. B. Pinning.
VK3GZ—Max Folie.

FEDERAL QSL BUREAU

Latest details on the proposed DX-pedition to Norfolk Island and Cocos-Keeling Islands by Jack Sinyser, W6BPO, and Bob James, W4WS (ex W4CHA), indicate they will arive in Sydney on 9th February and will be operative from Norfolk for two days from 12th February. They are scheduled to arrive in Perth about 24th Feb. and at Cocos on 26th Feb. Owing to the infrequent air schedules to Cocos (every three weeks) it is not certain that Jack will be able to make the Cocos trip as he must be back on his job early in March, but Bob, who is retired, will definitely make the Cocos location. The Cocos operation will last for two to three weeks. At both venues, Jack will sign VK2BPO/9 and Bob will sign VK2BRJ/9.

A visitor to Australia early in March will be K6KA. His schedule provides a stay in Melbourne from 28th Feb. to 3rd March. Information on his movements may be obtained from either VK3AKB or VK3TE. He may be operative from Norfolk Island under the call sign of VK9KA.

A new award sponsored by the Gaucho Radio Club, Brazil, is called the C-20-S Award. Information on the requirements may be obtained from this Bureau.

The National Amateur Radio Union of Greece has issued a set of awards. They have sent details of the requirements which may be obtained from this Bureau.

R.E.F. member, S.w.l. F15908, Pierre Galtier, Box X, Vieux Fort, 94 Vincennes, again complains that VK stations will not QSL even when he includes an I.R.C. He lists 12 VK stations who have converted his I.R.C. to other uses. What about it fellows, no matter what your views on S.w.l. reports, it is dishonest and discourteous to ignore an I.R.C. report. If your cards are too costly to "waste" on S.w.l's, reply on a piece of paper.

Bruno, HB9QO, who worked in VK a few years back, has now migrated to VK. He reached Melbourne with XYL and child on 4th January. Bruno, wisely, would prefer to settle in Melbourne, but employment opportunities in the electronic field are greater in Sydney, so it appears that Sydney will be his permanent location.

Bureau statistics for the year 1968 show a total of 41,674 cards handled. This compares with 88,234 in 1967 and 79,463 in 1966. The 1968 total would have been 10,000 lower if the Russians had observed the new arrangements earlier than October. At long last am getting a breather!

"CQs" from July 1967 to May 1968 inclusive are available gratis on personal application at this Bureau. First up best dressed and no phone reservations. Good hunting, good health and good QSL results in 1969.

—Ray Jones, VK3RJ, Manager.

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REMEMBRANCE DAY CONTEST

Editor "A.R.," Dear Sir,

I have a bone to chew over about the Remembrance Day Contest. It was stated in the results for 1968 in the November issue that "VK7DK's tally of 1822 points for 18¾ hours of operating could stand as a record for some time". Evidently this statement was made having done no research into the results of previous contests or that the points obtained for Amateurs in VK0, VK1, VK8 and VK9 mean nothing and don't count.

On going back through previous results to 1960, I find that this score has been exceeded by two Amateurs, VK0WH 1920 points in 1960, and VK0CR 2076 points in 1967, so how can Den's commendable result be still considered a record? I think for the first time the 2000 point mark was exceeded last year.

I had not really thought about the rules for the R.D. Contest before the above inaccuracy appeared, but now feel on reflecting that the contest treats those in the VK0, VK1, VK8 and VK9 areas as the ugly ducklings. Surely these scattered Amateurs in these areas could be treated for the purpose of such a contest as a separate division and as such eligible for award of the trophy should results indicate so. I imagine quite a number of the chaps in these areas are members of the W.I.A. to various Divisions. If there were points for percentage of Amateurs participating for 1967 and 1968 I feel sure Antarctica would win hands down with a 50% participation rate.

What about it chaps? Aren't these outlying Amateurs who give us so much of our interesting DX worth consideration as regards our own domestic contests? I definitely think so, what say you?

—Rodney Champness, VK3UG.

ERRORS IN R.D. CONTEST RESULTS

Editor "A.R.," Dear Sir,

Regarding the R.D. Contest results, I believe an error has crept in. The station VK3ASW/P is shown in the open section with 1083 points. It should, I think, read VK3AFW/P as I operated this station (VK3AFW/P) and claimed 1083 points for the "open" and cannot find my call sign elsewhere. It appears that there is a misprint or a strange co-incidence.

—R. R. Cook, VK3AFW.

Editor "A.R.," Dear Sir,

It appears that in the R.D. results, page 11, November issue, a small mistake has been made. Instead of VK7ZL as top VK7 c.w. score, it should read VK7FB. I don't think there is a VK7ZL, but 7ZL is part of my postal address. I deny the inference that I used a 10kw. b.c. transmitter in the contest, hi, hi!! I am sure this is correct as the points score is the same as I claimed.

—Mike Jenner, VK7FB.

Wireless Institute of Australia
Victorian Division

A.O.C.P. CLASS

Morse:
THURSDAY, 6th FEB., 1969

Theory:
TUESDAY, 18th FEB., 1969

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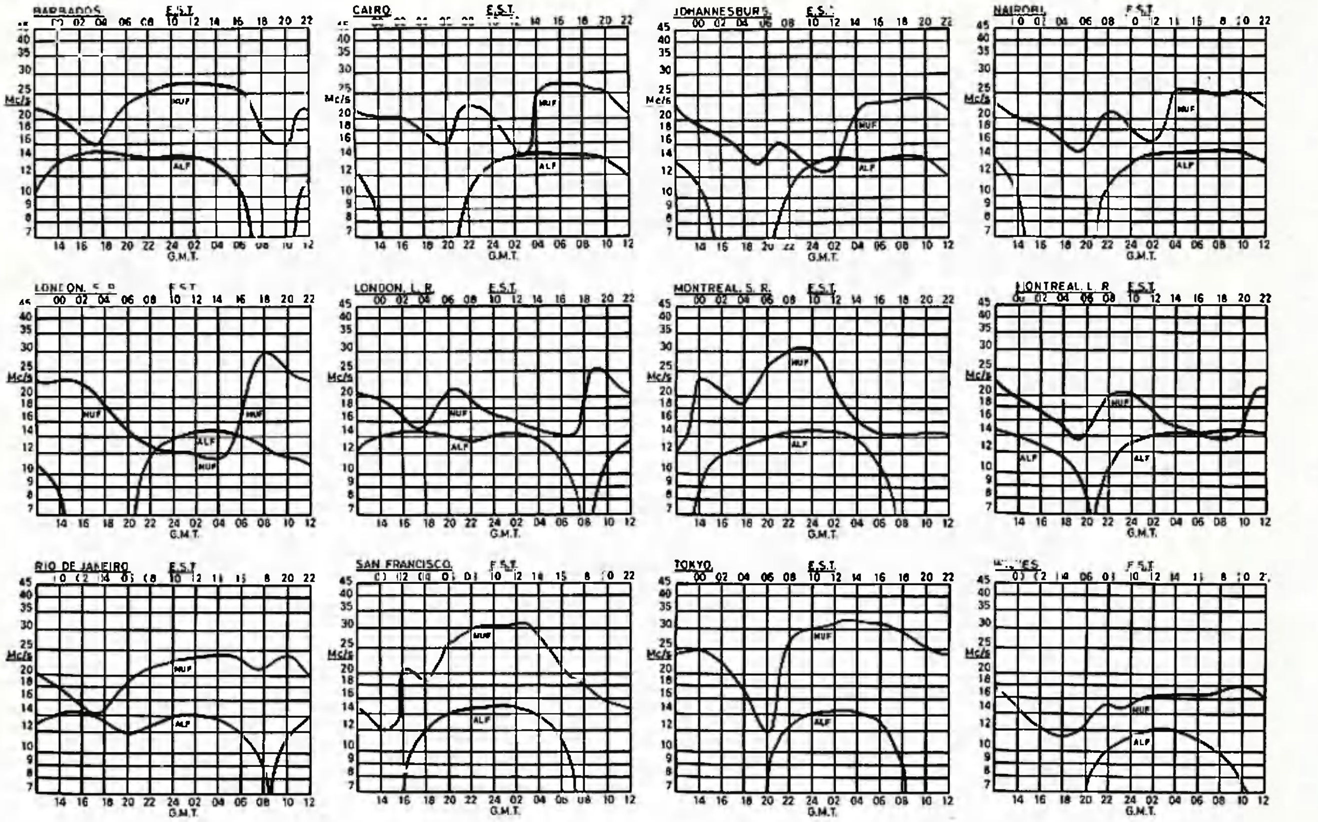

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MARCH, 1969
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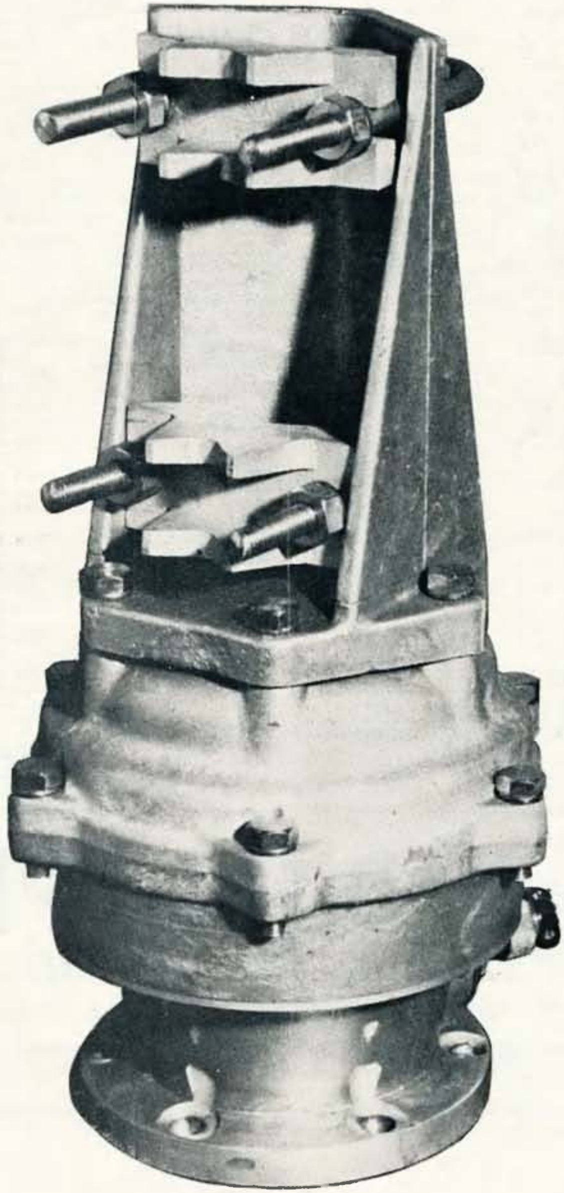

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5A54	$1.05 " "	6CW5	$1.08 " "
5Y3GT ..	92c " "	6CW7	$1.22 " "
6AD8	$1.08 " "	6DQ6A ..	$1.65 " "
6AE8	$2.88 " "	6GW8	$1.31 " "
6AL3	$1.18 " "	6L6	$3.52 " "
6AN7	$1.22 " "	6M5	$1.00 " "
6AN8	$1.89 " "	6N3	88c " "
6AO5	$1.03 " "	6R3	$1.18 " "
6AR5	$1.68 " "	6S2	$1.42 " "
6AR7GT	$1.44 " "	6SQ7	$1.96 " "
6AU4GT	$1.18 " "	6V6GT ..	$1.35 " "
6AU6	$1.05 " "	6X4	75c " "
6AV6	90c " "	9A8	$1.50 " "
6BA6	$1.08 " "	9U8	$1.35 " "
6BD7	88c " "	12AU7A	$1.12 " "
6BE6	$1.09 " "	12AX7 ..	$1.25 " "
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amateur radio

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Members of the W.I.A. should refer all enquiries regarding delivery of "A.R." direct to their Divisional Secretary and not to "A.R." direct. Non-members of the W.I.A. should write to the Victorian Division, C/o. P.O. Box 36, East Melbourne. Two months' notice is required before a change of mailing address can be effected. Readers should note that any change in the address of their transmitting station must, by P.M.G. regulation, be notified to the P.M.G. in the State of residence; in addition, "A.R." should also be notified. A convenient form is provided in the "Call Book".

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CONTENTS

COVER STORY

Antennas are increasingly in the news these days and our front cover this month shows the working end of a new rotator from Bail Electronic Services. Development of these devices has been such that models like the "Emotator" 1100M, designed with push-button control, are within the economic range of most Amateur uses.

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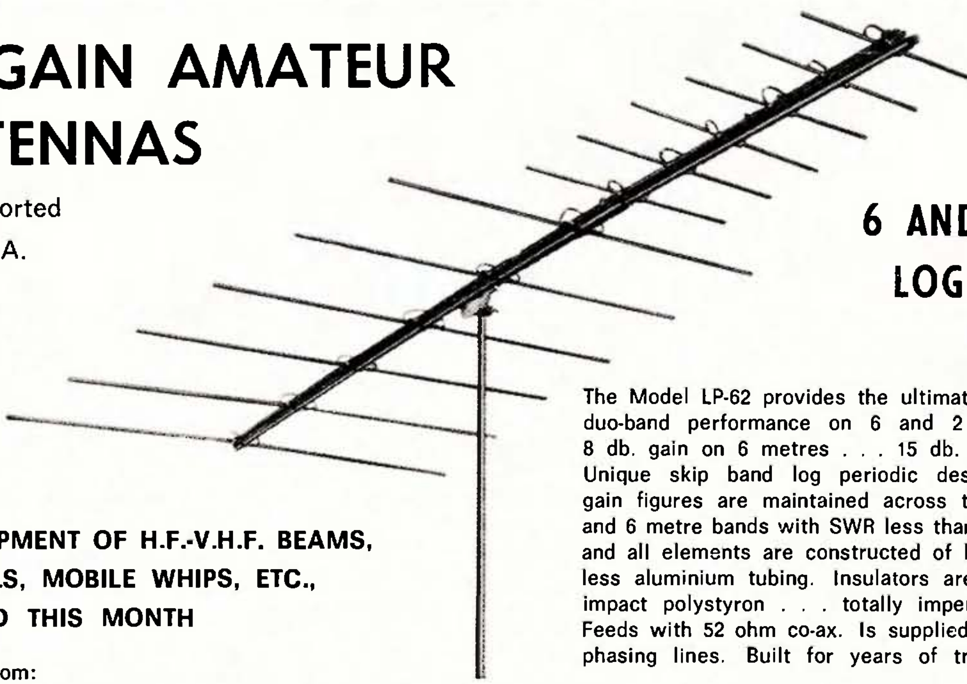

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FEDERAL COMMENT

About 1,000 copies of this issue of "A.R." are being sent out as complimentary copies — perhaps you, the reader are one of these 1,000. This came about because a few months ago the Magazine Committee decided to include a Questionnaire soliciting information about the magazine and Amateur Radio generally; they also asked "is there anyone to whom you would like a complimentary copy sent?" They were overwhelmed with replies and now have a tiger by the tail!

We hope you find favour with this "house journal" of the Wireless Institute of Australia.

If you are an advertiser you may be interested in the circulation. This magazine reaches nearly 5,000 Amateur Radio operators or people with an associated interest in radio. These are radio "hobbyists," but they are also consumers of many non-related products, and in an estimated 38% of cases they are in positions of responsibility in the electronics industry, or telecommunications, or other related occupations. They are united through their hobby, not through being similarly employed, therefore this journal is, we believe, a unique medium for reaching a diverse group of consumers. In the U.S.A. an estimated 49% of Amateurs are engaged in radio communication, and other electronic and electrical engineering, according to the Stanford Research Institute report of 1967.

So, we suggest, you may care to use our W.I.A. journal to bring before our members information about your products. The support of advertisers is necessary for this journal's continued survival and conversely the supporting of our advertisers is a must as far as we, the Amateurs, are concerned. We should show preference in our purchasing for products regularly advertised in our journal.

If, however, you are not an advertiser, but a non-member Amateur Radio operator who has received this copy as a result of a friend's request for a complimentary copy to be sent to you, then what's in it for you?

Firstly, we hope the editorial material (the technical articles, the notes of Amateur Radio activities, etc.) is of interest to you; secondly, we hope you consider the work being done by Australia's Amateur Society, the W.I.A., is appreciated by you as shown by your support and membership. Two things then are to your benefit—the receipt of a well-produced magazine, and the maintenance of your hobby, through your support of its Society.

Should you merely wish to receive the magazine, then twelve copies at 30 cents each is $3.60, direct subscription. However, you can receive the magazine at a lower cost per copy—at present 17 cents, but this will cost you a bit **more** than $3.60! How's that again? Put it this way, subscriptions to the W.I.A. vary from State to State, and vary from grade to grade, and range for full members (licensed operators) from $8.00 in Victoria to about $5.00 in some other States, but all are considerably above the $3.60 for 12 copies of "A.R." Why pay more to receive the magazine?

Because, I believe, if you can see your way clear to be a member of the W.I.A. rather than just a direct subscriber to its journal, you give support to its efforts to "represent the Amateur Service". You also support the activities of a large band of enthusiastic honorary officers. (W.I.A. has no fully-paid officers, and honoraria are rare. The editing and production of this magazine are done by voluntary labour, the major costs being paper, printing and postage. Its cost to members is 17 cents a copy.)

Where do the extra few dollars go? How is this W.I.A. organised? There are six States or **Divisions**, each autonomous, and you pay your sub. to your "Division". Each Division, irrespective of size, carries one vote at the annual Federal Convention where Federal policy is determined. One Division (Victoria), in addition to running its own Divisional affairs, provides the personnel for an independent Federal Executive body to implement decisions of Federal Council. The Victorian Division, in addition, assumes responsibility for publishing this magazine on behalf of the Federal body.

Say for argument that your sub. is $6.00 p.a. Of this, 17 cents × 12 = $2.04, goes to the publishers of "A.R." magazine; also about $1.00 goes to Federal Executive of W.I.A. So about $3.00 of your, say, $6.00 is remitted from your Division's funds, the remainder is retained in your State for its administration. The $1.00 to F.E. is made up as follows: 30 cents per member is the annual "per capita" fee, 20 cents per member will be recovered starting this year so that Australia can pay its dues to the Region III organisation of South-East Asian and Oceanic Amateur Radio Societies. The other 50 cents odd (it's been about 47 cents per member on the average over recent years) is used by Federal Council through Executive to finance the annual meeting of delegates from the six Divisions.

The mechanism of this "50 cents odd" calculation is that air fares, accommodation and meals over the Easter period for six delegates and three members of Executive, are placed in an account, stirred around, and the total is divided up between States according to membership. All members of the W.I.A. contribute the same to the cost of the Convention, but the total paid by larger Divisions is, of course, greater. The effect of this procedure is that the travel costs of delegates from States far from the Convention venue are subsidised by States close to the venue. As the Convention is held in rotation around the States, this to a degree evens out over the years. (This year the Convention is in Canberra, next year it is expected to be in Perth.) However, all W.I.A. members pay the **same** per capita fee of 30 cents, they pay the **same** Region III. contribution of 20 cents, they pay the **same** share of Convention costs of about 50 cents, they pay the **same** price for "A.R." of 17 cents × 12 = $2.04. So the cost of "Federal" activities and administration is the **same** for all members, about $3.00, irrespective of where they reside. The difference between $3.00 and your actual sub. is the cost of maintaining your State W.I.A. organisation and paying for its administration.

You may care to contact your Divisional Secretary and enquire about membership and subscription, or you may care to send the application form published as an insert to this issue. But only do this if you would like to spend a few dollars a year extra to support your Amateur Society. You may like to support us if you're pleased that you can become a licensed Amateur at 15 now, you now only have to pass 10 w.p.m. c.w., you now can use 400 watts p.e.p. s.s.b. output, you can now go portable or mobile for five days without prior permission, you can now officially use unmanned v.h.f. repeaters under certain conditions, and because you can, in short, enjoy quite liberal operating conditions.

The gaining of those privileges and others over the past few years has been because your society is held in high regard by the administration, and because it represents (just) over 50% of Amateurs. Very soon we may have to "represent the Amateur Service" very strongly in reference to v.h.f. frequency spectrum allocations. It would be a great source of strength if we represented 60% or 70% or **all** Amateurs, active or inactive.

Are you a long-time member? Then please show this to a friend who is a call sign holder, but inactive. He may like to receive the magazine. Please note, however, that for all of you, the direct subscription to the magazine will cost less than W.I.A. membership, but is the saving really worth it?

John Battrick, VK3OR

AN EXPERIMENTAL 455 Kc. I.F. STRIP

E. MANIFOLD,* VK3EM

ONE would think that by now everything that could be written about i.f. amplifiers would have been covered in some way or another, but it seems that there are still ways of using available units to produce better results, any information available not having been circulated to any extent. There is nothing new in the fact that ceramic filters can be used in i.f. stages, having been done many times, but to date very few designs have used them in cascaded stages utilising the double ring-dot type of resonators.

Where these filters have been used in cascaded stages practically no information has been given as to the passband selectivity, except one article[1] (also Ref's 2 and 3) did mention that "good skirt selectivity with reasonably square flat-topped response" was available.

To original thoughts and queries on this subject, no answers were readily available, but in line with tuned circuit characteristics where by increasing the number of cascaded stages, a narrower bandpass and steeper skirt selectivity is produced, particularly at frequencies of 50-100 Kc., it was thought that similar results could be produced by cascaded ceramic filter stages.

Looking at the selectivity curves for "Murata" SF455D ceramic filter units in single stages (Fig. 4), shows that the peak of the curve is reasonably sharp and is adjustable over fairly wide limits with different coupling condensers, but the skirt selectivity leaves much to be desired, definitely not satisfactory for a communications type receiver by modern standards.

All the foregoing thoughts had been provoked by the fact that Ric Hill, VK3RC, had made available several SF455D and BF455A "Murata" ceramic filter units from I.R.H. Components Pty. Ltd. for experimental purposes. Unfortunately, the project has been delayed due to the pressure of other duties and has only now become a reality.

A p.c. board was laid out and prepared with parts assembled to the circuit of Fig. 1, using NPN germanium transistors, only because these were at hand, although other circuits for these filter units show silicon transistors as being used, as in Fig. 3, which should be low to medium gain types to avoid instability.

For this reason no resistor values have been shown on Fig. 1 for base and emitter bias resistors as they will vary, depending on the type of transistor used, and as it does not affect the final result to any extent they were not included.

As this was an experimental set-up, no a.g.c. circuitry was included, the main consideration being the selectivity, stability and gain of the strip, using the "Murata" ceramic filter units and by-passes for three stages of i.f.

* 267 Jasper Road, McKinnon, Vic., 3204.

It was realised at the outset that each filter unit may, or may not, be exactly the same frequency at 455 Kc., but it was hoped that the spread over the three units would not be excessive, and proved to be an average centre frequency of 454.8 Kc. for the experimental strip, for these three units.

VARYING THE COUPLING

When first assembled the coupling condensers between pins 1 and 2 on each filter unit were all 25 pF. on the assumption that it would produce a curve at 2 Kc. bandwidth, similar to the published curves for a single stage (Fig. 4), but with steeper skirt selectivity.

Certainly the skirts were much steeper but the nose of the curve was also much sharper (curve No. 4, Fig. 2) and was only suitable for c.w. operation, being approx. 0.6 Kc. at the 6 db. point and 2 Kc. at the 40 db. level, the limit of measurement at this location.

Single signal selectivity indeed, as by a listening test, placing the b.f.o. on either side of the i.f. passband only half of the signal was copiable, the other sideband being just audible when tuning over the signal.

Unfortunately this is where the difference in each filter unit becomes noticeable, as the curve plotted for this arrangement was slightly asymmetrical due to the different frequency of one unit.

The next test was to go to the other extreme and fit 150 pF. condensers in place of the 25 pF. condensers across pins 1 and 2 of the filter units, the result being indicated by curve No. 1 Fig. 2 with a 4.5 Kc. bandpass at 6 db. and 8.5 Kc. at the lower extreme.

This was considered as being too broad for the present s.s.b. requirements, so the 150 pF. condensers were replaced with 100 pF. condensers to produce curve No. 2 (Fig. 2) which, while very good for a.m. operation, was

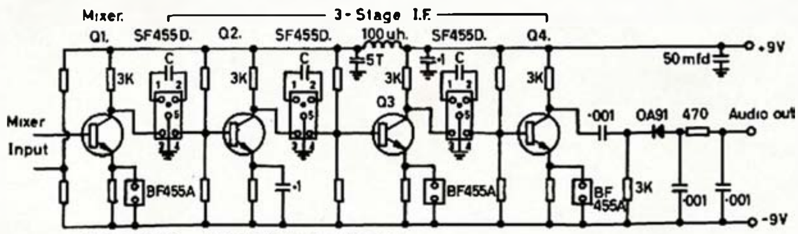


FIG. 1. CIRCUIT OF CERAMIC FILTER I.F. STRIP

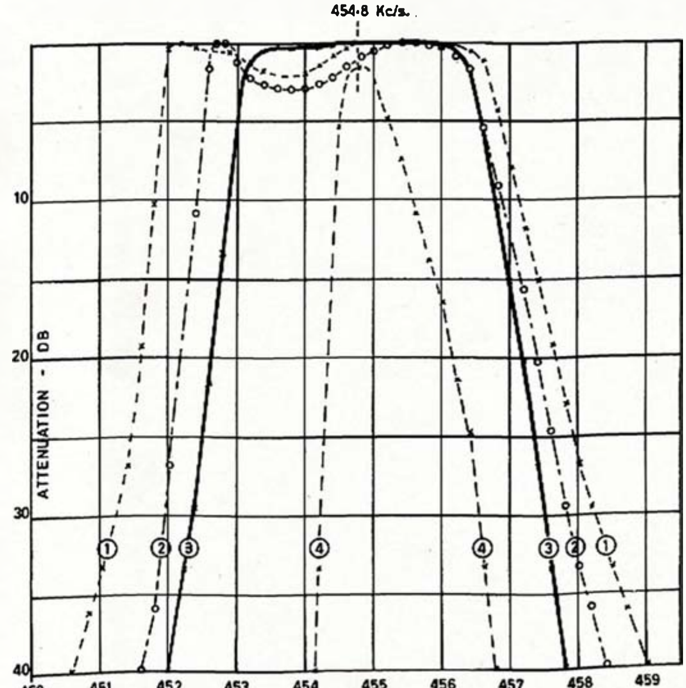


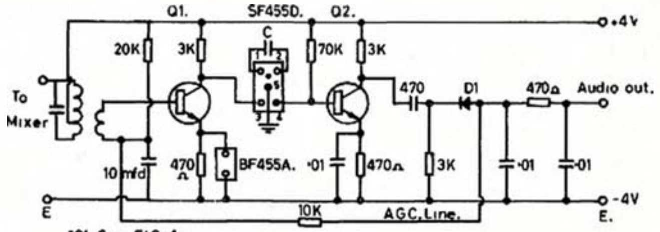
FIG. 2.- 3 Stage I.F. Response curves.

not the best it was felt necessary for in a good communications receiver.

Consequently, the coupling condensers were replaced again with 50 pF. in the first stage, 56 pF. in the second stage, and 50 pF. in the third stage, only because these were the only ones of this value available at the time. Curve No. 3 (Fig. 2) resulted from this variation, which was considered to be a fair compromise for both a.m. and s.s.b. operation for the receiver.

modern receiver. While it may not be quite as good as the mechanical or crystal filter units, neither is it as costly nor space consuming as the whole i.f. strip is approx. 4" x 2" with room to spare.

My thanks to Ric Hill, VK3RC, for the samples of the "Murata" ceramic filter units and bypass units for the test, and to Harold Hepburn, VK3AFQ, for his support and interest in the project.



"C" See FIG. 4.

FIG. 3. "MURATA" CERAMIC FILTER CIRCUIT. (as supplied.)

All previous curves with the larger condensers gave a dip in the top of the response curve, but the 50 pF. combination gave what was essentially a flat-topped response curve with steep sided skirts.

LISTENING TESTS

For listening tests a receiver front-end was capacitively coupled from the mixer plate with a few pF. to the "Murata" ceramic filter i.f. strip, which was followed by an audio amp. and speaker, to give alternative listening either through the normal receiver or through the new i.f. strip and audio stages, using the audio volume controls to mute either receiver while tuning a signal.

For the initial test a strong b.c. station was tuned at approx. 1500 Kc., mainly because there would be no fading to confuse the test.

Tuning the main receiver on the strong b.c. station with the 7 Mc. dipole for the antenna, the bandspread on the receiver was greater than 10 Kc. and was still audible at 15 Kc. from either side of resonance. This was not so good, but was indicative of most older communication type receiver response to strong signals on any band.

The ceramic filter unit was then turned on and the same tuning done again, which confirmed the result obtained by curve No. 3 of Fig. 2. The difference being that over modulation was noted, or overloading in the i.f. strip, I wonder, surely b.c. stations do not splatter—or do they?

Weak stations 10 Kc. away from the strong b.c. station could be copied with the ceramic filter, which were inaudible with the main receiver i.f. in circuit.

CONCLUSIONS

In conclusion, it is felt that this experimental unit is a simple, inexpensive approach to upgrading an existing receiver and obtaining a narrow bandwidth response i.f. strip which requires no alignment but may require adjustment to get the desired bandpass, is stable, and is in keeping with the requirements of the selectivity of a

The "Murata" SF455D and BF455A ceramic units are available from Ham Radio Supplies, 323 Elizabeth Street, Melbourne, Vic., 3000.

ADDENDUM

Perusal of "Coryra" publication for January 1969 shows that Roger Davis, VK1RD, has been doing parallel work on these "Murata" filter units, as he has published a preliminary report for an i.f. strip to be used in a project receiver for that magazine.

No circuitry was given, but from the report, the results mentioned appear to be similar to the response curves of Fig. 2.

A complete i.f. strip was to be published for February with p.c. board and parts available for subscribers to "Coryra" only.

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1. R.S.G.B. Bulletin: "A FET Receiver for VHF Bands," by A. L. Mynett, G3HBW, Dec. 1967, p. 796.
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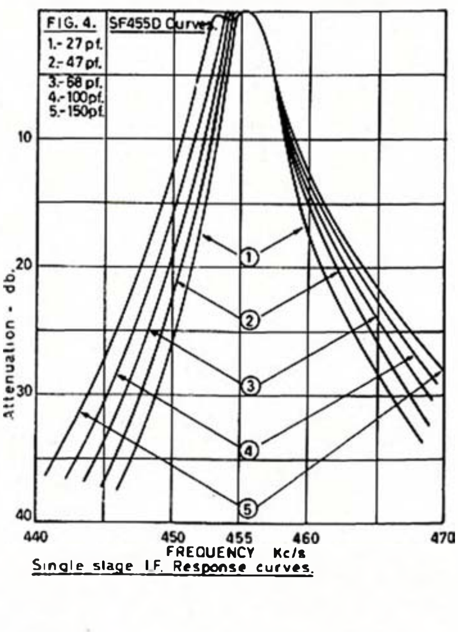
3. Electronics World: "Clevite Ceramic Filters," by David L. Pippen, Nov. 1965, p. 34.



Single stage I.F. Response curves.

Book Review

RADIO COMMUNICATIONS HANDBOOK

Published by R.S.G.B.

This book is the fourth edition of the ever popular R.S.G.B. Handbook, now with a new title and a greatly enlarged content, containing 21 chapters and some 800 pages. This edition represents a very considerable advance on the preceding one and is more than 50% larger.

There is a completely new chapter on r.t.t.y., incorporating a considerable amount of information on the Creed teleprinter (the most common unit available to Australian Amateurs). Most other chapters have been re-written and enlarged to include new information on receivers, transmitters and aerials with extensive information on propagation phenomena. U.h.f. techniques are comprehensively covered.

We anticipate this publication will find its way onto most Amateurs' bookshelves as well as many professional libraries.

Our copy direct from the publishers.

HAM RADIO PROJECTS

Bert Simon, W2UUN

This book contains 104 projects, all of which fall into the simple and cheap category, indeed many are quite basic one and two-tube rigs, relatively easy to assemble and operate. In the author's own words, "If you have a well stocked junk-box, you should be able to build many of these projects for just the cost of a few capacitors and resistors."

In addition to numerous tube configurations, there is a fairly extensive grouping of semi-conductor devices using the latest in transistors, however prime emphasis has been placed on cost.

The sections of the book cover antenna devices, audio devices, c.w. helps, interference suppressors, pre-amps. and pre-selectors, receivers and converters, receiving accessories and transmitters. These are projects for all bands from 3.5 to 1296 Mc., but some basic knowledge of construction and layout is definitely needed, as in the main they are limited to a schematic drawing, list of parts, and barest essential details for construction, although some useful wiring hints are included, mainly for the higher frequency projects.

Published by TAB Books, U.S.A. Price $US3.95.

ELECTRONIC CIRCUIT DESIGN HANDBOOK

Second Edition, by Editors of EEE Magazine

This publication is aimed more at the professional engineer than at the Amateur operator, although the more advanced Amateur will find much of interest. The 320 pages (11 x 8½ inches) contain a wealth of information, over 500 circuits with 600 illustrations. The accurate and clear circuit descriptions are supplemented by easy to follow diagrams which contain all component values and other needed data.

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THE QUESTIONNAIRE – SOME FURTHER PROGRESS

Before proceeding with further analysis, we would mention that a few late replies have arrived, sufficient to raise the over-all return to 31.2% a little under a 1% increase. A few trial runs showed that the extra replies made practically no difference to the figures already compiled, hence it was decided not to re-work the vast number of calculations already made. These late returns have been retained in order that the comments included in them may be taken into consideration at a later stage of our investigations.

The subject of readers' requirements took a considerable amount of "crystal gazing" as comments left some answers in doubt. These we have classified as "maybe". Some made no attempt to answer the question, so have been omitted from the figures.

The summary gives us the following table:

	Yes %	No %	Maybe %
Technical articles	98.3	1.3	0.4
DX Notes	47.5	51.5	1.0
VHF Notes	52.5	46.2	1.3
Federal Notes	60.0	23.4	16.6
Divisional Notes	50.5	45.5	4.0
SWL Notes	23.4	75.5	1.1
Trade Reviews	71.5	27.9	0.6
Book Reviews	59.0	40.5	0.5
Correspondence	61.5	36.8	1.7

In VK1-2, VK5-8 and VK7, the majority did not want the DX Notes, while in VK3 exactly the same number voted for as did against. The other two Divisions had a majority in favour of DX Notes by only very narrow margins.

In VK4-9 and VK7 the majority voted against the VHF Notes, again the margins were very small, being less than 2% difference.

All States voted in favour of Federal Notes, and some most enlightening comments were included. In due course, these comments will be extracted and forwarded to the Federal Executive for their consideration and action where thought necessary.

The Divisional Notes appear to be the strongest bone of contention. As the table shows, the voting was fairly even, so much so that in VK3 and VK4-9 the "no" majority made it by only one vote. VK7 were also against, but by a wide margin. The most frequent comment by those in favour, stipulates the Divisional notes should not be in the old form, but should be restricted to items of general interest, such as reports of meetings and future activities, with personal "pars" eliminated. Those against, in the main, consider that all Divisional matters are best left to Divisional bulletins and broadcasts.

No State favoured SWL Notes and the only surprise in this section was the noticeable lack of support by the SWLs and Associates themselves. Many with call signs, although indicating SWL Notes should be included, indicated they had no personal interest themselves, but felt they would be of use to others. On this matter, we will have more to say later, when we review the many comments in more detail.

All States except VK7 are in favour of Trade Reviews, only 33% of their votes being in favour. Many interesting comments were made regarding the types of review, and these will be taken into consideration later.

VK6 voted against Book Reviews by a margin of 3%, while all other States were in favour by fairly high margins. VK7 was again the odd-man out on the subject of correspondence with a 3% majority being against the correspondence section.

Readers' preferences appear most interesting and more work has to be done on this matter. As far as we have gone, we find the first choice to be:

VK1-2	Antennas
VK3	Receivers
VK4-9	Receivers
VK5-8	Receivers
VK6	Transmitters
VK7	Receivers

On an Australia-wide basis, the first choice figures are:

Antennas	25.4%
Audio Equipment	0.9%
Hints and Kinks	11.9%
Receivers	26.6%
Test Equipment	12.5%
Transmitters	22.5%

As to how we finally evaluate this information and how best to use it, has yet to be decided, but for certain, we will not be wasting space on audio equipment, unless it is strictly orientated towards Amateur Radio applications.

As far as the question on advertisement perusal is concerned, there is no point in making any calculations. Well under 1% would have indicated they did not read them, and possibly under 5% only look at some of them. This matter has been commented on at great length in the "any other suggestions" portion of the questionnaire. Some suggestions are completely impracticable, but this was only to be expected. However, we did find some wheat amongst the chaff, and we have already acted on some of the sound suggestions received. Some of the suggestions we would like to act on, and in these cases we can only pass them to the advertisers for their consideration. To all those who adversely commented on certain advertising material, we can only draw attention to the fact that we had already taken action on this matter at the time the questionnaire was published, and such type advertising has not appeared in recent months.

A point frequently raised is the lack of advertising from the "smaller" States. This is a matter that has been raised at Federal Conventions for many years when attention has been drawn to the Federal Policy Book, item M06, which states:

"That there shall be appointed in each Division a sub-editor of 'Amateur Radio' who will be responsible within the Division for—

(a) Collation of Divisional Notes.
(b) Procurement of technical articles.
(c) Furthering the circulation of the magazine within his Division.
(c) Collaborating with the Publications Committee in increasing the volume of advertising in the magazine."

This policy item was framed back in 1947 and after 22 years has never been taken seriously by any Division, therefore any complaints regarding lack of advertising from certain States should rightly be directed to the Council of the State concerned for their action.

The whole matter of advertising is a complex one and it may help if some few details are clarified. There is the impression that advertising is a highly profitable operation for the magazine. While there is some profit in it, it is not large. In setting advertising rates, factors such as circulation and likely return for the expense must be considered, as well as production costs. In an earlier report, we gave estimates of the national level of spending on our hobby, and it must be admitted the **average** figure for each Amateur is not high. To encourage more advertisers, we must either spend more individually or increase the number of active Amateurs to increase the size of the market. As the position stands now, we are of the opinion that the new rates we have had operating since January are fair to all concerned.

Literally hundreds of suggestions were received which would improve the magazine, but only by greatly increasing the costs of production. For this reason they cannot be seriously considered at this time, but could be incorporated as part of a long-range programme. For example, a popular suggestion was that the size of the magazine should be the same as "QST" and similar publications. This suggestion has been considered for at least the last ten years, but as it is more expensive than the present size, we cannot make the change. Going through our library, it is noticeable that the American publishers are the main exponents of the smaller format, while the Societies with smaller circulations prefer the larger format. It would appear they also use larger formats for economic reasons.

We whole heartedly agree with all those who asked for photos and descriptions of stations of other Amateurs. Some years ago we did have such a section, but for some reason the supply of suitable material dried up. Odd ones have been directed to us over the years, but very few have been suitable for reproduction. If Divisional sub-editors (????) would like to follow this one through we will go along with it. Two from each Division will keep us going for a year. If we are rushed with offers, publication will be made in State numerical sequence from 2 to 7, one at a

(Continued on Page 18)

PROJECT—SOLID STATE TRANSCEIVER

PART FIVE

H. L. HEPBURN, VK3AFQ, and K. C. NISBET,† VK3AKK*

To date this series of articles has described all of the modules necessary to build the receiver part of the project and some of the modules for the transmitter.

This month's article will be devoted to the power regulation and distribution system and to the signal interconnections necessary for the receiver section to be made operable.

VOLTAGE REGULATION AND DISTRIBUTION

The right hand side of Fig. 14 gives the circuit of the voltage regulator, while the left hand side shows the way in which the various voltage outputs are distributed to modules.

Note that the part of Fig. 14 within the dashed lines contains the components in the regulator module and contained in the regulator kit. The small circles on the left hand side of the dashed "box" are the diagrammatic representation of the pins which constitute the output points on the p.c.b.

The regulator has been designed to accommodate an unregulated input of from 12 to 15 volts d.c. This range was adopted in that it covers the limits met with in mobile operation. It will however continue to function down to 11.5 volts, but not below. If the unregulated d.c. is derived from a mains operated supply, it is recommended that at maximum load (i.e. on transmit) the output voltage from the supply does not fall below 12 volts.

In the usual type of solid state voltage regulator the reference voltage for the base of the regulator transistor (or transistors) is obtained from the unregulated supply by means of a zener diode and a dropping resistor.

This system has two drawbacks. Firstly, the range through which the supply voltage may vary without exceeding the rating of the zener, or getting outside the control range of the zener, is comparatively narrow. To overcome these two problems, the dropping resistor has to be fairly large in value and, as a consequence, the stabilised d.c. output is well below that on the unregulated line. Secondly, the actual voltage at which the zener controls is somewhat dependent on the current flowing through it and thus the regulation of the supply output is degraded.

In the circuit being described, the usual dropping resistor is replaced with a field effect transistor. One characteristic of a FET is that, if connected as a diode with gate joined to source, the current flow through it will be (within wide limits) independent of the voltage drop across it. Thus as unregulated supply varies, the current through the diode connected MPF102 remains constant, the zener current remains constant, the zener control voltage remains constant, and the regulation of the whole supply is improved.

In addition, the lower limit of the unregulated supply range is only a volt or so above the regulated supply output. In the circuit described, the unregulated supply can drop to 11.5 volts while the regulated output is still being controlled at 10.5 volts.

The string of three diodes in series with the 9.1 volt zener are being used as low voltage zeners to bring the stabilised regulator base voltage up to about 10.6 volts.

This, well regulated, control voltage is applied to the base of the 2N3564 regulator/"driver" which in turn controls the output voltage from the emitter of the 2N3055 main voltage regulator. The 1.5 ohm resistor in the unregulated line has been included as a safety measure and limits the current

* 4 Elizabeth Street, East Brighton, Vic., 3187.
† 25 Thames Avenue, Springvale, Vic., 3171.

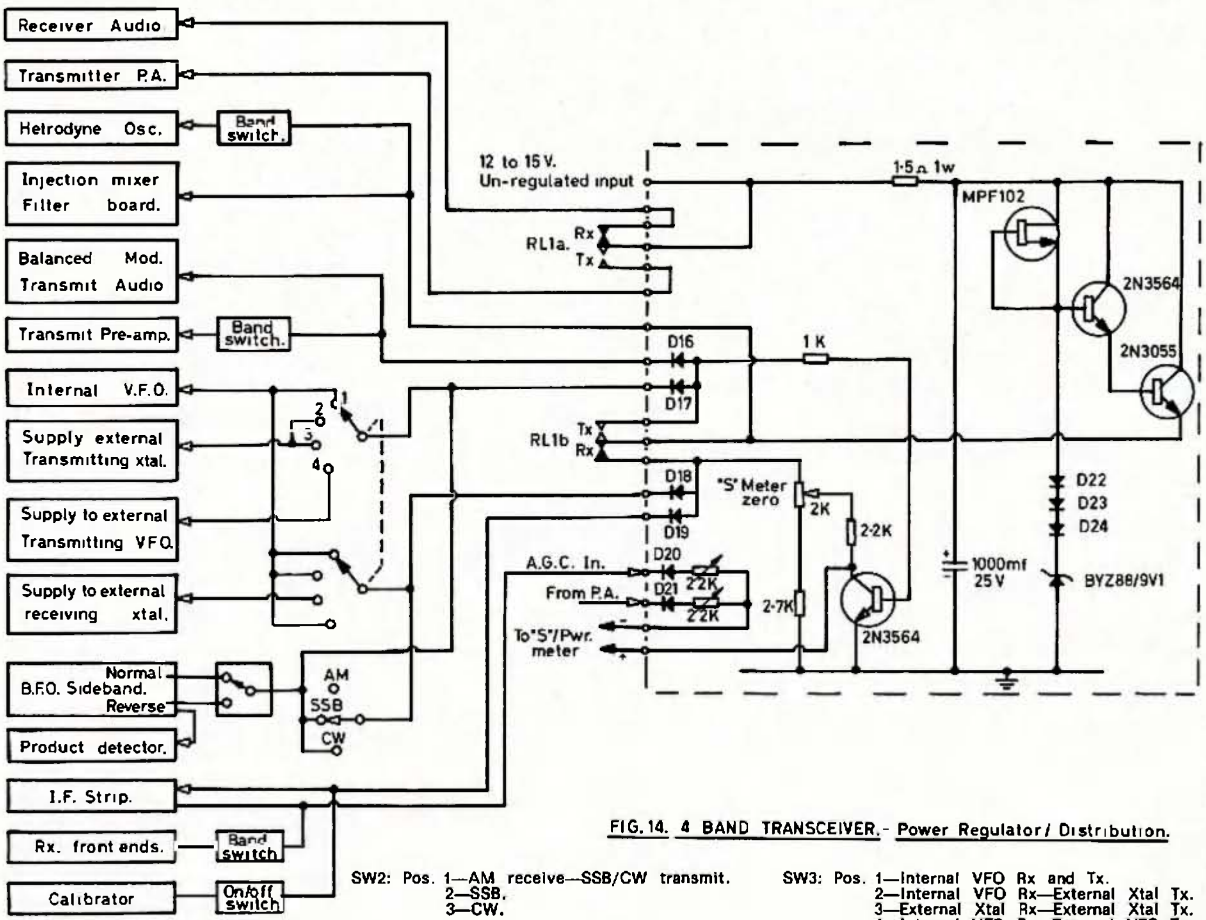

FIG. 14. 4 BAND TRANSCEIVER.- Power Regulator/ Distribution.

SW2: Pos. 1—AM receive—SSB/CW transmit.
2—SSB.
3—CW.

SW3: Pos. 1—Internal VFO Rx and Tx.
2—Internal VFO Rx—External Xtal Tx.
3—External Xtal Rx—External Xtal Tx.
4—Internal VFO Rx—External VFO Tx.

drain in the event of short circuits or component failure.

The 1,000 uF. capacitor across the unregulated input improves both the filtering and the dynamic regulation of the supply.

The rest of the regulator module is devoted to the various change-over, gating and adjustment functions required by the transceiver. They will now be described.

(i) The unregulated supply voltage is applied only to the receiver audio module and to the transmitter p.a. Both of these functions have wide current demands and are best separated from the remainder of the modules in the interests of economy and stability.

RL1A applies unregulated voltage to the receiver audio module when in the unenergised "receive" condition and to the p.a. board when energised through the p.t.t. or other tx/rx switch.

(ii) The injection mixer and filter modules are energised at all times and thus are supplied straight from the regulated output. According to the frequency required, one of the hetrodyne crystal oscillators must be in operation at all times and is thus supplied straight from the regulated line via the band switch.

(iii) The regulated d.c. line is connected to the change-over contacts of RL1B. In the unenergised receive position, voltage is applied to the receive only functions via the gating diodes D18 and D19. At the same time no voltage is applied to the base of the "S" meter switching transistor so that it is open circuit and allows the "S" meter circuit to function. When energised on transmit, the relay contacts apply voltage to the "transmit only" functions through the gating diodes D16 and D17. Voltage is also applied on transmit to the base of the meter transistor switch, pulling it hard on and isolating the "S" meter circuit.

(iv) In the transmit position regulated voltage is applied via D16 straight to the balanced modulator and to the various transmit mixer/pre-amplifiers via the band switch. The line through D17 goes to the two-pole four-way switch which is used to select either the internal v.f.o. or alternative external frequency control facilities. D17 also gates a supply to the b.f.o. at all times.

(v) In the receive condition, D18 gates supply voltage through the internal/external switch to the v.f.o. and to the b.f.o. via the a.m./s.s.b./c.w. function switch. Note that the b.f.o. is always energised on transmit, but **on receive only** it may be made inactive when receiving a.m.

D19 gates supply to the receiver i.f. strip and to the (optional) crystal calibrator on receive. Note that the receiver front-end supplies are obtained from the a.g.c. line via the bandswitch, and that the product detector supply comes from the gating diodes in the b.f.o. (refer to Fig. 12 in Feb. 1969 "A.R.").

The four gating diodes D16-19 are used to prevent transmit functions being energised on receive (and vice-versa) through the interconnections of the internal/external frequency control switch.

(vi) **"S"/Power Out Meter**

The meter used is a simple 0-1 mA. instrument and is used to indicate both the relative strength of the received signal or the relative power output of the transmitter. Change-over switching is automatic.

The meter type in the project is the one advertised by Ham Radio Supplies, of 323 Elizabeth St., Melbourne, 3000. It is ready calibrated in (arbitary) S units.

On receive, the relative signal strength is indicated by comparing the a.g.c. rail voltage with that of the regulated supply rail. As the signal strength increases, the a.g.c. rail voltage falls and the voltage across the meter rises. The meter is thus forward reading. The no-signal voltage across the meter is set to zero by means of the 2K tab pot, while the 22K in series with D20 is used to set the full scale deflection of the meter.

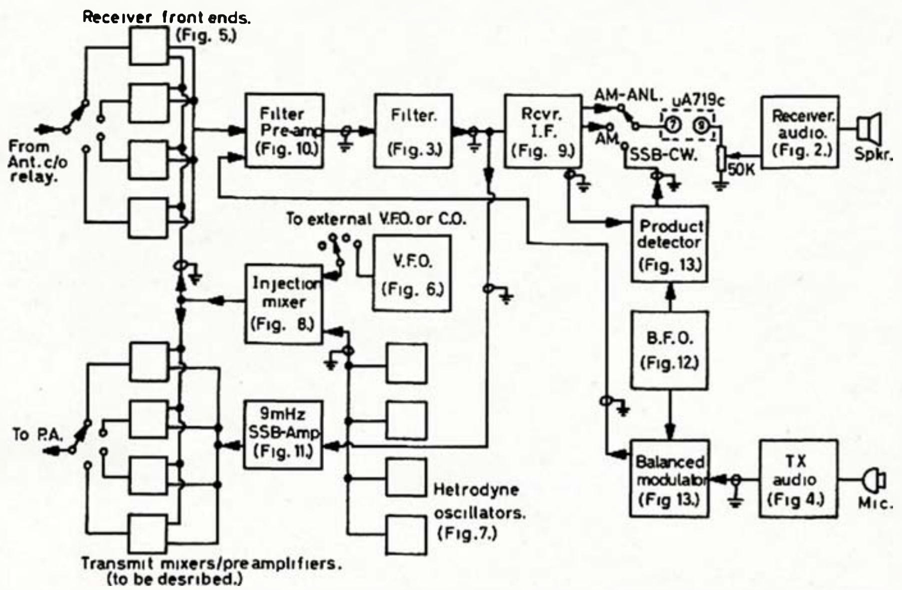

FIG. 15. 4 BAND TRANSISTOR TRANSCEIVER - Signal interconnections.

On transmit, voltage is applied to the base of the 2N3564, switching it hard on and effectively grounding the a.g.c. line. Rectified r.f. from the p.a., negative going in polarity, is compared with the voltage on the regulated supply rail to give a forward reading indication of power output. The 22K tab pot in series with D21 is used to set the full scale reading of the meter. The two diodes D20 and D21 are needed to prevent interaction between the two negative supplies to the meter.

SIGNAL INTERCONNECTIONS

Fig. 15 shows the signal interconnections between the various modules of the receiver and some of those for the transmitter. The references on the various modules are the figure numbers given in "A.R." since the series started in November 1968. It is recommended that this description be read in conjunction with the back articles.

Note that all signal wiring between the boards is done with small diameter co-axial cable for r.f. and with shielded cable for audio.

The signal from the antenna goes via the antenna change-over relay (RL2) through one section of the bandswitch to the link coils on each receiver front-end board. The 9 Mc. outputs from each board are all paralleled and taken to the filter pre-amplifier. Note that the filter pre-amplifier also accepts signal from transmitter balanced modulator and that the signal change-over is done on the filter pre-amp. board by means of a diode (D6).

On both receive and transmit, the output of the filter pre-amp. is taken to the filter board from which it goes either to the receiver i.f. strip or the 9 Mc. transmit amplifier. Selection of the signal path is effected by means of diode D9 on the 9 Mc. amplifier board.

There are three outputs from the i.f. strip—a.m. (not limited), a.m. (limited) and a 9 Mc. s.s.b./c.w. outlet to the product detector. The first two (audio) outlets go to two of the three switch positions, with the third position accepting audio from the product detector.

The product detector, b.f.o. and balanced modulator are housed together in a die cast box, the output of the b.f.o. being connected inside the box to the product detector/balanced modulator board. Fig. 14 shows how h.t. is applied either to the p.d. or b.m. to select the required function.

Audio from the mode selection switch is amplified in the spare section of the uA719C 9 Mc. amplifier on the i.f. board before passing to the receiver audio module via the audio level control. This will be explained more fully below.

Returning to the front-end of the receiver, the outputs from the four (or more) heterodyne crystal oscillators are applied in parallel to the injection mixer. The appropriate crystal oscillator is selected by switching h.t. to it (see Fig. 14). The v.f.o. output or one of the external frequency control sources is applied to the injection mixer, the output of the mixer being applied at all times to the paralleled inputs of the four rx front-end boards and the four transmitter mixer/pre-amp. boards. Once again selection of the required function is made by applying h.t. to the appropriate p.c.b. via the bandswitch.

Output from the 9 Mc. s.s.b. amplifier is applied to the four paralleled inputs of the transmit mixer/pre-amp. boards.

Band switching in the receiver has thus been reduced to a single bank with most of the frequency selection being done via the h.t. line.

The treatment of the audio outputs from the i.f. strip and product detector may need expansion.

A spare "transistor" is available on the uA719C in the i.f. strip and this is used to provide additional a.f. amplification before the main audio module.

The required audio output (a.m. unlimited, a.m. limited, or s.s.b./c.w.) is taken from the wiper arm of the function switch straight to pin 7 on the uA719C. Output is taken from pin 9 of the i.c. In the project p.c.b's these spare pins are made readily available on the top of the p.c.b. by use of terminal pins.

Output from pin 9 is taken direct to the top of the 50K audio level control, the slider of which goes direct to the input points on the audio module.

After the rest of the tx modules have been described, the balance of the signal interconnections as they apply to the remainder of the transceiver will be detailed.

AVAILABILITY

The voltage regulator boards and kits will be made available in the usual way by application to one of the authors the price being $16.60 plus 20c postage for the full kit. Boards will be separately available at $2.00 each plus 5c postage.

ERRATUM

It is regretted that an error appeared in the January issue. Fig. 9 shows that the input to the uA719C is with the coil tap going to pin 2 and the decoupled side of the input going to pin 1.

These connections should be reversed with the "hot" input from the coil going to pin 1 and the "cold" or decoupled side to pin 2.

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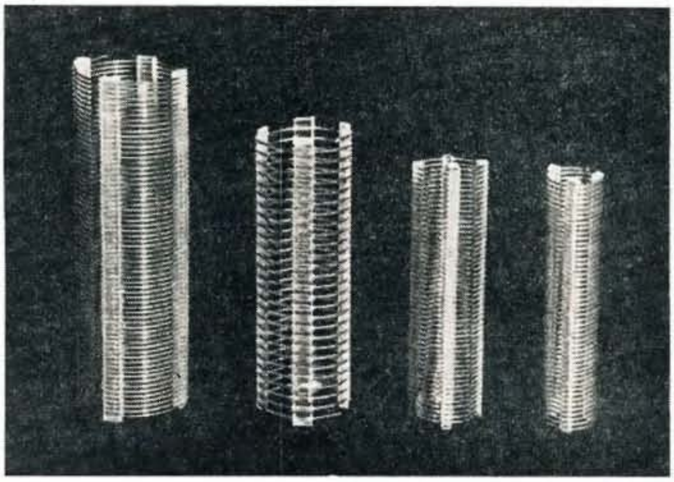

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2-08	⅝"	8	3"	No. 3006	76c
2-16	⅝"	16	3"	No. 3007	76c
3-08	¾"	8	3"	No. 3010	91c
3-16	¾"	16	3"	No. 3011	91c
4-08	1"	8	3"	No. 3014	$1.04
4-16	1"	16	3"	No. 3015	$1.04
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References: A.R.R.L. Handbook, 1961; "QST," March 1959; "Amateur Radio," December 1959.

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The W5OMX Communications Receiver*

Single-Conversion Superhet with Good Stability

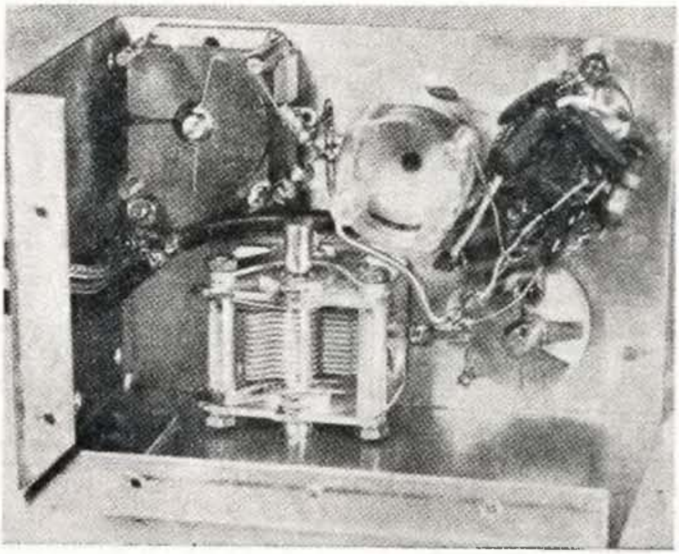
COL. DAVE CURTIS,† W5OMX

● As communications receivers go, this one is reasonably simple and straightforward. It combines some of the best features of previous designs, including a high frequency crystal filter for s.s.b. selectivity, an audio filter for c.w. selectivity, a beam-deflection mixer, dual detectors, audio-derived a.g.c., and a temperature compensated v.f.o.

LONG-TIME "QST" readers will recall W1DX's excellent article on receiver design in the January, 1957 issue.[1] At the time it appeared, the article was studied with great interest. Particularly, the point that selectivity belongs as close to the antenna as possible seemed to make a great deal of sense. With the appearance of high frequency filters at reasonable prices, the author initiated the design of a receiver to utilise this principle. For various reasons, however, this receiver never got beyond the block-diagram stage. A more recent article by W1DX,[2] which was illustrated with an operational piece of hardware, provided the final push. Serious design and construction followed, and the "W5OMX" receiver, described here, is the result. It is a spectacular performer.

The W5OMX Receiver. Main tuning dial (J. W. Miller, MD-7) has both 6:1 and 36:1 tuning ratios. A 6:1 planetary drive assembly (Arrow Electronics, Type 4511) is used on the preselector tuning capacitor. The pointer is home-made.

Unfortunately, the author's shack is not equipped with test gear adequate to permit performance measurement. Consequently, resort had to be made to subjective comparison, and the opinions of fellow Amateurs. These judgments suggest that the double-conversion receiver, utilising a low frequency second i.f. to obtain selectivity, may be on the way out. The author's second receiver —a 16-tube double-conversion job of sound design—simply cannot compete. In side-by-side tests, using a common antenna the contrast is remarkable. The new receiver performance is characterised by a clarity in signal quality, the result of a markedly lower overall noise level. Signals masked to unintelligibility by noise in the older receiver become readable copy. In conditions of reasonably low atmospheric noise, signals appear to pop out of surrounding quiet.



V.f.o. assembly with the side-top cover removed. The 6AU6 socket and associated components are at upper right with the band-set capacitor C7 at lower right. The coil is glued securely to a ceramic stand-off insulator. The differential capacitor, C8, with temperature compensating capacitors C9 and C10 attached, is at upper left. Note that all major components and tie points are fastened securely to the same side of the enclosure for maximum mechanical integrity. When mounted on the chassis the right-hand end of the box in this view is at the top, the left-hand end is bolted to the chassis.

PERFORMANCE

In more useful specifics, here is how the receiver stacks up:

Sensitivity: Very f.b. Digs right down to the noise level on all bands, 80 through 10 metres. The receiver has made possible R5 copy of both ends of a W6/W2 QSO on 40, and of a KL/W4 QSO on 20, using only a finger touching the input connector as an antenna!

Stability: Truly marvellous. From a cold (room temperature) start, drift is inconsequential after a 15-minute warm-up. Further, the switching arrangement permits leaving the filaments on continuously. When this is done, and heat soaking has occurred, there is no apparent drift after the mode switch is turned to the appropriate "on" position. If there is any drift, it is the other guy!

Selectivity: About right for s.s.b. Gives good single signal selectivity on c.w.

Mechanical: Can take sharp raps with no noticeable frequency shift.

Birdies: A few. There are one or two of consequence on each band segment, except on 15 metres where there are six (by actual count). These tune sharply, and seldom bother reception. Nevertheless, this is a basic design deficiency which, perhaps, could be overcome by someone who is mathematically inclined and who can select conversion frequencies more intelligently.

A.g.c.: The circuit suggested by W1DX[2] is the best we have seen. S.s.b. signals ranging from S2 or 3 to 10 over 9 come out of the speaker at quite reasonably similar levels. This is one a.g.c. that will be used most of the time.

---

* Reprinted from "QST," January, 1968.

† 29 Outer Octagon, Randolph AFB, Texas 78148, U.S.A.

1 Goodman, "What's Wrong with Our Present Receivers?" "QST," January, 1967.

2 Goodman, "Some Thoughts on Home Receiver Design," "QST," May, 1965.

CIRCUIT OUTLINE

Interested? Let's have a look at the schematic of Fig. 1. As far as the signal is concerned, this is a single-conversion receiver. The incoming signal is amplified in the single r.f. stage using the pentode section of a 6AZ8. It is then converted to an i.f. of 9 Mc. in a 7360 mixer. A band 2.8 Kc. wide is sliced out by a steep-skirted crystal filter, FL1. The signal is then amplified through three i.f. stages using 6BA6s, and finally detected by an infinite impedance detector, V3B, if a.m., or by a 6BY6 product detector, if s.s.b. or c.w. The otherwise conventional audio system includes a selective filter for c.w. work. The a.g.c. system is audio derived.

The main tuning element is the v.f.o., covering 5 to 5.5 Mc. Bands are changed by altering the frequency of local injection to the signal mixer. This is accomplished by heterodyning signals from the v.f.o. and from the crystal oscillator V2A to produce the required injection frequency in the output of the heterodyne mixer, V2B. A 3.5 Mc. crystal oscillator, using the triode section of the 6AZ8, provides markers for the low frequency edges of the bands covered.

THE V.F.O.

The v.f.o. is a 6AU6 in a very high-C Colpitts configuration. A differential capacitor, C8, in combination with NP0 and N750 fixed capacitors, permits simple and accurate adjustment of temperature compensation. With reasonable attention to mechanical design, and careful adjustment, stability is impressive indeed. This circuit was used in an earlier project,[3] and was found to provide stability comparable to that of the BC-221 frequency meter. No small part of the stability is due to the use of the rugged low-torque Miller tuning capacitor.

R.F. STAGE AND CRYSTAL CALIBRATOR

Air wound coils are used in the preselector. The gain in this stage appears to be approximately 12 to 15 db. on 80 and 40, dropping off to about 6 to 8 db. on 15 and 10. It does a good job of rejecting i.f. images (none have been found). With some antennae, the gain of this stage may have to be reduced slightly to prevent oscillation on the 80 metre band; on other bands the amplifier is perfectly stable at full gain. Input and output circuits are gang-tuned. Ceramic trimmer CI (one for each input coil) is used to adjust the tracking.

The triode section of the 6AZ8A, V1B, is used in the crystal calibrator. The frequency can be "zeroed in" against a calibrating source by means of C4. Notice that the 15 metre band and all ranges of the 10 metre band are covered with a single set of preselector coils.

3 Curtis, "The W4JWV Single-Sideband Exciter," "QST," January, 1963.

SIGNAL MIXER

The 7360 performs the mixing function effectively, and contributes inconsequential noise. It does not appear to overload on even the very strongest signals. The mixer gain control, R2, is used to prevent oscillation on 80 metres, and to adjust the overall gain on the other bands. By adjusting the gain at this point, the high gain i.f. strip may be operated at full amplification at all times for optimum a.g.c. action.

I.F. AMPLIFIER

Since selectivity is provided ahead of the i.f. strip, these stages are designed purely for amplification. The 24 pF. capacitors across the hot ends of the i.f. transformers increase the overall gain spectacularly. A 0.2 volt signal at 9 Mc. injected into this strip ahead of the crystal filter comes out at a whopping 20 to 25 volts. This accounts in a large measure for the rather impressive overall sensitivity of the receiver. The i.f. gain control, R3, is used only during initial adjustment and testing; therefore it is not mounted on the panel, but on the rear apron of the chassis.

DETECTORS

The 6BY6 product detector, developed by W6TC for his very efficient HBR

C1—2-12 pF. ceramic trimmer (one for each L2 coil).
C2—Dual section air variable, approx. 50 pF. per section.
C3—See coil table.
C4, C12, C13—Approx. 12 pF. compression trimmer.
C5—See coil table.
C6—100 pF. variable.
C7—30 pF. air trimmer.
C8—27 pF. differential capacitor.
C9—22 pF., NP0.
C10—22 pF., N750.
C11—See coil table.
CR1-CR4, incl.—Silicon diode, 400 p.i.v., 1 ampere.
CR5, CR6—Silicon diode, 200 p.i.v., 750 mA.
FL1—9 Mc. crystal filter (McCoy "Silver Sentinel").
J1—Chassis mounting co-axial receptacle.
J2—Open circuit jack.
J3—Closed circuit jack.
L1-L7, incl.—See coil table.
L8, L9—Filter choke.
L10—0.5 hy. toroid.
M1—S meter.
R1, R2, R3, R5, R6, R7—Linear control.
R4—Audio taper control, S3 attached.
RFC1—24 turns No. 28 wound on 470,000 ohm ½w. resistor.
RFC2—Same as RFC1, 14 turns.
RFC3, RFC4, RFC5, RFC8—2.5 mh. r.f. choke.
RFC6, RFC7—1 mh. r.f. choke.
S1—7-section 7-pole 8-position ceramic rotary switch.
S2—S.p.s.t. toggle switch.
S3—S.p.s.t. switch (see R4 above).
S4—3-section 6-pole 5-position phenolic rotary switch.
S5—D.p.d.t. toggle switch.
T1—9 Mc. input transformer.
T2—9 Mc. output transformer.
T3, T4, T5—10.7 Mc. interstage transformer. Mount with spade bolts.
T6—Power transformer, 550 volts r.m.s., centre tapped, 110 mA.; 6.3v. 5 amp.
T7—2 watt audio output transformer (5000 ohms to voice coil).
T8—Transistor audio input transformer, 5000 ohms to 7500 ohms, centre tapped.

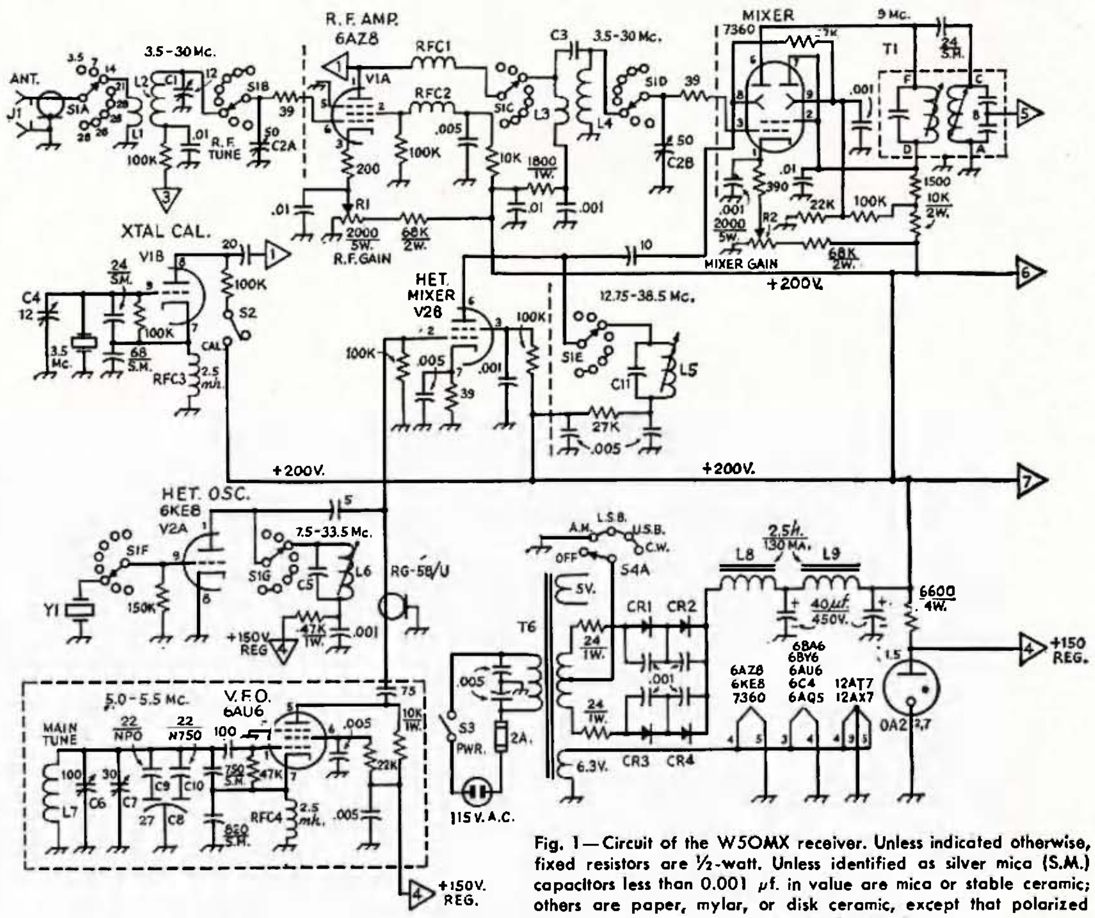


Fig. 1—Circuit of the W5OMX receiver. Unless indicated otherwise, fixed resistors are ½-watt. Unless identified as silver mica (S.M.) capacitors less than 0.001 µf. in value are mica or stable ceramic; others are paper, mylar, or disk ceramic, except that polarized capacitors are electrolytic.

Y1—See coil table.
Y2—9001.5 Kc. (see text).
Y3—8998.5 Kc. (see text).

receivers,[4] works well at 9 Mc. This circuit has the very desirable feature of accepting a wide range of signal levels with little or no apparent distortion in the audio product. The infinite impedance detector provides these same advantages in a.m. reception, without overloading the last i.f. transformer as would a diode.

B.F.O.

The b.f.o. uses the two triode sections of a 12AT7 as separate crystal oscillators. The crystals at 9001.5 and 8998.5 kc. (supplied by McCoy with the filter), permit selection of lower and upper sidebands, respectively, by keying the appropriate 12AT7 cathode. These crystals are adjusted to proper frequency by trimmers C12 and C13.

AUDIO SECTION

Three stages of audio provide generous output to high impedance phones or a speaker. You can hear signals on this receiver over the QRN of all but the noisiest "harmonics"! In the c.w. mode, a high-Q audio filter, composed of toroid L10 and its related capacitor, permits peaking the beat note at approximately 1,000 cycles. Substitution of a different value of capacitance will move the resonant frequency to your choice of pitch. Selectivity may be varied by adjustment of R7.

4 "Hints and Kinks," "QST," June, 1962.

A.G.C.

The a.g.c. circuit amplifies and full-wave rectifies audio from either detector, and controls the r.f. amplifier and all three i.f. stages. It is remarkably effective, and makes the multi-party s.s.b. ragchew a real pleasure. (Those who enjoy fiddling with knobs probably won't like it!) The fast-attack/slow-decay characteristics which result from the component values suggested by W1DX have proven to be very close to the ideal.

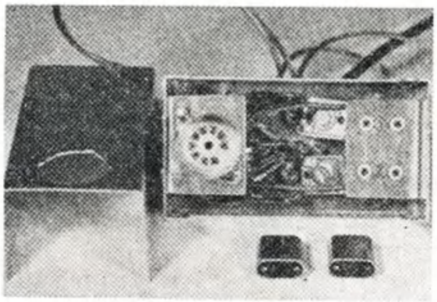
The S meter and power supply circuits should be familiar to most readers. S meter adjustments are made at the rear of the chassis. Silicon rectifiers are used in the power supply, and a voltage regulated tap supplies the v.f.o. and heterodyne oscillator.

MUTING

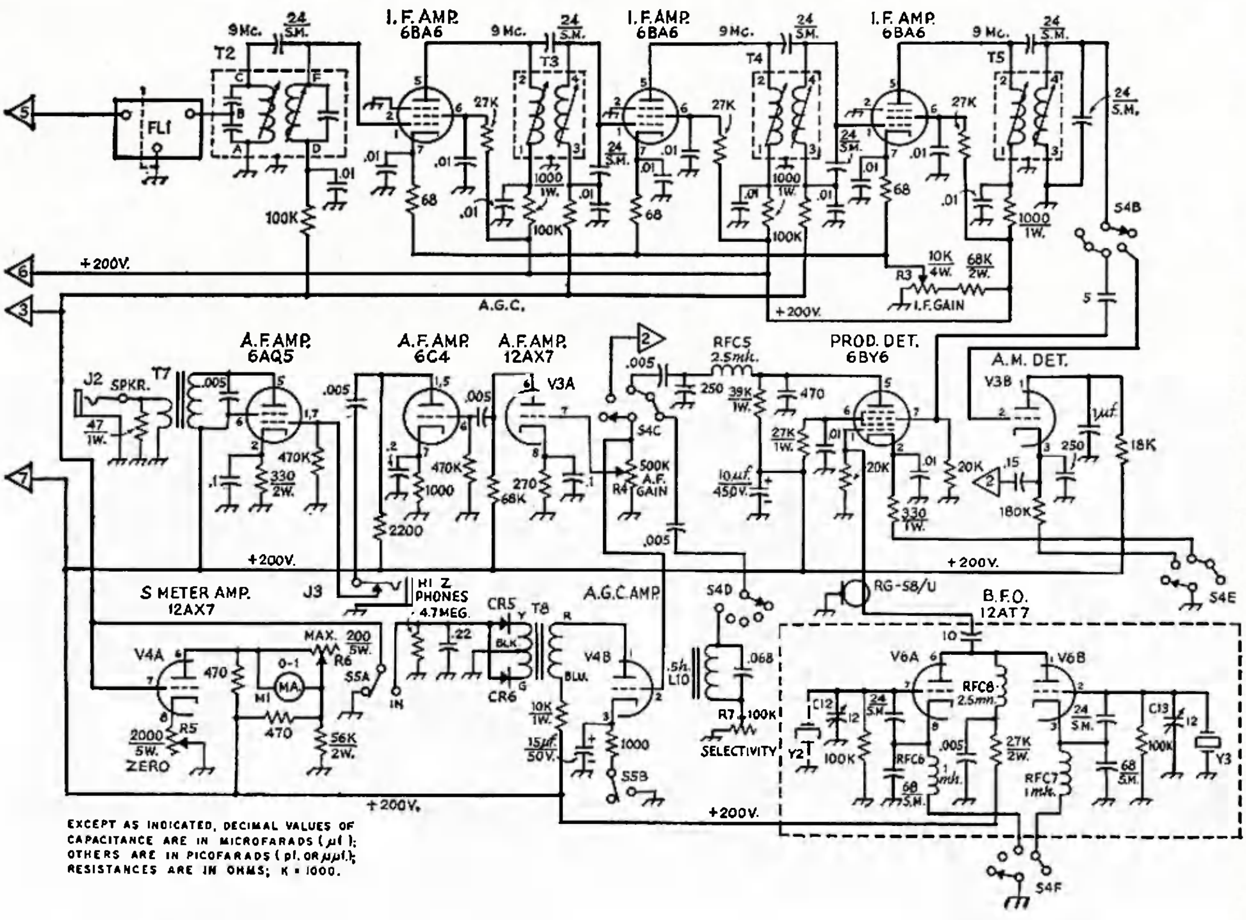
You will note that no provision for muting is indicated in the circuit schematic. Three possible arrangements are suggested. Your choice should be based upon how you intend to connect the receiver into the overall station set-up. If you intend to monitor your transmissions on the receiver, and use an antenna relay that grounds the receiver input on transmit, break the plus B or cathode connection of V1A, and insert the muting switch and remote connections at this point. If you have side-tone monitoring, you can cut off the receiver entirely by breaking the plus B or cathode connection of the 7360 mixer, and inserting the muting connections at that point. Finally, and perhaps the best of all, although additional components will be requried, use the muting arrangement suggested by W1DX.[3]

CONSTRUCTION

Viewed in its entirety, the construction of a receiver of this complexity may appear to be an overwhelming task. Certainly, it would be a very ambitious first project. However, for anyone with sufficient experience and skill to do the minor fabrication and locate



B.f.o. assembly with tube, cover and crystals removed. The sockets for the crystals and the 12AT7 are mounted on small aluminium brackets, the small components underneath being wired prior to final assembly. The crystals are plugged in internally and require no clearance holes in the cover. Crystal trimmers C12 and C13 are fastened to the bottom of the Minibox enclosure, at the centre. The shielded leads and output co-ax. cable leave the enclosure through tightly fitting holes to minimise r.f. leakage.



EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (µf.); OTHERS ARE IN PICOFARADS (pf. OR µµf.); RESISTANCES ARE IN OHMS; K = 1000.

sensibly the many small components, it should be a feasible undertaking. The primary ingredients of successful home-brew construction seem to be patience, a willingness to take one step at a time, and the interest to keep going. If you have these talents, you can probably build a receiver of the same superlative performance as the one described. And it should be better looking; this one is the final result of many, many component substitutions in the search for optimum performance.[5]

The following paragraphs contain construction and alignment suggestions, roughly in the order followed by the author. Additional information may be obtained by a careful study of the several illustrations and accompanying explanatory captions.

The receiver is built on a 10" x 14" x 3" aluminium chassis which fits into the 11" x 15" x 9" cabinet. An additional 10" x 17" x 3" chassis (the smallest size obtainable made from 16 gauge stock) was purchased as a source of material for the v.f.o. enclosure and shielding partitions.

ASSEMBLING THE V.F.O. AND B.F.O.

Make the v.f.o. first. The main part of the enclosure was made from a corner of the spare chassis. Its dimensions are 4⅝" x 3½" x 3". The side/top cover was cut from adjacent spare chassis material. (The rear of the box is left open.) Mount the major components all on one side of the box, as shown in the detail photograph, to minimise frequency changes with mechanical stress. Care should be used in locating the tuning capacitor so that its extended shaft will be high enough above the chassis to clear the McCoy filter in the i.f. strip (see top chassis photograph), and yet not be so high that it will crowd the dial too close to the upper edge of the panel.

The b.f.o. components are assembled in a 1⅝" x 2⅛" x 4" Minibox. Construction is detailed in one of the photographs.

BAND SWITCH

Before starting to lay out the component pattern on the chassis, the under chassis shields should be cut, using material from the aprons of the spare chassis. The longer shield has a length of 8¾"; the other two are 7" long. Then they should be placed temporarily in the chassis while their positions are adjusted. Space them apart suitably to provide adequate room for the coils, and measure the spacing accurately.

Make a mark on the rearmost shield, indicating the distance that the switch shaft will be placed from the end of the chassis. Mark and drill the switch-shaft and mounting holes in the three partitions, using extreme care to see that they are as identically located as possible. Make the holes reasonably oversized. Then assemble the switch and shields as a unit, using spacers on the switch assembly rods to obtain the partition spacings measured earlier. Do not tighten the assembly nuts more than finger tight. Place the assembly in the chassis, and press down firmly on the shields while the assembly nuts are tightened. Spot the shield mounting holes, remove the assembly, and drill the holes.

Avoid any mounting holes in the area that will be occupied by the v.f.o. box, since this box must rest flat on the chassis. (The b.f.o. assembly can be raised on spacers to clear any mounting screws in its area.) Additional holes that should be drilled in the shields are one in each of the shields, below and to the left (in the bottom view) of the switch wafers (for wires), one in the upper left-hand corner of the second shield, and another in the same relative position in the first shield (for tie-point strips). A ⅜" hole should be drilled in the first shield, to the left of the short vertical shield. This will be used to pass the co-ax. feed line from the v.f.o. to the heterodyne mixer, and some of the power leads. The corners of the partitions that rest in the fold of the chassis should be cut off to allow passage of wiring between the panel and the rear of the chassis.

CHASSIS LAYOUT

Once the shield locations have been determined, the positions of the two main rows of components will become apparent. With the v.f.o. subassembly placed with its rear edge flush with the rear edge of the chassis, and the shaft of the tuning capacitor central on the chassis, the location of surrounding components can be spotted. In locating the preselector tuning capacitor, place it far enough toward the edge of the chassis to assure space for its dial on the panel.

After all hole centres have been marked and hit with a centre punch, the various holes may be drilled or cut. The author used a nibbler to cut the i.f. transformer holes to approximate size, and finished up with a file.

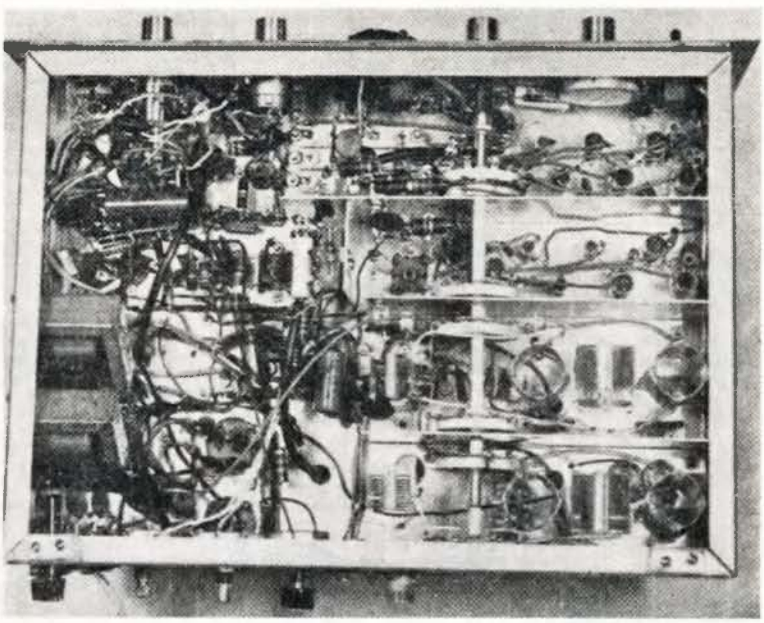
Before mounting any components on the chassis, fasten the panel temporarily in place, and place the shafts of the v.f.o. and preselector tuning capacitors against the back of the panel while you mark the shaft heights.

WIRING

Tie-point strips should be located liberally on the underside of the chassis, convenient to tube sockets and related components. It is advisable also to place grounding solder lugs on most of the mounting screws. You may not use all of them, but it is much more convenient to install them as you mount the components than later on when space becomes scarce as the wiring progresses.

Power supply and filament connections should be made first. Thereafter, the wiring procedure is not particularly critical. Installation of the preselector coils can be left as a last operation, after the v.f.o. and b.f.o. circuits have been adjusted. To make sure that no connection is overlooked, it is a good idea to mark the schematic with a coloured pencil as each connection is completed.

The author wired the front circuits first, working toward the rear of the chassis. Following standard practice, long leads, particularly those connecting front-panel controls and switches to components at the rear of the chassis, may be made with shielded wire. This practice permits fastening the leads



Bottom view showing band switch and coil compartments. The pair of close-spaced wafers at the top switch the heterodyne-oscillator coils and crystals. The single wafer below switches the heterodyne-mixer coils. The signal-mixer coils are in the next compartment, switched by the pair of widely-spaced wafers. R.f. stage coils are in the bottom compartment; one of the two switching wafers is hidden by the lip of the chassis. The 40 and 80 metre air-wound coils are cemented to platforms made of polystyrene sheet. The higher frequency coils are supported on switch terminals. The mode switch is in the upper left-hand corner, filter chokes in the lower left-hand corner. A.g.c. components are mounted on tie points on the short vertical shield near the centre.

5 To assist those who wish to duplicate this project, the author will provide full-size templates for chassis and front panel, an enlarged schematic, complete with parts list, and 8 x 10 inch enlargements of the four primary illustrations, at a cost of $4.50 post paid.

COIL TABLE

L2, L4									
Band	Turns	Wire Size	Diam. Inch	T.P.I.	L1 Turns	L1/L2 Space	L3 Turns	L3/L4 Space	C3 pF.
80	50	24	1	32	6	2 t.	6	10 t.	None
40	22	24	1	32	6	2 t.	3	10 t.	None
20	12	20	1	16	4½	1 t.	3	6 t.	5
10–15	6	20	¾	16	3	1 t.	3	2 t.	5

L5					L6				
Band	Freq. Mc.	L μh. (Nom.)	Type	Y1 Mc.	Freq. Mc.	L μh. (Nom.)	Type	C5 pF.	C11 pF.
80	12.75	3.3	21A336	7.5	7.5	6.8	21A686	45	25
40	16.25	2.2	21A226	11.0	11.0	3.3	21A336	30	20
20	23.25	1.5	21A156	18.0	18.0	2.2	21A226	20	10
15	30.25	1	20A106	25.0	25.0	1.5	21A156	None	None
10	37.5	0.82	20A827	32.00 33.50	32.25	1	20A106	None	None
10	38.5	0.82	20A827	33.0 33.5	33.25	1	20A106	None	None

L7 — 8 turns No. 20, 1 inch diam., 16 t.p.i.

L1/L2 and L3/L4 (as well as L7) are of Miniductor, Air Dux, or Polycoil stock, with the indicated number of turns removed to provide spacing between the main coils and the coupling links.

L5 and L6 are iron-slug coils (phenolic). Type numbers are J. W. Miller (suffix RBI). Those with prefix 20 are 1/4 inch diam.; prefix 21 indicates 3/8 inch diam.

solidly in place by soldering the shield to conveniently located soldering lugs along the way. Shielded wire should also be used for all a.f. grid leads to avoid unpleasant feedback problems. R.f. by-pass capacitor leads should be as short as possible, using the centre post of the related tube socket as a common grounding point.

TESTING THE V.F.O. AND B.F.O.

The v.f.o. tuning range should be checked first with all tubes except the v.f.o. voltage regulator tube out of their sockets. After power has been turned on and the v.f.o. allowed to warm up, a v.t.v.m. with an r.f. probe should show about 2 volts at the output coupling capacitor.

The v.f.o. frequency can be checked by comparing it with the signal from a calibrated source, such as a BC-221 frequency meter, or a general coverage receiver. Set C8 at about midpoint. Set the tuning capacitor C6 at about 3 degrees from maximum capacitance. Then adjust C7 to bring the frequency to 5.0 Mc. Turn C6 to about 3 degrees from minimum capacitance, and check the frequency again. If the frequency is higher than 5.5 Mc., spread the end turns of the coil apart, and repeat the process. If the frequency is too low, squeeze a few of the turns slightly closer together, and repeat the process. It should be possible to arrive at an adjustment where the 5 to 5.5 Mc. band occupies about 95 per cent. of the dial, with the band central on the dial.

Plug in the b.f.o. tube and check the r.f. output voltage. It should be about the same as from the v.f.o., i.e. 2 volts.

CHECKING THE AUDIO SECTION

Plug in the audio tubes. With speaker or headphones connected, and the a.f. gain control near maximum, a sharp click, when the top end of the gain control is touched with the lead of a pencil, will tell you that the audio stages are working.

I.F. ALIGNMENT

Plug in the 7360 mixer and i.f. tubes. Connect the r.f. probe at the arm of S4B. Introduce a 9 Mc. signal at the input to the last i.f. stage. The author used the crystal calibrator as the source, with a 9 Mc. crystal, borrowed from his s.s.b. exciter, plugged into the calibrator. The 20 pF. calibrator coupling capacitor was temporarily disconnected from pin 1 of the 6AZ8, and connected by means of an extension lead to pin 1 of the last 6BA6 i.f. tube. (A reasonably accurately calibrated r.f. signal generator may be used, if available.) Tune T5 for maximum output. Move the signal source to pin 1 of the second i.f. tube, and adjust T4. Do the same with the first i.f. tube and T3. You will probably have to reduce the i.f. gain as you move down the i.f. strip to avoid burning out the diode in the probe.

Introduce the signal at the output connection of the crystal filter, and adjust T2. Finally, inject the signal at pin 3 of the 7360 mixer, and adjust T1. (If you are using an r.f. signal generator, you may have to jockey the frequency slightly to hit the centre of the crystal filter passband.) Reconnect the calibrator coupling capacitor to the plate of the 6AZ8.

S METER ADJUSTMENT

The next step is to adjust the S meter circuit, since it will be used in adjusting the preselector. With V4 out of its socket, adjust R6 for full-scale S meter reading. Plug in V4. Allow the tube to warm up and, with the a.g.c. switch off, adjust R5 for a zero reading.

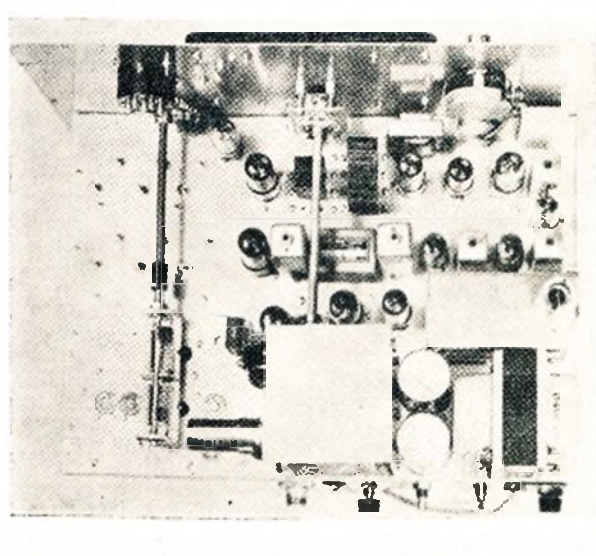
HETERODYNE TUNING

Now plug in the 6KE8, and adjust each slug-tuned coil (L6) for approximately 3 to 4 volts as measured with the r.f. probe at the "hot" end of the coil. The lower frequency crystals are capable of producing much more than 4 volts; the higher frequency crystals may not provide quite 4 volts. Tune for all you can get up to a maximum of 4 volts.

Using a grid dip oscillator, tune the heterodyne mixer coils (L5) to the frequencies listed in the coil table. Be sure that the band switch is set to the band corresponding to the coil you are checking, because the stray capacitance may vary with the switch position.

PRESELECTOR ALIGNMENT

Alignment of the preselector coils can now be undertaken. The author



Top chassis view of the W5OMX receiver. Mounted in two groups in the upper left-hand corner of the chassis are the slug-tuned coils L6 (top) and L5 (below). In the lower left-hand corner are the preselector tuning capacitor and the C1 tracking trimmers. The i.f. strip runs across the centre with components in logical order, starting with the 7360 mixer, and turns vertically at T4, ending at T5. Proceeding to the left from T5 are the two detector tubes, the 6AQ5 audio output tube, the heterodyne crystals, the 6KE8 and the 6C4 (above). The audio output transformer and c.w. filter toroid are to either side of the mixer-gain (top) and c.w. selectivity controls. Occupying the lower right-hand corner of the chassis are the v.f.o. and b.f.o. units, and power supply components. Immediately above the v.f.o. compartment are the calibrator crystal (with hole for access to trimmer C4 just to the left), the 6AZ8, the 12AX7 a.g.c. tube (V4), and the VR tube. Along the rear apron are the antenna connector, speaker terminals, i.f. gain control, S meter controls, muting terminals, and fuse holder.

built the preselector coils for 80 metres first, and aligned the front end on this band before proceeding to the higher frequency bands, in order. However, it need not be done this way. The alignment procedure is the same for all bands. The important consideration in making the coils is to keep L2 and L4 as nearly identical as possible, including lead length and proximity to chassis and shields.

With a set of coils in place, introduce a signal near band centre at the antenna connector. Set the v.f.o. to mid scale, and the mode switch to one of the side-band positions. Adjust C2, and the slug of L5 for maximum S meter reading. Then tune the preselector slowly across the signal. If the signal peaks at two dial settings, it means that the circuits are not tracking. By cautious adjustment of C1, and the turn spacing of either L2 or L4, a condition should be found where only a single S meter peak occurs as C2 is tuned across the signal. (The paragraphs on r.f. alignment in the "Receiving Systems" chapter of the A.R.R.L. Handbook explain how this is done.)

TEMPERATURE COMPENSATION

To adjust the v.f.o. temperature compensation, the most stable frequency source you can get is required. The crystal calibrator will do nicely. Allow the receiver to warm up thoroughly; leave it on for at least an hour or two. Tune the receiver to zero beat with the calibrator. Then, as drift occurs, adjust C8 slightly, and bring the receiver back to zero beat with C7. Continue to do this until no drift is apparent.

B.F.O. ADJUSTMENT

Remove the cover of the b.f.o. enclosure, and adjust trimmers C12 and C13 for optimum s.s.b. reception. Most 80 and 40 metre stations use l.s.b., while those operating in the higher bands use u.s.b. (Most c.w. operators prefer the u.s.b. position.) The b.f.o. frequency is adjusted so that it falls only high enough on the filter slope to assure adequate low frequency response. With this adjustment, the "other side" of a c.w. signal simply is not there.

V.F.O. CALIBRATION

After checking to make sure that the 5 to 5.5 Mc. band is still centred on the dial, the dial may be calibrated (0 to 500, and 500 to 0) against a standard, such as a BC-221 frequency meter. The tuning should be found to be close to linear. A single dial calibration for all bands requires the exact crystal frequencies listed in the Table. Crystals not too far off on the high side can be "rubbered in" with a small compression trimmer in parallel with the crystal. Crystals on the low side must be ground or etched in. (The 3.5 Mc. band edge marker will provide a reference.) Otherwise, C7 in the v.f.o. will have to be retrimmed each time bands are changed, zeroing the v.f.o. against the calibrator with the v.f.o. dial set at the previously calibrated zero mark.

Before placing the receiver in the cabinet, punch four or five holes through the bottom, and along the top back of the cabinet for air circulation.

You should now be able to make R5 copy of signals that your Amateur friend down the block may not be able to hear. Congratulations!

☆

PROVISIONAL SUNSPOT NUMBERS

SEPTEMBER 1968

Dependent on observations at Zurich Observatory and its stations in Locarno and Arosa.

Day	R	Day	R
1	78	16	79
2	82	17	81
3	130	18	86
4	131	19	89
5	126	20	91
6	96	21	95
7	98	22	107
8	106	23	122
9	128	24	153
10	138	25	197
11	145	26	189
12	150	27	183
13	163	28	149
14	113	29	137
15	88	30	91

Mean equals 120.7.

Smoothed Mean for March 1968: 104.8.

Predictions of the Smoothed Monthly Sunspot Numbers

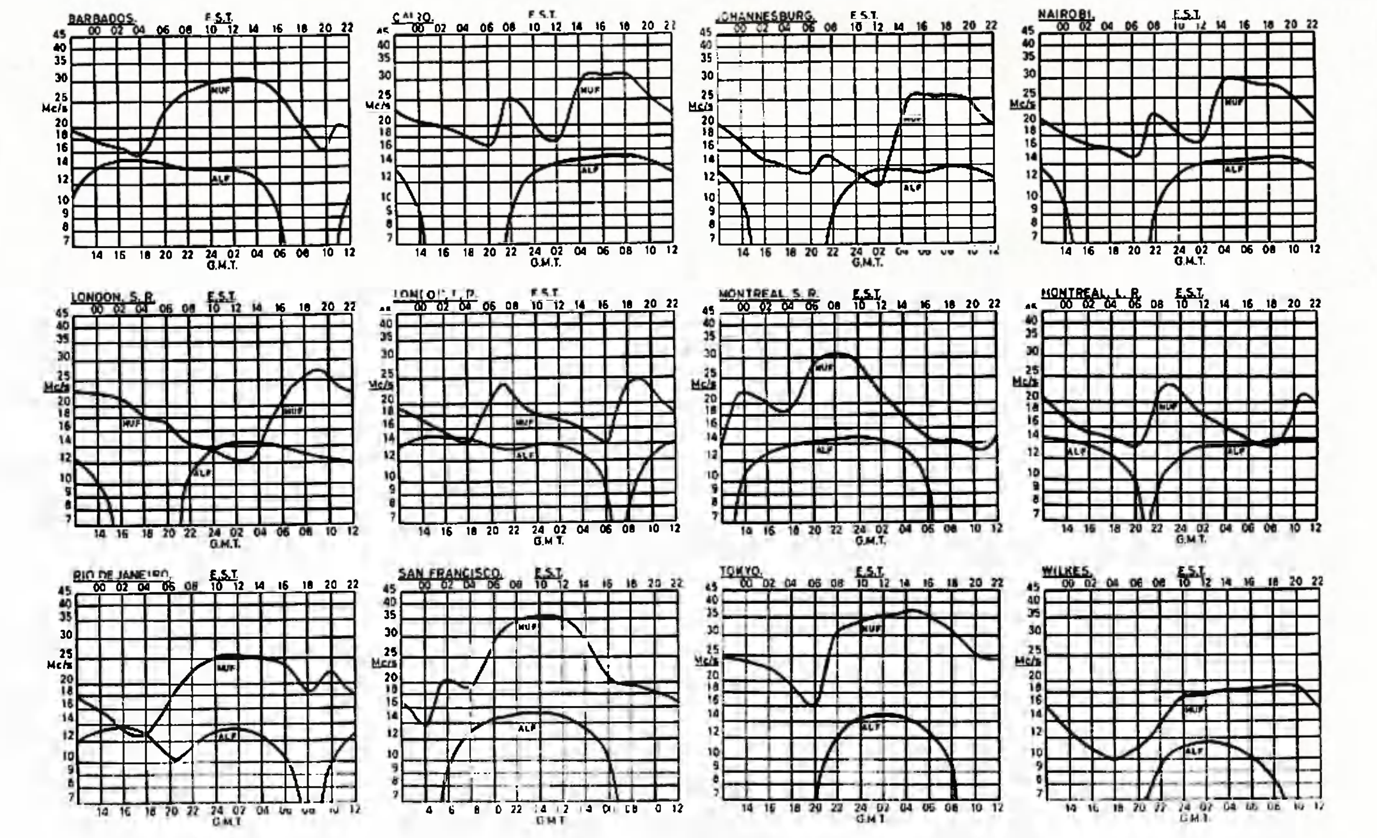
October	108	January	100
November	104	February	98
December	102	March	97

—Swiss Federal Observatory, Zurich.

AMATEUR FREQUENCIES:
USE THEM OR LOSE THEM!

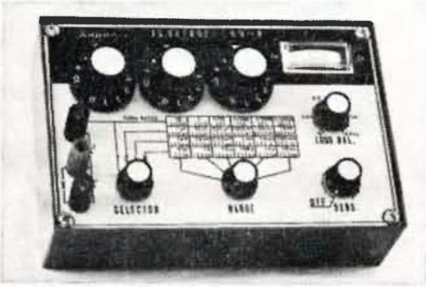
PREDICTION CHARTS FOR MARCH 1969

(Prediction Charts by courtesy of Ionospheric Prediction Service)



New Equipment

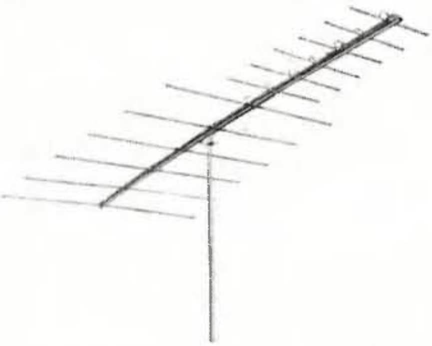
VERSATILE AC BRIDGE



Model BR8 AC Bridge branded "Rapar," measures resistance, capacitance, inductance and transformer turns ratios with high accuracy performance. The unit operates from 9-volt battery; dimensions: 7½" wide x 5" deep x 3" high. Housed in blue hammertone finish metal case; price: $46 plus 15% sales tax.

Further information from Radio Parts Pty. Ltd., 562 Spencer St., Melbourne, Vic., 3000, and City and East Malvern branches.

LOG PERIODIC FOR 6-2 METRES



Shortly available from Bail Electronic Services is a log periodic antenna for 6 and 2 metres. Manufactured by Hy-Gain Electronics Corp., U.S.A., this model LP62 antenna is claimed to provide the ultimate in uni-directional, duo-band performance on 6 and 2 mx. All elements and boom are constructed of heavy seamless aluminium tubing. Designed to feed from 52 ohm co-ax.

Electrical Specifications: gain (6 mx), 8 db; gain (2 mx), 15 db.; front-to-back ratio, 25 db.; max. power input, 1 kw.; v.s.w.r., less than 2:1; impedance, 52 ohms; unidirectional pattern.

Mechanical Specifications: Longest element, 9 ft.; boom length, 24 ft.; turning radius, 16 ft.; net weight, 20 lbs.; max. wind survival, 100 m.p.h.; mast diameter, 1⅝" o.d.

Further details from Bail Electronic Services, 60 Shannon St., Box Hill North, Vic., 3129; or from N.S.W. rep., Sandy Brucesmith, 47 Hyman St., Tamworth, N.S.W., 2340.

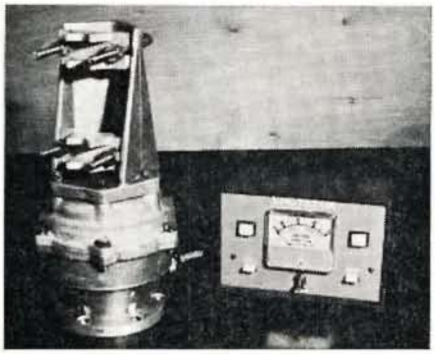
PANORAMIC DISPLAY UNIT

Designed as a companion unit to the Eddystone 830/2 communications receiver (also illustrated), the EP20 panoramic display unit now available is intended for applications where a visual display of h.f. or l.f. signals is advantageous. Characteristics such as modulation, amplitude, presence or absence of spurious emissions and interference, may be observed at a glance.

The EP20 is particularly useful when setting up a receiver for s.s.b. or f.s.k. signals. An additional facility is that the display unit can be used as a wobbulator for the visual alignment of the i.f. stages of receivers.

Specifications and other details obtainable from R. H. Cunningham Pty. Ltd., 608 Collins St., Melbourne, Vic., 3000.

MOTORISED ANTENNA ROTATOR



Heavy duty antenna rotator, "Emotator" model 1100M, available shortly from Japan, features heavy cast aluminium construction, stainless steel bolts, nuts and washers. Bearing design with 90- ball bearings provides high vertical carrying capacity enabling it to withstand bending pressures due to unbalanced weight, wind, etc. Limit switches prevent over-run. Positive braking with solenoid operated double plunger. Drive is through steel gears from a fractional horse power motor.

Specifications: Torque, 400 kg/cm.; vertical moment, up to 7,000 kg/cm.; time for one rev., 55 secs. (approx.); brake power, 5,000 kg/cm.; supports beam assembly weight of 200 kg.; max. vertical thrust, 1,000 kg.; mast diameter, 1¼" to 2¼"; weight, 17½ lb. (approx.); control cable, 7 wires; approx. sizes, 13¾" high, 5¼" base diam., 7¼" largest diam.

The Indicator-Control Box is attractively finished in grey lacquer with large illuminated meter, indicator lights and piano lever "left-right" controls coupled to micro-switches. Transformer is contained within the control box. Size: 5½" x 8⅜" x 4". Weight, 5 lb. 12 oz.

Further information from Bail Electronic Services, 60 Shannon St., Box Hill North, Vic., 3129.

☆

FEDERAL AWARDS

W.I.A. 52 Mc. W.A.S.

Additional members to 31/12/68:—

Cert. No.	Call	Additional Countries
83	VK4ZRG	2
84	VK3AQR	2

Intending applicants for this award are reminded that new rules are now in effect in relation to the number of VK call areas required. Full details will be found in "A.R." June 1968, p. 14.

AUSTRALIAN D.X.C.C. COUNTRIES LIST OMISSION

Despite numerous checks to ensure accuracy, UH8, Turkoman, was not included in the list as published in January 1969 "A.R."

It is suggested that D.X.C.C. members and others interested in the list should insert the addition in the space below UL7, Kazakh, at the foot of column three.

Any inconvenience caused to members by this omission is regretted.

FEDERAL AWARDS MANAGER—CHANGE OF ADDRESS TO WHICH APPLICATIONS FOR AWARDS ARE TO BE SENT

In future all applications for Awards, enquiries, etc., should be addressed to:—
Federal Awards Manager, W.I.A.,
P.O. Box 67,
East Melbourne,
Victoria, 3002,
Australia.

"ELECTRONICS AUSTRALIA" D.X.C.C. LISTING

Amateurs are advised that the D.X.C.C. Countries List, as published in "Electronics Australia," December 1968, Amateur Band News and Notes, pages 156 and 157, is NOT the current list for the D.X.C.C. Award. This list was taken from that published in "A.R." in January 1968 and since that time several important changes have taken place. The only official up-to-date list is that published in "A.R.," January 1969.

—Geoff Wilson, VK3AMK.
Federal Awards Manager.

W.I.C.E.N. EXERCISE BY VK3 NORTH-WESTERN ZONE

A very successful civil defence exercise was held at Mildura on Sunday and Monday, 26th and 27th January, by the North Western Zone members. V.h.f. communication was provided for a 37½ mile Murray River Marathon Swim.

The problem of providing reliable v.h.f. communication can be appreciated when it is remembered that the actual river level is much lower than the surrounding country, added to this are cliffs and heavily timbered areas. Channel B 146 Mc. was used throughout, and all equipment being MR3A units.

A houseboat accompanying the eleven swimmers was fitted with a ground plane antenna, and from the start of the race at 1100 Saturday to 1730 Sunday, communication to the Mildura Base was through a portable station located on the cliffs at Mindook Station, approx. 17 air miles from Mildura. At 1730 Sunday a mobile station was brought into use to cover the houseboat, while the portable station shifted from Mindook to Monak. The Monak location was used from 2000 hours to 0230, at this stage the base had been working direct to the houseboat for some time. The marine/mobile operation ceased at 0600 Monday morning when the first swimmer arrived at Mildura, and from then to the arrival of the last swimmer at 2320 Monday, mobile stations were used to pass information from the swimmers' locations to the base. Over 100 formal messages were handled, dozens of which were phoned from the base to their destination.

NEW CALL SIGNS

SEPTEMBER 1968

[Although the following list was issued by the P.M.G. Dept. under the date of September 1968, all the VK3 call signs cover from June to September 1968.—Ed.]

VK1DI—D. I. Ralph, Flat 7, Clayton Court, Carroll St., Hughes, 2605.
VK1ZDR—R. C. Speer, Lawley House, Barton, 2600.
VK1ZJM—J. A. Mowatt, Station: Reid House, Allara St., Canberra, 2600; Postal: 4 Hinemoa St., Panania, 2213.

VK2AD/T—A. J. Brucesmith, 47 Hyman St., Tamworth, 2340.
VK2HI—A. H. B. Brodrick, 18 Rhoda Ave., Wagga Wagga, 2650.
VK2NM—L. Pollack, 2/241 Forest Rd., Arncliffe, 2205.
VK2QN—E. C. Roberts, 588 Punchbowl Rd., Lakemba, 2195.
VK2ADV—C. McHicks, 19 Harley Rd., North Avalon, 2107.
VK2BPB—P. Bass, 83 Nicholson St., Strathfield, 2135.
VK2ZFF—F. F. Teixeira, 17/70 Arthur St., Randwick, 2031.
VK2ZGP—G. K. Facey, 13 Coral Rd., Cronulla, 2230.
VK2ZHH—H. A. Tyrer, Lot 4, Kingdon Pde., Macquarie Fields, 2564.

VK3ER—Eastern & Mountain District Radio Club, 426 Riversdale Rd., Surrey Hills, 3127.
VK3HV—H. P. J. Trutmann, 7 Nerita Gardens, Corio, 3214.
VK3JD—J. G. Ditchburn, 80 Clausen St., North Fitzroy, 3068.
VK3NS—J. A. Taylor, 2 Valerie St., East Bentleigh, 3165.
VK3UI—D. S. Van Elkan, 520 Glenferrie Rd., Hawthorn, 3122.
VK3VH—D. A. Sinclair, 208 Canterbury Rd., Canterbury, 3106.
VK3VR—J. H. Dexter, 15 Glenshian Lane, Mt. Eliza, 3930.
VK3WP—B. A. Endersbee, 169 Canterbury Rd., Canterbury, 3126.
VK3YC—W. J. Douglass, 4 Brodie St., Bendigo, 3550.
VK3AFL—D. A. Page, 152 East Boundary Rd., East Bentleigh, 3165.
VK3AIA—S. C. McLean, 204 Balaclava Rd., Caulfield, 3162.
VK3AIC—J. A. Niedeck, 19 Talofa Ave., Ringwood East, 3135.
VK3AMW—Wangaratta and District Amateur Radio Club, 5 Gayer Ave., Wangaratta, 3677.
VK3AOR—R. W. McLean, 313 Crompton St., Ballarat, 3350.
VK3AQP—J. McL. Bennett, 56 Lancaster St., Ormond East, 3165.
VK3ATF—J. B. B. White, Grant St., Point Lonsdale, 3225.
VK3ATO—Wireless Institute of Aust., Midland Division, 504 McIvor Rd., Bendigo, 3550.
VK3AUT—A. U. Magnus, 10 Hillcrest Rd., Glen Iris, 3146.
VK3AVL—E. H. Connery, 75 South Cres., Northcote, 3070.
VK3AXB—J. Linden, 135 Hume St., Wodonga, 3690.
VK3AYE—L. A. Ball, 52 Shiels Tce., Casterton, 3311.
VK3AYF—S. Rayson, 1588 Dandenong Rd., Huntingdale, 3166.
VK3AYK—K. F. Price, 1 Valdale Crt., Heathmont, 3135.
VK3AZF—K. E. C. Gillon, Flat 1, 76 Roberts Ave., Springvale North, 3171.
VK3AZH—K. J. Horsfall, Flat 14, 51 Buckley St., Essendon, 3040.
VK3ZEP—H. F. Paton, Station: 49 Havelock Rd., Hawthorn, 3123; Postal: C/o. 18 Selwyn St., Hawthorn, 3123.
VK3ZHL—C. W. Gliddon, 9 Gloria Ave., Dandenong, 3175.
VK3ZIU—I. Marks, 13 Melosa Ave., East Brighton, 3187.
VK3ZIY—C. I. Yandell, Flat 2, 28 Donna Buang St., Camberwell, 3124.
VK3ZJO—E. G. Briggs, 563 Neerim Rd., Hughesdale, 3166.
VK3ZKL—A. Slamin, 15 Normanby St., Prahran, 3181.
VK3ZKO—R. J. Broughton, Flat 1, 32 Wattletree Rd., Armadale, 3143.
VK3ZLG—R. J. Green, 22 Shackleton St., Belmont, 3216.
VK3ZMM—I. W. Cerchi, Unit 2, 428 Riversdale Rd., East Hawthorn, 3123.
VK3ZOH—J. R. Hargrave, 74 Haydens Rd., Beaumaris, 3193.
VK3ZQA—E. M. Lane, 49 Albert St., Ararat, 3377.
VK3ZSL—A. Slarks, 13 Orchid Ave., Oakwood Park, 3175.
VK3ZSU—D. G. Politakis, 37 Hopetoun Ave., Morwell, 3840.
VK3ZTN—P. J. Solly, Station: Rainbow, 3424; Postal: P.O. Box 102, Rainbow, 3424.
VK3ZVN—C. Sawtell, 43 Clyde St., Box Hill, 3129.
VK3ZXF—R. H. Hudson, 16 Prince Edward Ave., McKinnon, 3204.
VK3ZXS—H. Smith, 32 York St., Strathmore, 3041.
VK3ZYI—S. Curtis, 437 Middleborough Rd., Box Hill, 3128.
VK3ZZR—R. L. Reid, 2 Ellen St., Springvale, 3171.
VK3ZZT—A. J. M. Scott, 21 McKean St., Box Hill North, 3129.
VK3ZZU—P. S. D. Edwards, 101 Main St., Blackburn, 3130.

VK5ZBT—A. F. Raftery, 22 Princess St., Croydon, 5008.

VK6AO—C. G. Andrews, 14 Curtis Pl., Melville, 6156.
VK6DB—D. F. J. Benck, 18 Omdurman St., Wagin, 6315.
VK6HJ—H. M. Smith, Station: 22 Lockwood St., Exmouth, 6707; Postal: P.O. Box 22, Exmouth, 6707.
VK6JL—J. L. Lewis, 111 Churchill Ave., Subiaco, 6008.
VK6JT—J. S. Brown, 92 Acanthus Rd., Riverton, 6155.
VK6JU—M. G. Burleigh, 147 Gloucester Cres., Safety Bay, 6169.
VK6LT—L. F. Toussaint, 19 Errinbee St., Riverton, 6155.
VK6ZEV—G. D. L. Armstrong, Station: Kojonup Rd., Katanning, 6317; Postal: C/o. Radio Station 6WB, Katanning, 6317.

VK8MR—M. D'A. Richardson, Station: 18 Mary St., Stuart Park, Darwin, 5790; Postal: P.O. Box 228, Darwin, 5794.
VK8ZCA—M. W. McLennan, 582 Fernau St., Nightcliff, 5792.
VK8ZEC—P. M. Van der Velden, C/o. N.T. Musical Pty. Ltd., 54 Cavanagh St., Darwin, 5790.

CANCELLATIONS

VK2GB—J. W. Birdsall. Not renewed.
VK2MB—H. T. S. Banks. Deceased.
VK2WZ—J. H. Lean. Not renewed.
VK2YK—C. A. Coyle. Not renewed.
VK2AHN—D. J. Murphy. Not renewed.
VK2AUO—R. A. Emmerton. Not renewed.
VK2ZEX/T—A. J. Brucesmith. Now VK2AD/T.
VK2ZOJ—A. H. B. Brodrick. Now VK2HI.
VK3CD—J. Rich-Phillips. Deceased.
VK3VJ—A. W. Adams. Now VK2II.
VK3ABQ—J. A. Moran (Sgt.). Transferred to Western Australia.
VK3AGS—G. E. Sheeran. Now VK2BGS.
VK3AIO—W. M. Ryan. Now VK4WR.
VK3AMR—J. A. Howie. Now VK2AYH.
VK3ZGQ—D. K. W. Bradbury. Transferred to New South Wales.
VK3ZJF—J. A. Taylor. Now VK3NS.
VK3ZMD—J. F. Davis. Transferred to New South Wales.
VK3ZOF—W. E. Metzenthen. Overseas.
VK3ZQZ—J. McL. Bennett. Now VK3AQP.
VK3ZYR—S. Rayson. Now VK3AYF.
VK3ZYW—R. W. McLean. Now VK3AOR.
VK5AJ/T—R. A. Hipwell. Transferred to Victoria.
VK5LV—J. R. Godson. Transferred to Queensland.
VK5LW—J. R. Godson. Ceased operation.
VK5ZJK—M. W. McLennan. Now VK8ZCA.
VK5ZKA—P. M. Van der Velden. Now VK8ZEC.
VK6AN—F. W. Noble. Left country.
VK6GH—W. G. Hayman. Deceased.
VK6ZAZ—C. G. Andrews. Now VK6AO.
VK6ZDN—J. S. Brown. Now VK6JT.
VK6ZDR—R. C. Speer. Transferred to New South Wales.
VK6ZEC—D. F. J. Benck. Now VK6DB.
VK6ZGL—J. L. Lewis. Now VK6JL.
VK6ZLT—L. F. Toussaint. Now VK6LT.
VK7OZ—W. E. Dixon. Ceased operation.
VK8ZDE—H. W. Spaulding. Transferred to New South Wales.
VK8ZMR—M. D'A. Richardson. Now VK8MR.

GELOSO CALENDAR '69

R. H. Cunningham Pty. Ltd. are making available free on request the Geloso calendar for 1969. Beautifully printed in full color, the calendar shows historic buildings and places in Italy. Requests should be addressed personally to Mr. R. H. Cunningham, 608 Collins Street, Melbourne, Vic., 3000.

THE QUESTIONNAIRE

(Continued from Page 7)

time and then through again, but please, no box Brownie shots or similar. Find a competent photographer (there will be one in your Division) and send us good clear prints, preferably no smaller than 10" x 8", sharply focused, and with reasonably good contrast.

We were surprised at the number of requests for the history of Amateur Radio in Australia. The Federal historian, Mr. George Glover, has been working on this project for several years, collating and checking through old records, and when last contacted on the matter was able to report considerable progress having been made. His writings cover the first fifteen years and in draft form, copies have been sent to many old-timers for comment and additions or corrections that they can recommend. We expect to be making full use of this work in due course.

A common request was for more technical articles. Here we are largely controlled by what we receive, and despite some of the comments, very few are rejected. Over the last five years only ten articles submitted have not been used, one of these because the author has never completed it. From the replies we now know that the articles we have published are: too long, too short, too technical and too simple, give too much detail and too little detail. In other words, we have no hope of winning. We must assume that a magazine published for Amateurs will be read by Amateurs, who by the very virtue of passing a written examination to obtain their licence have a certain basic level of knowledge on the subject, and this should be the minimum level to which we publish. On the other hand, we are faced with finding the maximum level, without getting too high for the majority of readers. To this question we have no answer, as there is always a percentage of readers anxious to improve their knowledge of the subject, and this is one of the prime objectives of the W.I.A.

To produce all the articles for which we are asked, we would need a laboratory and a large staff. We now believe there is more than sufficient talent within our own ranks to produce all the material we could ever use and we refer you back to the policy item reproduced earlier in this report.

As a guide to prospective sub-editors, we are looking for articles on equipment for the u.h.f. frequencies. We are now aware that considerable work is being done on 432 and 1296 Mc., but we have not been favoured with any articles.

There will be no report next month, as time will have to be devoted to the annual report for the Federal Convention. With the May issue, we hope to have a look at the frequencies and modes being used, and, space permitting, a survey of a few more of the suggestions received.

Correspondence

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers.

DX-PEDITION TO ANDORRA

Editor "A.R.," Dear Sir,

Last summer I was active from the principality of Andorra with the call PX1FD. I now intend to re-activate this call about Easter, probably from 5th to 11th April.

During July/August last we formed a team with PX1KT and PX1YY. All arrangements are being made for PX1YY to accompany the DX-pedition in April and most probably PX-1KT will also be on the air. It could thus be that the station would be operated around the clock.

Further details are not yet determined precisely, but will be known definitely by the end of January/early February. Licences are being asked for and will probably be granted in due time.

Could you possibly insert a few lines in the next issue of "Amateur Radio" to inform the VK Amateurs about this opportunity.

I shall, of course, keep you posted on all details (frequencies, time scheduling, transmitters used, etc.).

Thanking you beforehand for your collaboration. I hope we can avail ourselves to make many solid QSOs between VK and PX.

My best 73 in the meantime.

—Guy Gillain, ON5FD.

1296 Mc. TESTS

Editor "A.R.," Dear Sir,

I wish to advise you of recent experiments which have been carried out on 1296 Mc. band. On Sunday, 29th December, 1968, during the New Year's Field Day Contest, while portable at Mount Gibraltar, near Bowral, I contacted VK2ZAH at Hornsby—a distance of 65 air miles. The portable gear used consisted of completely home-made equipment, running from a transistor power supply with 9 watts output at 1296 Mc. from a veractor; receiving equipment consisting of a crystal locked converter into a tunable i.f. The antenna used was a twin 10-turn helix a wavelength apart, with a solid metal reflector.

The gear at Barry's end (VK2ZAH) was running 8 watts output from a 2C39, antenna, 4 ft. dish, crystal locked converter to an AR7.

Signal reports exchanged were 5 and 6 and 5 and 5. A very good contact, which prompted us to try our luck a little further the following week-end, so on Sunday, 5th January, 1969, when we proceeded to a mountain, 132 road miles from Sydney, we found it was possible to work Bill VK2ZAC over a path of 71 air miles from Shooter's Hill to Narwee. Signal reports were 4 and 5 and 5 and 6, the portable gear being the same as used in working Barry. Bill used a veractor multiplier with seven watts output to a quad helix with a crystal locked converter to BC348.

Both these contacts have been confirmed and distances have been agreed upon by both parties.

—R. C. F. Norman, VK2ZCF.

FOREIGN STATIONS AND N.F.D. CONTEST

Editor "A.R.," Dear Sir,

I would be obliged if you would find space in "A.R." to print the following, which I see as a constructive attempt to bring to the notice of members a ridiculous situation that has developed in respect of the Memorial to the late John Moyle, whom I held in the highest regard.

I have read in the columns of "A.R." various letters pertaining to the N.F.D. Contest, those for and against its coincidence with the A.R.R.L. Contest. Insofar as they conflict, these worthy letters are revelant. They do, however, miss the wood for the trees.

All those stations that worked foreign stations and included these stations in their scores must, under Rule 10, disqualify themselves. Whether it transpires that this is done formally or not under the rules as they stand morally these stations were outside the Contest, and sought to seek an advantage over other rule-abiding stations.

The Objects of the Contest make it clear that VK stations are to work VK stations only.

The Objects say: "The operators of Portable and Mobile Stations within all VK Call Areas will endeavour to contact other Portable/Mobile and Fixed Stations in Australia and Overseas Call Areas."

Rule 8 defines a Call Area. Rule 8: "The following shall constitute Call Areas—VK1, VK2, VK3, VK4, VK5, VK6, VK7, VK8, VK9 and VK0."

Under the Rules there is no place for a G3 call area or a W6 call area, etc. Where the Objects speak of "Overseas Call Areas" they clearly refer to those Call Areas being VK Call Areas without Australia, i.e. not being within Australia proper, e.g. Willis Is., Papua, etc.

One could quote analogy after analogy from life where self interest conflicts with the social mores and social values as laid down in various Statutes, Ordinances, Orders, Rules, etc., but the fact of the matter remains the same, a Rule, etc., is either observed as it is laid down or it has not been.

Any discussion that comes later will come after the fact that the rules of the contest have been blatantly broken, mostly by ignorance and scant reading of the Rules, it is hoped, but nevertheless broken.

It is now up to the Contest Committee to decide what to do, and the best of luck to them, because whatever it is, will it be popular with everyone?

—R. F. Meany, VK3HA.

—...—

"CQ" SSB AWARD RULES

The 2 x SSB Certificate will be issued to any licensed Amateur station presenting proof of contact with 100, 200 and 300 countries. Stickers will be issued for each additional 25 countries confirmed up to 300, thereafter they will be issued in increments of ten. This proof shall consist of a proper QSL card to be checked by the 2 x SSB Award Manager or by one of the authorised checkpoints for "CQ" DX Awards. (W.I.A. Awards Manager in VK.)

1. All applications should be submitted on official application form "CQ" 1067. This form can be obtained free by sending a self addressed stamped envelope to the 2 x SSB Award Manager.
2. All QSL cards must be clearly marked 2 x SSB, and be in alphabetical order.
3. Claims for 100 countries must be included in the first application.
4. Confirmations must be accompanied by a list of claimed countries and stations to aid in checking and for future reference.
5. Include with the application eight IRCs to defray cost of the certificate. Sufficient postage for the return of confirmations must be included with a self addressed stamped envelope with each application. When sending for endorsements, two IRCs or a self addressed stamped envelope should accompany each application.
6. All contacts must be with licensed land based Amateur stations working in authorised Amateur bands.
7. All contacts submitted by applicant must be within a 250-mile radius of the original location.
8. Any altered or forged confirmations will result in permanent disqualification of the applicant.
9. Fair play and good sportsmanship in operating are required of all Amateurs working toward 2 x SSB Award. Continued use of poor ethics will result in disqualification.
10. Once a country has lost its status as such, it will automatically be deleted from our records. There will only be a current country count.
11. Decisions of the "CQ" DX Awards Advisory Committee on any matter pertaining to the administration of this award shall be final.
12. All applications should be sent to: Louise Rippe, W8HDB, 2 x SSB Award Manager, 3785 Susanna Dr., Cincinnati, Ohio, U.S.A., 45239.

VK applicants should forward their QSLs and check-lists to W.I.A. Awards Manager, who will certify applications and return cards.

(Reproduced by permission of the DX Editor "CQ" Magazine.)

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CONTEST CALENDAR

1st/2nd Mar.: 35th A.R.R.L. DX Test (Phone Section).
1st/16th Mar.: I.A.R.C. C.W./R.T.T.Y. Contest.
8th/9th Mar.: 32nd B.E.R.U. Contest (R.S.G.B., C.W.
15th/16th Mar.: 35th A.R.R.L. DX Test (C.W. Section).
29th Mar./13th Apr.: I.A.R.C. Phone Contest.
5th/6th Apr.: Polish DX C.W. Contest.
12th/13th Apr.: "CQ" W.W. W.P.X. S.S.B. Contest.
19th/20th Apr.: Helvetia 22 Contest.
26th/27th Apr.: P.A.C.C. C.W./Phone Contest.
25th/26th Oct.: "CQ" W.W. DX Contest—Phone Section.
29th/30th Nov.: "CQ" W.W. DX Contest—C.W. Section.

—D. Rankin, F.E.

1969 I.A.R.C. PROPAGATION RESEARCH COMPETITION

(A DX CONTEST WITH A PURPOSE)

RULES

Contest periods: This year, the contest will be run in two sections. CW/RTTY from 0001 GMT, 1st March, to 2400 GMT, 16th March. Phone from 0001 GMT, 29th March, to 2400 GMT, 13th April.

Objective: The objective remains the same. Work as many stations in as many different CPR Zones as possible. Countries do not count in the score. Work your own Zone only once for Zone credit.

Bands: All bands—1.7 through 30 Mc.

Exchange: RS or RST report plus your CPR Zone number.

Duplicate QSOs: You may work the same station as often and for as long as you wish. When a single QSO exceeds 6 minutes, a new log entry shall be made for each 6 minutes or part thereof.

Logging: Use GMT only. Observe rule for duplicate QSOs. QSO may be made in another contest or with a station not participating in this test, provided all necessary information is logged.

Scoring: One point for each QSO except no contact credit for working stations in your own Zone. See rule on objective. Multiplier of one for each Zone on each band. You may work one station in your own Zone for Zone multiplier only. Total score is the sum of all contacts multiplied by the total Zones for all bands.

Entry Classes: Entries will be accepted in the following categories:

Single Operator—Single Band.
Single Operator—All Bands.
Multi-Operator—All Bands.
Radioteletype—All Bands.
Mobile—All Bands (includes all categories of mobile).
All Events—This is a new category. You may submit a total score for all modes and bands.

Awards: Winners in each category in each Zone will receive a suitable certificate or other award. All entries of 100 or more valid QSOs will receive a CPR Certificate of the appropriate grade.

Logs and summary sheets may be obtained from I.A.R.C., Box 6, 1211 Geneva 20, Switzerland, or from the Chairman of the Contest Committee. Send all logs to the following address unless otherwise instructed. Logs must be posted prior to 1st June, 1969.

L. M. Rundlett, Chairman,
I.A.R.C. Contest Committee,
2001 Eye Street, N.W.,
Washington, D.C., 20006.

—...—

"CQ" WORLD WIDE WPX SSB CONTEST, 1969

PRECIS OF RULES

Time: 0000 GMT, 12th April, until 2400 GMT, 13th April.

Single operators can only work a maximum of 30 hours within the above stated 48 hours. The 18 hours of non-operating time must be shown in the log and may be taken in up to five periods during the contest. Multi-operator stations can operate the full 48 hours.

Bands and Mode: 3.5 Mc. to 28 Mc. S.S.B. only.

Exchanges: 59001, 59002, etc.

Scoring: Three points per contact with stations on different continents. One point per contact with stations on the same continent. No points are allowed for contacts with stations in the same country but are permitted for multiplier purposes.

Multiplier: Sum of the number of prefixes worked multiplied by the number of contact points. N.B.—A prefix may be counted only once during the contest irrespective of the band worked. W2, WA2, KA2 are different prefixes.

Logs: To "CQ" WPX Contest Committee, 14 Vanderventer Ave., Port Washington, L.I., N.Y., 11050, U.S.A.

N.B.—Full details appear in March "CQ" magazine and serious contestants are recommended to read these in detail.

DX

Sub-Editor: PETER NESBIT, VK3APN
32 The Grange, East Malvern, Vic., 3145

(All times in GMT)

ASSORTED

Steve VK8CC announces that he hopes to visit St. Brandon and Rodriguez Is. some time during the period March to May, before he returns to Europe on vacation. Call signs will be VQ8CCB (St. Brandon) and VQ8CCR (Rodriguez). 160 through 10 metre operation is planned with particular attention to be given to the l.f. bands to help those who are trying for 5BDXCC. QSL direct to Box 14, Curepipe, Mauritius. Three IRCs are required for an airmail reply, otherwise cards will go via the Bureau.

Rumors are brewing for an early March DX-pedition to Cocos Is. (TI9), by TI2RE, CMB, CF, 4JP and maybe some W6.

VR6TC is QRV Tuesdays; 1st Tuesday in each month on 21060 c.w. from 2130z onwards, other Tuesdays 21350 s.s.b. from 2200z. For a sked write well in advance to W5OLG, Box 261, Grapevine, Texas, 76051. State which Tuesday you will be on freq. Wait for Tom to call you.

ZL5AA/3: Ian ZL5AA has arrived at Campbell Is. where he hopes to operate for two or three months.

It is alleged that French licensing authorities have issued no licences for operation from Clipperton Is. While on the topic, W1MQT (who is not QSL manager for TA3AB) says that Frank, the operator of TA3AB, has no licence to operate from Izmir. He says that the Govt. of Turkey does not permit American personnel to operate Amateur stations there. (DX News.)

All is not lost, however. A.R.R.L. has advised DJ1QP that DXCC credit will now be granted on the cards of his recent GC5AET operation. Up to now about 1,000 direct QSLs have been answered.

Don VE6AJT was very active as VR5AE, but has apparently returned home since the FW8DY operation because of financial problems. The ZM7 permit will be valid for one year.

Rhodes Island activity is planned for this Easter by Jim SV0WN and Don SV0WI. The anticipated frequencies are 14195, 21245 and 28545; listening 5 kc. up. Keep an ear out for Don and Jim.

Dick GC8HT hails from Guernsey in the Channel Islands. To help anybody interested in working this rare country/prefix, Dick has available a list of skeds, i.e. times and frequencies that he will be active on and looking for contacts. The sked list covers the whole year, with skeds from 160 right through to 10 mx. If you are interested in obtaining a list, send Dick an s.a.e. and an IRC and he will reply via airmail. Dick's address is: R. Taylor, La Cour de Longue, St. Saviour's, Guernsey, Channel Islands.

Skeds for March are: 10th, 14186 s.s.b. at 0730z and 14043 c.w. at 1000z. 17th, 21013 c.w. at 0730z and 21343 s.s.b. at 0900z. Altogether 21 skeds are listed for March, but the ones listed here are the best for VK. On the average, Dick receives 100 cards per week, but peak weeks have exceeded 200. Threfore, to be sure of reciving a QSL, the following must be observed: Write the month in words, not as a number; use GMT time; and send a self addressed envelope with one IRC. (These rules could apply when seeking a reply from any rare DX station. Check at the Post Office to see how many IRCs are needed for an airmail reply, if wanted.)

QSL MANAGERS

CR6LF—W3HNK
CR7GA—WA3HUP
EP2FD—WA5ERS
FP0AA—VE1AKT
HB0LL—DL7FT
HS3AL—W3KT
KV4EY—W3HNK
KW6AA—WB6YCT
PX1PA—DL7FT
SV0WN—K3EUR
TA1RF—DJ4SK
TA2E—VE3ABG
TU2AY—DL7FT
VK9RJ—K6UJW
VK0VK—VK6VK
VP1RC—WB6EFA
VP1VR—W4VPD
VP2DAJ—WB4EFE
VP2GRN—W4YHB
VP2GSM—W4YHB
VP2SAB—WB2WOW
VP8KL—WA3IKK
VR5AE—VE6AO
VU2AJW—WA6NFC
XE1PJL/XF4—XE1J
XE0LOW—WB2GQK
ZD8AB—W8BMS
ZD8JL—W9JVF
3A2CU—DL7FT
4TA4OS—OA4OS
5R8AM—K2KTX
5R8AS—W6FQ
5V4AP—DL1HH
5V4EG—DL1HH
5V4JL—DL1HH
7P8AR—W4BRE
9K2BV—W5EGR
9X5AA—W1YRC

A2CAU—Box 200, Francistown, Botswana.
VR7JE—Box 2, I.L.E., Zambesia, Mozambique.
CR8AI—L. Fernandes, Dili, Portuguese Timor.
CT2AK—Box 143, Ponta Delgada, S. Miguel.
DX1NY—B. Smith (K8LNY), C/o. S.E.A.C.R., A.P.O., S.F., 96274.
ZS2MI—Box 838, Germiston, S. Africa.
KV4CI (direct only)—H. Miller, Box 1853, St. Thomas, Virgin I.

ACTIVITIES

160 metres often open to DX regions according to George L6042. He has been hearing the following: K2GNC 1801 kc. 1142z, W6QHQ 1992 kc. 1420z, JA2CLI 1908 kc. 1506z. George says "Conditions right on the button during the Jan. 11 Trans-Pacific Test. Heard W5HPC, W8ANO, W8GDQ (579), W4BGO, K2GNC, W8KW?, and some weaker ones. K2GNC and W4BGO continuously called VK5KO, who apparently had a good signal over there, but John didn't hear them." (Thanks George)

Further reports of how good 20 mx has been come from Fred VK4RF. A large list of 63 call signs worked (s.s.b.), every single one a winner, bears this out. Unfortunately space does not allow publication of the whole list, but a few picked at random are 5A3TX, 7Q7AM, TU2AY, TJ1AU and FP8CY. Clearly now is the time for 20 metres. (Thanks Fred.)

THE XL OPERATOR CLUB

The membership of this fraternity is based on long term service and excellent achievements in the field of Amateur Radio. The requirements are intensive activity over many years on various bands.

A minimum of 40 points is required for membership. The points may be earned as follows:

(1) Five points for the first full 10 years the applicant has been licensed, PLUS three points for each five years thereafter.

(2) Five points for the first 200 DXCC countries confirmed, PLUS three points for each additional 50 countries confirmed.

(3) Five points for each 100 DXCC countries confirmed on EACH of the 28, 21 and 14 Mc. bands.

(4) Three points for each 50 DXCC countries confirmed on EACH of the 7 and 3.5 Mc. bands.

(5) Two points for each 20 DXCC countries confirmed on EACH of 1.8 Mc. and v.h.f./u.h.f. (v.h.f./u.h.f. is considered as one band).

The country totals are calculated regardless of the mode of operation. A.R.R.L. DXCC rules apply for counting the countries. If you can claim at least 40 points, send your application to Award Hunters' Club International, C/o. OH2YV, J. Velamo, Isokaari 4-B-30, Helsinki, Finland. Include your call, name, address, plus (1) the date of your first transmitting licence, (2) the DXCC score confirmed (or credited by A.R.R.L.), (3) number of confirmed countries per band. Finally, certify personally that the information presented is true. No other certification is necessary; the word of XL operators is trusted. If false information is given, it will spoil the Ham Spirit. Enclose sufficient return postage (there is no membership fee.)

WORLD WIDE POLL OF MOST WANTED COUNTRIES

Readers are requested to send to G. Watts, 62 Belmore Road, Norwich, Nor. 72-T, U.K., a list of your "most needed" countries (not more than 25). As the G. Watts bulletin "DX News" is read by most of the world's top DXers, the results will be a useful guide to intended DX-peditions. The results will be published in this column as soon as they come to hand, listing the countries in order of priority; thus providing valuable information for those making DX-peditions. It is in the interest of all readers to participate in this Poll. (Anyone wanting to save postage can send their list to me and I will airmail it to G. Watts.)

SUMMARY

More activity reports are needed. It is a pity that out of so many readers only two can be bothered sending in reports. Surely there are others who have had interesting experiences on the air that others would like to hear about. How about it, chaps?

Acknowledgments to DX News, LIDXA, ZL2AFZ, VK3VK, OH2YV, VK4RF and GC8HT.
73, Peter VK3APN.

FAIRCHILD APPOINTMENTS

Recent additions to Fairchild Australia Pty. Ltd. sales engineer force include Robert C. Hunt who will assist Phil Cohen in Melbourne, and Brian Shirley in Sydney who will assist David Finch.

VHF

Sub-Editor: CYRIL MAUDE, VK3ZCK
2 Clarendon St., Avondale Heights, Vic., 3034

Another summer season is almost over and the DX reports are very poor. Judging by the numbers exchanged by those taking part in the Ross Hull Memorial V.h.f. Contest and the poor DX conditions this year's scoring will be one of the lowest on record.

I would appreciate news from all other States for this page in "A.R." but please keep it to material that is of interest to all readers and not of local gossip that is out of date by the time I receive it. Closing dates for copy for the V.h.f. page of "A.R." for the next few months are: May issue, 28th March; June issue 30th April; July issue, 30th May.

73 until next month, Cyril VK3ZCK.

V.H.F. BEACON TRANSMITTERS

GB3CTC—Cornwall, England—144.10 Mc.
SM4MPI—Sweden—145.96 Mc.
ZD3AA—Cook Island—52.032 Mc.
ZE1JZA—Rhodesia—432.048, 144.016 Mc. 144.0
JA4, 6, 8, 9IGY—50.50 Mc.
VK5VF—53.00 Mc.
VK6VF—52.006, 144.198, 432.59 Mc.
VK3 ATV0—51.76 Mc.
GH1MB—Malta—70.10 Mc.
ZB2VHF—Gibraltar—70.26 Mc.
ZD7WR—St. Helena—28.992 Mc.
JA1IGY—51.99 Mc.
VK4VF—144.40 Mc.
VK7VF—Devonport—144.90 Mc.
VK6BF (?)—Albany—144.50 Mc.
VK4 TVQ0—51.74 Mc.

These beacon frequencies were compiled from data supplied by George VK3ASV, ex VK3ZCG and overseas magazines.

Any information regarding these or any other beacons that you may know of will be gratefully received and acknowledged in this column.

VICTORIA

The DX hounds on both 6 and 2 metres have had a big set-back over the past few months. Early in December conditions started to look very bright, with all VK States and a few JAs, but alas, come Christmas and the New Year, the Ross Hull Contest and little or no DX to be found.

Since then 2 mx has improved a little, but DX on 6 is very sporadic. The majority of openings in the 52-54 Mc. band appear to be in the mornings, early afternoon and again in the evening when it is almost impossible for most Melbourne chaps to fire up on 6 mx.

An interesting point on the modes used, s.s.b. is on the increase with a large number of VK2s, 5s and 6s using this mode. Here in VK3 there are only a couple of Amateurs regularly using s.s.b. on this band.

Wide and narrow band f.m. is becoming popular on 6 mx, especially in areas where t.v. channel 0 is in use. The net frequencies in most common use are the International 6 mx f.m. net on 52.525 Mc. and 52.656 Mc., both of which are vertically polarised.

Band reports: 6 mx is generally poor, but for DX hunters and those not pestered by Television Indians, the evenings can be quite interesting.

2 mx is improving with DX to northern and central VK3, southern VK2, VK5 (Mt. Gambier and Adelaide), and to northern Tasmania. Most of these openings are at night.

Reports have been received of stations in the Melbourne and Geelong areas having heard some ZLs at fair to good strength, but alas no ZLs have been reported as being worked.

70 centimeters reports suggest that this band is superior to 2 mx. Several stations now operate mobile with a single cloverleaf for the radiator and QQE03/20 tripler as the transmitter, the exciter being the 2 mx mobile rig. This band is also becoming popular on field days.

Many new call signs have been heard on this band lately, but there still appears to be a shortage of receiving converters, judging by the number of cross band contacts being made. DX has been reported from VK7, VK5, VK2 and inland VK3.

Fox Hunts.— Visitors to VK3 and those in VK3, the regular Fox Hunt night has been changed to the fourth Friday in each month instead of the fourth Wednesday. 73, Robert VK3AUR.

SILENT KEY

It is with deep regret that we record the passing of the following Amateurs:

VK5NK (ex VK8NK)—
Ralph James Knight.

VICTORIAN DIVISION

STATE CONVENTION

will be held on

15th and 16th MARCH

at

BENDIGO

Convention Dinner, Sunday Lunch and Afternoon Tea, $4.50, or Sunday activities only, $2.

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Reservations to be made with Bill Sadler, VK3AMZ, 504 McIvor St., Bendigo, Vic., 3550, no later than 7th March, enclosing $2 per head deposit.

TOWNSVILLE

Amateur Radio Club

The **1969 Class** for those interested in obtaining an **Amateur Licence** begins on:

Saturday, 8th March, 1969.

Time: 8.30 a.m.

Location: 4TO Auditorium.

Class Instructor: L. Noseda, VK4EX.

For further information contact:

P. J. Lindsay, VK4ZPL/T, Tel. 6161

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FEDERAL

RESERVATION OF CALL SIGNS

Mr. Carroll, Controller, Radio Branch, P.M.G's Dept., during a recent discussion with Federal Executive, pointed out that where a licensee has died, it is policy of the Department not to re-issue his call sign for five years, unless in special circumstances. Where very special circumstances exist, call signs are not re-issued for ten years. In the event of unrenewed call signs, these are reserved for two years where no special reasons are given, but consideration will be given to the reservation of call signs for greater periods if, for example, a licensee is transferred Interstate or overseas, but intends to return to his original call area.

SPECIAL INTERSTATE CALL SIGNS

We have been informed by the P.M.G's Dept. that it has been decided to set aside a block of call letters from which allocation may be made to Amateur licensees who are subject to frequent Interstate transfers in their work and desire to retain the basic call letters by which they are known throughout the Amateur fraternity. It will, of course, be necessary for the numeral denoting the particular State to be changed when such transfers are effected and application must be made to the Superintendent in the State in which the station is to be established before removing it to another address, in accordance with the provisions of paragraph 87 of the Amateur Handbook.

Call signs are reserved for use in the various States are as follows:—

N.S.W.	VK2CAA - VK2CBZ
Vic.	VK3CCA - VK3CDZ
Qld.	VK4CEA - VK4CFZ
S.A.	VK5CGA - VK5CHZ
W.A.	VK6CIA - VK6CJZ
Tas.	VK7CKA - VK7CKZ

An applicant for a call sign from the abovementioned series will be required to furnish satisfactory evidence that his employment is likely to result in his being transferred Interstate at some future date.

The abovementioned arrangement is being introduced on a trial basis for three years and, of course, will apply to full privilege licence holders only.

RECIPROCAL LICENSING IN FINLAND

We have received from Niilo OH2XK, the Secretary of S.R.A.L., some information sheets about regulations for Amateur Radio in Finland. Any Amateurs intending to travel to Finland can obtain such information from F.E. or write to S.R.A.L., P.O. Box 10306, Helsinki 10, Finland. In short, OH licences will be granted to the citizens of Australia as well as about 12 other countries.

JAMBOREE-ON-THE-AIR

The Boy Scouts World Bureau indicates that the 12th Jamboree-on-the-Air will be held in the third week in October, thus making the date for 1969 as 18th-19th October. National organisers of J.O.T.A. may be interested to contact L. Jarrett, of the World Bureau, on the 10 and 15 metre bands most week-ends using his HB9AMS call sign.

HAMADS

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FOR SALE: Apache Tx, five-band with SB-10 S.s.b. Adaptor, excellent condition, $200. BC348 Receiver, p.s. and speaker, $60 o.n.o. VK3ADY, Phone 88-4005 (home), 62-6025 (bus.) (Melbourne).

FOR SALE: Collins 302C-3 RF Wattmeter. Switch for forward and reflected power, dual scale. 200 watts and 2000 watts, very accurate, as new. $95. A. Swinton, Kulnura, N.S.W. VK2AAK.

FOR SALE: FL100B Transmitter, five-bands, excellent condition, $225. Also Star SR600 Receiver, double conversion on 80 metres, triple conversion on other bands, pre-selector, 1st local oscillator xtal controlled, beautiful condition, twelve band positions, $240. VK3CH, A. Nunn, 10 Arcady Gr., Vermont, Vic., 3133.

FOR SALE: Galaxy V. (less power supply), Galaxy Remote VFO, Heath SB200 Linear, $675. R. Mirdas, Box 1277, Canberra City. Phone 49-2649 (days).

FOR SALE: Hi-Gain 204BA 4-element 20 metre beam. New, still in box, $140. R. Mirdas, Box 1277, Canberra City.

FOR SALE: Model 32S3 Collins Transmitter, latest model, top notch condition, as new. A highly flexible transmitter, 3.4 to 29.7 Mc., p.e.p. 175 w. input, 100 w. output. Grid blocked keying with adjustable soft or hard output, usable for RTTY. Dual conversion, Collins ALC and inverse feedback. CW spotting control allows zero beating with incoming signal. Fitted with Collins mechanical filter, bandswitch, etc. 11 selectable crystal positions in 200 Kc. segments. Very high stability, 100 cyc. after warm-up, easy access. Front panel selection provides optional transceiver operation, CW sidetone for monitoring in receiver. In all, a very high quality transmitter. $650. A. Swinton, Kulnura, N.S.W., VK2AAK.

FOR SALE: Model 62S-1 Collins Transverter for use on 2 and 6 metres by merely pressing a switch to change from h.f. In-built power supply, 160w. p.e.p., 4X150 final on VHF. Any mode of operation—SSB, AM, CW and RTTY, as determined by exciter. Ultimate in frequency stability, 23 switchable crystals 0.005%, 200 Kc. increments 143.6/148 Mc. and 49.6-54.2 Mc. Power output 65w. p.e.p. $680. A. Swinton, Kulnura, N.S.W., VK2AAK.

FOR SALE: Webster Band-Spanner whip. Like new, $35. R. Mirdas, Box 1277, Canberra City.

KW77 Triple Superhet., Amateur Bands Rx, 1.8-29.7 Mc. in seven bandspread bands, CW, AM, SSB, xtal cal. fast/slow AGC, $200 or near offer. R. Collins, VK5RY, 5 Dean Court, Modbury, S.A., 5092. Tel. 64-1210.

SELL: Eddystone EC10 fully transistorised s.s.b. and a.m. Communications Receiver. Brand new in original carton with instruction manual. $175. Roth Jones, 1 Albert Road, Melbourne, Vic., 3004. Phone 26-6911.

SELL: SB200 with spare set of valves, $180. Drake TR3 Transceiver with remote VFO, power supply, plus spare set of output valves, $550. SBE34 Transceiver, operates 240v. a.c. or 12v. d.c., microphone and cables, spare set valves and transistors, $350. H. G. Wilson, 31 Glenview St., Greenwich, N.S.W., 2065. Telephone 43-2427.

SELL: 400w. 3-band Linear, g.g. 811As, a.c. p.s.u., $65. 160 mx Transceiver, 150w. a.m., needs separate p.s.u., $25. Channel A FM Base Station, A.W.A. 40w., a.c. p.s.u., control unit, $45. MR10A, Channel A and B, complete mobile installation, $50. VK3AST, Phone 787-2318.

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VHF COMMUNICATIONS also features information regarding the development of electronic equipment, measuring methods, as well as technical reports covering new techniques, new components and new equipment for the Amateur.

VHF COMMUNICATIONS is a quarterly, published in February, May, August and November. Each edition contains roughly sixty pages of technical information and articles.

VHF COMMUNICATIONS' subscription rate (air mailed direct from the publisher) is $5.50 per year. Every copy is despatched in a sealed envelope to ensure that it arrives in perfect condition.

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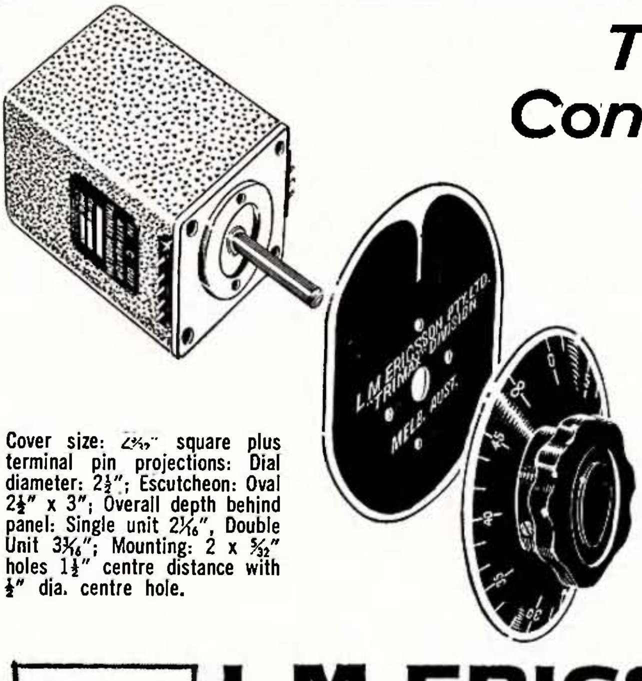

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PS 500 AC

TS 500

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20m Band	14.0-14.6 MHz	
15m Band	21.0-21.6 MHz	
10m A Band	28.0-28.6 MHz	
10m B Band	28.5-29.1 MHz	
10m C Band	29.1-29.7 MHz	

Communication Method: SSB (A3j) AM (A 3H) CW (A1)

Maximum Input Power: (Xmitter final stage) 200W (PEP)

Standard Input Power: (Xmitter final stage) 180W (PEP) 120W on 28 MHz band only

Antenna Input Impedance: 50-75 ohm

Carrier Suppression Ratio: More than 40 dB

Single Side Band Ratio: More than 40 dB

Mic. Input Impedance: High impedance (dynamic or crystal mic. recommended)

Xmitter Audio Frequency Characteristics: 300-3,000 Hz (-6 dB)

Receiver Sensitivity: 1μV S/N 10 dB (14 MHz)

Receiver Selectivity: 2.7 kHz (-6 dB) 5.0 kHz (-55 dB)

Spurious Rejection Ratio: More than 45 dB

Image Ratio: More than 60 dB

Undistorted Power Output: More than 1W

Receiver Output Impedance: SP 500 ohm PHONE 8 ohm

Power Consumption (using PS-500AC): 450W (At maximum power output) 250W (Receiving Mode)

Tubes and Transistors used: 17 TUBES, 3 TRANSISTORS, 15 DIODES

Dimensions: W: 13⅛"; H: 8⁹⁄₁₆"; D: 11¹³⁄₁₆"

Weight: 17.6 lb

FOR/FOA SYDNEY: TS 500, $491.00; PS 500 AC, $98.00

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- Separate VFO tuning for both receiver and transmitter.
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- Provision for crystal locking of the transmitter.
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- 17 tubes, 4 transistors and 7 diodes.
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455 Kc. centre frequency, 55 db. gain, uses two PNP transistors and diode detector. Bandwidth 5 Kc. at 6 db. DC requirements: 6 volts at 2 mA.

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plus postage 20 cents

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80 Metres to 10 Metres

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- Stability better than 100 cycles. "Vackar" type VFO. Voltage regulated power supply.
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- Fully adjustable VOX and ANTITRIP circuits for automatic transmission/reception.
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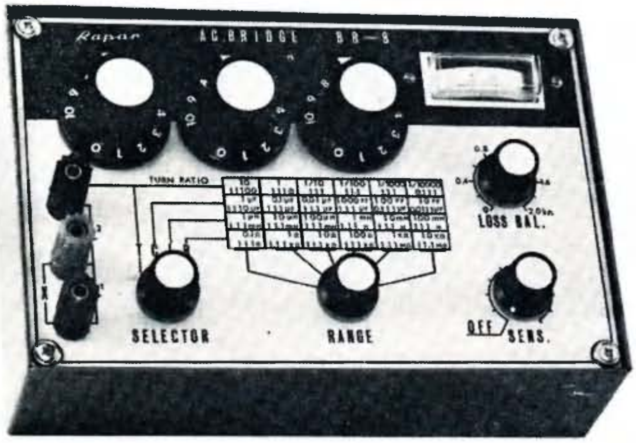

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Measures:

Resistance, Capacitance, Inductance and Transformer Turns Ratios

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SPECIFICATIONS:

Resistance: 0.1 ohm to 11.1 megohm in 5 ranges
Accuracy: 0.1 ohm to 10 ohm ±2% ±0.1 ohm
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Inductance: 1 uH. to 111 H. in five ranges
Accuracy: 1 uH. to 100 uH. ±5% ±1 uH.
1 mH. to 111 H. ±2%

Capacitance: 10 pF. to 1110 uF.
Accuracy: 10 pF. to 100 pF. ±2% ±10 pF.
111 pF. to 111 uF. ±1.5%
111 uF. to 1110 uF. ±5%

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Size: 7½" wide x 5" high x 3" deep.

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Vol. 37 No. 4

APRIL, 1969

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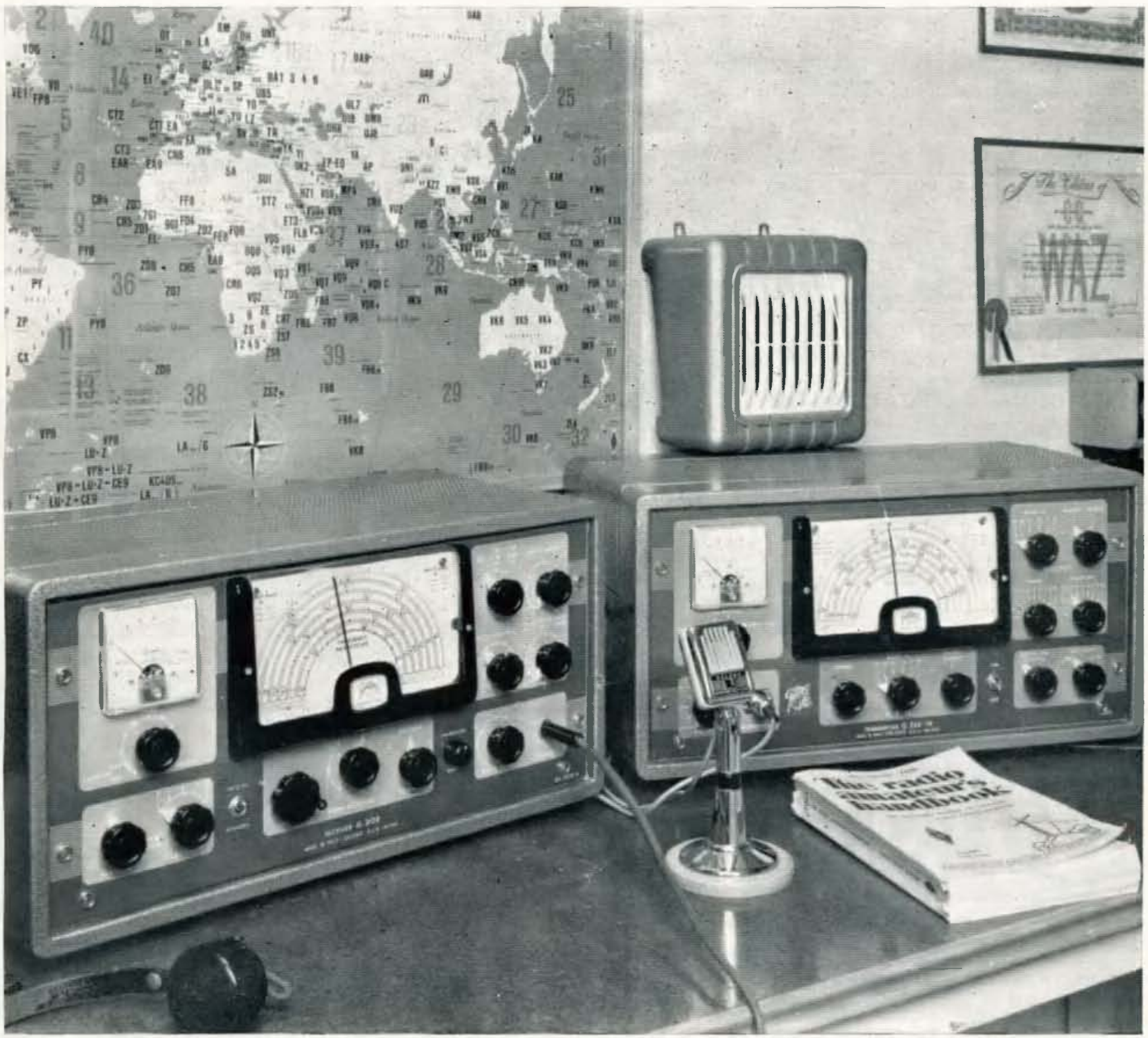

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0.01	uF.	160v.	12c	0.0018	uF.	600v.	18c
0.01	..	600v	25c	0.0022	..	400v.	12c
0.012	..	125v	13c	0.0022	..	600v.	18c
0.012	..	400v	12c	0.0027	..	400v.	17c
0.012	..	600v.	19c	0.0027	..	600v.	18c
0.015	..	125v.	13c	0.0033	..	400v.	12c
0.015	..	600v.	19c	0.0033	..	600v.	14c
0.018	..	600v.	22c	0.0039	..	400v.	12c
0.022	..	125v.	13c	0.0039	..	600v.	18c
0.022	..	400v.	14c	0.0047	..	400v.	15c
0.022	..	600v.	24c	0.0047	..	600v.	22c
0.027	..	160v.	14c	0.0056	..	400v.	15c
0.027	..	400v.	15c	0.0056	..	600v.	15c
0.027	..	600v.	22c	0.0068	..	400v.	15c
0.033	..	125v.	14c	0.0068	..	600v.	15c
0.033	..	400v.	15c	0.1	..	125v.	15c
0.033	..	600v.	22c	0.1	..	400v.	18c
0.039	..	125v.	14c	0.1	..	600v.	27c
0.039	..	400v.	14c	0.2	..	400v.	20c
0.039	..	600v.	28c	0.5	..	400v.	20c
0.047	..	125v.	14c	0.12	..	125v.	25c
0.047	..	400v.	14c	0.12	..	600v.	20c
0.047	..	600v.	14c	0.15	..	125v.	15c
0.056	..	125v.	14c	0.15	..	400v.	15c
0.056	..	400v.	14c	0.15	..	600v.	20c
0.056	..	600v.	18c	0.18	..	125v.	17c
0.068	..	125v.	13c	0.18	..	400v.	17c
0.066	..	400v.	14c	0.22	..	125v.	15c
0.068	..	600v.	18c	0.22	..	400v.	22c
0.082	..	125v.	20c	0.22	..	600v.	24c
0.082	..	400v.	22c	0.27	..	125v.	22c
0.082	..	600v.	28c	0.27	..	400v.	25c
0.001	..	125v.	15c	0.27	..	600v.	28c
0.001	..	400v.	15c	0.33	..	125v.	25c
0.001	..	600v.	18c	0.33	..	400v.	28c
0.001	..	5Kv.	45c	0.39	..	160v.	22c
0.001	Feed	Thru	29c	0.39	..	400v.	40c
0.0012	uF.	400v.	15c	0.47	..	125v.	28v
0.0012	..	600v.	15c	0.47	..	400v.	35c
0.0015	..	200v.	15c	0.47	..	600v.	40c
0.0015	..	600v.	15c	0.68	..	125v.	35c

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.. .. 262—	6	..	12 ..	53c
.. .. 270—	9	..	6 ..	40c
.. .. 272—	9	..	12 ..	70c
.. .. 287—	12	..	6 ..	53c
.. .. 288—	12	..	9 ..	78c

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15 watts. Primary: 10,000/8,000 ohms push pull. Secondary: 2, 4, 8, 15 ohms. Price $5.50.
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MULTIMETER, Model OL-64

20,000 ohms per volt d.c., 8,000 ohms per volt a.c.

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D.C. volts: 0-0.3, 1, 10, 50, 250, 500, 1,000, 5,000.
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D.C. current: 0-30 uA.; 1, 50, 500 mA.; 10 A.
Resistance: 0-5, 500K ohms; 5, 50 megohms.
Decibels: Minus 20 to plus 22 db., plus 20 to plus 36 db.
Capacitance: 250 pF. to 0.02 uF.
Inductance: 0-5000 H.
Load current: 0-0.06, 0.6, 60 mA.
Self contained batteries: 22.5v. (BL-015) x 1, 1.5v. (UM3) x 2.
Size and weight: 6 x 4-1/5 x 2 in. 650 g.
Meter movement fund. sensitivity: 30 uA., F.S.D.

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2¼ inch diam., 8 ohms	$1.75
2¾ inch diam., 8 ohms	$2.00
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amateur radio

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APRIL 1969
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General:—

Contests:—

COVER STORY

Shown on our front cover this month is the "ham shack" laboratory of Geloso, Milan, Italy. This equipment was operated by John Geloso (died 1st Feb., 1969), who will be remembered by many operators throughout the world as one of the early members of the Italian Radio Society. Depicted left to right: The Geloso G209 receiver and the G222 a.m. transmitter.

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A selected range of products useful for Amateur application

Prices include Sales Tax but are subject to change without notice

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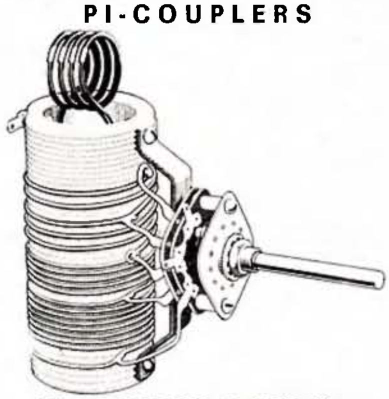
Type RB Electrolytics are particularly suited to printed circuit wiring. Pig tails are brought out at one end for vertical mounting. Low leakage, extended shelf life, compact and robust, high ripple rating, low cost.

Capacity	Wkg. Volts	Surge Volts	Ripple Current	Price (inc. S. Tax)
0.5 uF.	25	30	10 mA.	19 Cents
2 ..	12	14	10 ..	19 ..
2 ..	25	30	10 ..	20 ..
5 ..	10	12	10 ..	19 ..
5 ..	12	14	20 ..	19 ..
5 ..	25	30	25 ..	20 ..
10 ..	10	12	10 ..	19 ..
10 ..	12	14	25 ..	19 ..
10 ..	25	30	40 ..	24 ..
25 ..	25	30	130 ..	24 ..
25 ..	50	55	150 ..	26 ..
30 ..	10	12	50 ..	20 ..
30 ..	12	14	100 ..	20 ..
50 ..	10	12	60 ..	24 ..
50 ..	12	14	200 ..	24 ..
50 ..	25	30	250 ..	26 ..
100 ..	10	12	200 ..	24 ..
100 ..	12	14	300 ..	24 ..
100 ..	25	30	350 ..	31 ..
250 ..	12	14	400 ..	28 ..

Normal range of Power Supply Filter Condensers available in values of 8, 16, 24, 32, 50, 100 and 200 uF. at working voltages of 350/500 v.

PI-COUPLERS



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Geloso Pi-Coupler Type 4/111 for use with parallel 807s, 6146s, etc. 75 watts. $3.94.

Geloso Pi-Coupler Type 4/112 for use with single-ended 807, 6146, etc. 75 watts. $3.94.

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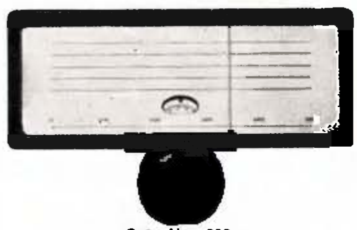
LOW PASS FILTERS

A "Cabena" Low Pass Filter will fix t.v.i. Cut-off frequency, 30 Mc., attenuation at 60 Mc. better than 30 db.; insertion loss, negligible. Impedance 50-72 ohms.

Price $11.50

EDDYSTONE INSTRUMENT DIALS



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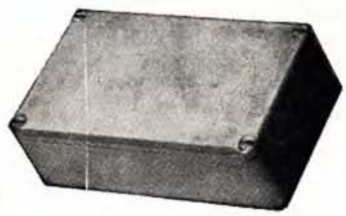

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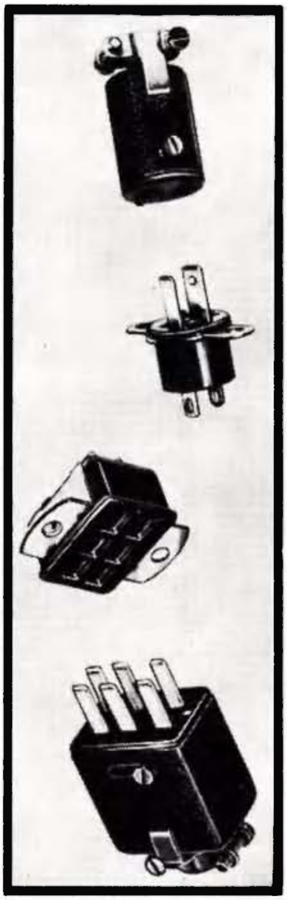

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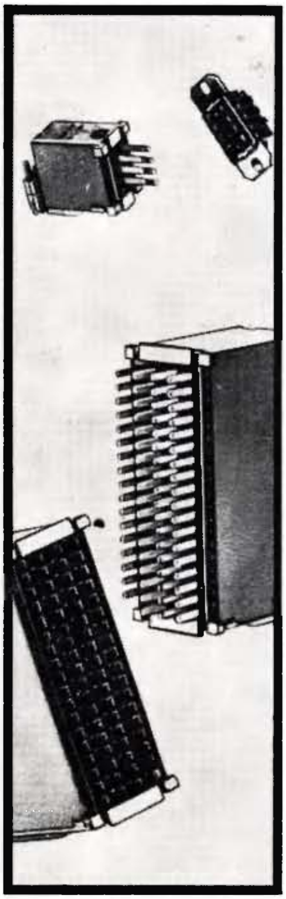

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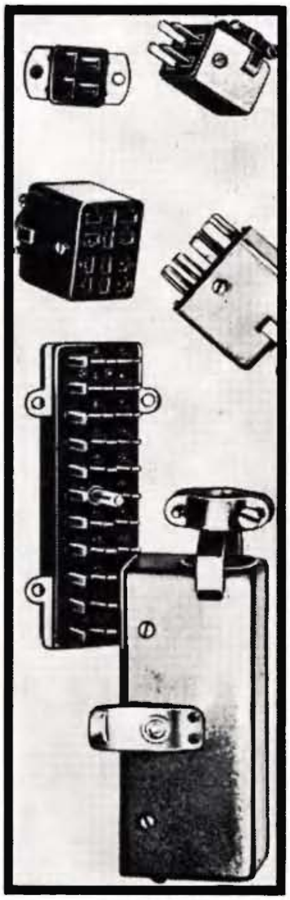

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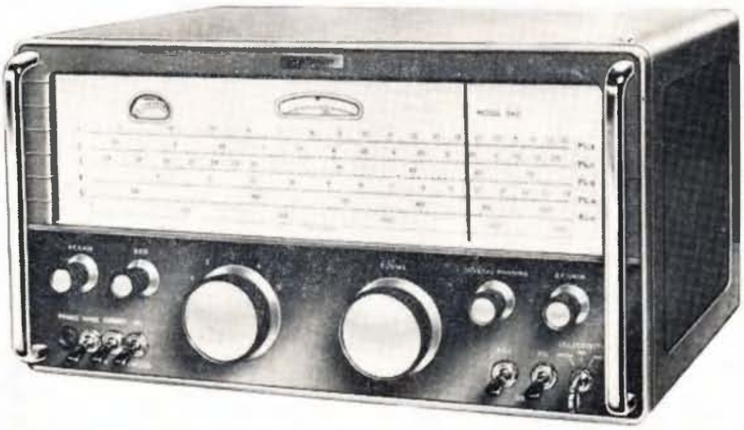

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Listed below are the highest twelve members in each section. Position in the list is determined by the first number shown. The first number represents the participant's total countries less any credits given for deleted countries. The second number shown represents the total D.X.C.C. credits given, including deleted countries. Where totals are the same, listings will be alphabetical by call sign.

Credits for new members and those whose totals have been amended are also shown.

PHONE

VK5MS	317/340	VK5AB	298/314
VK3AHO	312/326	VK4FJ	285/304
VK6RU	308/333	VK4KS	277/292
VK4HR	306/324	VK4TY	275/278
VK2JZ	304/321	VK2APK	272/277
VK6MK	304/323	VK3TL	271/277

Erratum Feb.: Cert. No. 93 shown as VK4XY should read:
Cert. No. 93 VK4XJ 115/119.

New Members:

Cert. No. 94—VK4RF 112/112
Cert. No. 95—VK3ALM 106/106

Amendments:

VK3ZE	210/213	VK5BB	151/154
VK4PX	192/193	VK3TG	147/151
VK3VK	171/171	VK4UC	124/124

C.W.

VK2QL	300/322	VK3YL	267/284
VK3AHQ	292/306	VK2APK	266/274
VK4FJ	290/314	VK3ARX	266/275
VK3CX	289/312	VK6RU	266/289
VK2AGH	282/296	VK3NC	264/277
VK4HR	277/300	VK3XB	264/278

Amendments:

VK3RJ	243/257	VK2QK	146/146
VK3KS	219/226	VK4RF	121/133

OPEN

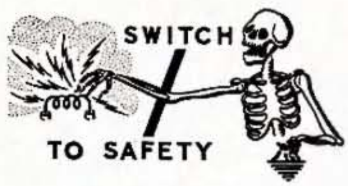
VK2AGH	311/331	VK4TY	301/315
VK4HR	310/334	VK4FJ	298/322
VK6RU	310/335	VK2APK	289/299
VK6MK	305/324	VK3ARX	289/298
VK2VN	304/321	VK3TL	287/293
VK2EO	302/325	VK3XB	286/274

New Members:

Cert. No. 116—VK2AND 102/102
Cert. No. 117—VK4RF 167/179

Amendments:

VK4KS	279/298	VK4PX	212/217
VK4UC	218/219		



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FEDERAL COMMENT

PIRATES

The excellent editorial reproduced below needs no explanation. In passing, it is worth noting that Departmental enquiries were not limited to New South Wales but also took place in Victoria with, it is believed, satisfactory results.

We are grateful to Don Miller, VK2GN, President of the N.S.W. Division, for permission to publish his article which originally appeared in the monthly Bulletin of the N.S.W. Division.

"Some recent activities in Sydney by the P.M.G. Department and the Police Department, and the resultant publicity in news media with references to Radio Amateurs, caused quite a number of members to contact the Institute. These members wanted Council to take some action to counter this adverse publicity. Unfortunately, the press applies the term Radio Amateur loosely to any radio hobbyist, be he licensed or otherwise, and this made any immediate action difficult. However, this is under scrutiny at the moment and some worthwhile line of approach is being sought.

"As licensed Radio Amateurs, we can be concerned only with what goes on within our authorised bands. The question is—is our own house clean? I am afraid too many of us are overly tolerant of known and, in some cases, self-confessed 'pirate' operators in the Amateur bands, instead of actively discouraging this type of activity. How many of them would continue operation if we all ignored transmissions from any such stations and passed the word around the bands that VK2XYZ is an illegal operator? This appears to me to be the most effective method of discouragement—combined with a few calm words of advice when one finds oneself in QSO with a 'pirate'.

"Both h.f. and v.h.f. bands seem to becoming equally popular with such operators, and recently I had the pleasure of hearing a relatively new licensee 'read the riot act' in a calm and impersonal manner to a self-confessed pirate with a self-allocated, somewhat indelicate, call sign, who was heard to state that he saw no reason to bother with exams., etc., when he already had his shack papered with QSLs from all over the world.

"Do YOU remember how much effort you expended before that long-awaited Amateur Operator's Certificate of Proficiency arrived in the mail?

"Do you value your hard-earned privileges so lightly that you are prepared to share them with others too indolent to make a similar effort?

"Over to you, gentlemen."

—Don Miller, VK2GN.

PROJECT—SOLID STATE TRANSCEIVER

PART SIX

H. L. HEPBURN, VK3AFQ, and K. C. NISBET,† VK3AKK*

Only one module will be described in this article—the transmitter mixer. Fig. 17 gives the circuit diagram, from which it can be seen that the module consists of a Motorola 1550G integrated circuit used as a mixer and a 2N3564 emitter follower.

Input from the heterodyne oscillator chain is gated by D25 to L25, which is a link winding on the cold end of the tuned circuit L26/C1. Reference to the receiver front-end diagram will show that the same input is made to all the receiver mixers in parallel with no gating used. The need to add a gate to the transmit mixer arises from the method of coupling used. Whereas the various receive mixers are capacitively coupled to the hetrodyning source, the transmit mixers are inductively coupled and, if not isolated in some way, the input to the "active" module would be effectively short circuited by the link couplings of all other "inactive" modules.

When h.t. is applied to the "active" module via the bandswitch, D25 is switched into the conducting state via the 47 ohm/0.1/1K network. L26/C1 is broadly resonant around the injection frequency. Input to the 1550G is across pins 1 and 4 with pin 4 kept at r.f. earth potential by the 0.1 capacitor.

The 9 Mc. s.s.b. output from the tx filter amplifier (Fig. 11, Feb. 1969 "A.R.") is applied to pin 10 of the I.C. via the 1-2K potentiometer and an 0.047 uF. capacitor.

The potentiometer acts as a drive control and is front panel mounted. Since pin 10 of the 1550G is at a relatively high impedance, it is possible to use paralleled capacitive coupling to other mixers and obviate yet another switch bank.

Output at signal frequency from the 1550G is from pins 6 and 9 with pin 9 kept at r.f. earth potential by the 0.1 uF. capacitor and receiving h.t. feed via the 100 ohm decoupling resistor.

L27/C2 and L28/C3/C4 are resonant at the signal frequency and serve to remove all but the required mixing product from the output. L27 and L28 are inductively coupled.

C3 and C4 form a capacitive divider across L28 to give the necessary low impedance input to the 2N3564 emitter follower stage.

Output from the emitter follower is taken via the 0.047 uF. capacitor to the p.a. board to be described later.

Coil winding data is given in Table 1.

As in the case of the receiver front-ends, there is one complete "train" for each band. Each p.c.b. contains two signal "trains". Thus two p.c.b's are needed to cover four bands, three p.c.b's for six bands and four p.c.b's for eight bands.

* 4 Elizabeth Street, East Brighton, Vic., 3187.
† 25 Thames Avenue, Springvale, Vic., 3171.

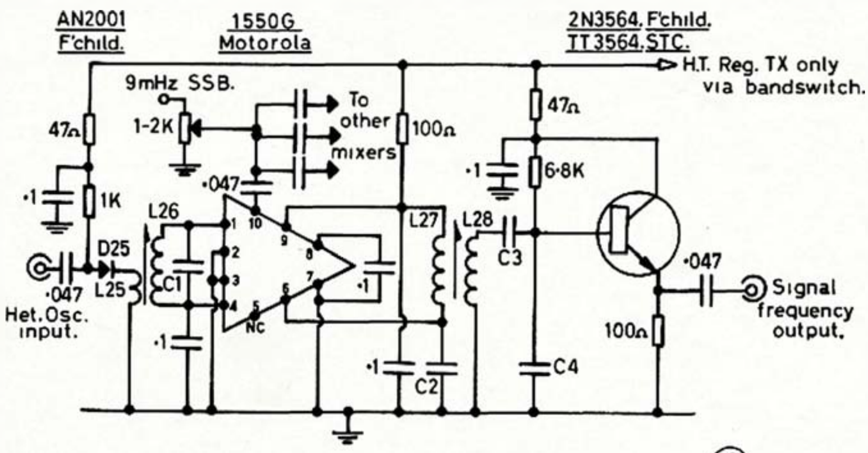

FIG. 17. 4 BAND TRANSISTOR TRANSCEIVER-TX MIXER.

Band	L25 Link	L26	L27	L28	C1 pF.	C2 pF.	C3 pF.	C4 pF.
160	6 turns	38 turns	80 turns	80 turns	33	470	470	4700
	33 B.S.	33 B.S.	39 B.S.	39 B.S.				
80	5 turns	30 turns	55 turns	55 turns	33	330	330	1500
	33 B.S.	33 B.S.	33 B.S.	33 B.S.				
40	4 turns	25 turns	38 turns	38 turns	22	100	150	1000
	33 B.S.	33 B.S.	33 B.S.	33 B.S.				
20	5 turns	34 turns	28 turns	28 turns	220	47	68	560
	33 B.S.	33 B.S.	26 B.S.	26 B.S.				
15	5 turns	30 turns	25 turns	25 turns	47	33	33	330
	33 B.S.	33 B.S.	26 B.S.	26 B.S.				
10	4 turns	20 turns	15 turns	15 turns	22	33	47	220
	33 B.S.	33 B.S.	26 B.S.	26 B.S.				

Table 1.—Coil Winding Data—Transmitter Mixers.

Note.—All coils wound on Neosid 722/1 bakelite coil formers; all use F29 slugs.

AVAILABILITY

Full kits are available on application to 4 Elizabeth St., East Brighton, Vic., 3187. Prices are as follows:

(a) Single-band kit	....	$10.40
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(c) Three-band kit	....	$22.90
(d) Four-band kit	....	$28.90
(e) P.c.b. only	.... each	$2.00
(d) Instructions	.. .... per set	$1.00

— • • • —

ADDITIONAL TIME SIGNAL FROM VNG, LYNDHURST

On Monday, 3rd February, 1969, at 0600 E.A.S.T. an additional time signal broadcast commenced from station VNG, Lyndhurst, Vic.

The broadcast will be of an experimental nature on 20.5 Mc., using the time signals and voice announcements of the normal VNG service. The emission will be single sideband, reduced carrier, with the time signal appearing 1 Kc. higher than the assigned frequency. Time of emission will be 0600 to 2000 E.A.S.T. daily (i.e. 2000 to 1000 U.T. or G.M.T. daily).

With the commencement of this additional broadcast, the full schedule for time signal transmissions from VNG, Lyndhurst, Vic., will become:

Time of Emission U.T.	Frequency Kc.	Type of Emission
*0945-2045	4500, 7500	DSB
*2100-0930	7500, 12000	DSB
2000-1000	20500, 25500	SSB

* Times of resumption of emission following the break for frequency change are approximate.

—P. R. Brett,
Senior Assistant Director-General
(P.M.G. Research Laboratories)

NEW IDEAS ON AMATEUR TELEVISION

PART ONE—INTRODUCTION

GRAHAME WILSON, VK2ZGW/T*

IT is ten years since the last series of articles on Amateur Television has appeared in the pages of "Amateur Radio". For some time now it has been quite evident that there is a great deal of interest in Amateur Television, but very little know-how as literature on the subject is rather rare or not suitable for Amateur requirements. The purpose of this series of articles is to introduce the Amateur (yourself) to Amateur Television and to let you know what it is all about.

Amateur Television, today, is not as complex as many Amateurs imagine. The day has passed when Amateur Television was restricted to the broadcast engineers and their complex equipment, now almost any enthusiastic Amateur can build a television camera with very little cost. Indeed, a simple camera including the hard-to-get items such as the vidicon and yoke can be built for less than $50 and can actually be simpler than a s.s.b. transmitter. Not many s.s.b. stations, with their complex and expensive transceivers, can brag of a cheaper set-up.

Ten years ago it would have been quite impractical for the average Amateur to attempt the construction of a television camera because of complexity, cost and availability of parts. Since then, circuits have become much simpler requiring only about six valves or the equivalent number of transistors.

The hard-to-get items are now easily obtained through various channels at quite reasonable prices. An illustration of the simplicity of ATV (Amateur TV) is that high school students in the U.S. are building cameras for science projects!

Surely then Amateurs should have little trouble starting in ATV.

With little doubt ATV has more unexplored facets of electronics than any other branch of Amateur Radio, but many Amateurs have little or no desire to start in ATV or, for that matter, any experimental electronics since the advent of the commercial transceiver. It is, in my opinion, very important that Amateurs keep up the experimental nature of their hobby. Today Amateurs must diversify their interests in the light of the enormous technological developments that have taken place in electronics over the last few years. In the early days of radio, electronics was radio, today radio is only a very small part of electronics, because of this Amateurs must look to other fields in electronics to keep abreast of the times. The Radio Amateur should concern himself more with amateur electronics; television provides an ample opportunity to do this. Television has been often called "that epitome of electronics" because of its very diverse nature, covering everything from d.c. to microwaves and pulse circuits to the photo-electric phenomena, the field of experimentation is enormous. There is something of interest in television for every Amateur.

Moving from the field of radio into the field of television, one experiences a completely different outlook on electronics. In radio we consider "systems" such as a communications receiver on the basis of "sine-wave thinking", that is to say we design the system to accept and "process" sine waves according to what we want to do. In television, we do exactly the opposite, we **must** think in pulses **not** in sine waves as we have been accustomed.

At first this is a little difficult, but one soon becomes used to it and after a short while you think nothing of it as it becomes the normal thing to do. When you get to this stage you find that those nasty circuits, that you once thought only engineers played with, now make sense. You can't believe the excitement that you can get out of experimenting with multivibrators, bistables and the like until you have tried it!

The usual reaction is that you ask yourself why you didn't start experimenting in this field years ago.

Yes, it is a really fascinating field, the main thing is not to lose heart along the way, you'll get the hang of it finally.

ACTIVE GROUPS

A question I am often asked, "What does ATV involve, what sort of performance can one expect?" In Australia at the moment there are about 280 Amateurs licensed to transmit television and about a dozen do, occasionally! About five times this number could go on the air within a short space of time if they wanted to. As far as I know, there are only two groups of ATVers in Australia, one in Adelaide and one here in Sydney.

The group in Adelaide has been going for some time now and they have had a reasonable amount of success from transmitting pictures over quite long distances (about 90 miles) to demonstrating colour television at the Adelaide Show.

The group here in Sydney is smaller and has been going only about six months. It has about eight members, two of whom are on the air with the possibility of about three more or so in a couple of months. The two Amateurs on the air at the moment are Vic Barker, VK2ZVV/T, who has two cameras, one home-made and the other an E.M.I. industrial camera; he also has a colour television (home-brew) and a colour sync. pulse generator (P.A.L.). The other is Barry Gerdes, VK2ZAH/T, who also has two cameras, an E.M.I. and a Philips.

Both stations are having slight problems with their transmitters, but by the time this article goes to press all the bugs, we hope, will be ironed out. At the moment both stations can be picked up over a distance of about five to seven miles.

The actual performance Amateurs can expect from Amateur Television depends on the amount of work they are prepared to put into it. Most Amateurs will have little trouble in obtaining industrial quality of about 350 lines and about 30 db. signal to noise ratio. On the other hand, Amateurs who are prepared to do a little extra work should not have much trouble in obtaining broadcast quality although transmission of the picture will degrade the performance a little.

The distances Amateurs can expect to work will vary a great deal, depending on transmission power, location and the like, there should be little difficulty working twenty miles under reasonable conditions. On 432 Mc., British Amateurs have worked about 216 miles for a good picture. Here in Australia, the maximum distance covered is just under one hundred miles.

GETTING STARTED

I think that is about enough general information—at least for the moment—and should give you some idea of what ATV is all about. I would now like to give you some idea of how you can actually get started.

Of course the first thing is, obviously, to get yourself some television "hardware"—things like vidicons, scanning coils, photo-multipliers and the like. As I said earlier, this is not as difficult and as worrying as it may first seem as there are several different sources from which they may be obtained. Firstly, they may be bought new from the manufacturer, secondly they may be obtained in a used condition as industrial throw-outs from TV stations, etc., and thirdly they may be bought new from the British Amateur Television Club (B.A.T.C.)

Vidicons obtained from the manufacturers come in several different varieties:—

(1) Broadcast quality, costing between $100 to $300.
(2) Industrial quality, costing between $50 to $150.
(3) Rejects and seconds, costing between $20 to $40.

As one can see, the rejects and seconds will be the most obvious choice for most Amateurs. These are quite satisfactory for Amateur use as they usually have only minor blemishes on the target which are not very noticeable under normal operating conditions. As far as I know, the only company who deals in reject vidicons is E.M.I., if there are others, please let me know and I will pass the information on in further notes. I think also E.M.I. might supply an industrial vidicon yoke, but it would probably be a little costly.

While television stations go through reasonable numbers of vidicons, they are usually difficult to obtain from this source for two reasons, one being that TV station technicians collect and hoard them with little intention of use, and the other being that they are smashed

* 31 Ada Street, Katoomba, N.S.W., 2780.

(the old tubes) by customs so that no duty has to be paid on the new tube. One can come away from this site almost crying. Unfortunately the people responsible do not realise that it will cost everyone more in the long run.

If you know anyone who has a few vidicons and who is not using them, try and persuade him to sell them at a reasonable price.

Probably the best method to obtain a vidicon or other ATV gear is to become a member of the British Amateur Television Club (B.A.T.C.). This club was formed in 1949 to inform and co-ordinate the activities of Amateur Television enthusiasts and is the leading ATV organisation with almost one thousand members all over the world.

B.A.T.C., like all other Radio Amateur organisations, offers publications and services to its members, the most important being its sale of vidicons and yokes, its technical query service, and its quarterly twelve-page publication, "CQTV". If you would like to become a member of B.A.T.C. you can write to the Honorary Treasurer at the following address:

Mr. M. J. Sparrow, Hon. Treasurer,
British Amateur Television Club,
White Orchard,
64 Showell Lane, Penn,
Wolverhampton, Staffs,
England,

enclosing 10/- sterling, which is the annual fee. This is very reasonable considering the benefits you get.

Any correspondence sent to B.A.T.C. is promptly dealt with and you can be assured of a reply almost immediately. The club itself is affiliated with the R.S.G.B. but runs as an independent organisation. This enables it to function in a more versatile manner in its own field of interest.

The items B.A.T.C. has for sale to members are vidicons, yokes, "C" mount lens flanges, vidicon bases and film strips of back editions of "CQTV". The vidicons are E.M.I. **separate** mesh (I will explain the importance of this in later articles) seconds, the yokes are also E.M.I. and were especially made for the club and are designed to be used with transistor circuitry. The film strips are of ten back editions of "CQTV" (about 120 pages), each page is photographed and takes up one frame of 35 mm. positive film. The prices of the items available are as follows:—

E.M.I. vidicons, **separate** mesh, second grade, one inch, £10.

Yokes (field, line and focus coils) for transistor circuits, £6/15/0.

Vidicon bases, 5/-.

"C" mount lens flanges, 8/6.

Film strips of 10 editions of "CQ TV", 15/6.

Note all these prices are **sterling**, you can arrange to send the correct money at your local post office in the form of a standard money order. Please **do not** forget to include postage, the yoke weighs about two pounds and costs about 8/6 stg. to send out here.

If you are thinking of taking ATV up, I seriously suggest you join B.A.T.C.

(To be continued)

THE FERRITE BALUN*

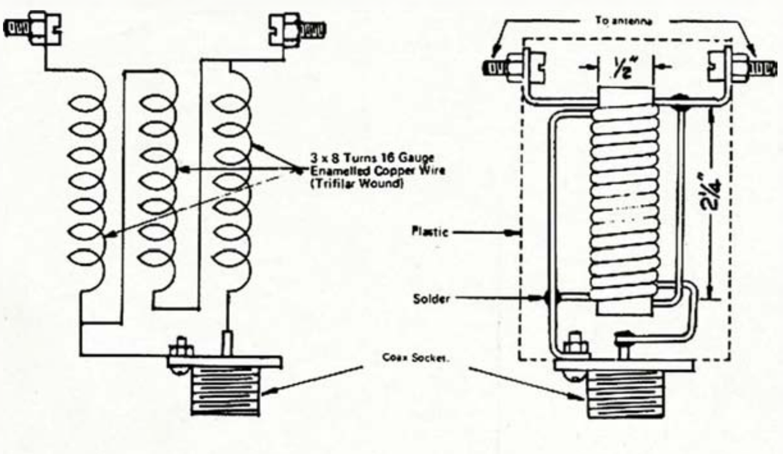
Its Uses and How to Make Your Own

JOHN HUGO, ZS1SC

This is a popular device in use today by many Amateurs. If you look at any of the recent Amateur magazines from the U.S.A. ("CQ," "QST," "73," etc.) you will see several makes of Ferrite Baluns being advertised.

Why a Balun? For what purpose? The one which we will refer to here is the 1:1 variety, which basically is a matching device which is used to efficiently feed a balanced and symmetrical antenna system of 72 or 50 ohm characteristic impedance with an unbalanced co-ax feedline of corresponding characteristic impedance.

Yes, unbalanced to balanced feed or vice-versa, that is what it does. You might say, "We've been feeding dipoles with co-ax. for years and they work fine." So they do, but they work better with this gadget!



EXPANDED VIEW — ASSEMBLED VIEW

Why? Because:

(a) Feedline radiation is eliminated.
(b) The radiation pattern (directivity) is improved.

Obviously (a) has many advantages —less power wasted and more power radiated from the antenna, less chance of b.c.i., better s.w.r. and so on.

With unbalanced feed to a dipole or driven element of a quad or yagi radiation is also inclined to be lopsided and so the pattern is upset, causing a loss in ultimate front to back ratio and of course forward gain. Many worthwhile advantages—not so?

The best news, however, is the ridiculous simplicity with which you can "roll your own" Ferrite Baluns. All you need for a 3 to 30 Mc., wide-band 1:1 balun capable of easily handling a kilowatt with completely negligible insertion loss is the following:

(1) A few feet of 16 gauge enamelled wire.
(2) Three feet of Ferrite Rod (up to 30 Mc. varieties).
(3) A co-ax. connector socket.
(4) A couple of solid nuts, bolts and washers.
(5) A plastic tumbler—Tupperware box, or other insulating protective cover.

The accompanying figure shows the construction—the coils (each 8 turns) are trifilar wound on the ferrite rod and the ends are connected as shown. The whole thing then is encased in the plastic box to make it weather proof—with the co-ax. connector plug at the bottom and the bolts opposite one another at the top, which, incidentally, go to the driven element on your beam, quad or dipole (with the shortest connecting leads possible!).

These jobs should be particularly suitable in a co-ax. fed inverted vee or multiband trap dipole. They are so cheap and easy to make that they could also in fact be ideally used on each in the separate driven elements of a triband quad and should materially improve the directional properties of antenna. Why not try it?

— . . . —

* Reprinted from "Radio ZS," July 1968.

CONTEST CALENDAR

Until 13th April: I.A.R.C. Phone Contest.
5th/6th April: Polish DX C.w. Contest.
12th/13th April: "CQ" W.W. WPX S.s.b. Contest.
19th/20th April: Helvetia 22 Contest.
26th/27th April: P.A.C.C. C.w./Phone Contest.
16th/17th August: Remembrance Day Contest.
4th/5th October: VK-ZL-Oceania DX Contest 1969—Phone Section.
11th/12th October: VK-ZL-Oceania DX Contest 1969—C.w. Section.
25th/26th October: "CQ" W.W. DX Contest—Phone Section.
29th/30th October: "CQ" W.W. DX Contest—C.w. Section.
6th Dec. 1969 to 11th Jan. 1970: Ross A. Hull Memorial Contest.
1st/2nd Feb. 1970: John Moyle National Field Day.

THE WORLD WITH A TRIANGLE

PART TWO

WAL SALMON, VK2SA*

WHEN Part One of this article was written, reference "Amateur Radio," October 1968, I had no idea that anything further would germinate from the triangular antenna configuration. However, on listening to recent reports on the air of failures in beam turning mechanism and two reports of Quads being lost in recent heavy winds, I was prompted to give some thought to the development of a fixed wire Quad to radiate in either of two directions, and the direction control to be located in the radio shack and the construction to be such as to entirely eliminate the use of spiders, booms or floppy fibre glass or Rangoon cane.

Reference might now be made (Fig. 1) to the triangular formation associated with the three masts at VK2SA and it will be seen that not one Quad, but two Quads can be accommodated, in addition to a 40 metre antenna, and if some electrical means could be devised to control the directivity of the two Quads, a fixed beam transmitting system capable of transmitting in four directions would be possible.

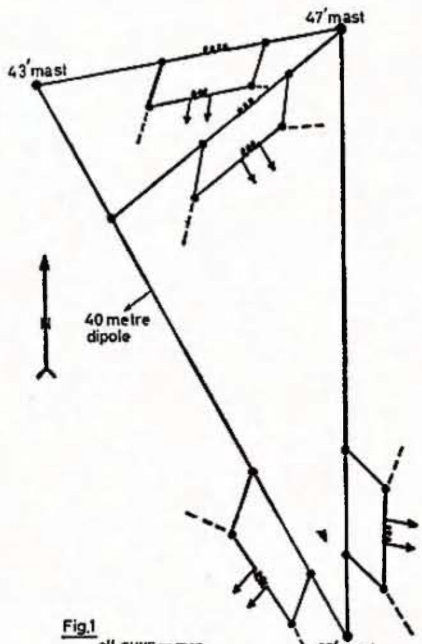


Fig.1

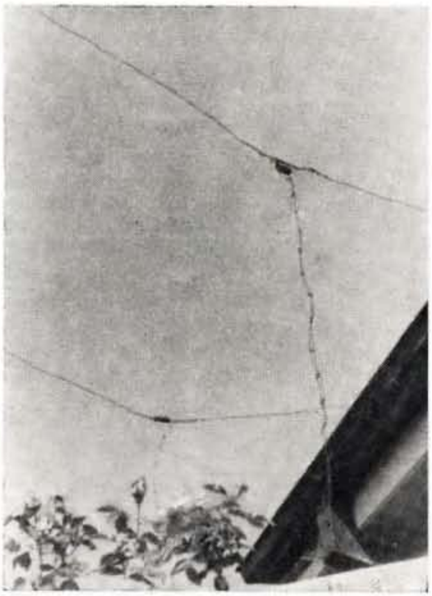
In addition the system would eliminate the use of beam turning motors and the absence of cane or fibre glass supports would provide a greater degree of safety in heavy winds.

Finally, the all-wire construction would allow the Quads to be hoisted or lowered to the ground by one person in a matter of minutes.

All these advantages have been achieved at VK2SA, and now for some practical data on the construction of the monsters.

* 77 Flora Street, Kirrawee, N.S.W., 2232.

Reference was made to various sources of information on Quads and it was apparent that there was conflicting evidence on the formula for wire lengths, also that a Quad could not be dipped with a grid dip oscillator. Feed systems were also considered and co-axial cable was ruled out as I had a heap of 300 ohm t.v. open-wire line to play with. In regard to the method of feeding the Quad, it was considered that the method of tapping across a loading coil with the 300 ohm line would be satisfactory and efficient.



Bottom elements of Quad at VK2SA. Note feed system across coil.

Tests were made with a constructed loop and a number of loading coils, and a coil of 10 turns on 1¼ inches diameter plastic tube was finally chosen. Reference might now be made to Figs. 2 and 3, giving full dimensions of the Quads which all dipped to 14 Mc.

The East/West Quad was erected on 2nd September 1968 and 300 ohm t.v. line was connected across the loading coils and both feeders terminated in the shack. The physical direction of the loops allow a radio directivity of either East or West and with the feeders terminated either into a "Z" match coupler or "Reflector Tuner" (coil and condenser) the direction of transmission can be aimed either East or West.

The system worked from the start. If it is desired to work in an **Easterly** direction, the **East** loop is connected to the transmitter "Z" coupler and the **West** loop is connected to the **Reflector Tuner**. Both the "Z" coupler and the **Reflector Tuner** are manipulated till the greatest amount of radio frequency energy is indicated in the **Reflector Tuner** by r.f. ammeter and pea lamp soup loop. This is a positive system and **virtually eliminates the use of the standing wave ratiometer.**

The front to back ratio of the Quad can be positively checked by firing up the antenna to receive in a westerly direction when the band is open to the **East.** Choose a good c.w. signal coming from **East,** then take a note of the "S" meter reading and then tune the **Reflector for minimum signal.** I have varied an S8 signal from the States to S4 with the Reflector Tuner. With the minimum signal you have the best possible front-to-back ratio obtainable with the antenna. After the above exercise you reverse the antenna to fire East and you are in business for American contacts.

The capabilities of the antenna were so good for DX contacts as to warrant consideration to the construction of a second Quad for North/South directivity and to add a little variation to the mythical dimensions laid down for Quads by the experts, a loop of 15 feet per side (Fig. 3) with coil 10 turns 1¼ inches diameter in the top horizontal section and a similar coil in the bottom section. This loop dipped at 14 Mc. An identical loop for reflector was also constructed and the antenna was hoisted at the bottom of the garden in such a direction to give North/South directivity.

To feed these two loops, it was necessary to run two feed lines consisting of 300 ohm t.v. open wire line a distance

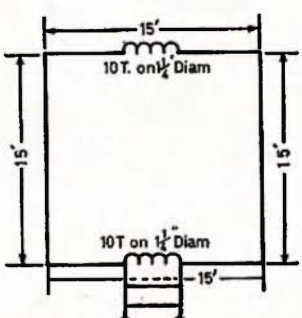


Fig.2 N/S Quad reflector same dimensions

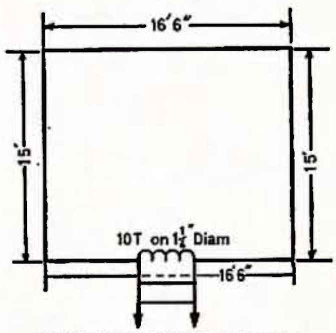


Fig.3 E/W Quad reflector same dimensions

of 84 feet from the shack to the antenna. This antenna was placed in operation on 24th September 1968, the first contact being my old friend, Bill VR2EK in Fiji at S8, followed by 9M2NF at S9 plus.

The critics might say that the loop planes are not parallel, but from the results obtained, it does not seem to matter greatly. The height of the top wires of all loops is about 35 feet.

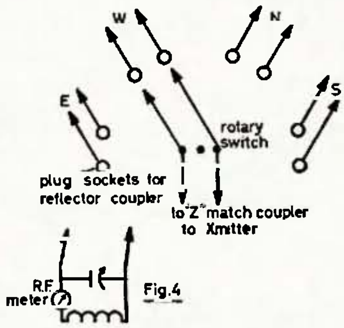
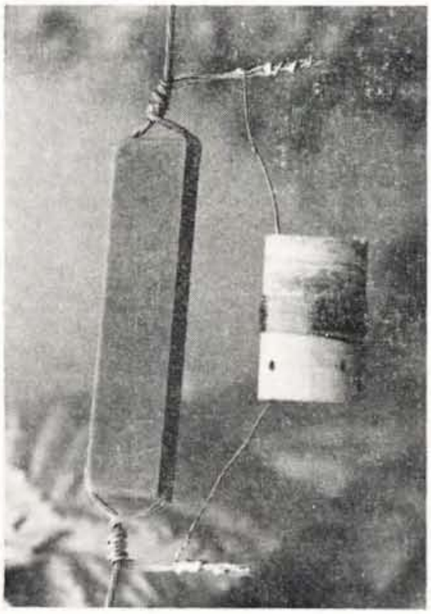


Fig.4

To switch in any one loop to the transmitter "Z" match, a four-position disposals 2-pole switch is used, labelled East - West - North - South (see Fig. 4) and assuming the South antenna is switched in, the Reflector Tuner is plugged into the North antenna feed line, thus giving South directivity.



Quad Coils. 10 turns on 1¼ inch diam.

Some observations might now be made on the loop loading coils (see photograph) and it will be noticed that the coil is soldered across an insulator, rather than being directly placed in the loop circuit. This is to eliminate any antenna strain on the coil former and for convenience in changing coils to permit variation of the resonance point as indicated on the g.d.o.

(Continued foot of next columns)

We now have four directions at the flick of a switch at VK2SA, and as for results, I submit the following statistics. Since 2nd September 1968 to 10th October 1968, a total of 438 overseas DX contacts have been made and of these 234 gave me from signal strength 7 to signal strength 9. Of the total contacts, about 50% were on c.w.

There is a first in everything and I close with the observation that I may be the only Ham in the world with two separate Quads in the backyard.

A MODIFICATION TO THE TRIO 9R59De RECEIVER

D. M. ROSENFIELD, VK3ZOP*

Having recently sold my only general coverage receiver, I proceeded to see what was available. The receiver I required was to be used basically as a tunable i.f. for my 6 and 2 metre converters, but had to have a few extras:

1. It should have a reasonable performance on 80-10 metres.
2. Oscillator and b.f.o. to be regulated.
3. Inclusion of a product detector.
4. Preferably to have a filter in the i.f., and last but not least,
5. Should be reasonably priced.

After considering what was available, I decided on the Trio 9R59De, which seems to fill my requirements except for one small fault.

Switching to the s.s.b.-c.w. position and setting the r.f. gain at maximum, it pulled the oscillator off frequency. Although s.s.b. is usually not received with the r.f. gain wound up, with the receiver in its original condition the r.f. gain control had to be turned back nearly half way to enable stable s.s.b.-c.w. reception, consequently weaker signals could not be heard.

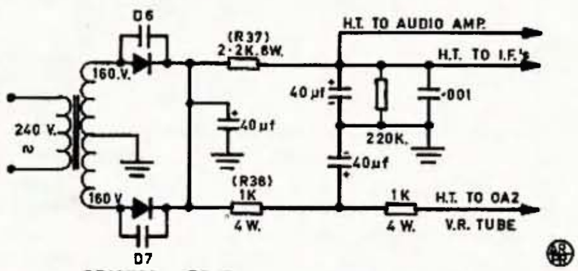
* 11a Marara Rd., South Caulfield, Vic., 3162.

Having removed the bottom cover on the receiver, I measured the h.t. voltage and wound up the r.f. gain at the same time and noticed a drop in h.t. by nearly 50 volts. This was enough to pull the oscillator and b.f.o. off frequency, so I removed the 2.2K 8w. filter resistor and substituted it with a small filter choke, re-arranged the filter condensers and needless to say practically cured the fault.

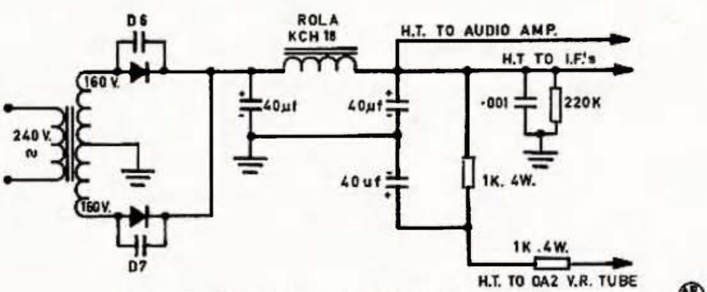
The variation on the h.t. line is now only 10 volts, with the result that the r.f. gain can be set just below maximum without pulling the oscillator.

A noticeable decrease in hum level will result if the modification is carried out as shown on the accompanying circuit.

The filter choke can be fitted to the side of the receiver chassis, above the OA2 socket.



ORIGINAL TR 10 9R59de H.T. CIRCUIT.



MODIFIED TR 10 9R59de H.T. CIRCUIT.

ECONOMY SPEECH COMPRESSOR

IAN J. HUNT, VK5QX/P*

The following circuit is one which has been used by the author for some time with quite exceptional results. Credit for the design must go to Howard VK5ZBE, who continually keeps prodding with yet more and more versions, both simpler and ranging to very elaborate. Following many requests over the air, I have finally got around to sending the details to "A.R."

The device depends upon the fact that the impedance of a diode varies according to the amount of current flowing through it.

The audio output from the simple transistorised amplifier is taken from the emitter of the second stage and fed to the transmitter speech input. From the collector of this second stage, some audio is rectified in a peak to peak detector, then filtered and fed to the base of the control transistor which has a diode in series with its emitter, connected across the amplifier input.

showed no appreciable reduction in output or distortion of the output waveform viewed on an oscilloscope.

Many on-the-air demonstrations have taken the form of speaking in a normal voice with the microphone, a high impedance dynamic type, at various distances ranging from 3 inches to 30 feet away in the next room. At the greater distances an echo effect is of course produced, but all reports indicate a lack of distortion and hardness so prevalent in many speech compression systems.

Various types of transistors can be used such as 2N3645 in the amplifier and AX8001 for control, however the control transistor should be of the type using the metal case and able to handle the necessary dissipation across the voltage rails.

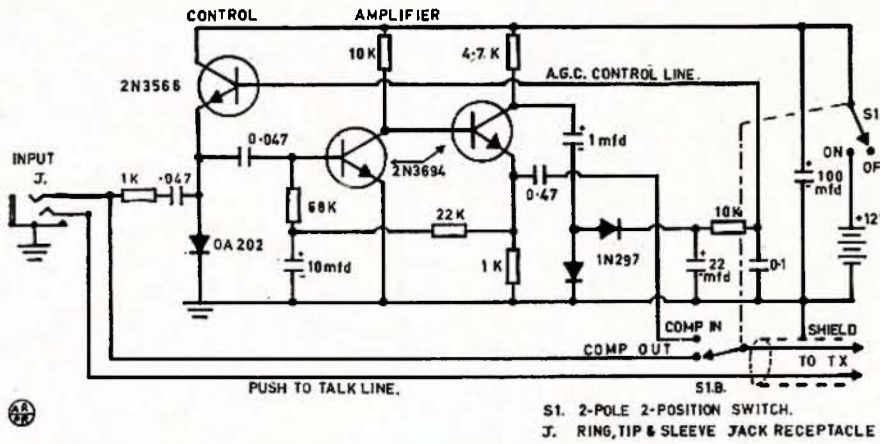
Layout is not critical, though the normal shielding required for transistors when large amounts of r.f. are

Another refinement envisaged is that of placing a small meter calibrated in db. in the control transistor collector lead so as to monitor the amount of compression in use.

Provision of an on/off warning light was considered unnecessary and would only serve to increase battery drain.

A small transistor radio battery has been in use for approximately nine months with no apparent sign of deterioration in performance and indeed a 9 volt battery providing only 8.5 volts on load produced quite worthwhile results.

So if while you are mobile in the hills and would like to get over the atmosphere of the whispering brooks and the trilling of the birds, go to it, and add one of these units to your equipment. It's also useful for people with quiet voices, when the family are asleep or when you want to add that extra punch for DX working. However, don't try it when using vox.



SPEECH COMPRESSOR

The higher the input signal, the greater the voltage supplied to the control transistor, and consequently the more current flows through the diode reducing its impedance and allowing it to act as an automatically variable attenuator across the amplifier. Conversely, the smaller the input level, the greater the overall gain of the system. A constant level output is thus obtained and has been measured as requiring a change of input level of 38 db. for a 3 db. change in output.

The attack time of the system is quite fast and whilst not ideal for handling transients of extremely short duration, is adequate for all normal speech use.

The additional gain in the unit provides some microphone preamplification which merely necessitates reducing the transmitter audio gain.

Frequency response is excellent and, although no exact measurement was done, sweeping the input oscillator used for testing from 100 cycles to 500 kc.

about should be employed. The unit was built into a small metal box, 5" x 3" x 1½", which allowed plenty of space for the phone jack, compressor on/off and in/out switch, plus battery and components mounted on matrix board.

The components were laid out on the board almost as shown in the circuit diagram. Resistors and capacitors of the smallest available physical size were used.

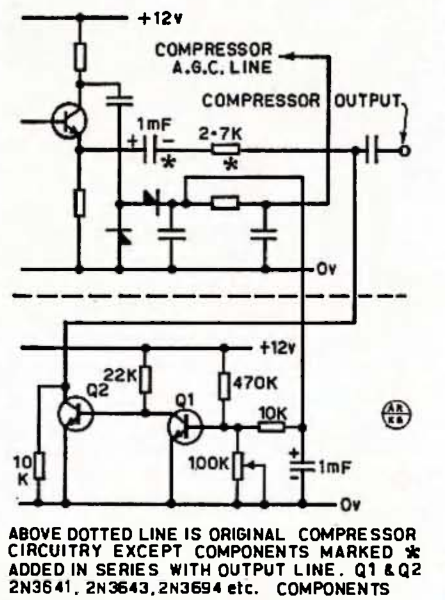
A problem involving some r.f. feedback was cured by providing a separate earth between the shielded braid of the output lead and the metal container besides connection to the 0v. rail.

The addition of a resistor/potentiometer and diode divider network across the supply allowed a set voltage to be applied to the base of the control transistor, switchable between the wiper of the potentiometer and the junction of the 10K ohm resistor and 0.1 uF. capacitor in the filter. Though this allowed a controlled condition of fixed gain, it was finally considered not worthwhile.

THRESHOLD CONTROL OF THE SPEECH COMPRESSOR

One disadvantage of the speech compressor previously described is that with it operating on low level signal any extraneous noises will be amplified equally, thus modulating the transmitter. It is definitely a disadvantage for the vox on a rig to trip on every time the operator moves in his chair to scratch his ear. The problem can, however, be solved by the addition of the simple two transistor control circuit shown. This allows the setting of a threshold level for voice, depending upon how close to the microphone or how loudly you wish to speak, while

(Continued on Page 15)



ABOVE DOTTED LINE IS ORIGINAL COMPRESSOR CIRCUITRY EXCEPT COMPONENTS MARKED * ADDED IN SERIES WITH OUTPUT LINE. Q1 & Q2 2N3641, 2N3643, 2N3694 etc. COMPONENTS USED SMALLEST PHYSICAL SIZE AVAILABLE.

COMPRESSOR THRESHOLD CONTROL

* C/o. P. Longhurst, 6 Northampton Cres., Elizabeth East, S.A., 5112.

IMPROVED F.M. OPERATION*

Proper Maintenance of Two-Way F.M. Equipment can improve Mobile QSOs

DAVID J. GOODMAN, WA8UIT

NOT everybody operating Amateur f.m. is in the two-way radio business. (It just seems that way!) It's well known that those who do work with mobile radio as a part of their job usually have enough knowledge of commercial two-way equipment to assure that their Amateur f.m. gear is in proper working order. But, what about those of us who never got closer to f.m. mobile equipment than the back seat of a taxi, until deciding to go Amateur f.m.?

The truth is that f.m. two-way equipment is pretty strange to a lot of fellows; even those who have been active Amateurs for years. The f.m. transmitters are generally easily understood, and being a comparatively simple device, they give the average Amateur little trouble. He can easily tell if he is getting the proper output, he can tune the transmitter, and in general, he knows what to do to make it work properly.

THE RECEIVER

Unfortunately, the f.m. receiver is another story. Comparatively few Amateurs have ever had much experience in critical receiver alignment, since no other popular Amateur operating mode requires the Amateur to understand his receiver and to have a fiddle as intimately with its total alignment as does f.m.

The result of this situation is a transmitter that works, a receiver that does not and an apologising operator. Time after time, the writer, along with other local stations, has responded to mobiles who were on their way through town, asking for a contact. Enough r.f. is heaped upon these fellows to cook a turkey, but alas, comes back the typical reply, "Sorry, Old Man, can't get your call there. We'll have to make it another time. Don't think this receiver is working quite right."

The answer to this situation is not difficult, if we consider how the receiver got sick in the first place. Most f.m. gear being operated by Amateurs today is obsolete commercially manufactured equipment that is between 10 and 20 years old. If it's mobile equipment, the chances are good that it has been in and out of perhaps as many as 15 different vehicles and has been worked on by scores of different people. It may have come directly out of service to the Amateur, or it might have been obtained from another Amateur who used it himself. In any case, since its ancestry and health history are unknown, the safest approach is pure skepticism.

"The equipment is presumed to be in as bad a condition as possible until proved otherwise," should be your motto. There is no reason to assume that those who worked on your unit left it in good order, even if it came right from commercial service, so you can be skeptical in that case, too.

We are going to discuss some of the steps to be taken to insure that a receiver is doing the job that it should be. The references are based on experiences with equipment for 2 metre f.m., but the techniques are directly applicable to 6 metre gear, as well.

TUBES

It's commonly known that close to 99% of the trouble in tube-type electronic equipment is the result of tube faults. The typical high band receiver has about 16 tubes, so it is mandatory to make sure that all the tubes are in satisfactory condition. This should be done before ever applying power for the first time. Test every tube in a dynamic mutual conductance tube tester. Test carefully for intermittent shorts and observe the emission level. Be critical. If a tube is marginal, shows a partial or solid short, or its emission falls off, throw it away. You might end up needing six or eight new tubes. If this shocks you, remember that our objective **is a receiver that works properly**. If you are going to replace tubes with spares from your junk box, test the spares, too. Be sure that all the tube types agree with the labels on the chassis for each socket. If a late-number tube has been substituted for the original, check to see that it is a compatible substitution.

THE RELAY

One thing that we are going to suspect right off the bat and are not even going to give a chance to prove its innocence is that nefarious malperformer, the antenna relay. This ghastly mechanical contrivance, ridiculously simple though it be, is subject to continuous use and because it carries respectable current and voltage, it arcs, pits, attracts dirt, gets tired physically, etc. Because it exists under these conditions, it very often ends up doing a pretty poor job of conducting r.f. in and out of your set, by the time you become owner. Receiving losses of up to 20 db., for example, due solely to antenna relay trouble, are not at all unusual.

To insure yourself against having later trouble with the relay, burnish the contacts carefully with a relay burnishing tool. If you don't have a tool, use white bond paper strips. Insert the paper between each contact and the transfer leaf, compress the leaf gently and work the paper in and out until no residue is visible when using a clean paper. Check the relay for correct overtravel in both the operated and unoperated positions. If necessary, adjust. Do this same cleaning and inspection job on the transmit-receive relay as well. This relay contains the receiver B+ continuity contacts and often contributes to low B+ as a result of poor conductivity in these contacts. (In some sets, the antenna and power switching is combined on one relay.)

TUNING AND ALIGNMENT

Next, we must make sure that the receiver front-end will really tune into the Amateur band. In the case of high-band equipment, many receivers will not tune down from their intended 150 Mc. range to 146 Mc. without modification. But the unsuspecting Amateur, observing what he thinks is a peak when adjusting the stages of the receiver which operate at channel frequency, is, in reality, seeing the drop-off as the slug passes out of the coil, **without ever reaching resonance**. This probably accounts for more sick receivers on 2 metre f.m. than any other single cause. A grip-dip meter check of each tuned circuit that operates at channel frequency will resolve your doubts on this issue. It's usually a simple matter to add 2 pF. or so of capacity across a coil externally, where needed, to bring the can down onto the Amateur band.

Precise alignment of the receiver is paramount for correct operation, and it is the next step. Correct alignment of commercial f.m. two-way receivers can be bothersome without having the benefit of proper test equipment, but it is possible. In receivers having a fixed low i.f. filter, the discriminator and the i.f. chain must be tuned with a precisely accurate signal source. The BC221 frequency meter, loosely coupled just ahead of the stage being adjusted, will do this job quite well. The BC221 is superior to most signal generators that the average Amateur may have at his disposal because of its accurate dial setting capabilities and its relative freedom from drift. The signal level can be kept below saturation by adjusting the coupling.

The same procedure can also be used for alignment of the high i.f. and the front-end of the receiver, even on 2 metres. A rough tuning of the front-end may first have to be made with a local transmitter serving as the signal source, in order to get an ample amount of signal. After this has been done, there should be sufficient sensitivity in a healthy high-band receiver to allow a harmonic from the BC221 (set at around 14.6 Mc.) to quiet the receiver when applied at the antenna input. For a final alignment of the front-end, the frequency setting of the BC221 should be adjusted to match the discriminator reading of a signal from a transmitter known to be on channel, and the front-end stages re-peaked.

POWER SUPPLY

If the receiver is to be used in a mobile installation, the power supply must be checked as the next step. Vibrators have disappointingly short lives, so we'll want to make sure that

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* Reprinted from "CQ," July 1968.

the one that came in the set can be trusted. A partial test of its condition may be made by simply checking the receiver B+ with the correct battery input voltage applied to the power supply. If the resultant B+ is less than 95% of the specified value, an investigation should be made to find the cause. Vibrator replacement is the starting point, followed by filter capacitors and then rectifiers (if the vibrator is of the interrupter type).

PREAMPLIFIERS

Let's assume that your receiver has now passed all the tests and is as sensitive as the day it left the factory. Have you done everything you can to insure good reception? No; because the day your receiver left the factory was a long time ago, and a great deal of progress has been made in the-state-of-the-art since then. At the time your receiver was made (if it's high band) the classic first r.f. amplifier tube was the 6AK5. It's a reliable tube, but it suffers from having a high noise figure. That is, because of certain structural considerations, it continuously generates noise internally. So, while it is amplifying an incoming signal, it is also amplifying its internal noise. If the incoming signal is greater than the 6AK5's internal noise, it will be amplified and detected. But, if the tube's internal noise level is greater than the signal, the noise will mask the signal and you'll never know it was there. A 6AK5 has a noise figure of about 10. db., at 144 Mc.

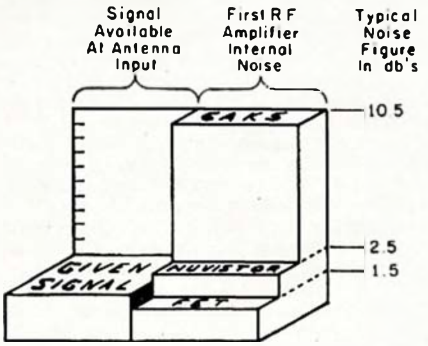

Fig. 1.—Relationship between the noise figure, receiver sensitivity and the various r.f. amplifiers discussed in the text.

In the 1950s, the introduction of the Nuvisitor was a big step in the development of low noise v.h.f. amplifiers. Nominal noise figures for Nuvistors are on the order of 2.5 db. But the last five years have really seen a breakthrough in v.h.f. amplifiers with the availability of a host of inexpensive bipolar and field effect transistors (FETs) having noise figures of around 1.5 db. at 144 Mc.

A look at Fig. 1 will help to understand the relationship between the noise figure of the first r.f. amplifier in a receiver, and it's sensitivity. In the pictured example, there is a given signal with strength greater than the internal noise level of an FET, but below that of the noise levels of both a Nuvistor and a 6AK5. In this case, we can expect the signal to be amplified and detected if the FET is serving as our first amplifier device, but it will never be heard if a Nuvistor or a 6AK5 is used. From this, it is easy to see the vast improvement in weak signal detection that can be obtained by substituting a low noise figure FET for a 6AK5 first r.f. amplifier.

The easiest way to make this substitution is to add an FET preamplifier between the antenna relay of your set and the antenna input jack on the receiver. The current literature is filled with simple FET preamp. circuits for 144 Mc. that you can easily build. Usually, a single transistor is all that is needed, as only enough gain to overcome the noise of the original first r.f. amplifier tube (most likely a 6AK5) is required; 15 to 18 db. ought to do it. If you are not a builder, such a preamp. can be purchased, ready to go, for around $12.

ANTENNA FEEDLINES

While of interest mainly to the operators of fixed stations, perhaps a word should be said about antenna feedline, as it affects the reception of signals. For the benefit of those v.h.f. f.m. newcomers who are refugees from the "low bands" (and there are more of these converts every day) it should be pointed out that feedline considerations that could be treated casually below 10 metres become absolutely critical at 146 Mc. The two most important of these factors are directly related; attenuation and length.

The two types of 50 ohm co-ax. that are best known to the Amateur are RG-8/U and RG-58/U. The published attenuation figures show that RG-8/U has a loss of 2.1 db. per 100 feet at 100 Mc., while RG-58/U has a loss of 4.2 db. under the same conditions. A lot of operators give these figures little attention and, because they have a length of RG-58/U around, or because it's cheaper, they use, say, 100 feet of it in their 2 metre feedline. Doing so means a loss equal to more than half the power. Even this fact doesn't seem to disturb some fellows too much, as they reason that they can always think up ways to boost the transmitter power to equalise this loss. What they fail to consider, however, is that the attenuation of the feedline will eat a 4.2 db. bite out of any signal being received by the antenna, before it ever gets to the receiver.

The 2.1 db. difference in attenuation between the two types of co-ax. is sufficient to make the difference between a readable and an unreadable signal, which, after all, is the ultimate test of desirability for any of the elements of the system. The lesson to be learned here is that when working at 100 Mc. and above, RG-58/U should never be used for runs of more than a few feet, such as for a feedline in a mobile installation or to interconnect pieces of equipment.

PREVENTIVE MAINTENANCE

So now you finally have a unit that receives properly and you are hearing all kinds of things you never knew were there. What's needed to keep it that way? Something called "preventive maintenance".

The technique of routine testing and inspection of electronic gear to prevent gradual performance fall-off (as well as to forestall disruptive failures) has been the accepted doctrine of all commercial and military communications organisations for decades. But for some reason, the Amateur laughs at the idea of this being applied to his equipment. For those Amateurs who would rather trouble-shoot than operate, this may be an understandable attitude. If you so desire, however, you can go a long way towards keeping your f.m. equipment in good condition simply by testing all tubes at least once every six months and keeping the relay contacts clean. Remember that if you replace a tube in a tuned stage in the receiver, you will have to re-peak that stage.

This service routine is especially important in an area where a repeater station is used. Because of a favorable transmitter site and/or high power, the area is blanketed with the repeater's signal and the local operators tend to get lazy about the condition of their sets. Should the repeater fail and simplex communication be attempted, the results would be disappointing, to say the least.

Or, if a mobile from an area that has a repeater takes a trip through territory where stations operate simplex, he may get the mistaken impression that there is very little activity there.

The personal opinion of the writer is that the case for repeater stations (in other than mountainous terrain) is often overstated. Direct mobile to mobile communications with reliability good enough for Amateur Radio is possible over surprising distances when all equipment is functioning properly.

Well, there you have it. With a little understanding and proper care, commercial f.m. two-way equipment will give an Amateur years of satisfactory performance. The terrific rate of growth of this mode of operation is a good indication of the enjoyment to be had from its use. A correctly functioning receiver is the key to that potential.

TECHNICAL ARTICLES

Readers are requested to submit articles for publication in "A.R.," in particular constructional articles, photographs of stations and gear, together with articles suitable for beginners, are required.

PROVISIONAL SUNSPOT NUMBERS

OCTOBER 1968

Dependent on observations at Zurich Observatory and its stations in Locarno and Arosa.

Day	R	Day	R
1	75	16	88
2	73	17	82
3	108	18	108
4	119	19	121
5	118	20	114
6	126	21	122
7	135	22	134
8	112	23	136
9	87	24	139
10	70	25	138
11	103	26	133
12	108	27	138
13	70	28	118
14	76	29	112
15	80	30	118
		31	99

Mean equals 108.7.

Smoothed Mean for April 1968: 107.4.

—Swiss Federal Observatory, Zurich.

S.S.B. Transmitter—An Amateur Engineering Project

Some Notes and Comments from the Author

In the two years which have elapsed since this project was first committed to paper, and finally published, further experiments were made which make certain alterations to the article desirable to bring it up to date. These are listed below.

Part One

Page 6, col. 1, § 5: "power point amateur."

Page 6, col. 3, § 2: delete "and new call signs".

Page 7, col. 1, photo: Exciter—four tuned circuits are now used in the i.m. (two only shown on the older picture).

Page 10, col. 2, § 3: The second mixer with a 12AT7 oscillator . . . The other half of the 12AT7 acts as buffer for the c.o. Block diagram: 6AM6 and 6AK5 now 12AT7.

Page 10, col. 3, §2: The c.o. is now in the v.f.o. box.

Part Two

Page 6, col. 2, compressor circuit: Add a 2 uF. electrolytic capacitor at the junction of the plus lead of the right hand side Ge-diode and the 100k ohm resistor, and ground (to increase a.g.c. decay time).

Page 6, col. 3, § 2: "picked up by the mike . . ."

Page 7, col. 2, v.f.o. circuit: 20 pF., N3300 TCc capacitor.

Page 8, col. 3, § 2: Ge-diodes are now again in use at 0.35v. r.f. (fan cooled rig). The high capacity of the Si-diodes made carrier null adjustment very voltage sensitive.

Page 9, col. 2, § 3: Replace "40 db." by allowed the usually used—20 db. carrier suppression—and to match low a.f. response to op's voice and the finally used mike.

Page 9, col. 2, second last §: Replace "double" by: four tuned circuits, to achieve 60 db. suppression of the v.f.o.-image signal at 414 kc. plus the operating frequency (see Part 1, page 9, Table C) otherwise appearing in the tx output. This circuit has 50 kc. bandwidth.

Page 9, col. 3, v.f.o. sub-title: Half the chassis is occupied by the c.o.

Part Three

Page 11, col. 1, end of § 3: It was similar later so with the c.o. in the v.f.o. box.

Page 11, col. 2, § 1: A 6AM6 triode connected was first employed. A 12AT7 is now used.

Page 11, col. 2, § 4: Delete from "grid stopper . . ." The 12BY7 is stable, but the 6BQ5 had to be neutralised in the usual manner.

Part Four

Page 10, col. 2, § 2: Replace first sentence with "Some r.f. is getting into the receiver via stray capacity at the aerial relay, and the v.f.o. . . ."

Page 10, col. 3, last §: Replace first sentence with "Experiments with different microphones showed that they should not produce spikes at certain voice frequencies to prevent over-modulation, or only a low average drive level can be used. Playing back . . ."

Page 11, col. 1: Exchange number 8 and 9 on literature reference.

—H. F. Ruckert, VK2AOU.

— . . . —

Correspondence

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers.

CONVERSION OF VALVE CIRCUITRY TO SEMICONDUCTOR TECHNIQUES

Editor "A.R.," Dear Sir.

I wish to thank you for printing the two articles on conversion of valve circuitry to semiconductor techniques ("A.R.," June 1968).

Following publication of these articles, I set to work converting a conventional amplitude modulated "taxi set" using the basic circuitry described.

A number of problems were experienced and the final product bears little resemblance to the original complete circuit.

The results, however, more than justify the effort expended. The receiver sensitivity is better than any other I have ever built. As a portable, the reduction in power consumption is listed for the benefit of others who may be interested.

Readers may also be interested in another article printed in "Electronic Engineering" for August 1967 entitled "Amplifiers Combining Bipolar and Field Effect Transistors," by W. Gosling. This article discussed some of the theoretical considerations beyond the scope of the articles printed in "A.R."

A.m. transceiver power consumption (battery current measured at 14v. d.c.)—

	Original Valve Set	As Converted
"Receive only"	1¾ amps.	25 mA.
"Stand-by"	4 ,,	1¼ amps.
"Transmit"	8 ,,	5 ,,

I hope that this letter will encourage others to further efforts.

My interests are now to be devoted to the construction of a 3-watt a.m. transmitter using BFY50 transistors. Information and assistance in the form of reports from other workers in this field would be appreciated.

Perhaps "A.R." may be considering a reprint along these lines?

—Max Riley, VK2ARZ.

SUBSCRIPTIONS DUE

All members of the W.I.A. are reminded that annual subscriptions are now due and should be paid promptly to their Divisional Secretary. Non financial members will not receive a copy of "A.R.," and back copies may not be available upon request. To preserve continuity of your files of "A.R.," please pay your annual subscription now.

ECONOMY SPEECH COMPRESSOR

(Continued from Page 12)

with the control potentiometer wound right out, maximum sensitivity can be provided if so desired. The ability of the compressor to lift the overall audio level is not impaired and vox can quite readily be used.

Operation of the circuit is as follows: Assume first a "no signal" condition from the compressor. Without a voltage being derived from the compressor a.g.c. system, no base current will flow in Q1 and therefore that transistor is cut off, i.e. its collector is "up" at positive rail potential. Its collector is common with the base of Q2 which causes that transistor to turn hard on (+12v. applied to base), the collector of Q2 therefore being "down," or at earth potential, effectively shorting the compressor output to earth.

This condition will remain until such time as an input signal to the compressor produces enough a.g.c. voltage to switch transistor Q1 "on". The level at which this occurs depends on the network consisting of the 470K resistor and 100K potentiometer across the base of Q1 and of course can be varied by adjustment of the potentiometer.

When Q1 is turned on its collector is "down" at earth potential, thus causing Q2 to turn off, as its base is commoned with Q1 collector and the full supply voltage is dropped across the 22K resistor. The output signal from the compressor is thus allowed to pass through as Q2 collector is therefore above earth by a value of 10K ohms.

Almost any silicon NPN transistor can be used. In the circuit shown a type 2N3641 was used. Layout is not critical, and little space is required. This control circuitry can be included on the same piece of matrix board on which the compressor is built,, with the potentiometer mounted on the front of the box. This circuit has been found to be very effective, no trouble to get going and an extremely worthwhile addition to incorporate. If you then wish to scratch your ear, just move the microphone a little further away while you perform this function. With the threshold control set correctly no such noises will be transmitted.

— . . . —

INTERNATIONAL SP DX CONTEST 1969

PRECIS OF RULES

Date: 1500 GMT, 5th April, to 2400 GMT, 6th April.

Bands/Mode: 3.5 through 28 Mc.—c.w. only.

Contest Call: Call "CQ SP".

Cyphers: The usual six-digit number incorporating RST, e.g. 599001, 589002, etc. Polish stations will send RST plus two letters denoting their powiat.

Points: Three points per SP station. The same station may be contacted on other bands.

Total score: QSO points multiplied by number of powiats contacted.

Awards: A certificate to the highest scorer in each country.

Logs: Keep a separate log for each band. Log all times in GMT. Submit the usual summary sheet listing scoring information, name and address, and including a signed declaration that all rules have been observed.

Send to, before May 1969: Contest Manager PZK, P.O. Box 320, Warsaw 1, Poland. Endorse "SPDX Contest".

NEW CALL SIGNS

OCTOBER 1968

VK2FJ—N. K. Shaw, 22 River Rd., Oatley, 2223.
VK2GP—G. T. Pile, 52 Clement St., Forbes, 2871.
VK2WX—J. Pollock, 15 Matthew Pde., Blaxland, 2774.
VK2ABG—G. R. Hughes, 33 Smith St., Manly, 2095.
VK2ACY—C. J. McCarthy, 37 Iris St., Frenchs Forest, 2086.
VK2ALI—P. G. Dale, 196 Beecroft Rd., Cheltenham, 2119.
VK2AMT—B. M. Thomas, 10 Bentley Ave., Forestville, 2087.
VK2AXW—W. H. W. Shand, 10 Chilton Pde., Warawee, 2074.
VK2BFI—J. Ginsberg, Oriental Hotel, Cooks Hill, Newcastle, 2300.
VK2BJR—B. J. O'Rielly, 41 Elizabeth St., Goulburn, 2588.
VK2BJT—I. S. Miller, 77 Rae Cres., Kotara South, 2288.
VK2BOM—R. J. Mitchell, 43 White St., Wagga Wagga, 2650.
VK2BWB—W. B. Pollock, 18 Watkin St., Hurlstone Park, 2193.
VK2BWD—Westmead Radio Club, 10 Helen St., Westmead, 2145.
VK2BXF—D. S. Roden, 4/257 Blaxland Rd., Ryde, 2112.
VK2ZHO—H. F. Padberg, 7 Pitnacree Rd., East Maitland, 2323.
VK2ZNI—N. A. Jefferey, Christian Brothers' School, Wagga Wagga, 2650.
VK2ZTN—R. A. Armstrong, 76 Denman Pde., Normanhurst, 2076.
VK2ZVV/T—V. G. Barker, 7 Short St., Carlton, 2218.
VK2ZWE—H. W. Spaulding, 7 Spring St., Abbotsford, 2046.
VK2ZXR—R. E. Anderson, 32 Oak Rd., Kirrawee, 2232.
VK3CH—A. G. Nunn, 10 Arcady Gr., Vermont, 3133.
VK3GG—E. Chick, 15 Vida St., Essendon, 3040.
VK3MK—J. D. Lundy, 90 Dalny Rd., Murrumbeena, 3163.
VK3OE—E. M. Planck, 62 Evesham Rd., Cheltenham, 3192.
VK3OQ—J. F. Dalstead, 8 Joami St., Cheltenham, 3192.
VK3YY—G. P. J. Clarke, 17 Gladstone Ave., Armadale, 3141.
VK3ADO—D. Glegg, 1 Tennyson Ave., Kilsyth, 3137.
VK3AGJ—L. N. Hocking, 7 Noonan St., Benalla, 3672.
VK3AIZ—L. Zschech, "Parkside," Hamilton, 3300.
VK3ANV—R. G. Gordon, Hopetoun St., Lockington, 3563.
VK3ANY—J. A. B. Wallick, 5 Fenwick St., Kew, 3101.
VK3AQO—D. T. Bellair, 1 Mossman Dr., Heidelberg, 3084.
VK3AQQ—J. W. V. Storey, Zig Zag Rd., Eltham, 3095.
VK3AQS—P. P. Seitz, 1 Freeman St., Yarraville, 3013.
VK3AUQ—F. D. Baarda, "Glenaulin," Sherbrook, 3789.
VK3AUR—R. K. N. Wilkins, 118 Mont Albert Rd., Canterbury, 3126.
VK3AUU—D. P. Tanner, Lye & Nixon Rds., Ripplebrook, 3818.
VK3AVZ—G. A. Trotter, 6 Morrison St., Wodonga, 3690.
VK3AYG—H. A. Alcorn, "Pine Ridge," Donvale, 3111.
VK3AXO—R. G. O. Wilson, 45 Pleasant Rd., Hawthorn East, 3123.
VK3ZGZ—J. E. Carter, 434 Como Pde., Mordialloc, 3195.
VK3ZPS—P. J. Armstrong, 24 Paschal St., Moorabbin, 3189.
VK3ZXB—R. P. Vise, 11 Mossman Dr., Heidelberg, 3084.
VK4AR—G. T. Ryan, 95 Railway Pde., Norman Park, 4170.
VK4HM—Cairns Amateur Radio Club, Station: Monro Park, Cairns, 4870; Postal: C/o. L. Olsen, 7 Parramatta St., Cairns, 4870.
VK4IC—B. Gibbs, 236 Vulture St., South Brisbane, 4101.
VK4LC—L. C. Raebel, Station: Alpine Tce., Mt. Tamborine, 4272; Postal: P.O. Box 282, North Tamborine, 4272.
VK4QQ—C. R. Rutson, 43 Oxford St., Paddington, 4064.
VK4US—P. L. Hubsher, Station: 24 Broad St., Labrador, 4215; Postal: 51 Real St., Annerley, 4103.
VK5GU—G. B. Hunt, 29 Park St., Woodville, 5011.
VK5IN—K. V. Hanson, 5 Foley St., Salisbury Downs, 5108.
VK5XI—B. Hannaford, 38 Wright St., Peterborough, 5422.
VK5ZGG/T—G. F. Gilbert, 24 Benjamin St., Manningham, 5086.
VK6CT—C. D. D. Todd, P.O. Box 376, Carnarvon, 6701.
VK6TS—Carnarvon Amateur Radio Club, C/o. A.W.A., P.O. Box 348, Carnarvon, 6701.
VK6ZBT—G. Taylor, 233 Preston Pt. Rd., Bicton, 6157.
VK6ZDY—P. L. Jackson, 60 Anzac Tce., Bassendean, 6054.
VK6ZEE—T. J. Regan, 79 Station St., Cannington, 6107.
VK6ZEO—G. C. Mullett, 13 Rothbury Rd., Embleton, 6062.
VK6ZGE—G. A. Koziol, C/o. P.W.D. Elect. Dept., Kununurra, 6743.
VK6ZGD—G. P. Clifton, 13 Morley Dr., Morley, 6062.
VK6ZGT—A. E. Trappitt, P.O. Box 37, Borden, 6338.
VK6ZGY—P. M. Crane, 36 Lena St., Tuart Hill, 6060.
VK7BX—M. C. Hooper, 182 Melville St., Hobart, 7000.
VK7HW—H. H. E. Westerhof, Flat 2, 37 King St., Sandy Bay, 7005.
VK7KJ—G. C. Johnston, 23 Cottesloe St., Lindisfarne, 7015.
VK7PS—H. P. Schulz, 519 Nelson Rd., Mt. Nelson, 7007.
VK7ZX—T. J. Cox, 108 Hampden Rd., Hobart, 7000.
VK7ZBM—B. W. Marriott, 41 Garden Rd., Moonah, 7009.
VK7ZJH—J. L. Hursey, 38 Addison St., Rosetta, 7010.
VK9LM—L. Meck, Station: McWilliam St., Goroka, N.G.; Postal: C/o. A.W.A. Ltd., P.O. Box 9, Goroka, N.G.
VK9RA—R. H. Ashley, Christmas Island, Indian Ocean.
VK0KB—K. E. Beman, Mawson, Antarctica.
VK0MI—W. J. Grudgfield, Macquarie Island, Antarctica.
VK0RM—R. W. McLean, Davis Base, Antarctica.

CANCELLATIONS

VK1UN—J. A. Robb. Transferred to Vic.
VK2AAQ—C. Churm. Transferred to Qld.
VK2AYA—G. A. Ahlstrom. Deceased.
VK2BLN—L. L. Neaverson. Not renewed.
VK2ZFG—G. T. Pile. Now VK2GP.
VK2ZHI—J. Pollock. Now VK2WX.
VK2ZIS—I. S. Miller. Now VK2BJT.
VK2ZNX—N. K. Shaw. Now VK2FJ.
VK2ZSF—W. H. W. Shand. Now VK2AXW.
VK2ZXB—P. R. Cearns. Transferred to W.A.
VK3AFL—D. A. Page. Not renewed.
VK3ASM—R. E. Glew. Not renewed.
VK3AZG—B. Gardiner. Transferred to N.T.
VK3ZDN—R. M. Macrae. Not renewed.
VK3ZEU—E. M. Planck. Now VK3OE.
VK3ZFB—D. T. Bellair. Now VK3AQO.
VK3ZKW—I. J. Battersby. Not renewed.
VK3ZKY—R. G. O. Wilson. Now VK3AXO.
VK3ZLQ—J. D. Lundy. Now VK3MK.
VK3ZPP—R. G. Gordon. Now VK3ANV.
VK3ZPX—R. K. N. Wilkins. Now VK3AUR.
VK3ZTA—L. Zschech. Now VK3AIZ.
VK3ZXG—J. W. V. Storey. Now VK3AQQ.
VK3ZYH—L. N. Hocking. Now VK3AGJ.
VK4CS—4 Signal Regiment Amateur Radio Club. Ceased operation.
VK4ED—E. B. Dearing (Jr.), Not renewed.
VK4HX—D. S. Roden. Now VK2BXF.
VK4ZGT—G. T. Ryan. Now VK4AR.
VK4ZJL—J. T. F. Linde. Not renewed.
VK5XJ—C. A. Pryzibilla. Ceased operation.
VK5ZCH—K. V. Hanson. Now VK5IN.
VK6AG—W. E. Coxon. Deceased.
VK6CZ—G. R. Potter. Ceased operation.
VK6KE—K. J. Echberg. Transferred to Vic.
VK6RP—R. S. Trew. Deceased.
VK7KW—K. St. C. White. Deceased.
VK7ZHW—H. H. E. Westerhof. Now VK7HW.
VK7ZKJ—G. C. Johnston. Now VK7KJ.
VK7ZMC—M. C. Hooper. Now VK7BX.
VK7ZPS—H. P. S. Schulz. Now VK7PS.
VK7ZTM—T. J. Cox. Now VK7ZX.
VK8XI—B. Hannaford. Now VK5XI.
VK9ZCQ—J. A. McLachlan. Transferred to S.A.
VK9ZRA—R. H. Ashley. Now VK9RA.

☆

TECHNICAL CORRESPONDENCE

Erratum and Additional Notes on "Putting the Geloso G222 on 160 Mx"

Editor "A.R.," Dear Sir,

In reference to the article, "Putting the Geloso G222 on 160 Metres," please note the following error. The first line in paragraph 2, column 3, page 11, should read: "The new oscillator coil for 1.75 Mc. was wound on a fairly large diameter former, and after some experiment, **without** a slug . . ." Not "with a slug".

I would also like to include the following two notes:

1. The numbering of the bands 1 to 6 is the opposite way round to that used by the makers.
2. Modifications to the v.f.o. only refer to type 4/104.

—J. A. Adcock.

DURALUMIN, ALUMINIUM ALLOY TUBING

IDEAL FOR BEAM AERIALS AND T.V.

★ LIGHT ★ STRONG ★ NON-CORROSIVE

STOCKS NOW AVAILABLE FOR IMMEDIATE DELIVERY

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New Equipment

S.W.R. METER

The "Rapar" Standing Wave Ratio Meter is available in two models, SE405-A for 52 ohm impedance, and SE405-B for 75 ohm impedance operation, from 1-150 Mc. at 500 mW. to 2 kW. p.e.p.

Specifications—
- Frequency range: 1-150 Mc.
- Insertion loss: < 0.2 db.
- Detectable S.W.R.: From 1:1 to 1.10.
- Impedance: Either 52 or 75 ohms (two models).

Price of either model: $18.50 plus 15% sales tax where applicable.

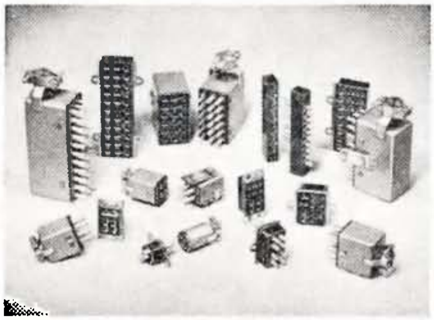
Further details from Radio Parts Pty. Ltd., 562 Spencer St., Melbourne, Vic., 3000, and City and East Malvern branches.

H.F. COMM. RECEIVER

The Eddystone "940" is a general purpose Communications Receiver covering from 480 Kc. to 30 Mc. in five overlapping ranges. It is suitable for reception of c.w., a.m. and s.s.b. signals, and by reason of the two r.f. and two i.f. stages incorporated, a high performance is obtained throughout the frequency ranges. Built-in power supply unit permits direct operation from a.c. supply of 110/125 and 200/240 volts, 40/60 cycles.

Available ex stock $424 plus 25% sales tax. Duty free ex bond store, government departments. Further information and brochure from sole Australian agents: R. H. Cunningham Pty. Ltd., 608 Collins St., Melbourne, Vic., 3000. Telephone 61-2464.

VERSATILE CONNECTORS



Painton (Australia) Pty. Ltd. have released a range of "Multicon" connectors with many improved features for multi-circuit connections and rapid linking of equipment. The full "Multicon" range consists of 2, 4, 6, 8, 10, 12, 18, 24 and 33-pole sizes and there is a complete selection of plugs and sockets with alternative mounting arrangements, cable fixings and retaining devices.

The Painton "Multicon" range is finished in silver-grey hammertone and basically interchangeable with the Painton "Standard" range plugs and sockets with the exception of the 6-pole size and 10-in-line unitor. A technical brochure setting out design data with illustrations is available on request. Inquiries to Painton (Aust.) Pty. Ltd., 29 Railway Ave., Huntingdale, Vic., 3166.

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YAESU MUSEN EQUIPMENT AND THE AUSTRALIAN MARKET

We have received a letter from Mr. S. Hasegawa, President of Yaesu Musen Co. Ltd., in which, amongst other things, he expresses his fear that Australian Amateurs may be confused regarding true information about his Company's products. He refers to an advertisement which appeared in "A.R." earlier this year, where-in it was indicated that certain equipment would be available in kit form.

Mr. Hasegawa stresses that they have not planned, nor do they intend to schedule in the future, kit sets of their equipment.

Mr. Hasegawa goes on to state that Bail Electronic Services have been their exclusive agents since 1965, and Yaesu Musen equipment purchased from other distributors does not carry the manufacturer's warranty, and spare parts could be difficult to obtain.

"Amateur Radio" accepted the advertisement under discussion in good faith. We realise that the fact that although any manufacturer may appoint an exclusive agent in an area, this does not preclude somebody else from seeking another source of supply either in the country of manufacture or through one of the free ports such as Hong Kong.

We have no intention of entering any controversy over this matter, as every prospective purchaser is free to select his own supplier.

Technical Data

COMPONENTS CATALOGUE

An electronic components stock catalogue for 1969 is now available from Soanar Electronics Pty. Ltd. Loose-leaf bound, the catalogue contains specifications of a range of Elna capacitors. both electrolytic and polyester film types, carbon potentiometers, and other devices. Requests for catalogues should be made to Mr. G. Soanes, Soanar Electronics Pty. Ltd., 42-46 Lexton Rd., Box Hill, Vic., 3128.

ANTENNA BROCHURE

The latest antenna brochure from Hy-Gain Electronics Corporation, U.S.A., features a range of communications types for h.f. and v.h.f. Amateur bands. The brochure contains 20 pages of illustrated technical information for base station and mobile antennas from 80 metres down to 2 metres, and includes the Hy-Gain model 14AVQ (40-10 metres), and the model 12AVQ (10-15 and 20 metres). Australian agents, Bail Electronic Services, 60 Shannon St., Box Hill North, Vic., 3129, will be pleased to meet all requests for copies.

FAIRCHILD "PLANAR" 1969

The Fairchild "Planar" for January 1969 gives details of the uA723, a second generation linear I.C., which incorporates on the one chip a temperature-compensated reference amplifier, an error amplifier, a power transistor, and current-limiting circuitry. It can be used as a series regulator, switching regulator, shunt regulator, floating high voltage regulator, or as a regulated current source, and for both positive and negative supplies. Further details from: Fairchild Australia Pty. Ltd., P.O. Box, Croydon, Vic., 3136.

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HIGGINBOTHAM AWARD

The Higginbotham Award for 1968/1969 was considered by the Publications Committee at its March meeting. It was unanimously agreed that the award go to Rodney Champness, VK3UG, as a token of our appreciation for his support and assistance to the magazine over a long period of time. Our congratulations to Rodney.

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CERTIFICATE HUNTERS' CLUB

During 1968 many C.H.C. Chapters were established in countries throughout the world and membership has dramatically increased.

New Zealand already has a fast growing Chapter, putting Oceania on the C.H.C. map. Let us do likewise. Form a Chapter and help encourage the world to work VK—and benefit ourselves at the same time. Six or seven members only are required from as many States as possible to set up the initial framework. So how about it chaps? Please write to VK4SS or K6BX, 3212 Mesa Verde Rd., Bonita, California.

—VK4SS

P.S.—If you have been collecting awards you may be eligible for membership. Enquiries to QRA above.

DX

Sub-Editor: PETER NESBIT, VK3APN
32 The Grange, East Malvern, Vic., 3145

(All times in GMT)

ASSORTED

Gus W4BPD is now well under way with his DX-pedition. He operated from 6W8XX during February, then continued his way across Africa. Around the beginning of April he hopes to meet up with Steve VQ8CC, and as soon as transport is available they will leave for Rodriguez and St. Brandon Islands. At Rodriguez they will be operating from the Mt. Venus cable station where five 70 ft. towers are available with a good selection of antennas for all-band operation. (Date of arrival here will be April 12-17 sometime.) Gus would also like to visit Blenheim and Geyser Reefs, and when Steve returns to Mauritius at the end of his vacation, Gus will proceed to VQ9 where he will join forces with Harvey VQ9V. At this moment Gus has no definite plans after the Indian Ocean, but he does hope to visit Heard Island if possible and then head for Bhutan. His gear uses two v.f.o's on all six bands for split frequency operation. Frequencies used are: c.w. 1827 (or as per sked), 3525, 7025, 14025, 21025, 28025; s.s.b. 3795, 7095, 14195, 21245, 21395, 28495 and 28605. Will QSY if there is QRM. QSLs via W4ECI.

ZS1AMB and ZS1ANT will be operating from Antarctica for about one year. QSLs, which may be sent via the ZS Bureau, will be dealt with by the operators on their return home. Skeds may be arranged via ZS5ZS.

IZ6KDB: Anyone short of a QSL for John's WPX operation from Ponziane Island last May, may send another card to I1KDB at his call book address.

Gavin VK3AEJ, who recently operated from Willis Island as VK4EV, has just commenced sending cards out. He has about 1,400 QSLs to reply to, so just be patient; he hopes to have the majority done within a month or two. QSL will be 100 per cent.

Frank DL7FT is planning a DX-pedition to Monaco from 3rd to 10th April 1969, using the call 3A2CU. The frequencies used will be: 3795, 7065, 14195, 14245, 21295 and 28545.

Over 7,000 QSOs were made during the Chatham Isl. activity of ZL2AFZ/C, 1DS/C, 1IL/C and ITU/C. QSL activity is now at a peak with George averaging nine hours per day on QSLs. For those who still need this island, ZL3ABJ/C is active most evenings on 80. His tour of duty will be until mid-year.

Excepting Fridays and Sundays, ZS3AW (ex DJ3KR) skeds DL9OH on 14158 at 19 GMT daily, then shifts to 40/80 mx. Jurgen is there until May, but is not permitted to make long QSOs, so please just RS/RST exchange .

Belgian stations operating from exhibitions are required to sign their calls /F. It does not mean that they are in France as some have erroneously assumed.

To make identification easier in the future, stations on Auckland and Campbell Islands will sign ZL/A, on Chatham Island ZL/C, and on Kermadec Island ZL/K.

A reader recently drew attention to the fact that the prefix A was reserved for U.S.A. and is in use by a number of military and semi-military stations, and that the Botswana prefix A2 was "non-official". The latest information to hand (from several different sources) indicates that A2 was allocated to Botswana by the I.T.U., and therefore would be quite "official".

While on the subject of prefix anomalies, there are plenty around if one cares to look. Apart from Amateur prefixes (such as AC, which definitely does overlap the U.S. allocation AA-AL), others are easily found. E.g. the Victorian airport stations ML and LAV should theoretically be in the U.K. and Norway respectively. (Enough said.)

GC8HT will be QRV 1st April 7013 at 18 GMT; 7th April 14013 at 0730 GMT; 14213 at 09 GMT; 10th April, 14113 at 14 GMT; and 14th April 21013 at 0730 GMT.

QSL MANAGERS

FG7TC—Box 521, Guadeloupe.
FL8HM—B.P. 215, Djibouti, T.F.A.I.
FL8MB—B.P. 49, Djibouti, T.F.A.I.
FO8CG—E. Ermiz, Otepa, Hao Isl., Archipel des Tuamoto, French Polynesia.
FR7ZC—P. Ferrand, Sainte Suzanne, Reunion Isl.
KH6GLU—Box 762, Kaunakakai, Hawaii, 96748.
KV4CI—Direct only. H. Miller, Box 1853, St. Thomas, Virgin Is.
LG5LG—Three IRCs; via LA Bureau.
ON6AF—via ON4TJ, 43H Conscience Straat, Merelbeke, Belgium.
PY0OK, PY0OM—via PY2SO: Box 97, Sao Paulo, S.P., Brazil.
TY6ATE—B.P. 107, Natitingou, Dahomey.
VK0WR—U.S.C.G. Cutter "South Wind," F.P.O., N.Y.C., N.Y., 09501.
W2CTN—J. Cummings, 159 Ketcham Ave., Amityville, N.Y.
YA1ZC—Box 638, Kabul, Afghanistan.
7G1CG—Box 33, Conakry, Rep. of Guinea.
9G1GL—Box 625, Toma, Ghana.

CR3KD—W2CTN.	VP2DAP—KV4AM.
CR5SP—W2GHK.	VP2DAQ—K7TMK.
FG7XX—W2CTN.	VP2DAR—W7PHO.
FK8BG—W5IXQ.	VP2MK—W8EWS.
FW8DY—KH6GLU.	VP7NF—VE1ASJ.
HK0TU—HK3RQ.	VS5PH—DL3RK.
PJ7VL—W2CTN.	YS1XEE—WB4BOJ.
PY0EP—PY1MB.	ZF1JF—W1IIM.
SV0WCC—WA0HPU.	5H3LV—VE3ODX.
VK2BPO/9—W4WS.	5W1AS—KH6GLU.
VK2BRJ/9—W4WS.	8Q5HT—DL5WB.
VP2AW—W9FIU.	9Y4PHO—W7PHO.

ACTIVITIES

A reliable contributor to the column, George Allen, L6042, sent in a run-down on his 160 metre listening activities: On two separate dates, VE3QU was heard on 1806 at 12 GMT. During the "CQ" W.W. 160 Contest, the following were heard: W7DL/7, W6JTB, W6QHQ, ?9ACI, W9PNE and JAs 1HXE, 2CLI and 3UI. Later on at 2132 GMT, the band opened to Europe for 11 minutes and DL9KRA was heard working Gs and GI—his serial number at that stage was 183, so he was doing a pretty good job. An OK1 was also heard, but the band closed before he could be identified. (Thanks, George—Peter.)

No other activity reports were received this month.

RULES FOR THE WPX AWARD

(Worked All Prefixes)

To obtain this award it is necessary to receive confirmation of contacts with the following number of prefixes:

(a) Mixed—400;
(b) CW—300;
(c) Phone—300;
(d) SSB—200.

Endorsements are issued for each 50 additional prefixes worked. Band endorsements are available for working the following numbers of prefixes on the various bands: 1.8 Mc., 35; 3.5 Mc., 150; 7 Mc., 250; 14 Mc., 300; 21 Mc., 300; 28 Mc., 250.

Continental endorsements are given for working the following numbers of prefixes in the respective continents: N.A., 126; S.A., 88; Eur., 146; Af., 80; Asia, 68; Oc., 51.

The definition of a prefix is:

(a) The two or three letter/numeral combination which forms the first part of the call (e.g. GM7OP counts as GM7; A2CAA as A2);
(b) A suffix designating portable operation in another area—if the suffix is the normal prefix used in that area (e.g. ZD8J/W6 counts as W6);
(c) Calls without numbers are considered as the first two letters followed by figure 0 (e.g. W4BPD/LX counts as LX0; RAEM counts as RA0).

Any prefix will be considered legitimate if its use was authorised by the governing authority. Cards need not be sent, but must be in the possession of the applicant. Any or all cards may be requested by the WPX Committee. All applications for WPX must be submitted on the official forms No. 1051, obtained by sending s.a.e. (pref. 8½ x 11 inch envelope or bigger) with one I.R.C. to WPX Committee, 14 Vanderventer Ave., Port Washington, L.I., N.Y., 11050, U.S.A. All contacts must be made with licensed, land based, Amateur stations in authorised Amateur bands. All contacts submitted by the applicant must be made within a 250-mile radius of the original location.

Good prefix hunting!

SUMMARY

Acknowledgments to: DX News, ZL2AFZ, L1DXA, VK4PX, "CQ" Mag., GC8HT, VK3AEJ and L6042.

73 and good DX.

—Peter VK3APN.

VHF

Sub-Editor: CYRIL MAUDE, VK3ZCK
2 Clarendon St., Avondale Heights, Vic., 3034

The only real news this month is that the VK6 v.h.f. beacons on 2 metres have been heard in VK3. Other things of note are that the VK3 6 and 2 mx converters are selling fast. All orders should be sent to the VK3 Disposals Committee, enclosing a cheque, postal order or cash in a registered letter.

Rumours have it that the VK3 V.h.f. Group are working on a 432 Mc. converter and a range of v.h.f. pre-amplifiers.

I would appreciate news from correspondents in other States.

73, Cyril VK3ZCK.

VICTORIA

Activity in VK3 is on the increase on 6, 2 and 0.7 mx, and interest in the V.h.f. Group activities has grown immensely. Functions such as the 2 mx scramble, 2 mx fox-hunt, field days, group meetings, etc., have been very well attended.

The latest project the Group has started on is the establishment of two v.h.f. beacons—one on 2 mx and the other on 432 Mc. It has been suggested that these beacons not be sited on a local mountain top, but in the metropolitan area. Lucky or otherwise, we do not require a beacon on 6 mx as we already have ATV Channel 0. Peter VK3ZYO is chairing a group consisting of VKs 3AUR, 3AOT, 3ZSB, 3ZGS, 3ZKD, 3ZYP, 3ZMU, and 3ZKB. A large amount of work will have to be done to produce, test and instal these beacons.

6 metres is still good for those who are patient enough to tune around the band. JA3 and JA1 have again been heard in Melbourne, whilst VK4s and VK2s can still be worked. One VK4 was heard to work a KH6, but alas, no sign of this juicy piece of DX was heard in VK3.

A report from a friend of mine in W6 indicates that DX of 1,400-3,000 miles is quite common in winter in W-land. Apparently the system in use over there is to point beams at the Northern Lights (Aurora Borealis) and use c.w. Although they are permitted to use one kilowatt over there, it should be possible over here by using the Aurora Australis as the reflecting layer and it could make possible winter DX to VK5, VK6 and possibly VK7. (The Taswegians would have a much better likelihood than those on the mainland.) If anyone is interested, would they please contact me via the Institute.

2 metre activity is high with many new stations appearing on this band, but the amount of DX around is very disappointing.

A report from Ron VK3AKC and Cyril VK3ZCK of hearing the VK6 2 mx beacon has been confirmed by a similar report received from George VK3ASV (ex VK3ZCG). So it looks like W.A.S. on 2 metres is a possibility and not a pipe dream after all.

432 Mc.: No reports have been received for this band, but it is believed that it is almost as active as 2 mx.

73, Robert VK3AUR.

Gippsland.—The VK3 Eastern Zone is planning to instal a two mx translator on Mt. Tassie in Gippsland. Frequencies and other details will be given as soon as P.M.G. and W.I.A. approval have been obtained.

The Zone has decided to use 2 mx f.m. Channel B as the main f.m. net frequency, as in some areas severe interference from the local t.v. channels makes Channel A impossible to use as a net. Channel A is still being used but only over short paths and as a second channel.

A tape recording of the recent East-West 2 mx opening was made by George VK3ASV which included signals from the VK6 2 mx beacon and the VK5 2 mx beacon.

73, George VK3ASV.

AMATEUR FREQUENCIES:

ONLY THE STRONG GO ON—SO SHOULD A LOT MORE AMATEURS!

Overseas Magazine Review

"BREAK-IN"

October 1968—

S.s.b. Transceiver, by ZL4IO. Designed primarily for use in mobile operation, the unit uses transistors except for the p.a. which is a pair of 6AQ5s in AB1. P.e.p. output is about 12 watts and a 455 Kc. sideband generator is used. The Moorabbin unit described in "A.R." appears to be much more versatile in that constructors can start with one band and add others as necessary. The low i.f. used means that multiple conversion would be a necessity if higher frequency bands were to be covered.

Slow Scan Television, by ZL2TAR. The author describes a system of slow scan television he uses on the h.f. bands. With one of these, you can see what your contact looks like!

November 1968—

Dual Gate FET 2 Metre Converter, ZL4LV. Small unit using 3N140, 3N141 and AF178 transistors—of interest to v.h.f'ers.

500 Kc. Spaced Synthesiser, ZL4IO. Part 3 of the article. A very interesting and quite complex construction for the experienced Amateur.

Using An Integrated Circuit, ZL1WL. Describes how to make a complete a.f. amp. with high impedance input of 50 mV. which will give 200 mW. output from a 6v. source. Type R.C.A. CA3020.

An FET Gate Dip Oscillator, ZL1BEB. Small, portable, low powered unit for 1.5 to 100 Mc. in four ranges.

December 1968—

Heterodyne Frequency Sub-Standard. Dr. "Farad" Foit and Toni ZL2BEV. One way of using up some of the surplus valves which are still available is to build a crystal controlled sub-standard with divider circuits to give outputs at 100 Kc. and 10 Kc. intervals for calibrating your gear.

Eight-Valve S.s.b. Exciter for 3.5-4 Mc., ZL2RI. This valve exciter is similar to a number of designs which have been described since about 1953 when one of the first units using the FT241A crystals appeared in "QST". A cascoded half lattice filter is used and this can be on any frequency between 370 and 517 Kc. The author's was on about 510 Kc.

Combined Crystal Oscillator and Multipliers, ZL375. Describes a twin triode oscillator using a 24 Mc. crystal and with output on 144 Mc. Simple and easy to get going using 12AT7 or 6SL7 tubes.

F.M. for the Two Metre Transmitter, ZL4TAJ. Describes a simple phase modulation adaptor for the two metre transmitter. Especially for those who have not purchased car phones.

Integrated Circuits, ZL4LV. The author discusses some ideas for using integrated circuits in s.s.b. circuits.

"CQ"

October 1968—

Amateur Radio Station Design, W9IOP. The author describes his ideal Amateur Station and how he filled half of a large room with racks of equipment. Australian Amateurs are likely to find the approach a little too expensive. One would not only need to be rich, but also devoted.

H.f. Conical Cage Antennas, W2EEY/1. Describes some work which was originally carried out for the Royal Canadian Air Force to develop wide-band h.f. dipoles. This could very well be of interest to Amateurs in some areas. So far as I know, although the author gives the impression that the work is original, I do not think it is. It is understood Marconi Co. in England did some work either during or after WW2 which they abandoned because they could not achieve the desired 10/1 bandwidth. Ever since I have worked for Electronic Industries (1955), I have been aware of designs by Rhode & Schwarz which did give the desired 10/1 bandwidth and are built for many frequency ranges.

The Signal Souper. K. K. Dobler uses noisy signals to "key" an a.f. oscillator to regenerate the received signal and obviate the necessity for us to use our ears as a selective filter. He says it works like a charm. I wonder whether this is really so because the ear and brain combined probably constitute a better selective system than the device which could produce errors.

Use and Abuse of Current Overload Protective Devices, W2EEY/1. The author describes the characteristics of various types of fuses and circuit breakers. Don't laugh, but I think it should be compulsory reading for all in electronics.

Vertical Antennas, W3JM. Part V. of the series which has been run in "CQ" over the last few months. Part VI. will appear in the November issue. This issue deals mainly with stacked verticals of various types to provide gain by narrowing the radiation lobe and generally decreasing its angle.

Improved Carrier Suppression for the HX-20. The Heath unit qualifies for a modification.

A 700 Watt P.e.p. Dummy Load (for about $2), WA8ZJH. The author found someone who was willing to sell him seven 50 watt non-inductive resistors with a nominal value of 344 ohms each which could be paralleled to provide a steady dissipation rating of 350 watts or 700 watts p.e.p. He got these for $US1.75 and even gives the seller's address.

The Corston Affair, Sylvia Margolis. Sylvia tells in her usual racy style how a British Amateur coped with a t.v.i. complaint. Amusing and probably earned her enough to buy her husband a new rig.

Trapless Trap Dipoles, W2EEY/1, or perhaps it should be more correctly titled "Stubs are Traps". It is still an interesting concept and whilst some of us might boggle at adjusting traps for correct operation, perhaps we can more readily see what we are doing when a piece of open wire line is involved. Shades of G4ZU!

The Ins and Outs of Good Soldering, W7CCG. The fine art of soldering for the newcomer and old-timer.

The Hammarlund HQ-125, "CQ" Staff. This is a very interesting solid state receiver which covers all h.f. Amateur bands in 200 Kc. segments and has eleven "spare" positions for other 200 Kc. segments between 3.4 and 30 Mc. Selectivity 0.5, 2.1, 6 Kc. Notch filter and many other features. Price $US529.50. (Here one could expect to pay about $A1060.00.)

That Extra Input, W3KBM. How to add a high level input circuit to that high gain a.f. amplifier. Could also be titled a simple audio frequency mixer using a pentode tube. Although the input impedance is high into G1 and G3, the tube gain is different and one caters for low and the other high level inputs, e.g. mic. and tape recorder.

C.w. Transceive Operation with the Drake T4 and the R4A, WA6UFW. The units transceive okay on s.s.b. and a.m. but since the carrier is shifted into the i.f. passband the receiver tunes about 1.2 Kc. lower in frequency than the transmitter and Don Schliesser tells how he overcame this problem.

An R.f. Actuated Keying Monitor, J. I. Randall. How to make a simple monitor using a newly developed electronic module known as the Cordover CWM-1. Only connections are given and no information is included as to the circuit of the module.

How To Make Five Million (points that is), W1BIH. A group of ardent DXers get together to visit Curacao for a contest and score five million points. Nice work if you can get it.

A 40 Metre Linear, VE7BRK. Take one Command Transmitter (BC458) and two amplifier stages and you have a linear capable of 150 watts output when the three 1625s are fed from 750 volts and driven by a 250 mV. sideband signal. Seems that there is still a lot of life in the old Command transmitters, even in this day and age. I have seen circuits running up to 1250 volts on the anodes of 1625s in s.s.b. service.

November 1968—

A Transistorised R.T.T.Y. T.U., W7PVF. A small relatively simple and solid state—will interest the r.t.t.y. gang.

An Improved Multi-Band Mobile Antenna System, W2OZH. This antenna is claimed to show a considerable improvement over previous whips, etc. So it should, the "capture area" is greater and it uses an 8 ft. whip at each end of the 17 ft. car. May have to alter slightly for our 15 ft. models.

Vertical Antennas, W3JM. Capt. Paul Lee continues his exhaustive dissertation on this very interesting subject.

The Raytrack Auto-Level Volume Compressor, reviewed by W2AEF. Perhaps the use of these will cause some re-thinking in the design of s.s.b. finals and power supplies for the tubes and transformers used by the "floggers" will probably be shortlived with that extra 14 db. of signal.

Finding True Receiver Sensitivity, W2EEY/1. Rated receiver sensitivity is not always achieved in practice. The author discusses the ways of ensuring "weak ones" are copiable.

Contest Capers, VK4SS, Alan Shawsmith. His (??) experience of contest operating and the obstacles one has to overcome from XYLs, harmonics and interlopers. Another "A.R." reader who wants a new rig or something and has set about earning it with his pen in the U.S.A.

Digital Meters and Multimeters, W2EEY/1. A short article to acquaint Amateurs with the availability of such instruments, their uses, accuracy and cost. So far as is known, the cheapest 3 digit d.c. unit with an accuracy better than ½ per cent. available in Australia is about $500 plus tax—almost as much as a new transceiver.

Putting the Motorola FMTU-30D and FMRU-16 on Two, K7CNZ. A mod. article applicable to the U.S. scene, similar to "A.R's" conversion of MR3s, and other mobile radio telephone equipment for Amateur use. No interest here.

The Expanded Lazy-H Antenna, W2EEY/1. A simple version of the Lazy-H with improved gain and a more convenient feed impedance.

Simple Heater Voltage Regulation, W2AEF. From using VR tubes or Zeners, Wilf Scherer takes his readers to a somewhat more complex approach of the saturated core transformer. The editor adds a note that v.t.v.m's should not be used for voltage measurement because they are peak reading. Most multimeters with rectifiers suffer from this defect to a considerable extent also and moving iron thermocouple or hot-wire (true r.m.s.) instruments should be used for preference. An interesting article which could form the basis for a better Australian article. This is a subject every Amateur should know something about.

Experiments with Three Arrays on One Boom, Part 1 (in two parts), W6ZWK. Sam has taken a different approach to most authors on interlaced beams. He uses a 36 ft. boom with four shortened elements on 14 Mc., and three elements on 21 and 28 Mc. All tuning adjustments are made from the boom by remote operation, using slugs in the loading coils. Some good constructional hints, although why he didn't have four elements on all bands with that big boom I'll never know.

Natural Towers, W1RIL. If you have a handy pine tree in your back yard just clear a path up one side for a drive shaft and lop the top to clear the beam and away you go! The rotating equipment is at ground level. Seems this one could provide a headache for the local council as it wouldn't be "built". The tree is still allowed to grow and the beam is almost invisible from the ground—according to the author.

Shorty Twins—Louder Still, G2IS. The author describes an improvement on a ground plane vertical by using two, spaced a quarter wave apart, for 6 db. gain and a 120 degree radiation pattern with a low vertical angle of radiation. By using four and switching, a variety of patterns could be obtained including coverage in any 120 degree segment at will. Similar systems are commonly used in the U.S. with a.m. b.c. stations and a few have been installed in Australia.

A 2 kW. P.e.p. Linear Amplifier, W9MIJ/1. With four 4X150As, the author produced a table top linear for 7-28 Mc. on an 11 x 7 x 2 inch chassis around which he wrapped some perforated metal for a cabinet. He found his chassis was a little small for a bulge was necessary—a-la racing car bonnets—to clear the loading capacitor when open and the cooling fan motor sticks up over the 4X150As like a sore toe.

"A Letter from Don Miller". According to the report which appeared in "QST" October 1968 and on p. 99 on Nov. "QST" both parties won the legal battle. Don's win appears to include a retraction of certain claims he made regarding operation from one or more of the claimed locations. "CQ" in their editorial "Zero Bias" describes the A.R.R.L. as "the largest commercial enterprise in Amateur Radio". This is as it should be for the A.R.R.L. profits flow back to members in the form of improved benefits.

Q. and A., W2AET. I always glance through these and sometimes find some merriment in either the questions or the answers. Wilf is very good, but some of his Questioners have never known or have forgotten the simplest theory.

"Determining S.s.b. Peak Power" is a very useful tip for Australians in this issue (p. 114). Remember the expression P.E.P. means Peak Envelope Power and this is **always** measured on the output side of the tx.

"RADIO COMMUNICATION"

October 1968—

G8ACC Mk. III. Solid State Transmitter. Three watts aerial power with low harmonic content on 70 cm. f.m. This is an article which could interest the v.h.f./u.h.f. men.

Technical Topics, Pat Hawker, G3VA. Discusses the "Hula Hoop" or "DDRR" antenna in its various forms with possible variations and anticipated performance of some as yet untried versions. Also discusses VE2IB's transistor v.f.o. circuit, an IGFET super-regen.

method of damping vibration in beam antennas and p.v.c. masts. On this latter score, your scribe has been looking askance at the prolific variety of rigid p.v.c. tubing now being produced and sold as conduit and water pipe and the fittings which are also available. This material may be markedly superior to bamboo for "quad" spreaders and other similar constructions and some of it appears to be rigid enough to use for booms in sizes above 1½ inch i.d.

G3GGK and G3EDD **Review the Heathkit SB101 s.s.b. transceiver,** and G2BVN reviews the **Omega-T Antenna Noise Bridge.**

Miniature High Performance Tuneable I.F., G3UJP. A 1.5-2.0 Mc. receiver for use as a tunable i.f. on all bands is described. This all solid state unit incorporates some very useful ideas which are likely to interest those amongst us who are really interested in building high class receiving equipment.

November 1968—

Semiconductor V.h.f. Power Amplifier using a Pi-Tank Circuit, G2HIF. The target was a 25w. c.w. 144 Mc. amp. which would not be too expensive. The design details are published here using two 2N3632s.

Technical Topics, G3VA. Discusses t.v.i. and the fact that for every problem there appears to be a cure which is as unique as the problem. He goes on to discuss a wide-range "Gate Dipper"—FET g.d.o. if you like, using an MPF102. W6PIZ's "Lazy Quad" follows. This is an antenna type which could have some advantages in small blocks. This is followed by paragraphs on Urban V.h.f. Noise, Schottky-Barrier Diode Front-End, I.F. Derived "Hang" A.g.c., Simple Meter Switching, a hint showing how a simple s.p.s.t. switch can be used for metering grid and cathode currents with an 0-1 mA. meter, Low-Cost APT Stations (seems that N.A.S.A. has a valuable publication SP-5079 entitled "Constructing Inexpensive APT —Automatic Picture Transmission—Ground Stations". Perhaps some of Bill VK3ABP's mates would like to send 50c to "The Clearinghouse for Federal, Scientific and Technical Information," Springfield, Virginia, 22151, U.S.A., for a copy of this 60-page booklet), Slow Scan TV, V.h.f. and V.h.f. Propagation, and Two Voltage Stabilisation Tips concludes Pat's offering for the month.

G8ACC Mk. III. 70 CM. F.M. Solid State Tx. This completes the series and should interest some of our 432 Mc. men.

Miniature High Performance Tunable I.F., G3UJP. Part 2 continues the description commenced in October issue. Your reviewer could not get wildly enthusiastic about this device—seems to him that a better approach is a 5.5 or 9 Mc. i.f. device. However, when well built they'll all give good performance and it takes all sorts to make a world.

"RADIO ZS"

September 1968—

Transistor Dip Oscillator, ZS1MM. The article is written in Afrikaans and although not easily readable, the circuit and drawing are understandable. Uses OC171/OC71.

There is another short Afrikaans article on what appears to be a tuning device for an 80 mx whip using a "Terry" clip to hold it in place.

"SHORT WAVE MAGAZINE"

October 1968—

Economical Five-Band Linear Amplifier, G3SQR. Author describes easily built linear using four PL500 or PL504 tubes. The amplifier runs about 525 watts peak d.c. input and could be expected to give an output of a little over 300 watts p.e.p.

Transistor Transceiver for Two Metre Portable, GW3UUS. Transmitter is crystal controlled on one fixed frequency and uses three transistors. Receiver is a super-regen. type using two transistors. Both tx and rx share a common a.f. amplifier unit.

Considering the Hallicrafters SR-400. Staff review of this transceiver, and the companion HA-20 DX Adaptor.

November 1968—

Getting on Four Metres, G3TDZ. Transistorised circuitry and construction notes. This article may interest some of our 6 mx men.

Variations on the HE-30 Theme, R. W. Bunney. This fellow changed his r.f. stage to a cascode using a twin triode ECC84 and did sundry other modifications in an effort to improve this well known receiver. S.w.l. interest.

Ideas for an El-Bug, G3XSE. Simple electronic bug. This circuit uses only two transistors as switches to manipulate a relay with r.c. timing circuits. The unit is simple and effective.

/MM in Witchcraft, G8BJP. The author is operator/navigator aboard a friend's 30-foot yacht and tells of his experiences.

R.T.T.Y. Station Control Simplified, G8LT. This article seems to be of a type which could interest a number of VK Amateurs because it uses equipment which is more likely to be available here than the American equipment described in U.S. publications.

"73 MAGAZINE"

October 1968—

A collection of Thoughts on Receiver Design, WB6BIH. Tips for the builder.

Three Tube Superhet Short Wave Receiver, W6ELJ. Performs like a six tube hearing aid.

The MO Receiver, K5WYG. This one will have you burning the midnight oil.

Project Facsimile Antarctic, K6GKX. Morale booster in the cold continent.

A High Performance Receiver for 2 Metres, W2HUX. A v.h.f'ers dream receiver.

Ham Workshop, W0PEM. The bare essentials to work on the gear.

New Life for an Old Circuit, Thorpe. Reviving the Vackar V.f.o.

V.h.f. R.f. Noise Suppression, K6ZFV. Mobile noise—good tips for h.f. too.

Reviewing the SR-400, W2NSD/1. Hallicrafter's latest transceiver is great.

FET Converters for 50 Mc., WB6YVT. Six metre converter that works.

Neutralisation, K6EAW. What neutralisation is all about.

The Q Q Meter, WB6IBS. The measurement and importance of "Q".

2 Metre Ground Plane, WB6BIH. Never under-estimate the ground plane. Author apparently has not seen those nice four-way screwed conduit boxes which come with covers and by the addition of four pieces of screwed conduit . . . there it is. Much easier than building boxes and drilling holes all over the place. This remark applies to 6 metre ground plane.

Improving Stability in Older Receivers, W6NIF. Good tips on making them solid.

Six Metre Ground Plane. Novel construction idea. See 2 metre remarks above. This was the article I was thinking of when I mentioned the boxes. The conduit boxes will also be useful for six.

V.h.f. Monitor, W4KAE. Keeping in touch with the group.

Simplified db. Levelling, W2DUD. A.l.c. and a.g.c. circuits.

F.m'ing a V.f.o. F.m. doesn't have to be crystal.

FET Pre-Amplifiers, W2EEY/1. Boosting receiver performance.

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FOR SALE: UM2 Mod. Tranny, 60w. audio, 120w. r.f., $25. Geloso VFO, 4/102, complete with cal. dial, escutcheon and tubes (6J5G, 6AU6, 6L6), $20. Graham McPhee, VK2AYE, Phone 528-8825 (Sydney).

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SALE: Yaesu Musen FL200B Transmitter, FR100B Receiver, matched for separate or transceive conditions. All bands plus WWV, 100 Kc. Cal., provision for other bands, in as new cond. with handbooks, speaker and mic., in original packing cases. $575 o.n.o. for both, will separate. R. J. Richards, VK2BRR, 49 Ourimbah Rd., Mosman, N.S.W., 2088. Phone 96-7252.

SELL: Collins 75S3B serial number 15579. This receiver is the latest in the "S" Line series. It is less than 12 months old and has been used very little due to my absence abroad most of last year. Immaculate, as new condition. $675. Roth Jones, 1 Albert Rd., Melbourne, Vic., 3004 (Phone 26-6911).

WANTED: Receiver, general coverage type. Lafayette, HE30, or similar. Price and details, etc., to Howard Anders, VK3AYV, 325 Waverley Rd., Mt. Waverley, Vic., 3149. Phone 277-1207.

WANTED TO BUY: Transistor, preferably 20w., must be very reasonable. May require linear to match. If not, what can you offer? Phone 91-2297 Brisbane. Urgent. VK4IM, J. D. MacLean, 89 Thorn St., Kangaroo Pt., Brisbane, Qld., 4169.

$100 REWARD is offered for information leading to the recovery of Collins KWM2 Transceiver, S/N 1284. Information in confidence to Harold Burtoft, 114 Links Ave., North Strathfield, N.S.W., 2137. Telephone: Business Hours 55-0433, Residence 73-2369.

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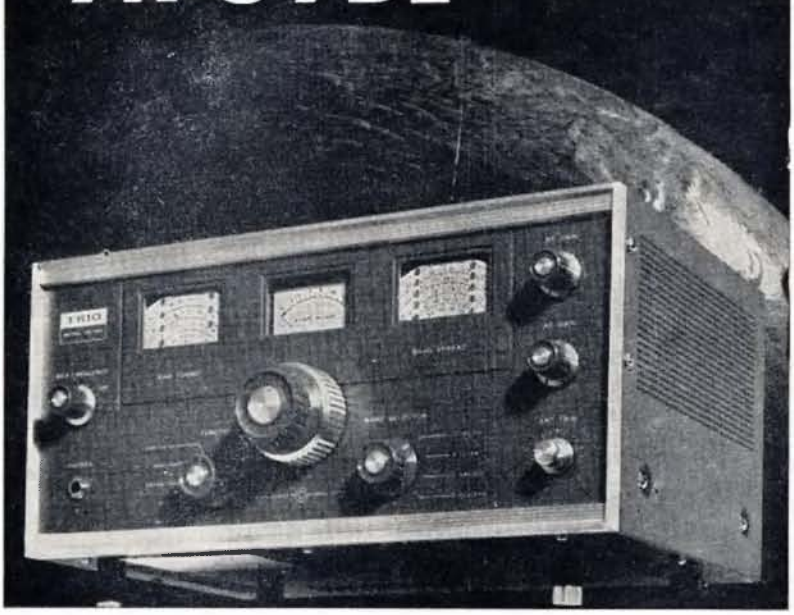

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V6—6BE6 Product Detector.
V7a—6AQ8 Beat Frequency Oscillator.
V7b—6AQ8 1st AF Amplifier.
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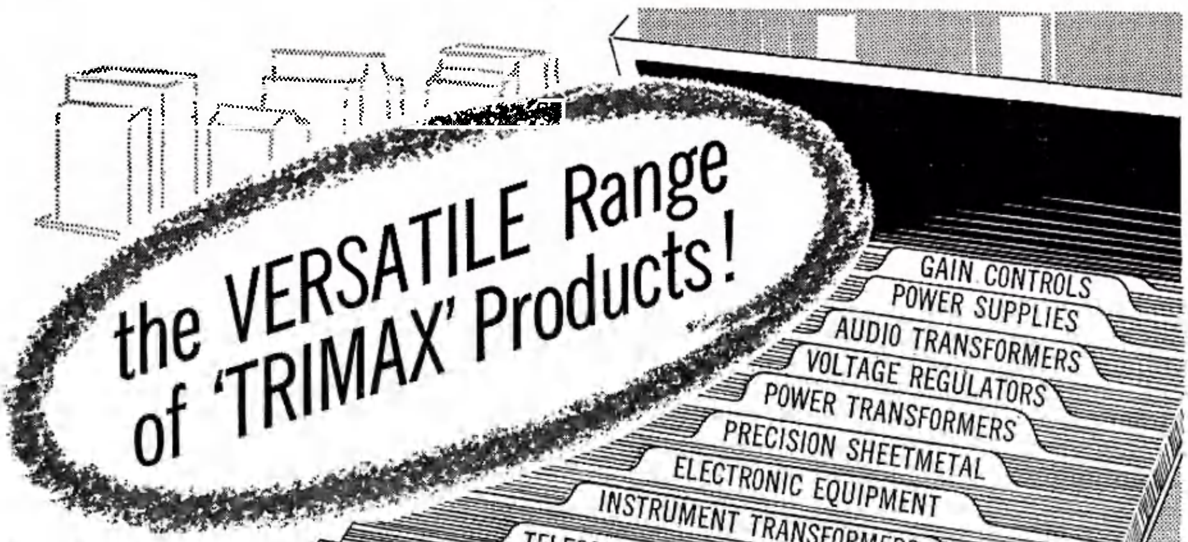

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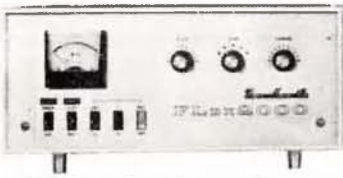
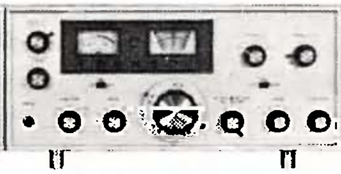


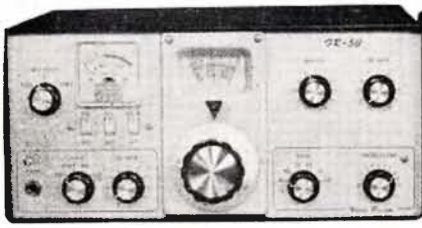
FLDX-2000 Linear Amp.
80-10 mx, AB2 G.G.

SP-400
Speaker



FRDX-400 Receiver
160-2 mx, WWV, C.B.

FLDX-400 Transmitter
80-10 mx, peak in. 300w.



FR-50 Receiver
80-10 mx, WWV

SP-50
Speaker

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FF-30DX 3-Section L.P. Filter
For T.V.I. reduction

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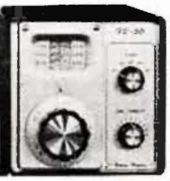
80-10 mx, peak inp. 100w.



FV-50 V.F.O.

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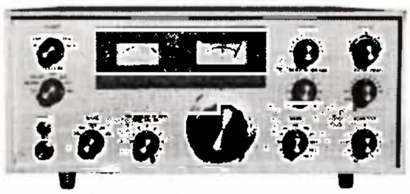

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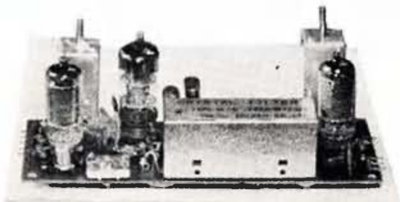

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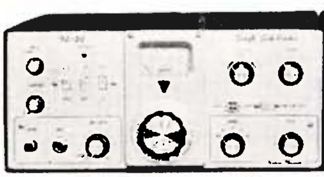
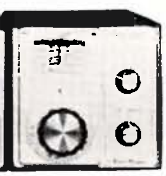


FL-50 Transmitter
80-10 mx, peak inp. 125w.



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AY 1119. NPN Silicon Planar Transistor for use in RF-IF application featuring high power gain.
AY 6105. NPN Silicon Planar Transistor designed for small signal RF and IF Amplifier. Low feed back capacitances make it especially useful for unneutralized amplifiers and high stability oscillators.
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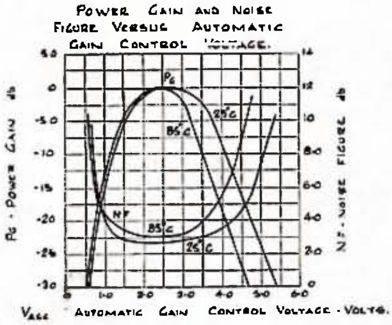
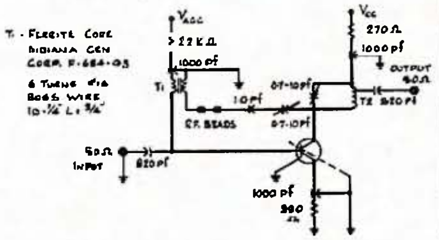
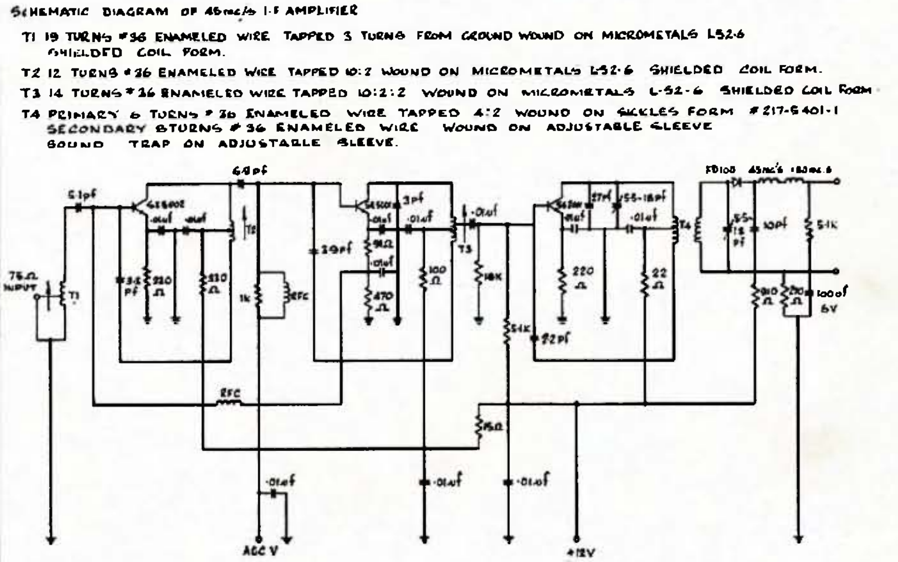
SE 5006. NPN Silicon Transistor designed for RF application featuring low feed back. Cob. 1.6 pF max. high power gain and low NF.
SE 5020. NPN Silicon Transistor is a high gain low noise RF type with forward AGC characteristics. Ideal for HF and VHF small signal amplifiers.







Electrical Characteristics at 25°C.

Type No.	LVCEO IC mA Volts	@ VCE (Sat) @ IC/IB Volts	hFE @ IC mA/ VCE = Volts	Pg AGC*	NF dB	Cob @ V PF	or Cre @ V PF	fT MHz	Tot. Pwr. @ 25° C.A. mW.
2N 3137	20	0.3 @ 50/5	20 min. @ 50/50	7 dB @ 250 MHz		3.5 @ 10		750 typ.	600
2N 3563	12	0.1 @ 10/1	20-200 @ 8/10	17 dB typ. @ 200 MHz	4.0	1.7 @ 10V		900 typ.	200
AY 1114	20	0.5 @ 50/5	60 min. @ 1/0.1		6.0	4.5 max.		550 typ.	200
AY 1119	15	0.3 @ 10/1	35 min. @ 10/1			4.0 max.		400 min.	200
AY 6105	30	3.0 @ 10/5	20-200 @ 4/5	Pg @ 60—450+800 MHz	8 @ 800 MHz		0.5 @ 10	425 min.	200
SE 5001	40		30 min. @ 4/10	8 mA AGC @ 45 MHz		1.6 max.		400 min.	200
SE 5006	40	2.0 @ 10/5	30 min. @ 4/10	10.5 mA AGC @ 100 MHz	5.5 typ.	1.6 max.		600 typ.	200
SE 5020	20	3.0 @ 10/5	20-200 @ 4/5	28 dB Pg @ 200 MHz 5 Vagc @ 200 MHz	2.8 typ. @ 200 MHz		0.5 max.	375 min.	175

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80 Metres to 10 Metres

- Ultra-precision three-stage double gear tuning mechanism, completely free of backlash, spreads each 600 Kc. over 1.68 metres with 1 Kc. dial calibrations.
- Stability better than 100 cycles. "Vackar" type VFO. Voltage regulated power supply.
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- May be connected with STAR SR-700A receiver for transceive operation.
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- Built-in antenna relay.
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MAY, 1969

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amateur radio

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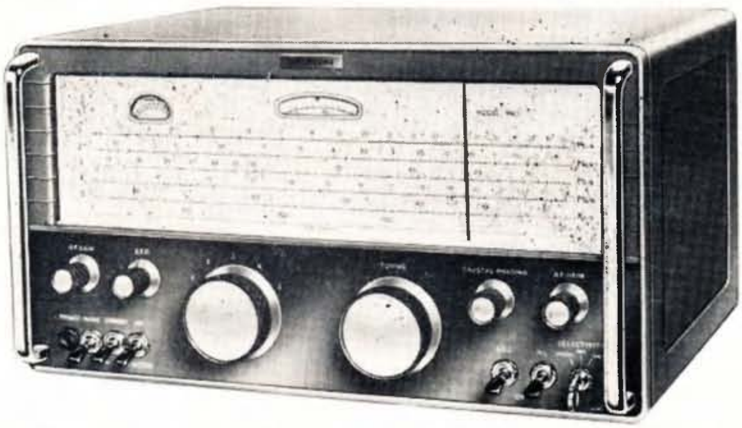

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VHF COMMUNICATIONS, the International Edition, printed in English, of the well established German Publication UKW-BERICHTE, is an Amateur Radio magazine catering especially for the VHF, UHF and Microwave enthusiast.

VHF COMMUNICATIONS will follow the same path as UKW-BERICHTE, by specialising in the publication of exact and extensive assembly instructions for VHF, UHF and Microwave transmitters, receivers, converters, transceivers, antennas, measuring equipment and accessories, which can be easily duplicated. The latest advances in semiconductors, printed circuits and electronic technology are described in great detail. For most articles, all the special components required for the assembly of the described equipment, such as epoxy printed circuit boards, trimmers, coil formers, as well as metal parts and complete kits will be available from the Australasian Representative.

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VHF COMMUNICATIONS is a quarterly, published in February, May, August and November. Each edition contains roughly sixty pages of technical information and articles.

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Mullard Special Quality Valves

for Industrial Applications

This chart enables you to identify at a glance the Mullard Special Quality Valve equivalents of C.V. Services Types, American Types and Mullard Standard Types. In addition abridged data is provided to assist in the selection of the Special Quality Valve most suited to your specific circuit requirements. Further information is available on request.

SPECIAL QUALITY PRODUCTION			DESCRIPTION	STANDARD PRODUCTION		
Mullard Type Number	Services Type Number	American Type Number		Mullard Type Number	Services Type Number	American Type Number
E55L	CV5808	8233	High slope wideband output pentode	—	—	—
E80CC	CV5989	6085	Double triode for industrial use	—	—	—
E80CF	—	7643	Triode pentode with separate cathodes	ECF80	CV5215	6BL8
E80F	CV2729	6084	Voltage amplifying pentode	—	—	—
E80L	—	6227	Output pentode	—	—	—
E81L	—	6686	Output pentode	—	—	—
E83F	—	6689	Voltage amplifying pentode	—	—	—
E86C	—	—	U.H.F. triode	EC86	—	6CM4
E88C	—	—	U.H.F. grounded grid triode	EC88	—	6DL4
E88CC	CV2492	6922	Double triode for use in computers and cascode circuits	ECC88	CV5358	6DJ8
E88CC/01	CV2493	—	Double triode for use in computers and cascode circuits	—	—	—
E90CC	CV5214	5920	Double triode for use in computers	—	—	—
E91H	—	6687	Dual control heptode for use as a gating valve	—	—	—
E92CC	—	—	Double triode for use in computers	—	—	—
E180CC	CV8431	7062	Double triode for use in computers	—	—	—
E180F	CV3998	6688	High slope wideband amplifying R.F. pentode	—	—	—
E182CC	CV5766	7119	Double triode for use in computers	—	—	—
E186F	—	7737	High slope wideband amplifying R.F. pentode	—	—	—
E188CC	CV5354	7308	Double triode for use as cascode amplifier	—	—	—
E280F	—	7722	High slope wideband amplifying R.F. pentode	—	—	—
E288CC	—	—	Double triode	—	—	—
E810F	CV5809	7788	High slope wideband amplifying pentode	—	—	—
EC1000	—	8254	Subminiature triode for use in measurement probes	—	—	—
ECC2000	—	—	Double triode for use as V.H.F. cascode amplifier	—	—	—
M8079	CV4025	‡6058	Double diode with separate cathodes	EB91	CV140	—
M8080	CV4058	‡6100/6C4WA	R.F. power triode	EC90	CV133	6C4
M8081	CV4031	‡6101/6J6WA	V.H.F. double triode with common cathode	ECC91	CV858	6J6
M8082	CV4063	‡6516	Output pentode	EL91	CV136	—
M8083	CV4014	‡6064	R.F. pentode with separate g3	EF91	CV138	—
M8091	CV4044	‡6443	Half-wave rectifier designed for operation at high altitudes	EY84	CV2235	—
M8096	CV4039	‡6062	V.H.F. power tetrode	QV03-12	CV2129	5763
M8097	CV4059	—	Low impedance diode with medium μ triode	EAC91	CV137	—
M8099	CV4070	—	Triode for use as grounded grid amplifier	EC91	CV417	—
M8100	CV4010	‡5654/6AK5W/6096	Low noise, R.F. pentode	EF95	CV850	6AK5
M8136	CV4003	‡6189/12AU7WA	Low μ double triode	ECC82	CV491	12AU7
M8137	CV4004	‡6057	High μ double triode	ECC83	CV492	12AX7
M8161	CV4015	‡6065	Variable μ R.F. pentode	EF92	CV131	—
M8162	CV4024	‡12AT7WA	Medium μ double triode	ECC81	CV455	12AT7
M8195	CV4085	—	Low microphony, low hum A.F. voltage amplifying pentode	EF86	CV2901	—
M8196	CV4011	‡5725/6AS6W	Dual control pentode	6AS6	CV2522	6AS6
M8212	CV4007	‡5726/6AL5W/6097	Double diode with separate cathodes	6AL5	CV283	6AL5
M8248	CV5311	‡6J4WA	U.H.F. grounded grid triode	EC98	—	‡6J4

‡The American types shown in this chart have the same electrical characteristics as the appropriate Mullard Special Quality type and they may, in general, be regarded as interchangeable. In the case of those types marked ‡ there are, however, certain differences in the test specifications.

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- TRIPLE CONVERSION RECEIVER
- NOISE LIMITER
- A.C.-D.C. OPERATION
- INBUILT POWER SUPPLY

SPECIFICATIONS:

RECEIVER	
Frequency Range:	144-148 Mc AM
Sensitivity:	1 microvolt for 10dB S/N at 145.5 Mc (0.05 W Audio Output)
Image Ratio:	50 dB at 145.5 Mc
IF Frequency:	1st IF 44-45 Mc 2nd IF 10.7 Mc 3rd IF 455 Kc
Noise Limiting:	Automatic
Squelch:	1 microV-300 microV.
Selectivity:	20 dB down at 10Kc
Audio Output:	3W 8 ohms
Input Impedance:	50 ohms (Unbalanced)
TRANSMITTER	
Frequency Range:	144-148 Mc AM
Power Input to Final:	22 to 26 Watts
RF Output Power:	10W 144-146 Mc AC 240V Operation 9W 144-146 Mc DC 12.8V Operation
Crystal Type:	FT-243
Crystal Frequency:	8-8.222 Mc
VFO Frequency:	8-8.222 Mc
Microphone Input:	High Impedance w/Push to Talk
Frequency Response:	—3 dB at 300 and 3,000 c/s
Output Impedance:	50-100 ohms w/Coaxial Connector
POWER SUPPLY	
AC Operation:	117/230V 60/50 c/s Receive Power Drain 106 VA Transmit Power Drain 146 VA
DC Operation:	DC 12.8V (12/14V) Receive Power Drain 90 VA Transmit Power Drain 120 VA
Tubes and Transistors used:	16 Tubes 1 Nuvistor, 8 Diodes, 4 Power Transistors
Dimensions:	H: 6⅝"; W: 11⅞"; D: 12¾"
Weight:	22.2 lb

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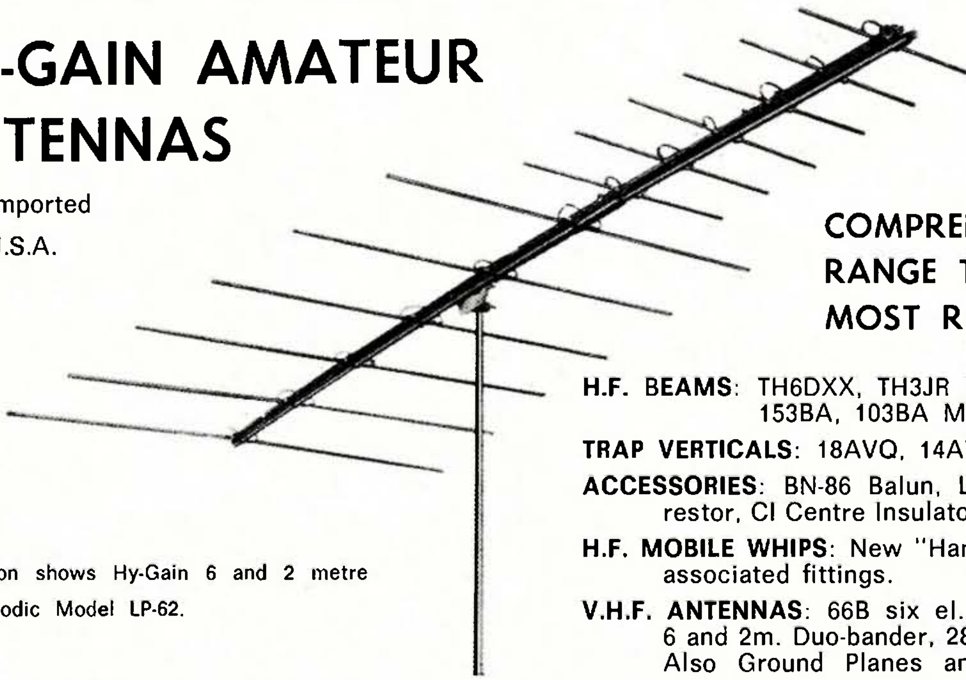

Illustration shows Hy-Gain 6 and 2 metre Log Periodic Model LP-62.

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FEDERAL COMMENT

By JOHN B. BATTRICK, VK3OR, Immediate Past Federal President, W.I.A.

I wrote this "comment" after returning from the 33rd Annual Federal Convention held last month in Canberra. This will be my last comment as I have asked Federal Council to accept my retirement from Executive due to pressure of business and for personal reasons. I announced this fact at the commencement of proceedings at the Convention, which left Federal Council the additional problem of a replacement for the office of Federal President.

However, it did allow for discussion among Federal Councillors and towards the end of the Convention, Federal Council, by unanimous decision, appointed David Wardlaw (VK3ADW) to fill the vacant position on Executive, Michael Owen (VK3KI) to the position of Federal President, and David Rankin (VK3QV) to the position of Federal Vice-President. I was appointed for a further term as the W.I.A. Director I.A.R.U. Region III. Association—for which I am grateful as it will allow me to continue to serve W.I.A. and Amateur Radio in an important area of activity, but without the stress attaching to the office of W.I.A. Federal President.

Personally I am very pleased with the decisions of Federal Council to appoint two such young and experienced men to the positions of President and Vice-President. This is, in any organisation, a rare combination—youth and experience. David VK3QV is well known as a long-standing member of Executive. His activities on v.h.f. bands and 10 metres, his competent management of W.I.A. Federal Activities (contests, etc.), his valuable assistance given to set up the Region III. inaugural congress, his contact with overseas Amateur Societies on a personal basis, his attendance at many Federal Conventions—all bring a valuable background of experience to his office. He will continue his work as Federal Activities officer in his new position.

The new Federal President, Michael VK3KI, is also a well known worker for Amateur Radio and the W.I.A. Over the past six or seven years he has been a tireless and determined officer in both Divisional and Federal matters. I say determined only because there are times when the pressing of matters clearly aimed at improving the W.I.A. organisation and our hobby has needed a forthright approach to the problems. This has been supplied and such things as the new Handbook, with its liberal operating and licensing provisions, the detailed work on the new Federal Constitution, the development and planning of the W.I.C.E.N. network in VK3, the detailed drafting of the interim constitution for the Region III. I.A.R.U. Association, the active attendance at many Federal Conventions, the recent achievements with regard to v.h.f. repeater/translators, show the results of his energetic and forthright approach.

JOHN B. BATTRICK, VK3OR,
Immediate Past Federal President, W.I.A.

A very high degree of personal rapport has been established between the officers of P.M.G. Central Office and our new Federal President over recent years. He still finds time to operate his r.t.t.y. equipment and to be active on v.h.f. f.m. nets (he was as a matter of interest, one of the first to operate equipment on 145.854 Mc. f.m., from which has grown the present net frequency system).

I put these points before you to indicate that Federal Council in its unanimous decision to appoint Michael and David to these high positions in our society recognises, no doubt, the value of youth when allied to such a wide and deep experience. Such people are rare and their expertise a "must" in any organisation. They will be ably supported by Peter Williams (VK3IZ) as Federal Secretary—also a longstanding co-worker with Michael and David, and a tireless administrator (or we hope he is tireless, hi). This point I may pick up—we all accept hard work, we all give our time as we can to help the W.I.A.—but stress none of us needs in this busy world of today.

The recent "Federal" Convention in Canberra was one of the most significant for many years. The fact that all the delegates and members of Executive present were housed together in the one centre which also contained the conference room allowed for many free exchanges of views both at the conference table and in the periods between formal sessions. As a result, many differences of opinion were explored, compromise reached, and stress reduced.

These areas in which compromise can be reached, that is, where some solution acceptable to all is possible from an initial position of difference, is one of the easiest areas for Executive to carry out. Easiest because the instructions stem from unanimity. However, many areas in which F.E. is required to execute some direction from Federal Council are less easy because instructions stem from majority decisions. Executive must, by virtue of our society procedures and rules, in these areas, proceed in a manner consistent with the views of the majority, however keeping also in mind the views of a minority. A deeper realisation of the difficulties inherent in this latter activity have resulted from the first convention in our "Federal Capital".

I hope you will all give your new Executive your wholehearted support during its coming year—I believe you have a vigorous and talented Executive with youthful and experienced leaders. As I said before, a rare combination. They have much to do for you (61 motions and motions arising were dealt with at the Canberra Convention between midday Friday and midnight Sunday). I commend them to you and thank them for carrying on from where I unfortunately had to leave off.

NEW IDEAS ON AMATEUR TELEVISION

PART TWO

GRAHAME WILSON, VK2ZGW/T*

As you have probably realised by now, Amateur Television offers a unique and challenging opportunity for the Amateur to try out his ingenuity, but there is a definite method of tackling Amateur Television so as to avoid as many problems as possible.

Firstly, if possible, you should join an ATV group or contact people involved in ATV so as to gain as much experience as possible. Many Amateurs have had experience in television and can give you a great deal of assistance.

Secondly, Amateur Television is quite different from Amateur Radio and so is the test equipment used. It is most essential that you have access to certain pieces of test equipment or you will be working in the dark—remember, television works on pulses, not on sine waves. Once again, group effort in pooling test equipment is about the best method. The most important piece of test equipment is the c.r.o., followed closely by the multimeter and signal generator.

Thirdly, you should plan your projects well ahead of construction, show your circuit diagrams to other ATVers for constructive criticism. Basic individual circuits should be built as prototypes and their performances noted before you build any major projects as this will avoid those nagging faults that always seem to follow a bad design. I will be giving you further hints on design later in the series.

The circuits used in television, or for that matter, any electronic circuitry, are built up of basic circuit functions and if you understand these functions you will not be restricted to one design but may modify it to your own needs. It is, therefore, necessary to get your basic television circuit theory off pat.

Fourthly, do not rush in to ATV and expect results immediately, start slowly and build up your equipment, such that each section is of known reliability and when connected to the "system" you know that it will work. This is a much better approach in the long run.

Throughout this series of articles my approach to the subject will be of more to giving information and ideas rather than describing projects that follow a rather rigid line of circuitry and construction. There are several reasons for this. Firstly, it would mean a great deal of developmental work on my part to produce designs that everyone can construct without difficulty, and secondly the requirements of different Amateurs will vary greatly according to their needs and the parts they have available.

If you would like to follow a series of articles on construction of ATV equipment try and obtain copies of "A.R." March to November 1958. This series of articles was magnificently developed by E. Cornelius, VK6EC/T, and the equipment described is quite suitable for use today as it was designed around C.C.I.R. standards that the television services comply with. Considering the time the series was written it would probably be safe to say that the articles would class as one of the "classics" of "Amateur Radio," the work put into this series must have been phenomenal. All I can say is if you can get hold of the series, read it!

As this article is the second in the series I will not have time to describe the "set up" in the shack fully, but I will endeavour to give you a brief idea of what the actual equipment in the shack consists of.

The ATV station consists of three major sections:

(1) The camera.
(2) The modulator and transmitter.
(3) The converter and receiver.

Taking the last first, the receiving section of an ATV station consists of a receiving device (antenna), a 432 Mc. converter and a television set. The antenna will usually be a Yagi with about 12 to 16 db. gain, or a phased array of similar gain. The converter will vary, depending on gain needed, location and the like. For just reasonable distances, almost any reasonably low-noised converter will do, it can also have a free-running oscillator as stability for television reception is not of paramount importance. The output of the converter can feed into an unused t.v. channel[1] of a standard television set.

The camera can be of two catagories:

(1) Still camera.
(2) Live camera.

The difference between the two is quite self-explanatory. In the still camera photographs (negatives and transparencies) can be televised. The still camera consists of what is known as a flying spot scanner, this is a simple device in which a c.r.o. tube is scanned so as to produce a raster. The light from this raster is then focused through a film negative onto a photomultiplier which picks up the signal and amplifies it. Synchronising pulses from the oscillators in the scanning coils are added to the output of the photomultiplier so as the video is synchronised (known as composite video).

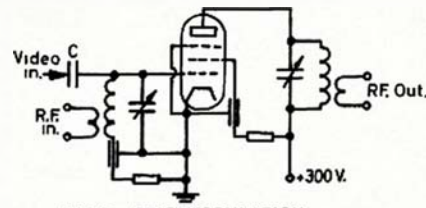


FIG. 2a. GRID MODULATION.

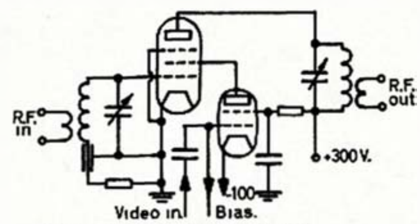


FIG. 2b. SCREEN MODULATION.

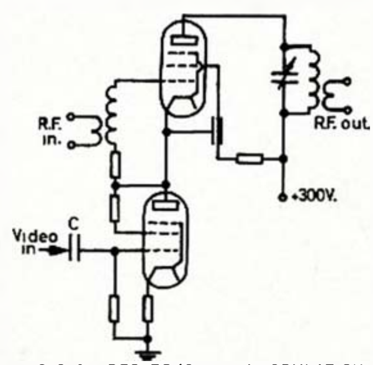


FIG. 2c. SERIES (Cascode) MODULATION.

"C" - Very large.

Note - These circuits are illustrative only.

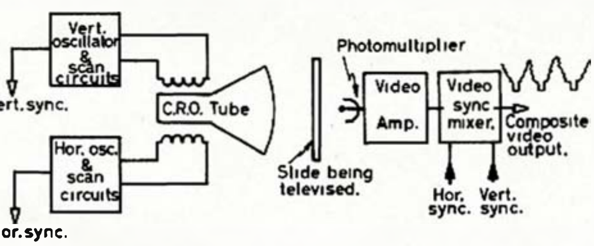


FIG. 1. THE FLYING SPOT SCANNER. (Simplified block diagram)

I will describe the operation of the live camera in my next article.

The next and last section of the ATV station is the transmitter and modulator. In many respects a video transmitter is the same as an audio one, the main difference being the bandwidth of the transmitter. In order to obtain bandwidths in the order of about 5 Mc., a different approach to modulating has to be taken, the use of reactive transformers is out and one has to adopt a completely different method. This is quite easily done by coupling

(Continued on Page 15)

* 31 Ada Street, Katoomba, N.S.W., 2780.

1 Local oscillator of t.v. set should not produce harmonics on 432 Mc. If you select the channel with this in mind.

A FIELD-DAY TRANSMITTER

T. MITCHELL, VK3EZ (Ex VK5TH)*

● This article is intended to encourage building for and participating in the National Field Day Contest. The transmitter has been proved in service as reliable communications with Eastern U.S.A., Canada and New Zealand have been successful.

THIS description of a self-contained 40 and 80 metre transmitter is intended to encourage some of our younger Amateurs to take an interest in portable operations and, in particular, to participate in Field Day Contests. As VK5TH/P and VK3EZ/P, I have enjoyed several Field Day Contests, starting with unsophisticated rigs, but year by year improving my gear.

In 1968 I used the transmitter described here in conjunction with a Super Pro receiver using dry batteries, for high tension. For the 1969 Contest I was in the field using this transmitter in conjunction with an Eddystone EC10 (transistorised) communications receiver. Voltage for the transmitter was obtained from the automobile cigarette lighter via a special plug which is available for about 60 cents.

Whatever the rig, crude or sophisticated, the John Moyle Memorial National Field Day Contest is, for me, the most important day in the Amateur Calendar. There is no more enjoyable experience than operating under field conditions, using equipment built, modified or improvised for the occasion.

* 91 Roslyn Street, Burwood, Vic., 3125.

In designing this 15-watt transmitter, my original intention was to build a transceiver. The space now occupied by the power supply and sidetone amplifier was to be used for a two-band transistorised receiver. Terminal TSB-3 was the receiver 12 volt supply. Having bought the EC10 receiver, the inducement to continue the in-built receiver ceased.

Some points of interest are:

1. Portability and Cost

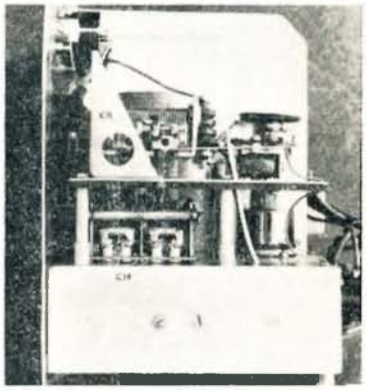
The cabinet, sidetone speaker, C14, C15, TR/1 and several other components were purchased quite cheaply from city disposal houses.

2. Single Switch Operation

See circuit diagram and note the separate meters for monitoring power amplifier grid and plate current. The space taken by a small meter is no larger than necessary to accommodate a switch, and having separate meters means less inter-circuit wiring. No microphone press-to-talk switch is necessary.

3. Keying

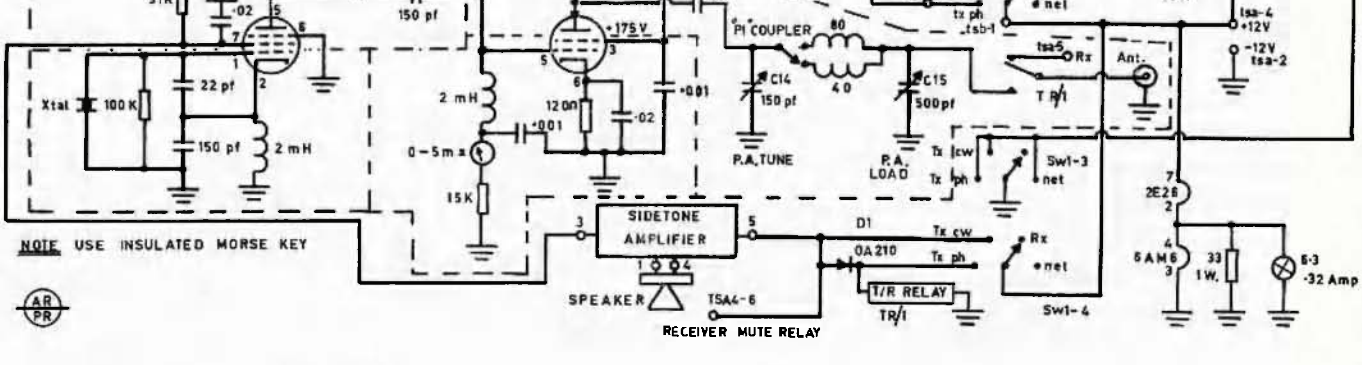
Screen grid keying is quite effective in this transmitter. In conjunction with crystal control and a regulated h.t. oscillator supply, and noting the very small keyed screen grid current (0.7 mA.), the transmitter output is clean, chirpless and free of key clicks. The disadvantage, of course, is that the



Morse key is at +150 volts potential. However, insulated keys are available at disposals houses at about 50 cents.

4. C.W. Monitor (Sidetone)

As a keen c.w. operator, I insist on a keying monitor. I do not like using a transistorised receiver for monitoring signals. It is far better to switch off the receiver whilst transmitting. Most



FIELD DAY TRANSMITTER

circuits previously published have used r.f. power as a voltage source for the monitor. However, I consider that with the low r.f. power available, adjustment of coupling could be tricky.

My circuit uses the oscillator keyed screen supply as a voltage source for the multivibrator transistors in the sidetone unit. Although this does not prove that the transmitter is actually radiating, it provides a faithful reproduction of the operator's keying characteristics. The 12-volt supply is used for the sidetone output circuit: Diode D1 prevents sidetone operation when switched to "transmit phone".

5. **Stability**

With crystal control, regulated high tension supply for the oscillator, and proper screening, stability is as good as many fixed station transmitters. The broken lines on the circuit diagram in conjunction with the photographs show clearly the screening. Note that the oscillator tube is mounted above the chassis to provide further isolation between oscillator plate and grid circuits.

6. **Minimum Operating Controls**

Careful consideration was given to this aspect and the circuitry provides single switch operation for four functions. The oscillator plate circuit tuning capacitor C5 tunes 40 metres at near minimum and 80 metres at near maximum. 80 or 40 metre crystals can be used for 40 metre operation. The EF91 (6AM6) is a well screened tube and operation on the fundamental crystal frequency is satisfactory.

7. **Phone Operation**

The modulator is based on an article entitled "Modulator Design with OC26 Transistors" in Mullard "Outlook" for May-June 1960, modified in the March-April 1962 edition.

8. **Coil Data**

Oscillator plate coil L1—

25 turns of 30 gauge enamelled wire on a 1" diameter former, turns removed to tune 80 and 40 metres at near extremities of C5.

80 metre final tank coil—

21 turns of 24 gauge wire on a 1½" diameter former, double spaced.

40 metre final tank coil—

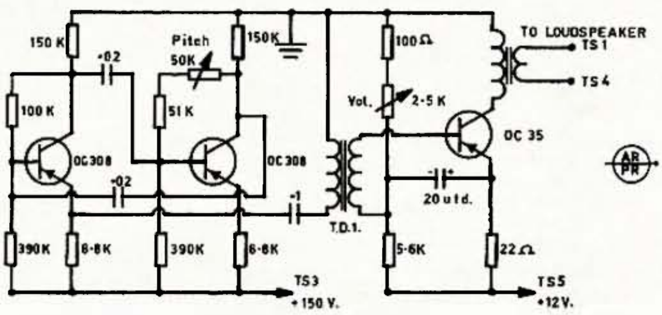
13 turns of 24 gauge wire on the same 1½" diameter former, double spaced.

GETTING LAST BIT OF POWER FROM A.W.A. MR3 CARPHONE

If you measure the voltage drop across the metering resistor in the p.a. anode of your MR3 (and I suppose other units also) you will find a drop of about 8 volts across this 100 ohm resistor which means that about ½ watt is being dissipated as heat.

So to make this ½ watt of power work, short out this resistor by applying a short to your metering plug and leave it plugged permanently into the p.a. anode metering socket.

—Max Hepner, VK3ZQY.



SIDETONE OSCILLATOR AND AMPLIFIER

1969 U.S.S.R. DX CONTEST

RULES FOR C.W. SECTION

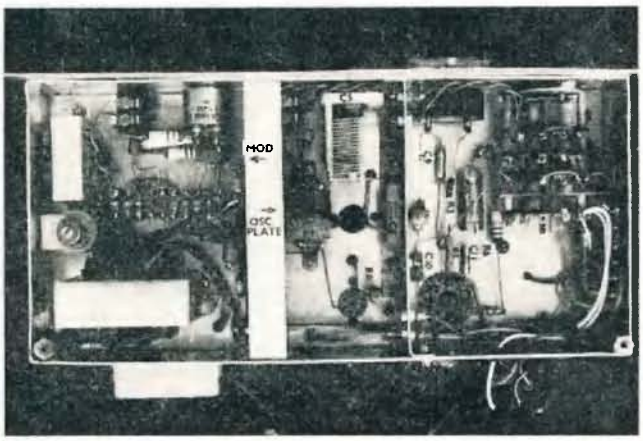
Date: 09 GMT, May 3, to 21 GMT, May 4.
Object: To work as many stations as possible, both in the U.S.S.R. and in other countries.
Exchange: RST plus three-figure serial number starting from 001.
Scoring: Each contact is worth 3 points. Contacts with the same country count 0 points, but can be counted as a multiplier. The multiplier will be equal to the total number of countries worked, regardless of the band. Final score equals sum of QSO points from all bands multiplied by number of countries worked.
Scoring will be for a maximum of 12 hours. Submit the complete log, but mark the 12-hour period you wish to be entered for and score only this period. Mail the log within 15 days to C.R.C., P.O. Box 88, Moscow D-362, U.S.S.R.

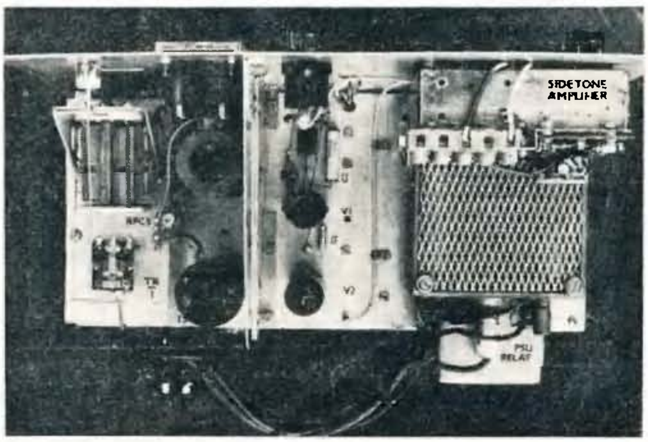
YL INTERNATIONAL S.S.B'ERS 1969 QSO PARTY

Beginning 0000 GMT, 24th May, through 2400 GMT, 25th May, 1969, both phone and c.w. S.s.b'ers have many c.w. only members so all bands and modes will be used and a new c.w. only plaque will be awarded for world high c.w. score. The QSO Party is in three categories, non members are welcome as all Radio Amateur awards are supported.
Categories: 1—DX/WK teams, 2—YL/OM teams, 3—single operator.
Exchange: RST, s.s.b. number, state, country, or VE/VO province, partner's call. If no partner, leave blank. If non-member, send "no number". Sending name is optional.
Suggested Frequencies: Plus or minus 5, 10, 15 Kc. as QRM dictates. Phone—3873, 7273, 14332, 21373. DX may transmit on 3773, 7090, 1433. C.w.—3565, 7065, 14070, 21070, 28070.
DX/WK Teams: Each team consists of a DX and a WK station. The team score is the sum of both partners' scores and determined when both logs are received.
YL/OM teams: Each team consists of one YL member and one OM member who are related, i.e. husband and wife, father-daughter, mother-son, brother-sister. Operation must be from same QTH using same rig and his or her own call.
Single operator category: Non members will be entered in this category.
Logs: Must show GMT date, GMT time, RST sent and received; his state, VE/VO province, or country; s.s.b'ers number, partner's call, bands and modes of operation. Logs must show six continuous hours of rest in each 24-hour operation and each team member must show at least six hours of operation during the party. To qualify for the single operator world-high combined score trophy, logs must show at least six hours of operation in each mode, c.w. and s.s.b.

Conditions: The same stations may be contacted for additional contact points on different bands and modes, but NOT for additional multipliers. All operations will be with one transmitter and receiver or one transceiver and receiver only. Any difficulty not covered by these QSO Party rules will be decided by the YL Int'l SSB'ers Executive Council for maximum pleasure to all participants.

Logs go to Woody Bennett, W0GNX, 8939 E. 31st Street, Kansas City, Missouri, 64129, U.S.A.





PROJECT—SOLID STATE TRANSCEIVER

PART SEVEN

H. L. HEPBURN, VK3AFQ, and K. C. NISBET,† VK3AKK*

THIS month's article will deal with the cabinet for the complete transceiver and give an abridged lining up method for the receiver. It was originally intended to describe the transmitter p.a. in this article but—to judge from correspondence—the majority of participants preferred to have cabinet and receiver line-up information first. The p.a. article will thus appear next month.

THE CABINET

An exploded view of the cabinet is given in Fig. 21, from which it can be seen that it consists basically of a "U" shaped chassis tray to which back and front panels are attached. Unperforated top and bottom covers, slightly wider than the depth of the cabinet, follow the rounded corners of the panels and attach to the vertical sides of the central tray.

Fig. 18 gives the front panel layout, the central item being the Eddystone Type 898 dial, with all other controls and inlet sockets being symmetrically grouped round it.

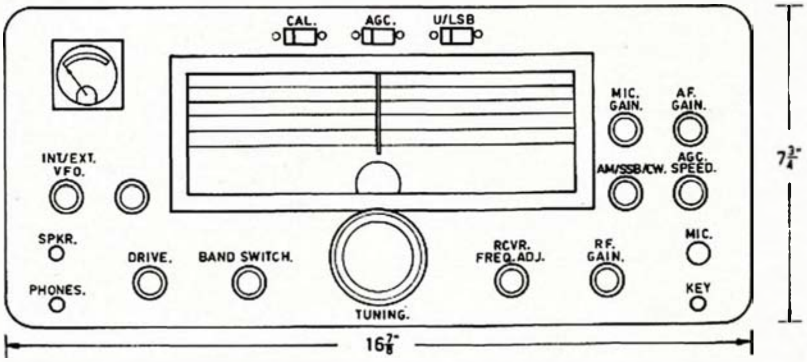


FIG. 18. FRONT PANEL LAYOUT.

Not shown is the rear panel which carries signal and power connections for external crystal or v.f.o. control, the antenna input socket, the power input socket and provision for future vox controls.

Figs. 19 and 20 give the layout of the various printed circuit boards and die cast boxes on respectively the top and under sides of the main chassis tray.

No attempt has been made to miniaturise the case, it being felt more important that there should be plenty of working space for both the initial interwiring and subsequent adjustment procedures. A bonus to this line of reasoning is that plenty of room is available for the future addition of extra bands, converters, calibrators, vox, two-tone test oscillators and other similar accessories.

The cabinet made for the project (and mentioned later under "Availability") has a chasis tray made of 16 gauge steel, a back panel of the same gauge and a front panel of 14 gauge steel. The top and bottom covers are of 20 gauge steel. All parts are fully drilled, cadmium plated, passivated and the exterior parts sprayed.

Those who wish to make a smaller cabinet to suit their own end requirements will undoubtedly do so. It is to be hoped they may get a few ideas from these notes.

As an example of the degree of "compression" that can be achieved, it is worth mentioning that one of the authors (VK3AKK), using standard project boards and a smaller (but less satisfactory) dial, has made a three-band transceiver that fits into the glove box of his Kombi station wagon.

RECEIVER ALIGNMENT

This part of the article will make frequent reference to coils, trimmers, etc., and the reader is advised to have before him the six previous articles in this series, i.e. the November and December 1968, and the January, February, March and April issues of "A.R." The reference numbers (of coils especially) are those used in the previous articles.

It is assumed that a **good** signal generator is available to do the lining up of the receiver. By "good" is meant a s.g. with a reliable attenuator. It is not recommended that use be made of the cheaper types whose leakage alone may be in excess of tens of microvolts.

With one exception, Figs. 14 and 15 in the March 1969 issue of "A.R." gave the d.c. and signal interconnections for the modules making up the receiver part of the project. The exception was the filter pre-amplifier. When on receive this module takes its h.t. feed from the a.g.c. line through a diode, and should be so connected in carrying out the commissioning procedure.

Rather than put all modules into their final case or cabinet, it is strongly recommended that they first be mounted on to a metal plate (aluminium for preference) about 18" and 12", using the layout given in Fig. 19. The voltage regulator board, the 0-1 mA. "S" meter and the b.f.o./prod. det. box can be wired "outboard". This procedure is recommended in order to make simple the removal and checking of any individual board should this be necessary.

It is also suggested that the various switches are not wired into circuit and that connections to the desired sections of the circuit be made using temporary leads. In this way it is possible to commission one band at a time and be sure it is operational before going through the time consuming process of wiring up, say, the bandswitch, and then perhaps having to disconnect when a problem turns up somewhere.

These general remarks apply not only to the bandswitch but to functional

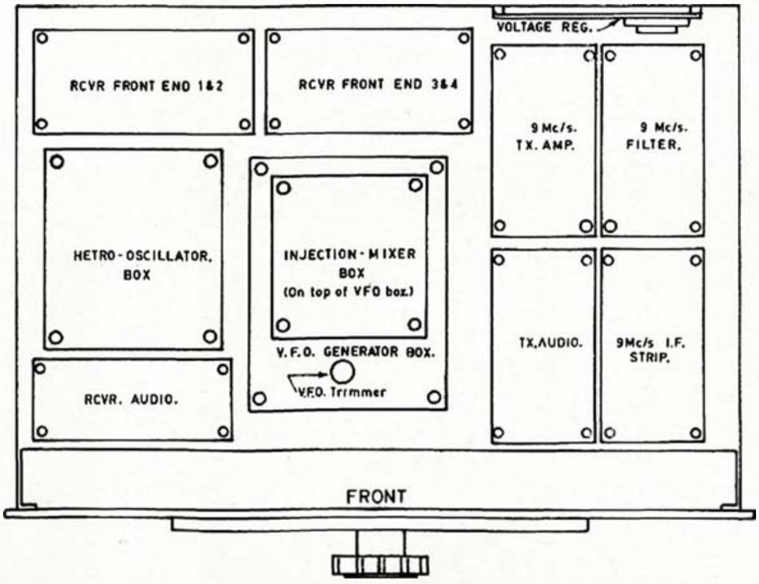


FIG. 19. ABOVE CHASSIS VIEW.

* 4 Elizabeth Street, East Brighton, Vic., 3187.
† 25 Thames Avenue, Springvale, Vic., 3171.

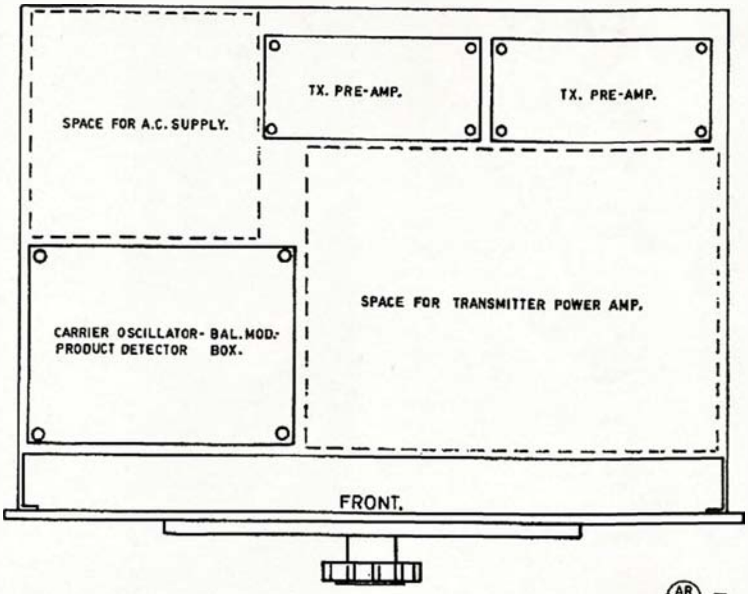


FIG. 20. UNDER CHASSIS VIEW.

switching such as a.g.c. speed, upper and lower sideband, a.m./c.w./s.s.b., etc.

To further simplify commissioning, it is recommended that no relays be used but that direct connections be made to the points on the v.r. board indicated by Fig. 14.

The general connection procedure is as follows.

(1) Receiver audio module. Take h.t. from the unregulated supply. Take input from the slider of a 50K potentiometer wired across the spare terminals of the uA719c i.c. (Fig. 14). The potentiometer can be mounted on a temporary bracket near the front of the base board.

(2) Receiver i.f. strip. Take h.t. from the unswitched regulated line on the v.r. board. Do not wire in the 320 uF. and 1,000 uF. a.g.c. timing capacitors at this time. Make the necessary connections between the a.m. (not limited) output pin, the 50K audio level control and the spare uA719c pins (Fig. 14 again). Do not wire in the a.m.-limited circuit.

(3) Connect the a.g.c. outlet on the i.f. board to the a.g.c. inlet on the v.r. board. Wire the "S" meter to the v.r. board. Set the 1.5K "S" meter zero and the 22K "S" meter f.s.d. trimpots on the v.r. board to half rotation. Set the 22K a.g.c. threshold trimpot on the i.f. board to maximum resistance to render the a.g.c. action inoperative (see Jan. '69 "A.R.").

(4) Temporarily connect a 100 ohm resistor across the i.f. board input terminals to act as a "load".

(5) From a signal generator apply 100 microvolts or so of modulated 9 Mc. to the input of the strip. Adjust the cores of T1 and T2 for maximum audio output, backing off the generator as resonance is reached. When on resonance, connect a 0-15 voltmeter between the a.g.c. line and earth. Adjust the 1.5K trimpot on the v.r. board to zero the "S" meter. Set the signal generator to 20 microvolts output and then adjust the 22K a.g.c. trimpot on the i.f. board until the voltage indicated on the 0-15 voltmeter just starts to drop. At this point the "S" meter should just start to rise.

The back end of the receiver is now nearly on frequency. Exact frequency will be established in the next step.

(6) Remove the 100 ohm resistor from the input to the i.f. board and wire in first, the filter board and then the filter preamplifier board. Use thin co-axial cable for signal connections, earthing each end of the shield to the earth pins provided on the various boards. It may be necessary to take the earth mat on the i.f. strip directly to the ground plate by means of lugs soldered to the earth mat at each corner and use the mounting bolts to complete the earth return. The h.t. feed for the filter board comes from the main regulated supply. The h.t. feed for the preamplifier comes from the a.g.c. line.

Apply a 100 microvolt modulated signal to the preamp. input. Swing the generator slowly around 9 Mc. until a signal is heard going through the pass band of the filter. Centre the signal in the pass band and adjust the cores of T3 and L23 (Fig. 10) to resonance. Repeak the cores of T1 and T2 on the i.f. board to resonance. Note that these adjustments, and those that follow, can be done using the "S" meter as a tuning indicator.

The back end of the receiver is now operative in the "a.m.-not limited" mode.

(7) **The VFO.**

To adjust the frequency of the v.f.o. to the correct range, the following procedure is recommended.

Set the main tuning capacitor to full capacity and the 3/30 pF. trimmer to half capacity. Apply power to the v.f.o. from the regulated line. Listen for the v.f.o. note between 8 and 10 Mc. on a general coverage receiver. Note this frequency. Open the tuning condenser to minimum capacity and again search for and note the frequency of the v.f.o. signal.

As the coil supplied in the kits has excess turns on it, the v.f.o. range in the unmodified condition will probably be less than 0.5 Mc. and will have a lower range frequency below 10 Mc.

Temporarily short the top turn of the v.f.o. air-wound coil and repeat the "range" measurement. The lower v.f.o. frequency will now have risen from, say, 8.5 Mc., or thereabouts, to perhaps 9.0 Mc. or thereabouts. Again short a turn and repeat the "range" measurements. Repeat this procedure until the lower v.f.o. frequency is close to 10 Mc. and can be brought exactly on to 10 Mc. by adjustment of the 3/30 pF. trimmer. Remove the shorted turns from the coil and check again that the lower v.f.o. frequency can be set to 10 Mc.

(8) The **46 Mc. oscillator** is now checked. Set the slugs of L15 and L13 (Fig. 6) to half way. Set the slug of L14 almost out. Screw L14 through its complete range and note where the drain current (as measured with a volt meter across the 1.0K decoupler, or with a 0-20 mA. meter in series with it) drops by about 0.5 mA. (indicating oscillation) and then rises again (in-

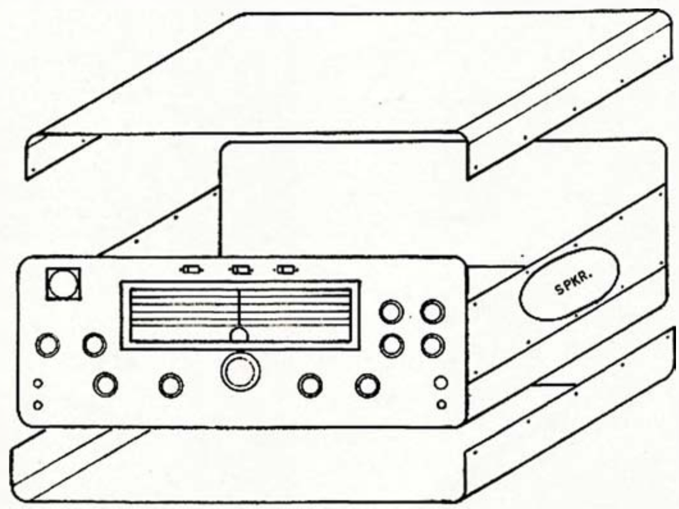


FIG. 21. EXPLODED VIEW OF CABINET.

dicating non oscillation). Set the L14 slug half way between the "oscillating" points. Check that oscillation starts reliably by switching the h.t. on and off several times. It may be necessary to repeat this procedure several times, making small adjustments to the core of L15 each time, to ensure reliable starting and oscillation.

(9) The **heterodyne oscillators.** For each band, one at a time, set the slug of L19 to mid way and the slug of L20 full out. Connect each oscillator to the regulated voltage line through a 0-10 mA. meter. Swing the slug of L20 through its full range, noting the points at which the drain current falls by about 0.5 mA. (indicating oscillation) and then rises again (indicating cessation of oscillation). Set the slug between these two points and check for reliable starting by switching h.t. on and off a few times.

(10) **Receiver front ends.** Check each front end strip separately, one band at a time.

Connect up the v.f.o./generator, the injection mixer and the appropriate heterodyne oscillator as shown in Figs. 14 and 15. The output of the injection mixer is coupled to the oscillator input of the front end board in use. Check that the 1,000 pF. capacitor across the output of the front end board is in place. (Refer to Dec. 1968 "A.R.") Connect the front end board output to the filter preamplifier, again using co-ax. H.t. feed for the front end board is taken from the a.g.c. line.

From the signal generator (set at mid band frequency) apply a 100 microvolt signal to the antenna input link (L1, Fig. 5).

Swing the v.f.o. tuning condenser until the input signal is identified. Peak the cores of L2 to L8 on the front end board, L16, L17 and L22 on the injection mixer board, and L10 and L12 in the v.f.o. for maximum output as indicated on the "S" meter, backing off the signal generator output as lining up proceeds.

The cores of the two 46 Mc. traps, L11 (v.f.o.) and L18 (inj. mix.) are set at the half way mark.

The complete receiver is now operational in the a.m. mode.

(11) The **carrier oscillator and product detector**. The carrier oscillator, or b.f.o., can be checked by applying voltage from the regulated line and listening around 9 Mc. on a general coverage receiver for output. Both "normal" and "reverse" carriers should be checked.

Feed output from the b.f.o. and the i.f. strip to the product detector. Apply a few microvolts of unmodulated signal frequency to the front end board. It should now be possible to hear an audio output. Replace the signal generator with an antenna, tune in a sideband station, and adjust the 3/30 pF. trimmer across the "normal" sideband carrier crystal to give acceptable speech quality.

This completes the primary commissioning procedure.

The various modules may now be placed in their final positions in whatever case or cabinet is to be used in the knowledge that they are all working correctly. Wire in the various external function switches and controls.

The final line-up consists simply of tweaking the various slugs to give maximum output. The cores of L3, L5 and L7 on the front end boards are adjusted to give maximum output at about 25% of the way above the lower band edge, while L2, L4 and L8 are adjusted at say 25% below the upper frequency end of the band in use.

AVAILABILITY

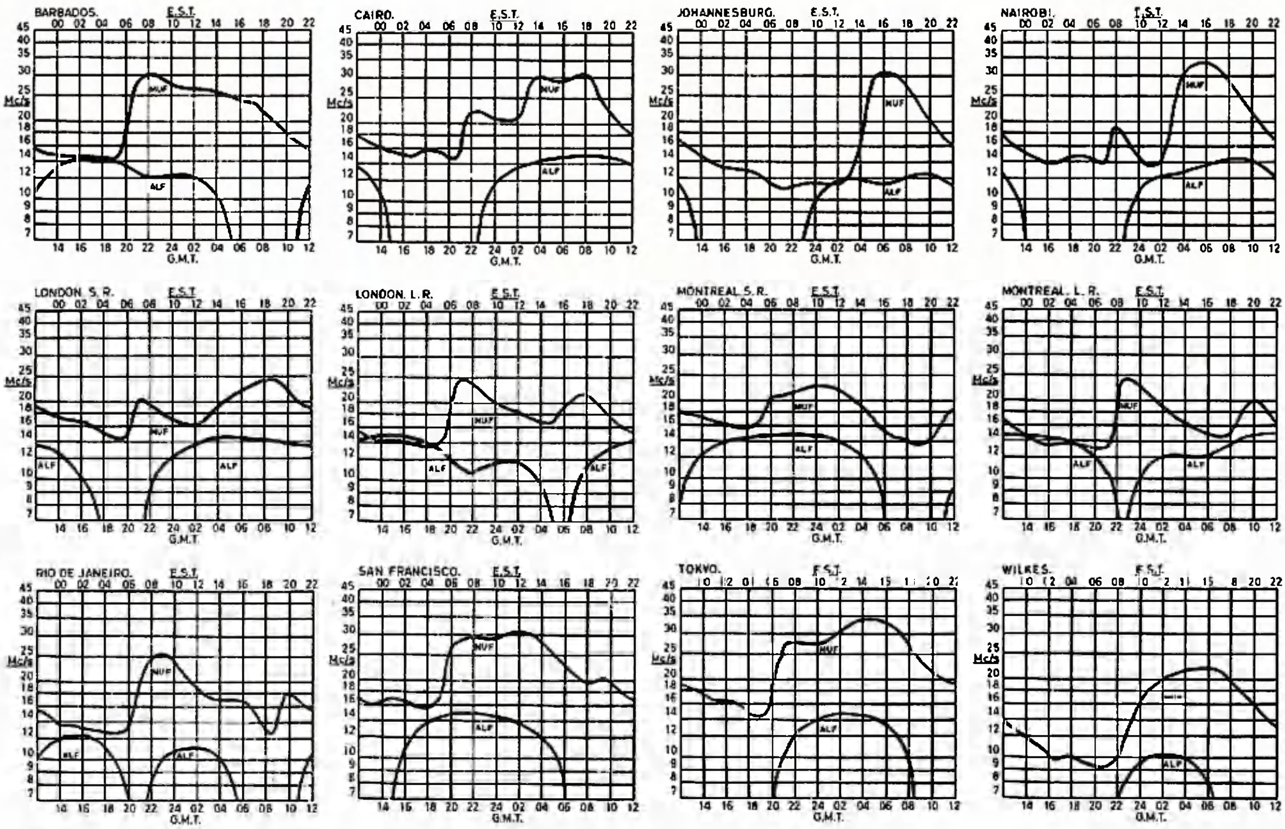
(a) Fully drilled, cadmium plated and passivated cabinets with the exterior sprayed black are $28.50 each, including packing. Supplies will be available from about the third week in May. Transport will be extra, so please include enough to cover 20 lbs. weight.

(b) Dials. The recommended Eddystone No. 898 dials are obtainable direct from Wm. Willis, of 430 Elizabeth St., Melbourne, 3000, at $22.22 each. They can be obtained through the project at the same price if required.

(c) Accessories kit. This contains all the necessary plugs, sockets, knobs, switches, etc., except the bandswitch. The standard kit—including "S" meter and two 12 volt DPCO gold plated relays costs $32.50 exclusive of postage. Relays and "S" meter are obtainable separately if required.

PREDICTION CHARTS FOR MAY 1969

(Prediction Charts by courtesy of Ionospheric Prediction Service)



THE DJ4VM MULTIBAND QUAD*

Aerial System with Two Driven Elements and Centre Fed Single Quad Loop per Element

by PROF. DR. PHIL. WERNER BOLDT,† DJ4VM

(Abstract Translation by H. F. RUCKERT,‡ VK2AOU, ex-DL1EZ)

THE advantages of a monoband cubical quad aerial, to give good DX results in spite of low installation height ($<1\lambda$) and its high front to back (F/B) ratio, are well known. Not solved is the problem of achieving these features if a conventional multiband quad with two or three wire loops per element is employed. At 28 Mc. only 25% of the 14 Mc. element area is being used. Field interaction occurs and the phase symmetry upper and lower quad half is disturbed. Recent publications' show that certain solutions to this problem are being tried.

The author developed a new quad, working at first at 145 Mc., and since autumn 1967 on the DX bands (German patent applied).

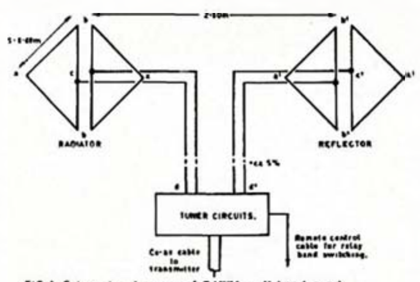


FIG. 1. Schematic diagram of DJ4VM multiband quad, both elements driven.

DESIGN FEATURES

Each quad element consists of two triangles and the hypotenuses are part of the feed line to drive the upper and lower element half exactly symmetrically (Fig. 1). The four sides of the quad (short sides of triangle) are 5 m. (16 ft. 3½ in.) to 6.4 m. (21 ft.) long for 14, 21 and 28 Mc. operation. The spacing between the radiator and the reflector may be 2.6 m. (8 ft. 6 in.). The reflector quad, including its tuned feeder, should have 5% more wire length or the tuning coil may be increased instead.

The feeder lines are made long enough so that the aerial tuners (one for each band, and such a set of three for each element, e.g. six tuners for a triband two element quad) can be easily reached from below the quad for tuning of the aerial at the final and high position. The feeder should not be a multiple of a quarter wave on any band, to avoid tuner adjustment difficulties. A single co-axial cable goes from the transmitter to the tuning box containing the switching relays and the tuned circuits of the aerial tuners.

* Abstract Translation from "DL-QTC", No. 9, 1968.
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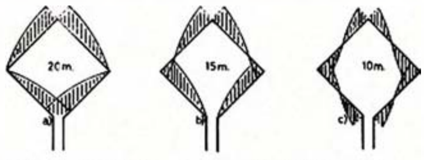

FIG. 2. Current distribution of an unsymetrical fed 20m quad element operated at 20m, 15m, & 10m. A nearly round radiation would occur at 10m.

Aerial relays may be used to switch the co-axial feeder to the desired tuner parallel tuned circuit, and to connect the parallel wire feeders of the two quad elements to the appropriate tuner pair. The relays may be remotely operated from the shack.

ADVANTAGES

This quad has less wind resistance than a conventional 2 x 3 wire loop quad. The wire length is not critical, and the four outer quad element sides may have 2.4 times the length of the shortest wavelength transmitted. Loops of 4 x 5 m. (mini quad) or over 4 x 6.5 m. (extended quad) bring reduced efficiency and additional radiation loops respectively. Separate tuning of each element at the three main operating frequencies assures low SWR and compromise free conditions.

An extremely high front to back ratio is maintained in spite of the same spacing for all three frequencies (F/B ratio is only 15 db. in the case of some other multiband quads). There is only a small frequency difference (30 Kc. at 21.3 Mc.) between tuning for the best forward gain and maximum F/B ratio. The usually necessary difficult-to-perform tuning near the top of the mast is avoided. Retuning of the elements at full operating height, after the initial tuning has been carried out near the ground, is no problem.

The accurate symmetrical tuning and feeding of the element halves guarantees clean phase conditions, causing better directivity (narrow beam of radiation), therefore more gain and extremely small backward radiation, resulting in less QRM, low vertical angle radiation (important for DX). (See Figs. 2 and 3). These advantages may be worth the effort to construct the more complex feeder-tuning system, if the operator wants no compromise but perfection.

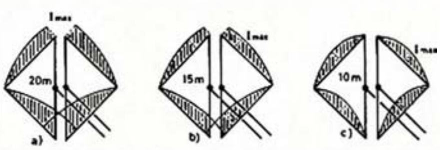

FIG. 3. Symetrical current in upper and lower quad dipole system.
(a) Full size on 20m.
(b) Extended quad on 15m.
(c) Bi-square quad on 10m (4db extra gain.)

CONSTRUCTION DETAILS

The boom carries at each end a cross made of fibre glass or weather-treated bamboo rods. The vertical member of the cross holds the tuned feeder part of the quad element (hypotenuses of triangle) in form of a 600 ohm (or so) feed line. The two dipole wires are strung between the cross ends to form the quad loop. (Fig. 5.)

The aerial tuners have approximately the following dimensions (capacitors being 50 pF. maximum):

COIL DATA

20 mx band: 10 turns, 4 cm. (1.57 inch) diameter.

15 mx band: 8 turns, 3.5 cm. (1.38 inch) diameter.

10 mx band: 8 turns, 3 cm. (1.18 inch) diameter.

The co-axial (50 ohm) feeder line may be link coupled (via 1 to 2 turns) or connected directly 1 to 2 turns away from the earthed centre of the tuner

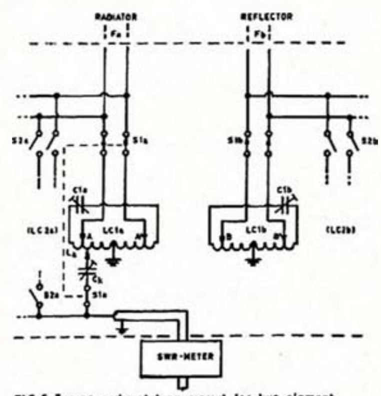

FIG. 5. Tuning and matching circuit for two element multiband quad (two of the required six tuners are shown) with parasitic reflector.

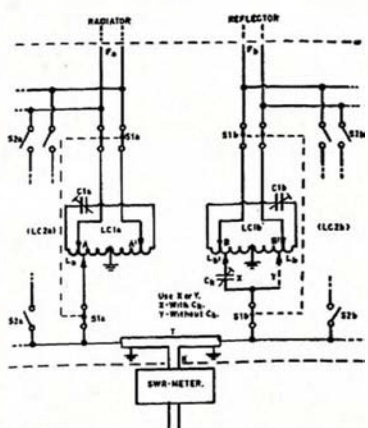

FIG. 6. With driven reflector, otherwise like FIG. 5.

coil. It is recommended to add the trimmer Ck to be able to tune out the coupling reactance in order to obtain a low SWR. It is advisable to check the tuning of C1a and C1b with a calibrated GDO, with the quad connected, but the co-axial line disconnected (at first).

If the co-axial cable connecting points have been correctly chosen (matched condition), only a slight retuning of C1a and C1b is needed after the cable has been attached.

The reflector tuning is carried out by adjusting C1b (C1a may be rechecked finally), and a testing dipole is used a few wavelengths behind the reflector and placed as high as the quad. The line between the test dipole (receiving diode) and the indicating instrument (near quad tuning box) must be r.f.-free and shielded to avoid misleading results.

Fig. 5 and Fig. 6 show a version with parasitic and one with driven reflector respectively.

The second case is shown in Fig. 6. In order to feed the radiator and reflector with r.f. of opposing phase, the co-axial line is split near the tuning units, and the leads from the switches (relays) S1a go to the left half of the coil La and S1b to the right hand side of Lb (case "Y"). The connecting points at the coils are slightly moved outwards (120 ohm) to achieve matching.

If a further improvement in the SWR is found to be necessary, the trimmer Ck (case "X") may be added (connection "Y" removed) and Ck is attached to the left side of Lb, e.g. left of the earthed centre tap. Ck and C1b are alternatively adjusted for SWR minimum.

The coil tap positions for the feeder leads from S1a and S1b (via Ck) are:—

20 mx band: 1.5 to 3 turns from the earthed centre.
15 mx band: 1 to 2 turns from the earthed centre.
10 mx band: 0.5 to 1.5 turns from the earthed centre.

The backward radiation minimum is very sharp. A SWR of less than 1:1.5 should always be obtainable at the tuning frequencies.

RESULTS

Absolute gain values are not quoted because a suitable test dipole (as high as the quad, at the right distance) was not available. The radiation pattern (Fig. 7) was obtained with the help of DJ5RH operating a high quality measuring receiver (Siemens, Type B83 600-A80) at a six miles (10 km.) distant location. The often quoted S meter readings of uncalibrated receivers are not accurate enough and often only wishful thinking.

The horizontal width of the radiated beam at the half power level amounts here to only 50° at 20 mx (75° with conventional full size quad values), 40° at 15 mx, 30° at 10 mx, and the half voltage beam width is 75° (90° with conventional full size quad values).

The narrow 20 mx beam is due to the quads' symmetry and the feeding of both elements, and the still narrower beam at 15 mx and 10 mx is the result of the extended elements (dipoles) used here.

The front to back ratio was on all the bands better than 40 db. (5 to 25 db. in some cases of multiband quads) for the version with driven reflector, and 25 db. with parasitic reflector. This ratio depends also on the (not measured) vertical radiation pattern of the aerial, e.g. the vertical angle the received signal happens to come in (propagation, position and type of the other operator's aerial).

Measurements over the 21 to 21.45 Mc. band (Fig. 8) show some interesting features, which are also true for many other beams. One finds a maximum forward gain at 21.34 Mc. and a substantial drop at 21 Mc., whilst the SWR is within 1:1.2 and 1:1.4 over the entire band with the minimum near 21.2 Mc. (not 21.34 Mc.). The F/B ratio maximum is found at 21.3 Mc. (30 Kc. below gain maximum). It is clearly demonstrated that a high gain aerial is selective and has to be tuned to the mainly preferred Amateur band section to utilise its ability to advantage.

It may be mentioned that the described quad principle can be adapted to other quad forms like triangle hypotenuses held horizontal, circular elements, Swiss (HB9CV) quad, etc., At v.h.f. it was noticed that a 50% increase of the loop circumference caused a marked gain increase. It may be possible to replace the three separate tuning units per element by one multiband tuned circuit (a la VK2AOU).

The author expresses his sincere thanks to Om Karl-Heinz Krah, DJ5RH, for the help during the aerial construction work and the assistance given during the many measuring runs.

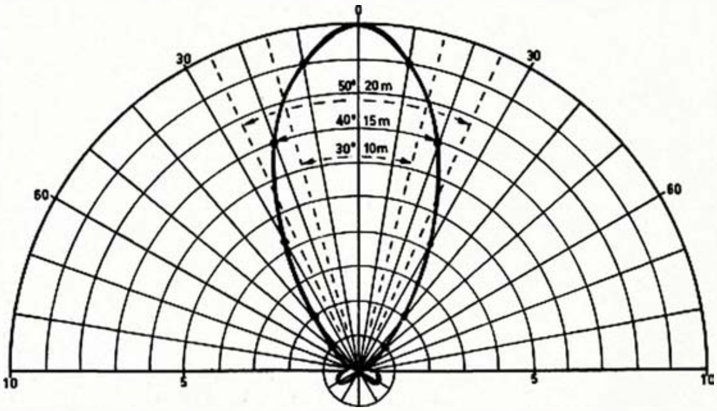

FIG. 7. Radiation pattern for DJ4VM quad for 20m.15m(solid line)& 10m with driven reflector.

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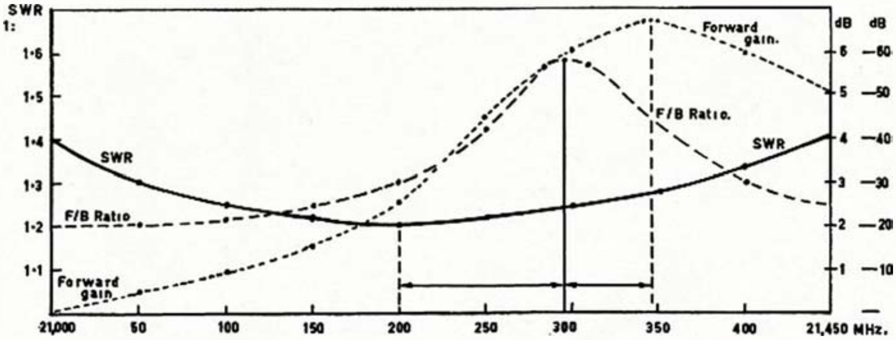


FIG. 8. F/B Ratio and forward gain variation of multiband quad (driven reflector) over 21 MHz band.

"IT"

A. J. C. THOMPSON, VK4AT*

We Radio Amateurs would not consider ourselves genuine unless we applied a little electronic touch to the solving of quite commonplace problems. We must be a sore trial to our more practical minded XYLs. This difference in our respective mental attitudes was startlingly illustrated quite recently on this particular radio active farm.

We have here a problem pup, much beloved until quite recently. His fall from grace was due to his base betrayal by an indignant hen. He was unlucky enough to get "copped" while still urging her to greater speed in the production of his breakfast egg. He repented on the chain with a sore tail, but this sad experience only endowed him with the knowledge that caution and silence were essential in all exploits hen-wise.

My own XYL, after much experimenting, has developed quite a standard technique. At the first sound of a triumphant hen she "hushes" me in elegant sign-language while she takes a couple of audio bearings to pin point the exact position of the chook. Then she rushes out casting one suspicious eye on our egg-eating pup and the other on a crow that lurks in the big fig-tree waiting for his breakfast too.

If no egg is forthcoming, then a very strained situation exists. Both the crow and the pup know where the egg is but she doesn't. The pup has the wrong technique under these circumstances. Anticipating an examination of his molars, he slinks off to his kennel, followed later by a wrathful XYL who ties him up. He gets in a couple of conciliatory licks on her face while her hands are so engaged, but it doesn't do him much good (or her either).

It was evident then that the situation badly needed that delicate electronic touch previously mentioned, that is so exclusive to such as us. Some trusting soul had providentially just given me an electric fence to fix. It already had quite a good "kick" but my junk-box produced the goods to make it even better. I tried it out on an old cow that always licked out the chooks feed tin and it worked fine. A china egg with a groove in it to take the wire, some fresh egg yolk for its aroma and for disguise, some insulating material and some well wetted ground were all that were needed extra.

Along comes the pup but he stalks past it as he remembered past tribulation over public displays with an egg as exhibit A. He sat down and scratched off a few imaginary fleas as he took stock of the situation, but, as no excitement had erupted from the house, he confidently returned. Cautiously he approached it, keeping a wary eye on the house. A quick removal to a more remote spot was standard practice, but the beautiful aroma of egg yolk that assailed his nostrils made him decide to give it just one delectable lick first. He was astonished! He didn't know if he let go of it or "It" let go of him, but he was first into his kennel and, although tightly jammed into the corner, it didn't take him long to be sure that "It" was not now with him too. He relaxed when he realised that he was temporarily safe. Then he gained enough confidence to even poke a little black nose and a suspicious eye out from his box. Re-assured, he ventured to give a few ferocious barks in the general direction of his enemy.

All was quiet. He ventured out, then hurried back (just in case . . .). He decided then that it had all been just one big mistake, so, out he came with his tail held high and jauntily strolled around looking for something to register a victory over, just to restore his shattered morale a bit. A fitting subject was right to hand in the outward garb of the family cat that he was currently feuding with. He cautiously sneaked up on her then "pounced". Puss, highly bred, and having nightmares, thus suddenly assaulted, fled up the electric light pole, but, on seeing the familiar pup as the cause of her fright, she descended inelegantly and stalked home, outraged dignity depicted in fluffed-out fur and quivering tail. She paused long enough to swipe him "fore and aft" when he enthusiastically tried to "tree" her for the second time. Pup ignored the scratches on his rear end to rub his lacerated nose through the long grass, even though it made him sneeze.

This brought him back to the vicinity of the egg. He was dismayed to see that a broody hen had beaten him to it, and, with happy clucky noises was just settling on it. From past experience he knew that clucky hens were hard to shift. They fluffed up their feathers with queer noises then pecked him on the nose. This one fortunately acted quite differently. She rose suddenly with much melody, exposing his precious egg, so he nicked in quickly and got it right from under her nose.

He wished he hadn't. "It" had got him again for sure, but fortunately let go of him while he was still in the air on the return journey. With his superior speed, he was again able to reach the safety of his own kennel. Temporarily safe, he then decided to stay put and just brood on the hard lives that pups lead on these farms where even the cows with calves kick playful puppies on the nose then roll them in the dirt and bellow in their ears. Now "It" had got his breakfast egg and bitten him twice. But he cheered up when he saw a silly hen approaching intent on swiping one of his discarded crusts. He hunched up ready to pounce. Now this was going to be **real** fun.

* Skyrings Creek, Pomona, Qld., 4568.

AMATEUR T.V.

(Continued from Page 7)

directly into the valve that is being modulated. A few basic circuits may give you the general idea.

Finally, before I close this article for this month, I would like to summarise what I have said.

Television, being a logical development of radio, should interest you Amateurs immensely, it should be a challenge for Amateur Radio. Seeing that some of our fellow Amateurs are not only capable of transmitting television signals but are capable of transmitting **colour**, the moment the P.M.G. gives Amateurs the go-ahead, don't you think that Amateurs could do a little better than they have up to date? It is up to you, prove the cynics who say "ATV is too hard to handle" wrong.

Even if you cannot become actively involved in video you can at least give a great deal of support to those who are by at least taking an interest. You can show this by at least receiving some of these chaps and giving them a signal report. If you would like any specific information about any facet of ATV at all please feel free to contact the ATV group in Sydney or contact me by letter at my address, which is:

Grahame L. Wilson,
29 Goodlands Avenue,
Thornleigh, N.S.W., 2120.

If you wish you also may phone me at the above address, the phone number being 84-5475 after 6 p.m. I hope you have enjoyed reading this article. I certainly enjoyed writing it. If you have liked it or you would like any particular item discussed, write to me personally or the Editor of "Amateur Radio."

In the next part I will be discussing cameras and the "systems" they employ with the theory behind it.

1969 VK4 SOUTH SEA ISLAND CONVENTION

This year the State Convention will be held at **Bribie Island** on the week-end of **7th and 8th June.** Mark your calendar now.

Council has had a preliminary discussion and May "QTC" will give final details. Also VK4WI will have up to date news.

The Convention will have as its main interest a Saturday evening function along the lines of an Hawaiian night—casual dress, help yourself to dishes, music, laughing, talking—good fun consisting of a buffet meal followed by a full evening's entertainment which should cater for all. We hope to make this function a most memorable occasion and its success will be ensured by your attendance. It will not be a problem for many to return home if not staying that evening. Settle in on Saturday morning, visit places of interest, set up shop, etc.

Saturday afternoon will be set aside for technical sessions when it is proposed to have experts deal with printed circuits, interference problems, modern circuitry, r.t.t.y. equipment, etc., etc., with displays and opportunities for queries. Technical literature will be available. Of course, those who wish may surf, play bowls, swim, etc.

Sunday morning, VK4WI will be operating and h.f. and v.h.f. contests, together with displays, will be the order. Early afternoon is the time for a general meeting followed by presentation of trophies and the auction.

Accommodation will be to suit you and your pocket—camping, stationary caravans, motels, flats, luxury hotels. Men's single accommodation will also be provided. For bookings for any of these, contact Ross Cuttle, Cummings St., Bribie Island; phone 53-1070. Children will be catered for with competitions, organised games and entertainment.

Our planning will be simplified if we know you may come. Get a message through to us. Of course we must know who will be along on Saturday night for the dinner and fun.

VK-ZL-OCEANIA DX CONTEST 1968 RESULTS

AUSTRALIA AND NEW ZEALAND

C.w. Section

Call Sign	80	40	20	15	10	Total
VK2APK	—	2360	6555	5715	3230	17860
VK2GW	—	2300	5550	3220	2190	13260
VK2VN	745	2030	2390	1005	2110	8280
VK2QL	345	1265	2480	775	780	5645
VK2QK	—	—	5055	—	—	5055
VK2BRK	—	2325	—	—	—	2325
VK2AND	—	—	1690	—	—	1690
VK3QK	—	2690	6465	3100	1075	13330
VK3AXK	—	—	—	8185	—	8185
VK3YD	—	—	5340	—	—	5340
VK3ARX	—	—	4835	—	—	4835
VK3APN	1085	3305	—	—	—	4390
VK3QI	—	—	4020	—	—	4020
VK3ABA	—	—	—	3460	—	3460
VK3OP	565	2655	—	—	—	3220
VK3ABR	—	—	1370	1095	—	2465
VK3RJ	—	—	—	—	1790	1790
VK3QV	—	—	—	—	1390	1380
VK4FH	—	—	3270	5885	2115	11270
VK4VX	—	—	—	7745	—	7745
VK4XJ	—	—	—	—	5220	5220
VK4WO	—	—	255	1845	—	2100
VK4QW	—	—	550	—	—	550
VK5FM	—	—	2735	6035	745	9515
VK5FH	—	—	6720	—	—	6720
VK5BS	—	—	765	—	—	765
VK5KO check						
VK6UT	—	—	5515	2220	—	7735
VK6AJ	—	—	5050	—	—	5050
VK7GK	940	1505	5445	1000	—	8890
VK8HA	—	—	—	1885	—	1885
VK9DR	—	—	—	1350	1495	2845
VK9XI	—	—	850	200	—	1050
VK9KS check						
ZL1AJU	—	1285	7560	8270	5810	22925
ZL1AMO	—	795	6160	8610	955	16520
ZL1DV	110	1590	6070	5090	2690	15550
ZL1HV	—	355	3210	2240	2430	8235
ZL1DS	—	—	—	—	5485	5485
ZL1AIZ	—	—	1205	—	2195	3400
ZL1BDN	—	—	1590	—	—	1590
ZL2ANX	—	1815	9485	2275	375	13950
ZL2CD	—	1385	4660	5665	2130	13840
ZL2FA	—	—	9525	—	—	9525
ZL3GQ	—	2740	8060	5420	—	16220
ZL3IS	—	—	—	—	3020	3020
ZL4BO	165	2570	6160	6140	2845	17880

Phone Section

Call Sign	80	40	20	15	10	Total
VK1GD	—	370	9995	5575	6375	22315
VK2KM	—	2240	8925	6340	5635	23140
VK2APK	—	1590	8425	4830	4285	18930
VK2AOU	—	—	2325	2340	1825	6490
VK2RX	—	—	4165	—	—	4165
VK2ATZ	—	—	3075	470	—	3545
VK2AKV	—	—	—	1415	735	2150
VK2AND	—	—	1135	545	270	1950
VK3AXK	—	—	6075	5695	2500	14270
VK3QK	—	400	3895	3130	2745	10170
VK3VK	—	—	7280	805	1025	9110
VK3LW	—	—	6565	—	—	6565
VK3ARX	—	—	5500	—	—	5500
VK3SM	—	—	—	4430	—	4430
VK3MJ	—	—	—	3975	—	3975
VK3ABA	—	—	—	3970	—	3970
VK3QV	—	—	—	—	3005	3005
VK4LT	—	—	7290	1675	3625	12590
VK4SD	—	—	9389	—	—	9380
VK4VX	—	—	—	—	7685	7685
VK4SF	—	—	5970	—	—	5970
VK4LZ	—	—	4770	620	—	5390
VK4RF	—	—	4275	—	—	4275
VK4DO	—	—	3810	—	—	3810
VK4PJ	—	—	—	2850	—	2850
VK4QW	—	—	1070	—	—	1070
VK5FO	—	—	6490	4880	4525	15895
VK5WP	—	—	1730	4355	4420	10505
VK5FM	—	—	—	3815	2795	6610
VK6UT	—	—	9445	3735	—	13180
VK7GK	—	480	9480	4330	3520	17810
VK8CM	—	—	2330	2465	910	5705
VK9XI	—	—	630	120	55	805
VK9KS check						
ZL1AMN	—	155	7000	6615	2505	16275
ZL1HV	—	—	—	8115	—	8115
ZL1DS	—	—	—	—	5050	5050
ZL1AIZ	—	—	265	3055	55	3375
ZL1AGO	—	3090	—	—	—	3090
ZL1BDW	—	—	2000	1020	—	3020
ZL1AFQ	—	—	2450	—	—	2450
ZL1HD check						
ZL2AFZ	—	—	6655	860	—	7515
WA2NAZ/ZL2ATL	—	—	4910	—	—	4910
ZL3IS	—	—	—	—	5130	5130
ZL3RT	—	—	2560	—	—	2560
ZL4BO	135	800	8930	4420	1950	16235

Listeners' Section

VK—L2342	4575	points
BERS195	5840	"
L3377	5410	"
L3395	2615	"
L3308 check		
L4144	8275	"
L4104	6275	"
L5088	10865	"
VK5-12245	4695	"
L6021	20335	"
ZL—ZL190	15450	"
ZL149	13720	"

VK BAND LEADERS

	C.w.		Phone	
A-B	VK2APK	17860	VK2KM	23140
	VK3QK	13330	VK1GD	22315
	VK2GW	13260	VK2APK	18930
10	VK4XJ	5220	VK4VX	7685
	VK2APK	3230	VK1GD	6375
	VK2GW	2190	VK2KM	5635
15	VK3AXK	8185	VK2KM	6340
	VK4VX	7745	VK3AXK	5695
	VK5FM	6035	VK1GD	5575
20	VK5FH	6720	VK1GD	9995
	VK2APK	6555	VK7GK	9480
	VK3QK	6465	VK6UT	9445
40	VK3APN	3305	VK2KM	2240
	VK3QK	2690	VK2APK	1590
	VK3OP	2655	VK7GK	480
80	VK3APN	1085	Nil	
	VK7GK	940		
	VK2VN	745		

ZL BAND LEADERS

	C.w.		Phone	
A-B	ZL1AJU	22925	ZL1AMN	16275
	ZL4BO	17880	ZL4BO	16235
	ZL1AMO	16520	ZL1HW	8115
10	ZL1AJU	5810	ZL3IS	5130
	ZL1DS	5485	ZL1DS	5050
	ZL3IS	3020	ZL1AMN	2505
15	ZL1AMO	8610	ZL1HW	8115
	ZL1AJU	8270	ZL1AMN	6615
	ZL4BO	6140	ZL4BO	4420
20	ZL2FA	9525	ZL4BO	8930
	ZL2ANX	9485	ZL1AMN	7000
	ZL3GQ	8060	ZL2AFZ	6655
40	ZL3GQ	2740	ZL1AGO	3090
	ZL4BO	2570	ZL4BO	800
	ZL2ANX	1815	ZL1AMN	155
80	ZL4BO	165	ZL4BO	135
	ZL1DV	110		

OVERSEAS

C.w. Section

North America

W1EVT	10530	WA5TPO	50
W1DTY	4172	K6HN	11427
W1AX	2352	K6AN	10175
W1ESN	484	W6RGG	7174
W1WY	352	K6HPZ	957
W1SWX	40	W6ID	360
W2LWI	6039	W6GBY	144
W2ZV	450	K6DDO	70
W8IBX/2	24	W7IR	11449
WA2HAI	3	K7VPF	24
W3NU	9928	W9VNE	3825
W3VKD	4890	W9IHN	2093
W3DPJ	24	W9LKI	952
W4OMW	1380	W0DYA	16
K4RDU	1092	VO1AW	90
W4BYB	496	VE3EWY	1350
W4KMS	168	VE3GCO	132
K4VQT	6	XE2AAG	154
W4HOS	297	KP4BBN	2080
W5BUK	3725		

Asia

JA1ADN	5518	JA3DEO	2047
JA1JKG	4123	JA3YKM	1869
JA1FGB	3757	JA4SZ	2832
JA1SR	3000	JA4XW	1166
JA1AYO	672	JA4IO	560
JA1SJV	320	JA4DCA	389
JA1PSW	80	JA4AKL	40
JA1XRH	24	JA4AQR/5	80
JH1AWI	12	JA6TQ	484
JA2CXF	6432	JA7CDV	5828
JA2WB	5880	JA7FC	3225
JA2LA	3836	JA8BB	630
JA2JAA	1722	JA9BKU	161
JA2CPD	880	JA0ADY	3007
JA2GTZ	858	JA0ASS	1602
JA2KRZ	504	JA0CDA	352
JA2KOW	208	JA0CHL	310
JA2YAR	48	JA0DVA	2
JA2ITH	8	JA0DJE	2
JA3LGG	4205	HL9KQ	1738

C.w. Section (continued)

Europe

DL7AA	4402	OK2WDC	64
DJ3WU	3240	OK1AII	48
DJ2YL	3068	OM2DB	40
DL1QT	1120	OM2QX	39
DJ4UF	644	OK1OO	18
DJ7PB	300	OM1CIJ	8
DL0LB (K)	2325	OM1EP check	
DL0PN check		OK2BCJ check	
DM2ATD	4818	OZ1LO	3712
DM2BJD	2976	OZ4PM	784
DM4WPL	1008	ON4XG	1344
DM2AUO	680	OH5UX	1920
DM4YEL	280	OH2OW	272
DM3MSF	240	OH5WH	256
DM3ZOC	56	OH1XX	234
DM2BHG	12	OH2BAD	99
DM2DEO	4	OH3TY	40
EA3KI	60	OH4RH check	
EA2HR	32	OH6NH check	
F3KW	690	LZ1AG	288
F9YZ	440	LZ1KAA	108
F3AT	240	LA9CE	120
F8SF	2	LA4K	2
G3SSO	2382	LA1H (K)	532
G5RP	1218	PA0VB	476
G2DC	720	PA0WAC	240
G3VMK	60	PA0UV check	
HA3MJ	300	SM7ANB	3402
HA5KFZ	50	SM3CXS	1640
HA5AF	24	SM0BYG	896
HA1KSS	2	SM7QY	832
HO0LC	2	SM7API	528
HB9KB	4867	SM5CLU	528
HB9GN	2160	SM3ARE	280
HB9DX	468	SM5CUN	98
IT1AGA	24	SM5BUS	80
OM2RZ	1540	SM3DVN	48
OM3OM	1062	SM5EXE	40
OK1AEZ	560	SM5APS check	
OM1XW	532	SP3AIJ	480
OK1TA	280	SP2PAH	432
OK1KYS	238	SP2AOB	24
OK3CDP	192	YU1BCD	992
OM3CEG	120	YU2FVW	216

U.S.S.R.

UA1KAQ (K)	504	UB5GG	96
UA1KAG	320	UT5HP	72
UA1ZL	133	UY5AP	24
UW1AY	2	UA6UO	224
UA3KBO (K)	4004	UW6AO	84
UA3UJ	3105	UD6BW	120
UW3NE	330	UD6AX	48
UA3TV	234	UF6LA	234
UA3KZO	208	UG6EA	60
UA3NP	150	UL7KAA	520
UA3KOE	48	UL7GW	300
UA3KHA	40	UH8DI	20
UA3GO	33	UH8DH	18
UA3TA	21	UI8FB	8
UC2KBK	658	UA9KCE	1520
UP2KBA	348	UW9PT	1368
UQ2GW	1024	UW9KDH	572
UQ2KCS (K)	198	UA9WL	462
UQ2KCT	48	UA9WS	416
UQ2NX	18	UA9UY	304
UR2FU	30	UA9DK	132
UR2BV	2	UA9HM	108
UA4IQ	990	UA9OO	108
UW4HW	204	UA9FN	56
UA4WT	156	UA9GC check	
UW4IB	80	UA0KZD	792
UA4KWB	40	UW0IF	590
UA4LU	24	UA0ML	530
UB5KLD (K)	1520	UA0LZ	414
UB5GX	930	UW0IW	60
UT5BY	341	UA0TD	51
UB5KDS (K)	168	UW0IQ check	

South America

PY2SO	1545	CE3ZW	8
LU4ECO	30		

Oceania

KH6GNE 4452

Phone Section

North America

W1DTY	644	W6ISQ	825
W2FCR	1476	K7RLS	1027
W3JNN	4805	WA7JRY	502
W3AKG	132	W8KIT	4031
W3DPJ	56	W0PAN	1224
W4HOS	848	W9ECV/0	828
W4WSF	114	VE3GCO	288
W4BYB	96	KP4BBN	64
W6GHM/5	8064	4A1LLS	2604
K5JEF (K)	6562	HR1KAS	1608
WA5EFN	1280	HP1JC	4440
WA6EPQ	14760	CO2FA	112

Europe

DJ2YL	8640	OZ2CE	108
DL7AA	5808	OZ4IA	2
DJ4LK	5365	OZ9CR check	
DL8PC	1974	OM1ADM	1566
DL0LB (K)	5580	OM2ABU	208
F3KW	5568	OM3BU	120
F9RM	462	OM2DB	96
F3AT	420	OM1HA check	
G3SSO	6016	OM1ADP check	
G5ALW	8	SM7AZL	4698
GW3NNF	1224	SM5API	1404
CT1MW	770	SM0BYG	1072
HA3MB	50	SM5BPJ	780
HB9KB	4611	SM7DMN	217
HB9UD	208	SM5BUS	160
I1AT	1092	SM3VE	20
I1AA	1040	SM5BNX check	
ON4XG	1704	PA0HBO	1498
ON5DJ	885	PA0ABM	95
ON4PL	240	PA0VB	60
OH7PI	6960	PA0CZA check	
OH2BC	2054	LA7VE	836
OH2BH	847	LA7AJ	540
OH2BAD	616	LA9CE	481
OH7QC	88	LA1H (K)	260
OH4RH check		LA7QI	44
OH8OW check		LA7VK	4
OZ3SK	3548	LA7JH check	
OZ1LO	2208	SP8AJK	726
OZ3KE	117		

Asia

JA1ADN	11870	JA4ERX	1704
JA1DNO	1480	JA4FM	564
JA1STN	708	JA4EMC	8
JA1SJV	636	JA5CBI	500
JA1BBU	506	JA5IU	8
JA1AAT	340	JA6YCU	12054
JA1JNM	320	JA6AD	11766
JA1BNW	234	JA6AFL	3213
JA1BHW	90	JA6IKN	40
JA1DMH	84	JA7CDU	8784
JA1BHX	72	JA7MA	7920
JH1JQU	4	JA7FC	2626
JA2CXF	8296	JA7CVW	210
JA2JAA	6699	JA7BKN	10
JA2DDN	3672	JA8BQB	7488
JA2EAD	1560	JA8EAT	8
JA2LXF	868	JA9BAB	2415
JA2BCI	40	JA9CHH	506
JA2HBE	18	JA0ADY	528
JA2ITH	10	JA0DAI	150
JA3DJ	9273	JA0DFL	24
JA3LGG	3952	KA7CW	420
JA3EVZ	858	9V1OE	288
JA3GNQ	840	HL9TT	1349
JA4XW	1989		

U.S.S.R.

UA1DJ	912	UH8BO	4
UA1FA	560	UA9OH	1416
UA3KBO (K)	6407	UA9BE	1330
UW3EH	440	UA9MR	546
UV3AAE	182	UW9WR	224
UA3KAG (K)	176	UA9PP	70
UP2ER	378	UV9OP	18
UR2AR	2314	UV9PI	18
UR2KAW (K)	2210	UA9MT	12
UW4IB	304	UV9OR	8
UB5WE	4280	UA0YP	1222
UB5FG	495	UA0DG	990
UT5GM	240	UA0NL	864
UB5OD	60	UA0SU	161
UO5BZ	8		

Oceania

KH6GNE	10620	DU1FH	21464
KH6GMP	3540	VR1L	26258
KH6GKI	2750	K0ILI/KG6	16124

Africa

ZS5OB	1314	CR6LF	48
ZS5OA	1278		

South America

OA4JR	1632	YV4IQ	80
OA4GQ	440	PY3AHJ	280

Listeners' Section

Europe

DM-EA3610/J	1066	I1-12843	—
DM-2542/L	1274	LA-M4811	414
DM-EA4604/J	460	LZ-2L93	12
DM-3676/L	32	OE-12680	—
EA4-1306	2622	ONL-383	—
EI-221	1200	HA5-146	2457
BRS26431	4806	HA6-020	440
A-5662	2730	HA2-007	676
G-1516	672	HA5-140	330
GW-7786	2988	HA5-153	12
HE9EVI	160		

North America

WPE-8JLL	450	WPE-9INP	112
WPE-9EIL	188		

Asia

JA0-1320/JA1	9100	JA2-3094	868
JA1-4876	1536	JA2-1885	494
JA1-8065	1410	JA6-2188	234
JA1-5966	1237	JA0-1893	4100
JA1-3989	473		

U.S.S.R.

UA1-13618	2484	UA3-170-200/UA9	624
UA3-127-202	374	UA9-165-55	198
UA3-127-11	300	UC2-0081	24
UA3-170-62	208	UQ2-037-10	300
UA3-142212 check		UP2-03864	858
UA4-0951	5412	UP2-0388	48
UA4-09476	1768	UB5-07325	1716
UA4-13321	210	UB5-0655	396
UA6-101-40	204	UB5-06519	360

ROSS HULL MEMORIAL V.H.F. CONTEST 1968-1969 RESULTS

TROPHY WINNER

VK5ZKR—C. M. HUTCHESSON

RESULTS TABLE

(Award Winners in bold type)

Call Sign	48-Hour Score	7-Day Score	Section
VK1VP	178	213	B
VK2ZCF	599	1302	B
VK2ZHR	128	268	B
VK2ZAH	228	228	B
VK2ZRE	40	110	B
VK3AKC	568	2015	B
VK3ZMS	256	872	B
VK3ZYO	188	804	B
VK3AOT	329	683	B
VK3ZOP	—	592	B
VK3AXV	166	570	B
VK3ZRG/T	224	523	B
VK3ABP	234	458	B
VK3AVJ	—	320	B
VK3ASV	105	275	B
VK3ZOS	—	75	B
VK4ZJT	266	782	B
VK4ZAZ/T	332	759	B
VK5ZKR	826	2103	B
VK5ZSD	392	737	B
VK5ZMW	280	719	B
VK5TN	50	95	B
VK6MM	—	99	B
VK7ZAH	332	884	B
VK7BQ	55	120	B

Receiving Section

VK3—Maurie Batt .... 529 pts.
VK5—S. Ruediger .... 682 pts.

Note: 1296 Mc. Australian and N.S.W. records were broken by contestants VK2ZCF and VK2ZAH, operating in the Contest on 28/12/68 (65 miles) and again by VK2ZCF on 5/1/69 (71 miles).

COMMENTS FROM THE LOGS

"Conditions for the 6 mx band really bad, fading out on 23/12/68 with few patchy openings during January, though on 26/1/69 a few JAs were heard at good strength in Sydney, though none were worked."—VK2ZHR.

"Feels that it would improve the Contest if separate band awards were given as an additive to the Contest." —VK3ZOP.

"Band conditions were quite poor. Of particular note, the absence of ZL and VK6 openings to this location. Also absence of short skip and 144 Mc. conditions."—VK4ZAZ/T.

"Rather poor 6 mx DX, but 2 mx made up for it from 7/12/68 to 12/1/69; 2 mx was open every day. On 3rd January, we even tried to get a number from the VK6 2 mx beacon, hi."—VK5ZMW.

"For the effort involved, if nothing else, to go on 576, the contact here was a three-day expedition. The points for 576 should be doubled from those set for this Contest."—VK5ZSD.

"6 metre scoring table ridiculous (for VK3 conditions), should be—

up to 50 miles .... 1 point
51-100 miles .... 5 points
101-200 miles .... 10 points

"Rules should have been published earlier. For scoring, the 432 table could be a little higher—it seems unrelated to average path loss compared with 2 mx. Otherwise, very good."—VK3AOT.

And so another v.h.f./u.h.f. contest passes with low activity on these bands. It is hoped that the future may be brighter. This year saw contestants competing for the trophy and only a narrow margin separating the winner and runner-up.

Perhaps next year will see a greater participation.

Looking forward to seeing YOUR log next year!

73. Neil Penfold, VK6ZDK, F.C.M.

☆

W.I.A. V.H.F.C.C.

New Members:

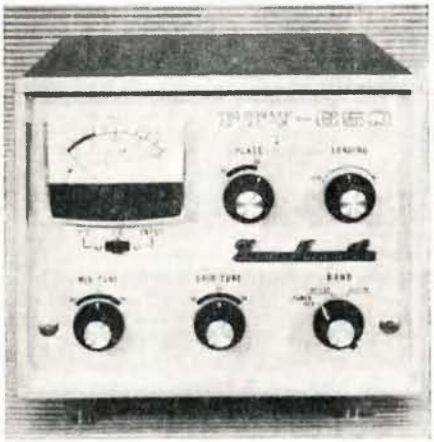
Cert. No.	Call	Confirmations 52 Mc.	144 Mc.
51	VK4ZRG	134	—
52	VK2AXI	114	—
53	VK3AQR	129	—
54	VK3AQR	—	203
55	VK3ZOP	—	105
56	VK3ASQ	—	108
57	VK3JS	—	225
58	VK3AOT	105	—
59	VK2ABC	102	—
	Amendments:		
44	VK3AMK	145	—
46	VK3ZNJ	230	—
47	VK3ZNJ	—	250

CONTEST CALENDAR

5th/6th July: R.S.G.B. 1.8 Mc. Contest.
5th/6th July: N.Z.A.R.T. Memorial Contest (3.5 Mc. only).
16th/17th August: Remembrance Day Contest.
4th/5th October: VK/ZL/Oceania DX Contest 1969—Phone Section.
11th/12th October: VK/ZL/Oceania DX Contest 1969—C.w. Section.
11th/12th October: R.S.G.B. 28 Mc. Telephony Contest.
25th/26th October: "CQ" W.W. DX Contest—Phone Section.
25th/26th October: R.S.G.B. 7 Mc. C.w. Contest.
29th/30th November: "CQ" W.W. DX Contest—C.w. Section.
6th Dec., 1969, to 11th Jan., 1970: Ross A. Hull Memorial Contest.
1st/2nd Feb., 1970: John Moyle National Field Day.

New Equipment

SIX METRE TRANSVERTER



The Yaesu Musen Model FTV-650 Six Metre Transverter takes a 28-30 Mc. signal and transverts to the six metre band in two ranges.

Transmitter: Input frequency range, 28-30 Mc.; input drive, up to 3v. r.m.s.; input, high impedance; input power to p.a. (S2001), 50w. d.c.; output frequency (two ranges), 50-52 Mc. and 52-54 Mc.; output impedance, 52-75 ohms.

Receiver: Frequency ranges, 50-52 Mc. and 52-54 Mc.; antenna input impedance, 50-75 ohms; sensitivity (when used with FRDX-400), better than 0.5 uV. for 10 db. S/N (s.s.b., c.w.), better than 1 uV. for 10 db. S/N (a.m., f.m.); image rejection, better than 50 db.; output frequency range, 28-30 Mc.; output impedance, 50-75 ohm unbalanced.

Power requirements (external): 6.3v. 3.5a. a.c., 150v. 30 mA. d.c., 300v. 50 mA. d.c., 600v. 150 mA. d.c., —100v. 20 mA. dc

Valves used: two 6CB6s, one 6AW8A, one 12BY7, one S2001 (p.a.).

Dimensions: 6¾" (plus feet) h., 8" w., 11½" d.

Further information from Bail Electronic Services, 60 Shannon St., Box Hill North, Vic., 3129.

PROVISIONAL SUNSPOT NUMBERS

DECEMBER 1968

Dependent on observation at Zurich Observatory and its stations in Locarno and Arosa.

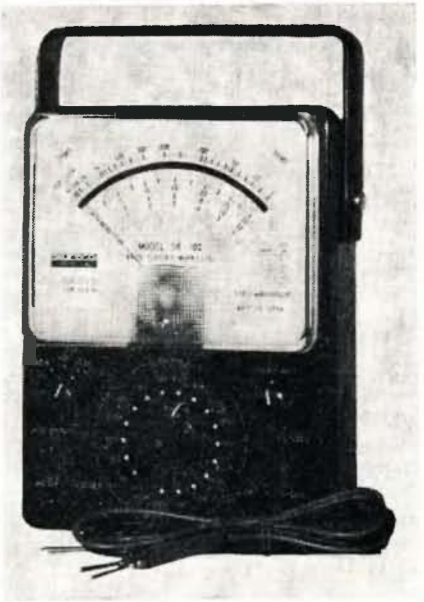
Day	R	Day	R
1	113	16	64
2	115	17	77
3	122	18	98
4	128	19	101
5	134	20	106
6	133	21	101
7	126	22	119
8	132	23	122
9	140	24	125
10	110	25	132
11	83	26	140
12	58	27	154
13	84	28	133
14	86	29	139
15	88	30	117
		31	119

Mean equals 112.9.

Smoothed Mean for June 1968: 107.0.

—Swiss Federal Observatory, Zurich.

WIDE RANGE TESTER



The 'Rapar' Model SK-100 Tester is a full size meter suited for professional and Amateur use. Features include overload protection, mirror scale, and is fitted with nickel plated test prods.

Sensitivity: 100K o.p.v. on d.c.; 10K o.p.v. on a.c.

The 23 ranges include—DC Volts: 0-0.6, 3, 12, 60, 300, and 1200. AC Volts: 0-6, 30, 120, 300, 1200. DC Current: 0-12 uA., 300 uA., 6 mA., 600 mA., and 12 amp. AC Current: 0-12 amp. Ohms: 0-20.0 megohms in four ranges. Centre scale reading: 150 ohms, 1.5K, 15K, 150K. DB.: —20 to +17. (0 db. = 1 mW. in 600 ohm line).

Further details from Radio Parts Pty. Ltd., 562 Spencer St., Melbourne, Vic., 300, and City and East Malvern branches.

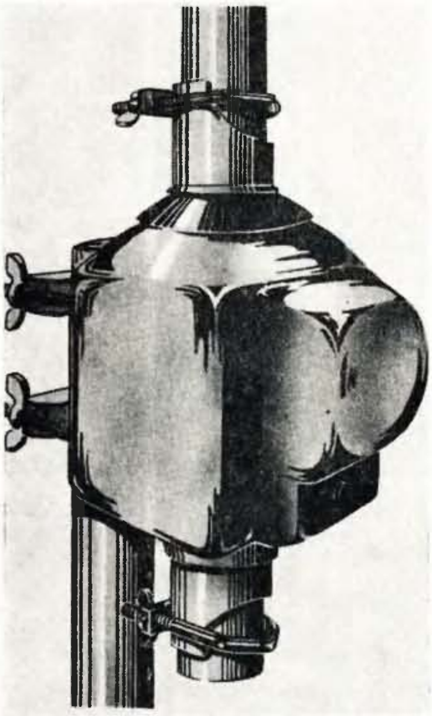
AUTOMATIC AERIAL ROTATOR

Designed to suit many applications requiring aerial rotation, the Stolle automatic rotator provides positive control from a fully synchronised unit by means of a balanced bridge circuit using transistor amplified control.

The connecting cable between the control unit and the drive unit operates from low voltage (42v.); when the rotation cycle is complete, the power shuts off automatically, and draws no current until it is activated again by turning the control knob.

The drive unit consists of a watertight cast metal housing with hollow shaft to take mast up to 1½" diam. Other features include: High carrying capacity (max. load 112 lb.), motor shaft bearings permanently lubricated, rotation angle 360 deg. (limited by stop at end of rotation), speed 1 rev. per minute, magnetic disc brake with self-restraining worm gear holds aerial in position.

The control unit is housed in an attractive moulded case, with 240 volt a.c. power supply (60w.). Push-button control sets the direction of rotation, left to right, while the dial indicator shows the direction of the aerial at all times.



Trade price: $45 plus sales tax. Further details from R. H. Cunningham Pty. Ltd., 608 Collins St., Melbourne, Vic., 3000.

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NEW W.A. BRANCH

R. H. Cunningham Pty. Ltd. have opened a branch office in Western Australia at 34 Wolya Way, Balga, Perth, 6061. Manager is Bob McGrath, and the phone 49-4919.

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RADIO PARTS CHIEF OVERSEAS

Mr. Allen Swann, governing director of Melbourne wholesale components house, Radio Parts Pty. Ltd., is currently in South America on a three months' holiday-business tour. Accompanied by his wife and daughter, Mr. Swann will visit principal capital cities and will investigate electronic manufacture and development. He is expected to return to Australia about May 24.

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TECHNICAL AWARDS

The awards for technical articles published during the year ended February 1969 have been made to the following Amateurs:

H. F. Ruckert, VK2AOU.
A. S. Lundy, VK2ASI.
R. B. Zielinski-Petersen, VK5ZIE.

The Publications Committee extends its congratulations to these gentlemen, and thanks them for their submissions.

Overseas Magazine Review

"QST"

December 1968—

What is R.T.T.Y.? K1PLP. Description of the process with the steps that need to be taken to get on the air on r.t.t.y. including modulating and demodulating techniques.

The Chirp Magnifier, WB2KVK/1. This is a device for increasing the amount of frequency drift or keying chirp from a v.f.o. An ordinary transistor radio can be used as an indicator if required. The answer for the "transceiver man".

Gimmicks and Gadgets, W6HDO. The author describes a converter to put v.h.f. f.m. 128-148 Mc. into the standard v.h.f. f.m. b.c. band of 88-108 Mc. and receive it on a normal f.m. receiver. Hardly applicable in Australia without an f.m. service.

A Solid State Product Detector for the HRO 60, W6PHF. A silicon diode ring de-modulator (detector) and i.f. stage module to improve s.s.b. and c.w. operation of an old standard receiver. This technique could probably be applied to a number of older receivers in use in Australia. AR7s could use this "as is," whilst AR88LFs, BC348s, AR8s, etc., will require a change in the i.f. amp. in the detector to suit the receiver being modified.

An Impedance Matching Method, K7KOK. Combining the balun and the L network. Design details are given for tuning networks for a number of Amateur bands.

Is a Balun Required? W1ICP. Lewis McCoy discusses the advantages and disadvantages to be obtained from the use of these devices.

Synchronous Weak Signal Detection with Real Time Averaging, WB6DEX and R. T. Kado. WB6DEX is W. R. (Ross) Adey, M.D., who was well known for his Amateur activities before leaving for the U.S.A. Ross describes a system of digging very weak signals out of the noise. The technique was developed for use in medical research and has now been applied to 144 Mc. moonbounce work.

A Solid State Audio Filter, WB6NMK. An a.f. filter using two 88 mH. telephone toroids (loading coils), one FET and an R.C.A. I.C. (CA3020) to be used with receivers or transceivers to give a bandwidth of 80 cycles at —6 db. The bandwidth is about the lowest practical limit as Morse at 25 w.p.m. needs a minimum bandwidth of about 75 cycles.

Further Improvements in the 32S-3, W4AX. A simple method of reducing spurious heterodyne products that have been observed in the output of the 32S-3 transmitter. Interested parties are also referred to a previous article by D. P. Shafer in "QST" Nov. 1964. It may be appropriate to point out to members that the Public Library in Melbourne and no doubt others also have "QST" and other overseas magazines available in the reading room. A copying service is available at reasonable prices.

A Two-Stage Transistor Pre-Amplifier for 1296 Mc., WA2VTR. Using special u.h.f. transistors, a low noise r.f. amplifier is described.

A 40 Ft. Self-Supporting Tilt-Over Mast for less than $50, W1YUT. With a title like that who needs a resume!

Combline V.h.f. Bandpass Filters, W2CQH. Since normal interdigital filters tend to be too large for convenient use at 144 or 50 Mc., the author loads the ends of the lines with capacitors.

"RADIO COMMUNICATION"

December 1968—

A Design for a Solid State Linear Amplifier, G2HIF. Factors essential to the stability and "fail safe" features of a 144 Mc. linear amplifier are discussed. The criteria for interstage coupling networks are established and a simple theoretical approach to the design is suggested. The parameters of a complete amplifier are determined in a worked example. This amplifier is stated to be capable of 20 watts p.e.p. (in British tradition, this should be output). It is a very neat design that appears to be reasonably easy to duplicate and could interest a large number of our v.h.f. men if the 2N3632 transistors are available at reasonable prices in Australia. It may also carry lessons for the h.f. men.

Technical Topics, G3VA. In this regular review type feature, Pat Hawker discusses "Linear Detection," and this is followed by "Narrow Band Hints from ZS6BT" who discusses the receiver requirement necessary for reception of weak c.w. DX in the presence of strong interfering signals. "What's happening in the co-ax?" F8ZF sent in details of a simple device for checking the current flowing in the outer sheath of the co-ax feeder. It consists simply of a toroid wound with a number of turns feeding a diode and an indicating meter. "Voice Peaks on S.s.b." and "Capacitively Loaded Dipoles" are the other two subjects discussed.

G3LUB R, C and L Bridge. The author sets out "the aim of the design" after the introduction, but, nowhere in the article does he set out a specification as it was achieved, nor does he give a clear indication of the order of accuracy to be expected from the bridge. This latter probably depends upon the calibrating facilities available to the builder and the in-built precision of one or two critical components. This is probably the most detailed bridge construction article which has been published.

"SHORT WAVE MAGAZINE"

December 1968—

Direct Reading Reflectometer, G3UXP. This unit which is based on the Monimatch design from "QST" has a number of things to recommend it. Firstly, two 50 uA. meters are used with individual adjustment pots, semi air-spaced dielectric co-ax is used which makes for easy insertion of the pick-up wires, the design will give f.s.d. of the meters with less than 10w. input on 1.8 Mc., and the unit is very neatly built into an Eddystone type die-cast box.

R.T.T.Y. Station Control Simplifier, G8LT. This is a continuation of the article which commenced in the November issue of this journal.

Reversing the Car Electrics, G3ESP. In these days of alternators, it is, of course, necessary to make major alterations to the device itself before one can be successful. With a generator, the matter is much simpler. The author describes the way to go about it. I have heard that with most cars it is only necessary to (1) reverse the battery polarity, (2) momentarily close the cut-out manually, (3) start vehicle and check that charging is now taking place in the reverse direction.

Notes on the Trio JR-500S Receiver, G2HR. Having purchased an inexpensive receiver and become aware of its shortcomings, the author proceeds to modify it and overcome them.

Centre Fed Multi Band Aerials, G3OGR. Design considerations for various types, feeding and tuning. Simple series and parallel tuner.

Rotatable Mast for Beam Working, G3MQV. The design of a simple unit for manual operation is described.

Transistor Converter for Four Metres, G3PRX. A mini converter to suit a tunable i.f. of around 20 Mc. is described.

The ZL Mini Quad, G3PHO/ZL2BDA. The 20 mx quad is only 10 feet on a side and elements are spaced 7 ft. 9 in. apart. Both elements are driven. The author reports that skeds with friends in G-land could not be considered satisfactory until he built this quad. After completion there was no trouble. Of course by shortening some elements it would be possible to make a quad for 40 which was no bigger than the usual 20 mx quad. What say someone? VK3AAR at Warrnambool is supposed to have one.

"73"

November 1968—

Computer Card Transmitter, K1EUJ. Plug-in components. (Grid leaks do not plug in!)

Crystal Filters, W3RET. The heart of s.s.b. This is an article which intrigued your reviewer greatly on a number of points. (1) The author is employed by McCoy Electronics. (2) He specifies his so-called ideal characteristics such as 6 to 60 db. shape factors of about 1.5 or less. (3) McCoy Electronics advert on p. 15 quotes the Silver Sentinel 32B1 and Golden Guardian 48B1 shape factor 6 to 60 db., 1.8/1 and 1.53/1.

Pop ups are shown about 45 db. down on the 32B1 and 55 db. down on 48B1, showing that the ultimate rejection is worse than the figures quoted by the author as desirable and since McCoy have sold filters for some time, one would believe, attainable. Maybe there is a strong argument for the home grown product which, although it may not be better than the highly advertised U.S. line, is cheaper and no worse.

Trouble Shooting Solid State, K3PBY. Modern day problems solved—the author discusses methods of trouble shooting solid state circuits.

I.C. Frequency Counter, WB6IBS. Easy to build counter for Amateur applications. An interesting article for the ardent solid state fan. The author claims the 20 Mc. counter can be built with $120 (U.S.) worth of semiconductors, etc.

C.V. Transformers for Ham Applications, WA9CQN. Constant voltage transformers are very useful devices and with most pieces of equipment are very useful for maintaining a constant voltage in the shack. Notwithstanding this, some equipment, especially if fitted with electronic d.c. regulators, does not take kindly to the waveform distortion inherent in the output of a c.v.t. Voltage should be measured by a moving iron meter or current by moving iron, hot-wire or thermocouple type r.m.s. reading instruments.

A Space Communications Odyssey, K6BW. It isn't going to be easy to keep in touch. Perhaps one should ask him if space travel is easy?

Surprise in the Skies, W1EZT. Pulsars—what are they?

Using Thin Wire Antennas, W2EEY/1. Fooling the landlord, or what the eye does not see the heart does not grieve.

A 7 Mc. Transistor Transmitter, WA6JND. An all transistor rig for 40 mx running 8-10 watts input and with a t.r.f. receiver in the same box. Battery operation all summer from one 45v. super duty B battery. This seems a good place for one of those small b.c. receiver/converter type superhet rx's with b.f.o.

Double Conversion of the BC348M, VU2TV. By using the i.f. strip at 85 Kc. from a BC453 he double converts his BC348 and makes it suitable for s.s.b.

The Gentrac, W6AJZ. A "do all" test set for receivers—the name on close investigation comes from "Generating and Tracing". According to the author it does what he says it will—all solid state too.

Harness Your Wiring, K5LLI. A professional wiring job for home-brew of lovely, laced looms!

Copper Wire, W1EZT. The forgotten component. The author discusses wire conductivity of various metals and alloys, wire gauges, etc.

Who Says You Can't Take It With You? WB6ABM. Or taking the Amateur station to college.

The Thermistor, WB6BIH. How to use this device for measuring purposes, especially temperature measurement.

Using S.C.R. in R.T.T.Y. Series Wound Motor, W8NSO. Some teletype machines use series type drive motors with a contactor type governor and consequent sparking at the contacts, which interferes with reception. Our hero used an S.C.R. to conquer the demon spark.

New High Voltage Transistors, K3VKC. The author lists type numbers with BVcbo from 90 to 1000v.

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FAIRCHILD INSTRUMENTS

Details will shortly be released of the range of Fairchild instruments available in Australia direct from Fairchild.

The Fairchild instrumentation range offers industry a broad line of digital multimeters, panel meters, electronic time and frequency measurement instruments and a curve tracer that is fully programmable.

The following instruments will be available:

Model 7050—A low cost digital multimeter.
Model 7000—A half rack digital multimeter.
Model 7200—An integrating digital multimeter.
Panel mounting digital meters:
Model 8040—A low cost frequency meter.
Model 8050—A 30 Mc. frequency/period meter.
Model 8220—A 500 Mc. digital frequency meter.

After-sales service will be provided and all information re availability, specifications, etc., can be obtained by contacting Fairchild at their Croydon, Victoria, production plant, or any of the Fairchild representatives.

1969 Annual Report to Federal Council

The Federal Council of the W.I.A.,
Gentlemen,

PREAMBLE

I present to you, on behalf of the Federal Executive, a report on its activities during the period subsequent to the 1968 Sydney Federal Convention, as required by section 33 (iv.) of the Federal Constitution.

The report follows the six sections traditionally used to classify motions at a Federal Convention, and deals with each section in turn. For each matter, where possible, I present a statement in the following form:—

(a) Institute policy.
(b) Subsequent actions.
(c) Future determinations.

In beginning this report, I wish to state that I have throughout referred to "Executive" or "members of Executive" in relation to the matters attended to on behalf of the Institute. I have done so because I feel that W.I.A. officers accept a duty to work on behalf of the organisation. The satisfaction gained is gained because the organisation is strong and active. I believe that any kudos attracted by actions of W.I.A. officers should attach to the W.I.A.

Of course, it is a corollary that the organisation cannot progress without hard work being done by its honorary officers, and administrative staff. To the members of Executive who have given me, and therefore the Institute, such fine support, I am grateful and thankful for a job well done!

1968-69 FEDERAL OFFICERS

Federal Executive—

Federal President: John Battrick, VK3OR.
Federal Vice-President: Michael Owen, VK3KI.
Federal Secretary: Peter Williams, VK3IZ.
Federal I.T.U. Liaison Officer: George Pither, VK3VX.
Federal Treasurer: Kevin Connelly, VK3ARD.
Federal Executive Member: Alf Seedsman, VK3IE.
Federal Activities Officer: David Rankin, VK3QV.

Federal Co-ordinators of Activities—

Federal QSL: Ray Jones, VK3RJ.
Federal Intruder Watch: David Wardlaw, VK3ADW.
"Amateur Radio" Editor: Ken Pincott, VK3AFJ.
Federal S.W.L.: Eric Trebilcock.
Federal Awards Manager: Geoff Wilson, VK-3AMK.
Federal Contests: Neil Penfold, VK6ZDK.
Federal W.I.A. Y.R.S.: Jim Webster, VK2ZCW.
Federal Repeaters: Chris Jones, VK2ZDD.
Federal Historian: George Glover, VK3AG.
Overseas Publications: Alf Chandler, VK3LC.

Immediate Past Federal President—
Max Hull, VK3ZS.

Section I.—CONSTITUTIONAL MATTERS

PROPOSED NEW FEDERAL CONSTITUTION

It was reported to the last Federal Convention that the solicitors acting on behalf of the Institute in relation to this matter had said that further delay was likely. In the course of this year, Executive was advised by the solicitors that except in relation to four matters, the articles as drawn would be granted the Attorney-General's approval. With one exception, the matters were of a minor machinery nature. The only troubling aspect was in relation to the proposed postal referendum. These provisions had been inserted at the request of the N.S.W. Division and had been the subject of extensive debate.

The matter has been referred to the Divisions for instructions. Once the Divisions are in agreement as to what course is to be adopted, Executive is confident that this long outstanding matter can be finalised. An appropriate motion has been submitted to Federal Council for consideration at the Federal Convention:—

Motion 1969 1.1: "That this Federal Council formulate an instruction to the W.I.A. solicitors to enable them to proceed with the submission of draft memoranda and articles of association to the Attorney-General".—Moved F.E.

EXISTING FEDERAL CONSTITUTION

During the year, Federal Secretary has undertaken a great amount of research through back records of the Institute in order to check the exact constitutional position at this time. Executive will prepare copies of the present Federal Constitution embodying all past amendments and being completely up-dated. Federal Councillors will thus all have a copy of the existing Constitution in common form.

A number of motions referring to amendments of the present "old" Constitution will be before the 1969 Convention for discussion, and I commend to you a perusal of Section X, which lays down the procedure to be adopted if it is wished to amend the existing Constitution.

Section II.—POLICY ITEMS

"AMATEUR RADIO" MAGAZINE

(a) **Policy** 1968/2.1: "That the cost of 'Amateur Radio' to the Divisions be increased" was moved by the publishers, the Victorian Division, who sought an increase in the cost to members of five cents per copy. This would have brought the cost up from fifteen cents to twenty cents per copy. However, after long debate, this motion was lost. Following that motion, the Queensland Division introduced two "motions arising":—

2.1.1.: "That a sub-committee be formed to urgently investigate all aspects of 'Amateur Radio' production comprising representatives from VK3 Division and Federal Executive," and also:

2.1.2: "That the cost of 'Amateur Radio' to Divisions be increased by twenty-four cents per member p.a."

These two motions were carried by majority.

(b) **Subsequent Action**: The Publications Committee of the Victorian Division has increased the cost to members from fifteen to seventeen cents per copy for 1968-9, and the effect of this will be a matter for its report and financial statement. Executive appointed Federal Vice-President VK3KI to convene a sub-committee as directed by 1968/2.1.1, and he was joined by Federal Treasurer VK3ARD, Victorian President VK3YQ and the Editor of "Amateur Radio," VK3AFJ. This sub-committee undertook a very detailed investigation, over a period of six months, of all aspects of publishing "Amateur Radio". The committee has concluded its investigations and has submitted a twenty-page report to Federal Council. The convener stated that he was satisfied that the Publications Committee was doing a most demanding job in a most responsible way. He thanked the Editor and VK3 President for the many hours put into this work over six months, and also thanked Don Watson, VK4DZ, who sent quite a lot of constructive material and comment to the committee.

During the time the sub-committee was carrying out its investigation, close liaison was maintained between Federal Executive and the Division publishing the magazine on behalf of Federal Council. Both the VK3 President and the Editor of "Amateur Radio" attended Federal Executive meetings to discuss matters pertaining to "Amateur Radio", and the Executive was at one stage asked to state its views on the future of "Amateur Radio", which it did in the following resolution:

"Federal Executive acknowledges the vast amount of effort put into the collection of material for submission to Divisions by K. Pincott. Federal Executive does not presume to direct the publisher in relation to the future of the magazine, but suggests that the following points should be acceptable—

1. The magazine should continue to be published.
2. Any arrangement by virtue of which the provision of working capital is not a burden on the Institute or on a Division is desirable, subject to the retention of editorial control by the Institute.
3. Any arrangement should result in some profit to the Institute.
4. F.E. recognise that the negotiations towards these ends must be left in the hands of the publishers."

The sub-committee investigated and reported on:—

(a) "Outside" publication of "Amateur Radio".
(b) Actual costs of "Amateur Radio".
(c) Future costs of "Amateur Radio".
(d) Letter from VK4DZ.
(e) General matters.

The sub-committee reached the following four general conclusions:—

1. That "Amateur Radio" in anything like its present form cannot reasonably be produced more cheaply by other methods by other printers.
2. A partial solution lies in the future exploitation of the advertising potential of the magazine, and to achieve this it is economic to utilise the services of a specialised advertising agency. This had already been done.
3. That if Divisions wish Divisional Notes to be restored or any other feature to be added, this will involve additional cost (in the case of Divisional Notes, 3 cents). In the last resort this is a decision for the Divisions, not the publishing Division, as in fixing a price the Divisions must accept responsibility for the magazine content.
4. It seems likely that costs will continue to increase. It will be reasonable for the publishing Division to continue to seek price increases. These cannot, at this time, (November 1968) be quantified; all we can say is that we are satisfied that further cost increases cannot be absorbed.

During the investigation it became apparent that more data was needed by the publishers to assist them in making decisions relating to the magazine. Accordingly a questionnaire was included in "Amateur Radio"—this has been reported on in recent issues, and a "Federal Comment" in a recent issue referred to the overwhelming response to an offer to supply a complimentary copy to a friend. A statement of costs of the magazine to W.I.A. members as compared to the cost of direct subscription was also mentioned.

In addition to the material supplied by Queensland Division, N.S.W. Division made other comments which were referred to the sub-committee. One of these referred to the transfer of all publications to Federal Executive control in accordance with the new Constitution. Another comment referred to the deletion of "Pubcom" reports from "Amateur Radio"—Executive passed this matter to the Editor for comment and his reply was forwarded to the N.S.W. Division.

During the year, Executive has continued to use the official organ of the Institute to inform members on various matters.

(c) **Future Determinations**: At the 1969 Canberra Convention, the Publications Committee of VK3 Division will report on last year's activities, and it is hoped that Federal Council will come to some agreement on the future of the "official organ" of the Institute. I believe that any agreement must be realistic from the economic point of view. If Federal Council wish one Division to publish on its behalf. VK3—the publishing Division—has again moved that: "The price of 'Amateur Radio' to Divisions be increased."

The aspect of publication of "Amateur Radio" by Executive raised by VK2 Division during the year will have to await the adoption by the Institute of the proposed new Federal Constitution. As pointed out earlier, Executive has asked for instructions on this constitutional aspect.

YOUTH RADIO SCHEME MATTERS

(a) **Policy**: These matters were raised at the 1968 Convention as a result of motions moved by the N.S.W. Division, viz.:

1968/2.2: "That Federal Convention confirm that the title of the Y.R.S. is 'Wireless Institute of Australia, Youth Radio Club Scheme —— Division' and that the scheme is an educational instrument of the Wireless Institute of Australia for the promotion of radio and electronics in schools and clubs."

1968/2.3: "That in view of the fact that so many members of the Youth Radio Club Scheme are not members of the Wireless Institute of Australia, that the Federal Convention encourage all Divisions to institute a form of student membership at a nominal cost to Youth Radio Club Scheme members."

1968/2.4: "That in view of the Youth Radio Club Scheme of Victoria and its associated correspondence section claiming to be affiliated with and not under the control of the Wireless Institute of Australia, that the Federal Convention endeavour to strengthen the bonds between these two bodies and the Wireless Institute of Australia."

These should be read in conjunction with 1966 motion 2.7.1: "That the W.I.A. provides a service for Youth Radio Clubs designed to assist the development of these Clubs. It cannot accept any responsibility for any action or views expressed by or on behalf of any club and that the substance of this motion be generally made known."

(b) **Subsequent Action**: Following the 1968 W.I.A. Federal Convention, a meeting of teachers assisting with Y.R.S. activities was held in Melbourne. These were Y.R.C.S. Supervisors from VK2, 3, 5 and 7, and others, and I attended their Convention by invitation. The meeting decided to form a Federal co-ordinating body of their own—the Y.R.C.S.A.—for co-ordinating syllabuses, standards, administration, etc. The meeting expressed a desire for close co-operation with W.I.A., and a wish to be affiliated with W.I.A. but not controlled by it.

The Federal Executive was later supplied with a copy of the motions passed at the Y.R.C.S. Convention by the teachers attending, and W.I.A. Divisions were also supplied with the Y.R.C.S.A. motions. Subsequent to that the N.S.W. Division drew Executive's attention to the decisions made in Melbourne in June with regard to the name of the Y.R.S. They also requested Executive to take immediate steps to ensure that the policy of the Institute was adhered to.

Executive referred the matter to Federal Co-ordinator of W.I.A. Y.R.S. and asked for clarification of the relationship between Y.R.C.S.A. and W.I.A. Y.R.S. He replied in terms which indicated that Y.R.C.S. was in effect a "separate" body with its own organisation, but was affiliated with the W.I.A. in different ways in different States.

After much discussion between Divisions and Executive on the matter, Executive requested the Federal W.I.A. Y.R.S. Co-ordinator to implement W.I.A. policy as it affected Youth Radio Clubs.

It is pleasing for Executive to note from reports that the Youth Radio Scheme is indeed flourishing. Executive thanks the teachers who are assisting W.I.A. with its objectives.

(c) **Future Determinations**: No motions on Y.R.S. matters have been brought forward for the 1969 Convention. There will be a report from W.I.A. Y.R.S. Co-ordinator to consider. No reports on how Divisions have complied with Motion 1968/2.3 have been received by Executive, nor has any report been submitted on 1968/2.4.

NOVICE LICENSING

(a) **Policy**: This was determined in 1959 and amended in 1962 and 1965. The policy item FED 17 thus read:

"That the following proposals regarding Novice Amateur Transmitting Licences be used as a basis of negotiation by Federal Executive with the appropriate authorities—

- (a) Morse code test of 5 w.p.m.
- (b) Elementary examination in radio theory (at a lower standard than required for A.O.C.P.) and P.M.G. regulations.
- (c) Operation to be allowed on the 3.5, 27 and 28 Mc. bands using c.w. only, and crystal control.
- (d) Power maximum 10 watts.
- (e) The A.O.C.P. examination must be taken by the end of 12 months, the licences not to be renewable except at the discretion of the P.M.G's Department."

At the 1968 Convention the following motion was passed:

1968/2.5: "That the Institute no longer advocate the issue of Novice Licences by the Australian Administration, with the reduction in the code standard," and then a motion arising was carried:

1968/2.5.1: "That the Federal policy item Fed. 17 be amended by adding the words 'if and when considered desirable'."

(b) **Subsequent Action**: Executive has undertaken no activity in relation to Novice licensing, believing that there is no current W.I.A. policy in relation to Novice licensing following 1968/2.5.

(c) **Future Determinations**: At the 1969 Convention, the Federal policy book will be amended as a matter of course. Executive will request some guidance from Federal Council in relation to an apparent conflict between 1968/2.5 and the motion arising 1968/2.5.1.

CODE SPEED TESTS

(a) **Policy**: This was determined at the 1968 Federal Convention by two motions brought forward by the VK7 Division and passed by Federal Council:

1968/2.6: "That Federal Executive consider the introduction of code speed tests within and conducted by the W.I.A. with a view to allowing any member so wishing to increase his code speed and be able to obtain a proficiency award."

1968/2.7: "That Federal Executive produce if necessary a code proficiency certificate to which code proficiency awards could be attached."

(b) **Subsequent Action**: Executive has been unable to consider this with sufficient attention to be able to suggest any action at this stage. The matter was discussed briefly with the VK7 Council by Federal President and Vice-President during a recent visit to Tasmania. The matter is still being considered by Executive.

Section III.—ADMINISTRATION: I.T.U. FUND MONIES

(a) **Policy**: This stemmed originally from the policy item Fed. 18 inserted in 1963:

"That the following plan for the next I.T.U. Conference be implemented—

- (1) That F.E. maintain a brief for the official W.I.A. representative.
- (2) That means of financing representation be implemented immediately.
- (3) That by Easter 1965, the Divisions shall raise a minimum total of £3,500 ($7,000) by a minimum contribution as follows—VK2, £1,300 (2,600); VK3, £800 ($1,600); VK4, £425 ($850); VK5, £550 (1,100); VK6, £225 ($450); VK7, £200 ($400).
- (4) That the said fund collected by the Divisions be paid to Federal Executive each six (6) months and Federal Executive shall hold the same in the I.T.U. Fund."

In addition, policy item I 01: "That after the targets for the I.T.U. Fund have been achieved, all future monies collected for similar purposes be collected in a general fund for the representation of the Amateur Service."

And motion 1967/3.5: "That in accordance with G.B. item 1 of the 1966 Federal Convention those Divisions who have not fulfilled the quota laid down do so from Divisional funds immediately" refer to I.T.U. Fund monies.

At the 1968 Federal Convention a number of motions were brought forward relating to handling of I.T.U. monies. Only one of these was carried:

1968/3.2.1: "That the Executive transfer the I.T.U. Fund into a separate bank account on or before the 31st day of May, 1968, and that to the balance shown in the accounts of the Institute dated the 28th day of February, 1968, and any further contributions to the fund received by the Executive after the 28th of February, 1968, shall be added the sum of $300 which shall be deemed to represent the interest which would otherwise have accrued to the Fund from the first day of March, 1964, until the 31st day of May, 1968."

This motion gave direction to Executive on the matter of interest accruing to I.T.U. monies, and established a policy for banking procedures.

(b) **Subsequent Actions**: Following the 1968 Convention, Executive took steps to comply with this motion 1968/3.2.1., and I.T.U. monies are now contained in a separate bank account, and earning interest. The VK3, 4, 5, 6 and 7 Divisions have filled their quotas as specified in Fed. 18, in accordance with 1967/3.5.

(c) **Further Determinations**: At the 1969 Federal Convention, Federal Treasurer will present a financial report which will refer in detail to these I.T.U. Fund matters. The amount held in the special bank account is $6,306 at the present time.

Section IV.—I.T.U./I.A.R.U. MATTERS

REGION III.

(a) **Policy**: Motions setting the background to Region III. activities are from 1966 and 1967 Conventions, at which times Federal Council conducted long debates on these matters. At the Hobart Convention, motion 1967/4.1 was passed:

"That Federal Council examine the way and the means by which liaison and assistance can be given to other countries in Region III. and outline a policy embracing one or more of the attached proposals, alternatives and questions."

During discussions on that motion, Divisions agreed that Executive should investigate the whole matter and put a proposition to the W.I.A. Motion 4.1.1 formalised this agreement:

"That the Executive prepare a detailed submission suggesting a policy to be adopted in relation to the Amateur Service in South East Asia and the remainder of Region III."

In addition, 1967/4.5 was discussed:

"That after due consideration of the attached Region III. report and any other evidence, Federal Council outline its policy on the five questions listed at the conclusion of the said report."

Further long discussion revealed that Federal Council needed more time for reflection and more information on Region III. before coming to a view. Accordingly, it was resolved:

"That debate on this motion (4.5) be adjourned 'sine die'."

Following the 1967 Convention, Executive members contributed articles to "Amateur Radio", Executive circulated material to the Divisions, and appointed a sub-committee to implement 1967/4.1 which issued a proposal. During the year, an Executive member visited many overseas countries during the course of a business trip, and kept F.E. informed on current thinking overseas.

As a result of these reports sent back to Executive, it was decided to recommend to the W.I.A. that a "Region III. Congress" be called and that it be held concurrently with the 1968 W.I.A. Convention in Sydney. W.I.A. agreed to this, and accordingly Executive issued the necessary invitations and the Region III. Congress is now a matter of record.

At the 1968 W.I.A. Convention, several motions and resolutions were passed unanimously: It was resolved that "Federal Council of W.I.A. endorses the action of Federal Executive in convening the inaugural Region III. Congress, and also states that it will consider financial support to any Region III. organisation formed as a result of the Congress".

That resolution was delivered formally to the opening session of I.A.R.U. Region III. Congress that evening, Friday, 12th April, as representing Australia's position.

1968/4.1: "That immediate action be taken to implement the aims arising from the discussions under items 4.2, 4.3, 4.4 of the 1966 Federal Convention, items 4.1, 4.5, 1967 Federal Convention, and subsequent action taken by Federal Executive in relation to Region III. organisation."

1968/4.1.1: "That the W.I.A. shall contribute $600 by December 1968 as its contribution to the I.A.R.U. Region III. organisation, and a similar sum by December 1969 and December 1970, and to provide such sum each Division shall collect 20 cents in respect of each of its members in each of the years."

1968/4.1.2: "That Federal Secretary convey the following statement to I.A.R.U. Region III. Congress:

1. The W.I.A. thanks the Amateur Societies of Japan, New Zealand and the Philippines, and the I.A.R.U. Headquarters for sending delegates to this inaugural meeting of Region III. Societies.
2. The W.I.A. is desirous of joining with these countries in co-operating to achieve a workable regional organisation, and if the participants at the Congress so request, W.I.A. will offer what administrative assistance it can, and provide what office-bearers are requested.
3. The W.I.A. will authorise its Federal Executive to contribute $600 each year for this triennium ending May 1971 to assist the regional organisation's finances. This sum will be reviewed before the second triennium commences."

Following the Region III. Congress a statement was issued which included the following points on organisation:

"It was resolved that there will be a board of directors, one from each Society represented and appointed by that Society. The President of the I.A.R.U. also to be a Director. The Wireless Institute of Australia is to provide a Secretariat and will be appointed by this Institute in consultation with the W.I.A. Director.

"It was further resolved that monies will be contributed by the Societies of Japan, Australia, New Zealand and the Philippines in proportion to their resources, such monies to be applied to purposes approved by the directorate.

"The meeting resolved that the Secretariat formulate draft rules to be circulated amongst Directors for discussion, and that subsequent opinions will be collated by the Secretariat and re-circulated to the Directors with a view to their adoption at the next Plenary.

"It was resolved that Directors and Secretariat plan future Directors' meetings.

"The meeting placed on record its gratitude for the offer of J.A.R.L. to hold the next Plenary meeting in Tokyo 1971."

(b) **Subsequent Action**: Letters and expressions of thanks for the action of the Institute in calling the Congress were received from overseas countries. The delegates from J.A.R.L. made a presentation to the Federal President of a Yaesu Musen FT-DX-400 transceiver which was received on behalf of the Institute, and placed in the Institute's station VK3WIA. All participants in the Congress and Convention expressed their appreciation of the excellent facilties and gracious hospitality provided by the Institute. Federal President thanked the N.S.W. Division for organising the facilities and hospitality which were very appropriate to the occasion.

Following the Region III. Congress, Federal Executive was faced with a statement from the Congress that amounted to little more than a broad expression of general policy. To a lesser extent, the motions passed by Federal Council dealing with these matters could be categorised in a like manner.

It was, at least, clear that the W.I.A. was to appoint a "Secretariat" in "consultation" with the W.I.A. Director. Of immediate concern to us was the fact that the participating Societies had undertaken to provide funds for the new organisation. These monies were to be remitted to the W.I.A. as providing the Secretariat.

The Executive took advice on the matter generally, and were told, firstly, that no "Club" or similar organisation could exist apart from its "rules" or other constitution, and the "statement" from the Congress in Sydney did not "create" any organisation. Secondly, if monies were collected on behalf of a non-existent organiastion and then expended (even with the best intention in the world and in accordance with the general tenor of the Congress statement) this would be at the risk of the W.I.A. and, more particularly, at the personal risk of those officers of the W.I.A. who authorised the payment.

It was also pointed out that if money was merely collected and accumulated, difficulties could arise as to what to do with those funds if, in fact, the organisation did not come into existence.

In the context of our position in South East Asia, it seemed that we could not afford to disregard this advice. Federal Executive felt that it was vital to ensure that the success of the Sydney Congress was built upon, and we also felt that a vigorous approach was required to turn the Region III. organisation into an actual working body.

At the outset, we ourselves were somewhat unsure of the problems involved, and felt that the best way to deal with the matter was simply to go ahead and carry out what we believed to be the intention of the Congress and the Federal Council.

At the outset, the Executive appointed myself as the W.I.A. Director, believing that this was the logical extension of my position as Federal President, at least in the somewhat difficult initial stages.

The other members of the Secretariat were Peter Williams (Secretary-General), Michael Owen, David Rankin and David Wardlaw.

I suppose that as the Region III. organisation was not in formal existence, we were really a sub-committee of Federal Executive, appointed to deal with the matter, but we felt it important to recognise the decisions of the Congress, and by calling this group the "Secretariat" we were able to preserve faith with the overseas Societies involved.

We then settled down to the long and tedious task of formulating an interim constitution. Our view that a constitution was essential was rapidly re-inforced by the refusal of the Nippon Bank to permit J.A.R.L. to remit funds out of Japan without the production of an appropriate constitution.

Our first attempt at an interim constitution failed to obtain unanimous support. (A copy of this first constitution and the covering explanatory letter was annexed to the copies of this report as submitted to Federal Councillors.) As a result of protracted correspondence, a series of amendments were formulated based on the suggestions of both I.A.R.U. Headquarters and the other member Societies involved. (These amendments were set out in a letter annexed to this report as submitted to Federal Councillors.) We believed that an interim constitution incorporating these amendments will be acceptable to all the Societies concerned, and therefore we have reprinted the interim constitution incorporating these amendments. (A copy of this re-printed constitution was also annexed to this report.) As I say, I believe that this interim constitution will be acceptable to the other Societies in the Region, and I commend it to the Federal Council for its approval. If Federal Council does so approve, I have every hope that within six weeks we shall have an interim constitution in existence that will enable the Region III. organisation to commence real operation.

There are two comments that I should make. I stress that the constitution we are presently discussing is only an interim measure to enable the Region III. organisation to come into existence. The adoption of a final constitution will be the primary task of the next Plenary. The adoption of the interim constitution has revealed widely diverging views and we must not under-rate the difficulties of resolving these divergences at the next Plenary.

The adoption of the interim constitution has involved us with much correspondence, and has, I think, brought us closer together, both with the other Societies in the Region and with I.A.R.U. Headquarters.

I have not dealt with the details of the proposals contained in the interim constitution. These are adequately set out in the material annexed to this report. This material also illustrates the vast amount of work that this task has involved.

Our aim has been to produce flexible rules but with sufficient detail on procedural matters to enable us to establish, if it ever became necessary, the procedural validity of what we have done. In considering these rules, I urge you to remember that we were bound to follow the structure as envisaged by Region III. Congress, and at the same time we had to construct rules that could adequately apply to Radio Societies in different countries with widely different legal and social backgrounds.

As a result of our experience over the past year, I believe that I can offer some views for the consideration of Federal Council. I feel strongly that the Region III. Association (as it is to be called) represents the area of the Executive's greatest achievement in the past year. I consider that the integration of this activity with the Federal Executive's other activities is essential and entirely consistent with the function of the Executive.

Our main immediate aim as a member of the Region III. organisation should be two-fold. Firstly, we must ensure that any final constitution adopted by the organisation is workable and conforms with the aims of the I.A.R.U. and the aims of the W.I.A. Secondly, we must prepare for the next Frequency Allocation Conference, using the Region III. organisation, to advance the interests of all Amateurs in all countries in the preservation of Amateur frequencies.

I believe that the Region III. organisation will remain one of the most important aspects of W.I.A. activity for at least the next five years. The decisions of the Federal Council at this Convention as to how we are to achieve our aims in this matter will be, in my opinion, vital.

(c) **Further Determinations**: Executive has submitted the following motions to Federal Council for instructions on various aspects of this section. That:—

1969/4.1: "The Federal Council ratify the action taken by the Federal Executive to date since the last Federal Convention in relation to the I.A.R.U. Region III. organisation."

1969/4.2: "The W.I.A. approves the I.A.R.U. interim constitution."

1969/4.3: "The Federal Council determine a policy in relation to the appointment of W.I.A. Region III. organisation Director."

1969/4.4: "The Federal Council approve in principle F.E. officers also holding positions on the I.A.R.U. Region III. organisation Secretariat whilst Australia is providing the same."

1969/4.5: "Federal Council direct what is to be done with any surplus collected pursuant to motion 4.1.1 of 1968 for the I.A.R.U. Region III. organisation."

Section V.—P.M.G. AND REGULATIONS

Only one motion in this section was passed at 1968 Convention:

1968/5.2.1: "That Divisions undertake to advise members of the existence of a gentlemen's agreement in relation to operating modes of c.w. and phone."

This was a motion arising from one to "request the P.M.G's Department to regulate the Amateur bands between telephony and c.w." The motion as presented was lost, and the above motion arising (5.2.1) was carried instead. No action was required of Executive by that motion.

Several matters, however, were taken by Executive to the Department, as it is Executive's policy to approach the P.M.G's Central Office on any matter which it feels may result in the granting of additional facilities to the Amateur Service, whether instructed by Federal Council or whether brought forward by one Division. So this appears an appropriate place for me to report to you generally on representation undertaken with the Department by the Institute.

Firstly, may I say that the Institute still enjoys excellent relations with the Post Office. I believe that this is because of the strength of Australia's Amateur Society, which is showing that it is viable, energetic, progressive, and, above all, united. If I may take this point a little further—I am very concerned that we may at times forget the ultimate objective of the "Institute" (defined as the Federal Council, Federal Executive, and the Divisions, **together**)—that is, to represent the Amateur Service, and to ensure that operating conditions and frequency allocations are as liberal as possible to ensure the continued interest in our hobby, and therefore our survival. I feel there is a danger that we may place the achievement of other objectives as of greater significance than this ultimate objective. I personally consider it is the duty of every W.I.A. officer as an ultimate objective **to preserve the W.I.A. as a viable society able to effectively represent the Australian Amateur Service—especially to the Australian Post Office!**

Shortly there may be a necessity to join in preliminary discussions pertaining to the forthcoming I.T.U. space frequency conference. We must present a strong, united voice at such discussions. My concern is that we may place matters out of perspective and fail to see the effect of some proposed action on the preservation of a "whole" Institute. Also I am concerned that the threat of unilateral action to achieve some immediate objective may jeopardise the unity and strength of the voice of the Amateur Service.

Following our successful Convention/Congress last year, the Postmaster-General, the Hon. A. S. Hulme, replied to my letter of thanks and said:—

"I am pleased to note your appreciation of Post Office participation in the meetings and the successful outcome of the discussions conducted, particularly those dealing with matters concerning the establishment of a Union of Region III. Amateur Societies. I wish you and the members of your Institute every success in furthering the aims and objectives of the Amateur Service."

May I ask you to ponder on the aims and objectives of the Amateur Service, the W.I.A. and W.I.A. officers. There should be no cause for things to be placed in such a poor perspective that the ultimate objectives are lost sight of!

V.H.F. REPEATERS/TRANSLATORS

During 1968, the Tasmanian Division provided Executive with a detailed case for an unattended repeater system in their State. Executive had previously been concerned with translaters in relation to Oscar/Australis experiments, and with repeaters in relation to W.I.C.E.N. activities. Some excellent material on repeater/translator systems was supplied on request from A.R.R.L. and other overseas Societies, and cases in relation to beacon transmitters were familiar to Executive.

Executive discussed the whole matter of these systems with the P.M.G's Controller Radio Branch, and the results of negotiations were publicised to Federal Council and members generally, as follows:—

"Agreement has been reached with the Department in relation to repeaters/translators as follows:

"(i.) The Department will approve the use of repeaters/translators in v.h.f. Amateur bands either on an experimental basis or on a permanent unattended installation basis.

"(ii) Such repeater or translator may either re-transmit within the same band or to another band. It is anticipated that such equipment will not be operated on frequencies below 144 Mc. though consideration may be given to their use in the 6 metre Amateur band.

"(iii) Any application (to be made to the Superintendent Radio in the State concerned) will be considered on its merits and the Department will have regard to the following points:

"(1) The number of translators permitted will be restricted to avoid undue interference in Amateur bands.

"(2) The Department will require to be satisfied that the design and construction of the particular equipment in respect of which permission to operate is sought is of a satisfactory technical standard though reasonable allowance will be made for experimental devices.

"The following additional technical points should be noted:

"(a) The equipment should include arrangements for 'fail safe' operation, i.e. failure of any component will not cause the transmitter to lock on.

"(b) The equipment shall be adequately and regularly maintained. A record shall be kept of all essential meter readings obtained during each maintenance visit, the repairs, adjustments and other maintenance undertaken and the purpose of operation (i.e. the times of switching on and switching off of the translator).

"(c) Any form of modulation appropriate to the band in use may be employed. Where system design requirements apply, means should be provided to avoid modulation in excess of allowable limits as a function of received signal strength.

"(d) No transmission shall take place in the absence of a received carrier or if so desired, voice or other modulation intended to convey intelligence.

"(iv) The Department will have to be satisfied that a permanent installation is desired by a reasonable number of Amateurs in the area concerned.

"(v.) Net frequencies or other normally frequented band areas shall be avoided for both input and output channels of repeater/translator, except where there is general agreement among Amateurs regarding such usage.

"(vi.) The Department will have to be satisfied that the equipment is safe from unauthorised operation and can be quickly turned off in case of malfunction.

"(vii.) The site chosen must be acceptable to the Department. Transmit and receive frequencies shall be as approved by the Department. As the Amateur Service is a secondary service in bands above 144 Mc., some restriction may be necessary in regard to the use of specific channels in these bands.

"(viii.) Permission to use such equipment will be granted on a basis somewhat similar to the licensing of a radio club—namely, one individual Amateur will be nominated as being responsible for the operation of the equipment.

"(ix.) To avoid the need for repeaters/translators to be fitted with equipment for identification purposes, stations communicating through them should include in their calling procedure an indication that they are operating through a particular repeater/translator.

"It is anticipated that all State Superintendents Radio will be aware of these arrangements presently. As the implementation of these arrangements may bring to light difficulties that have been overlooked, some delays could occur.

"The Department suggests that, wherever appropriate, the local W.I.A. organisation should co-ordinate applications. It is suggested that persons seeking the use of these facilities should not hesitate to make personal contact with the appropriate officer in their State, to ensure the fullest possible mutual co-operation."

General: Once again the Institute was treated with great consideration by the Department. We feel our relations with Mr. Carroll could not be more cordial. As is obvious, numerous difficulties surround the problem of v.h.f. repeaters/translators. We feel the solution set out above is eminently reasonable.

Following the release of this information to members in "Amateur Radio," a general desire arose for a meeting to co-ordinate this new facility. A meeting was arranged, and held in Wodonga. Members from VK2, 3, 5, and 7 attended, and Divisions requested Executive's participation.

Executive members attended, acting as chairman and secretary. The meeting published detailed minutes and because the meeting had an "informal" status, Executive later circulated postal motions, based on agreements made at the Wodonga meeting:

"(A) That the following policy be adopted in relation to repeaters/translators in Amateur bands—

1. (i.) A service translator is a translator designed to be used by current mobile equipment using channels A, B and C and with the intention of extending the range of similar operation;
   (ii.) An experimental translator is a translator for experimental purposes for use by specially designed equipment and not intended to provide a use for normal operation.
2. The primary frequencies for service translators shall be 146.4 Mc. input and 145.9 Mc. output, and the secondary channel shall be 146.1 Mc. input and 145.6 Mc. output with 146.2 Mc. input and 145.7 Mc. output and 146.3 Mc. input and 145.8 Mc. output being reserved for future expansion of service translator facilities subject to prior national agreement.
3. The frequencies for experimental translators shall be 145.76 Mc. input and 147.76 Mc. output and also 420.739 Mc. input and 431.50 Mc. output.
4. All translators shall be designed for a deviation of plus or minus 15 Kc.

"(B) That the following policy be adopted in relation to net frequencies—

1. That the primary national simplex 2 metre f.m. frequency be 146.00 Mc.
2. That the primary national simplex 6 metre f.m. frequency shall be 52.525 Mc., but the 52.656 Mc. and 53.950 Mc. frequencies may be used as alternative State channels.
3. That the VK2 Division shall act as a Secretariat for the co-ordination of net frequencies including translator frequencies."

Voting on these motions has been in the affirmative by all Divisions. One point which was discussed with Executive by the VK7 Division was in relation to the status of a Secretariat. Executive has put the view that for any Institute activity involving co-ordination throughout Australia, irrespective of where the co-ordinating group or person is located in Australia, the activity should be under the control of a Federal Co-ordinator. This officer is responsible to Federal Council through Executive's Federal Activities Officer.

Executive feels that this follows established procedure—the matter has been raised by motion for the 1969 Convention.

APEX, JAYCEES AND OTHERS "ON THE AIR"

At the 1968 Federal Convention, the following motion was introduced as general business: 1968/GB3: "That the Wireless Institute of Australia co-operate as far as possible with the Apex Clubs of Australia in their suggestion regarding Amateur Radio contact with Apex Clubs in South-East Asia."

Executive was also independently approached by a representative of Jaycees for a similar reason. This matter was raised with the Department, whose attitude was made clear and firm.

It appears that in the past the Australian Red Cross Society and various other organisations have made approaches, both at a Departmental and at a Ministerial level for permission to use Amateur frequencies for similar purposes. The Department is totally opposed to such activities on Amateur bands. It feels that "Jamboree on the Air" can be justified on the basis that one of the objects of that activity is to interest young people in Amateur Radio as a hobby, and the provisions of a communications facility is only part of the total object. In the case of other organisations, the express object of the exercise is the provision of a communications facility. The Department feels that if it makes an exception in the case of one of these no doubt worthy organisations, it will find itself acutely embarrassed in relation to other applications. It therefore seems probable that any applications by Jaycees or Apex will not be successful.

OTHER MATTERS RAISED WITH P.M.G's DEPARTMENT

Several matters affecting particular Divisions were attended to by Executive during the year—including transmitter hunts and 6 metre operation in Queensland, and matters of call sign allocation. Divisions have been informed of results of Executive's representations.

I.T.U. CONFERENCE FOR SPACE TELECOMMUNICATIONS

This is scheduled to be held at Geneva in late 1970 or early 1971. Executive has written to the Postmaster-General advising that if an Australian co-ordinating committee is formed similar to the committee prior to previous I.T.U. Conferences involving frequency assignments, our representative would be I.T.U. Liaison Officer, VK3VX.

In writing to the Postmaster-General, Executive stated that with the Amateur Service holding various assignments within the v.h.f.-s.h.f. range, it is essential that our I.T.U. representative be given the opportunity for a hearing.

The Postmaster-General has replied to the effect that the Post Office will make all preparations required for this Conference. In so doing, it will co-ordinate proposals originating from sources within Australia, and co-opt for discussion as required representatives of services likely to be affected by such proposals and those of other countries which are to receive consideration at Geneva. W.I.A. I.T.U. representative VK3VX will be supplied with a copy of proposals which may affect the Amateur Service when they are available.

Executive has submitted to I.A.R.U. Headquarters details of v.h.f.-s.h.f. activity in Australia, as requested.

Future Determinations: Quite a large number of motions in this section is before Federal Council for its discussion. Undoubtedly Executive will be requested to approach the Post Office on some or all of these matters, or may be requested to represent Amateurs or Divisions from time to time throughout the forthcoming year. In any case, Executive will continue to comply with Institute policy item P.02 of 1951:

"That any facilities granted by the Postmaster-General are not refused by the W.I.A."

Section VI.—CONTESTS AND AWARDS

These activities are administered by Executive through Federal Activities Officer on behalf of Federal Council. Council directives from Convention are acted upon by the co-ordinator appointed by Executive, and so are usually the subject of report annually to Federal Council, and therefore I will not report on contests or awards.

However, I wish to say a sincere thank you to those who so ably look after our contests and awards—the many hours of checking and recording are very much appreciated.

Section VII.—GENERAL MATTERS

Motion 1968/6.6: "That the Wireless Institute of Australia in a form appropriate to Amateur Radio publicise the anniversary of the arrival of Captain James Cook in Australia 1770-1970."

Executive has some suggestions as to the implementation of this motion, but as a formal motion requesting a report on progress made is before Convention, the matter will be deferred until the Convention.

1970 also co-incides with the 60th anniversary of the Institute, commemoration of which is a matter before 1969 Convention for discussion.

Perhaps both can be suitably commemorated at the same time? Executive will await Federal Council's instructions on these and other commemorative matters.

Motion 1968/GB1: "That the appropriate authority be approached for approval to mint a 5 cent stamp to commemorate the launching of the first Australian Amateur satellite—the Australis I.—and that the W.I.A's sponsorship of the project be recognised therein."

Past Federal President investigated the matter of commemorative stamps and reported that a commemorative postage stamp depicting Amateur Radio could be possible if a strong application were made soon enough. He was advised that any appliaction would be enhanced if it could include a celebration date or something of that nature. Procedures for applying were outlined, and it was indicated that the authorities work in advance on a two-year programme. However, as there is little likelihood of any launch of Australis or other Amateur satellite in the near future, according to reports received by Executive, we feel that no further action on this motion is possible. However, Executive now is in a position to advise Federal Council on future commemorative stamp issues.

Motion 1968/GB2: "That because of the over-statement of expenses of the Federal Convention held in Brisbane in 1966, in future statements of receipts and expenses relating to Federal Conventions, the detail of expenses be limited to costs relating directly to the Conventions and incurred only on behalf of Federal Executive and Councillors, and do not include expenses incurred by Divisional observers and others which are directly refunded by Divisions or others."

In accord with instructions contained in this motion, Executive provided Federal Treasurer and Institute Auditor with a detailed breakdown of 1968 Convention/Congress expenses. This will be a matter of report by the Federal Treasurer, but Executive wishes to state that the expenses of the inaugural Region III. Congress were met from funds accumulated as a result of overseas publications distribution by Executive to W.I.A. members.

The granting of commission to Amateur Societies for handling their publications was an act of deliberate policy by A.R.L. Board of Directors. Executive believed that it was well spent in a way designed to advance Amateur Radio in this Region, and was pleased that no burden fell on W.I.A. members, by way of per capita recovery, for the Region III. Congress.

Miscellaneous Motions:

1968/7.1: "That the term Hertz and its associated terminology be used in Institute publications at the discretion of the Publications Committee."

This matter was referred to the Publcations Committee, who, at their discretion, appear not to be using the hertzian terminology. No action is required of Executive.

1968/GB4: "That Federal Executive report on the present position with regard to supply of the brochure 'How Can I Become a Radio Amateur,' and endeavour to arrange for early delivery to Divisions."

At a recent Executive meeting, Past Federal President tabled an up-dated draft of this booklet. On examination by Executive, there still appears to be a few additions required. The delivery date to Divisions is still indeterminate.

1968/GB5: "That Federal Council recommends to Federal Executive the appointment of Mr. Jim Webster, VK2ZCW, as Federal Co-ordinator of the Wireless Institute of Australia Youth Radio Scheme."

Executive has acted in accordance with this Federal Council recommendation.

1968/GB7: "That the Divisions agree on a common form of application for membership for inclusion in the Institute's publication."

Divisions have provided information to the Publications Committee who published an insert to "Amateur Radio" for March to accompany a Federal Comment. Some Divisions have commented favourably on the effect this has had on membership applications.

1967/GB6: "That the W.I.A. encourage members to meet foreign students in Australia, and invite them to visit Amateur Radio installations while QSOs with Amateurs in the student's home countries are in progress."

Executive has been unable to take any action in regard to this motion during the past year.

Resolution: "That a review of the Policy Book be not undertaken at Convention, but that Federal Councillors peruse the Policy Book during the year and communicate any suggestions to Federal Secretary."

Executive has received no suggestions during the past year from Federal Councillors in relation to the Policy Book. Some motions before 1969 Federal Convention may require subsequent amendments to the Policy Book.

Venue of 1969 Convention: Extract from 1968 Minutes of Federal Convention:

"During discussion, VK6 invited Federal Council to come to Perth in 1969.

"VK2 referred to the cost of Conventions in VK6, and the fact that the last one was subsidised by the VK6 Division.

"Federal Secretary suggested that Federal Executive and the VK6 Federal Councillor examine the aspect of the cost of a projected Convention in Perth and report to Federal Council.

"Resolved to that effect, with tentative agreement that VK6 be the next venue—depending on Executive's report on costs."

Executive discussed the matter with VK6 Federal Councillor, and in order to effectively report to Federal Council, felt it would be relevant to consider an alternative to Perth. Accordingly, an initial unofficial approach was made to members of the Canberra Radio Club to provide some facts which could be placed before Federal Council giving an alternative venue to Perth.

A budget of costs for a Convention in Perth, as compared with a Convention in Canberra, was provided to Divisions in accord with policy item E01. Approval for Canberra as a Convention venue was received from all States.

The Constitution and Policy Book are silent on methods of determining Federal Convention venue—it is customarily held in Divisions in rotation and by invitation; however, the matter has been brought forward for discussion by Federal Council.

Membership: At the time of writing this report, membership figures are incomplete. The returns from VK6 and VK7 have been regular, but from other Divisions they are somewhat erratic. Executive would appreciate it if a report on February membership from each Division could be submitted at Canberra. Licensed Amateurs in VK totalled 5792 in December 1968.

Notable Achievements: It may be of interest to members to learn of some notable Amateur activity in the v.h.f.-s.h.f. range, carried out recently in N.S.W. and Queensland, on 1296 Mc.

On 29th December, 1968, VK2ZCF/2 worked VK2ZAH over a 65-mile path. This bettered the existing Australian record by about 18 miles. On the same day, VK4TE worked VK4KE/4 over 53 miles which also bettered the previous record.

On 5th January, 1969, VK2ZCF/2 worked VK2ZAC—71 miles—and VK4KE/4 worked VK4ZT/4 over 112 miles. Finally, on 2nd February, 1969, VK4KE/4 and VK4ZT/4 made two-way contact over a 138-mile path and this last mentioned contact will become the Australian record.

Personal Contact: During the year, some opportunities for personal contact between Federal and Divisional officers occurred. The VK3 Federal Councillor visited VK5 and New Zealand, and met with VK5 officers and also N.Z.A.R.T. officers. VK5 Federal Councillor visited Victoria and met with members of Executive and VK3 officers. VK2 and VK7 Councillors and some members met with members of Executive, and the VK3 Federal Councillor, at a Christmas Party arranged by Federal Secretary's XYL. Federal President and Vice-President were invited by VK7 Council to visit Tasmania and discuss Federal problems with them. Federal President and his XYL were the guests of the VK2 Division at their annual Convention dinner recently. At the Wodonga repeater conference, personal meetings between VK2, 3, 5 and 7 officers and members of Executive occurred.

These and many other opportunities for personal contact were taken by Executive, as we feel that often problems arise in our organisation through "breakdown of communications" between people.

Executive has placed before Federal Council for discussion and direction, the matter of N.Z.A.R.T.'s invitation extended to W.I.A. Federal President to attend their Gisborne Convention in May 1969. Executive believes that it should seize all opportunities to visit Divisions and other countries, if invited.

Oscar-Australis Satellites: No report has been received from the group undertaking these activities. However, we are informed by I.A.R.U. Headquarters that the general situation is best described as confused, and getting an Amateur satellite launched is not as easy as it was. There appears to be vigorous discussion on the future among the Oscar group, and it is reported that a new group in the East Coast area has formed a body similar to the Oscar body with basically the same aims. This new group will probably work closely with N.A.S.A., but things generally in U.S.A. are unsettled.

As Australia would rely on the provision of launch vehicles by U.S.A., the position in this country is therefore indeterminate.

Section VIII.—CONCLUSION

In concluding this review of the past year, I am aware that a number of errors of judgment may have been made. We, as Executive, must also concede that in respect of other matters we may not have always done things in a way that would be acceptable to all of you. Yet, overall, we believe that Executive has performed an important role in the affairs of our Institute, and has contributed to the advancement of Amateur Radio both within Australia and internationally.

(Continued on Page 26)

WIRELESS INSTITUTE OF AUSTRALIA—FEDERAL EXECUTIVE

STATEMENT OF INCOME AND EXPENDITURE for Year ended 28th February, 1969

1967/68			1968/69
	INCOME:		
$215	Interest received		$239.46
1,157	State Contributions—per Capita		1,223.70
317	Surplus Publication, Badges		485.27
—	Refund Expenses, Youth Radio Scheme		47.38
$1,689			$1,995.81
	EXPENDITURE:		
$32	Audit Fees	$31.50	
133	Depreciation	154.00	
—	R.D. Contest	6.50	
52	Awards Committee	10.90	
41	QSL Bureau	40.00	
34	Contests Committee	28.01	
39	Maintenance, Office Equipment	20.30	
10	Floral Tributes	8.00	
2	P.M.G. Licence	2.00	
—	I.A.R.U. Expenses	75.00	
108	Travelling Expenses	87.60	
203	General Expenses	82.37	
507	Stationery, Postage, Telephone	404.31	
303	Salaries	579.10	
16	Insurance	27.90	
8	Interest, I.T.U. Fund	317.77	
18	Y.R.S.	—	
115	Australis	—	
44	Badges	—	
30	Subscriptions	—	
			1,875.26
$1,695			
		Surplus for Year	$120.55
$6	Deficit		

REGION III. I.A.R.U. CONGRESS 1968

Fares	$52.00
Accommodation	381.34
Dinner	218.75
Other Meals	184.71
General Expenses	128.09
Transferred to Accumulated Funds	$964.89

BALANCE SHEET as at 28th February, 1969

1967/68			1968/69
	CURRENT ASSETS:		
	Commonwealth Trading Bank—		
$7,652	Federal Executive	$1,467.84	
987	Publications	381.98	
—	I.T.U. Fund	6,306.45	
263	Sundry Debtors	834.88	
442	Stock on hand—at lower of cost or market value	325.11	
49	Prepayments	131.34	
			$9,447.60
$9,393			
	FIXED ASSETS:		
$1,133	Furniture, Fittings and Equipment at cost less depreciation		1,213.27
$10,526	TOTAL ASSETS		$10,660.87
	Less		
	CURRENT LIABILITIES:		
752	Reserve Fund	$752.00	
5,414	I.T.U.	6,306.45	
—	Sundry Creditors	87.60	
			7,146.05
$6,166			
	ACCUMULATED FUNDS:		
$4,366	Balance, 1st March, 1968	$4,359.16	
—7	Add Surplus for year	120.55	
		$4,479.71	
	Less Region III. Congress	964.89	
			$3,514.82
$4,359			

AUDITORS' REPORT

We have examined the books and vouchers of the Wireless Institute of Australia (Federal Executive) for the year ended 28th February, 1969. In our opinion the accompanying Balance Sheet is properly drawn up so as to give a true and fair view of the state of the affairs of the Federal Executive as at 28th February, 1969, and the attached Statement of Income and Expenditure is properly drawn up so as to give a true and fair view of the results for the year ended 28th February, 1969.

Melbourne,
14th March, 1969

Hebard and Gunning,
Public Accountants

Book Review

WORKING WITH OSCILLOSCOPE

By C. W. Saunders

This rather large book of 104 pages measuring 11 x 8½ in., devotes more than half the available space to diagrams and circuits. It is this reviewer's opinion that the drawings are unnecessarily large and it is difficult to accept the somewhat unconventional style, although it must be admitted it is very distinct.

The first 32 pages are devoted to what are called lessons. These lessons outline the theory and operation on the oscilloscope, oscillographic patterns, time base oscillators, vacuum tube time base generators and vertical deflection amplifiers. The remainder of the book comprises 26 projects, enabling the reader to apply the oscilloscope to practical experiments using the oscilloscope as a test instrument in a large variety of applications. The text is liberally supplied with illustrations of the types of trace to be expected under various condtions.

TAB Book No. 472. Price $US4.95.

THE TYPE 111D IONOSONDE

By L. I. McGarry and S. M. Campbell

It may be recalled that the purpose of this series is to make available information about aspects of the work of the Ionospheric Prediction Service Division, Bureau of Meterology, which may be of some interest but would not normally be published in any scientific or technical journals.

The Australian Ionospheric Prediction Service uses vertical incidence ionospheric sounders to obtain data for prediction and research purposes. One such sounder, the Type 111D Ionosonde, was designed and built by the Prediction Service. This report gives a technical description of the methods used to sound the ionosphere and record the results on 35 mm. film. The report is illustrated with block diagrams and drawings.

Our copy from Ionospheric Prediction Service Division, Commonwealth Centre, Chifley Square, Sydney.

SEMICONDUCTORS: FROM A TO Z

By Phillip Dahlen

This book proved to be an extremely interesting and informative publication. The 26 chapters, spread over 272 pages with over 300 illustrations, gives a wealth of information on the range of transistors and semiconductors in use today—from basic diodes and transistors to FETs, MOS-FETs, tunnel diodes, integrated circuits, varicaps, photo FETs, light sensitive and light-emissive devices, unijunction transistors, field-effect diodes, SCR and zener diodes, etc. It explains how these various devices work and how they are used, with complete descriptions of all the common and unique circuits used in modern semiconductor technology.

The content begins with a review of how basic semiconductors work, including types and function, how a transistor conveys a signal biasing techniques, effects of temperature, factors limiting frequency response, etc. Succeeding chapters delve into the arena of field-effect transistors by explaining the differences between FETs and regular transistors, junction FET applications, frequency response, temperature effects and depletion and enhancement type MOS-FETs.

Considerable attention is given to integrated circuit applications. The use of varicaps is also covered, as well as unijunction transistors, field-effect diodes, zener diodes, diacs, and triacs, etc.

TAB Book No. 493. The price quoted is $US7.95 hardbound or $US4.95 paperbound. We are given to understand that TAB books are available from Robertson & Mullins in Melbourne.

SILENT KEY

It is with deep regret that we record the passing of the following Amateur:

VK3AOM—George W. Baty.

Correspondence

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers.

REMEMBRANCE DAY CONTEST

Editor "A.R.," Dear Sir,

Now that the results of the 1967 Remembrance Day Contest have been published, also the new Call Book, the writer has conducted a detailed investigation into the R.D. Contest rules to try and find a solution to make the contest a better one for all Amateurs, yet keeping to the expressed intention of the contest.

First of all it comes as a shock to find that the R.D. Contest, in its present form, is not a very democratic contest because approximately 200 licensed Amateurs cannot take part fully in the contest if they wish to do so.

The writer has very carefully examined the 1967 R.D. Contest rules published in "Amateur Radio," July 1968, the Editorial by VK3QV and the article by VK3TX in the August 1968 issue.

The rules commence, "A perpetual trophy is awarded annually for competition between Divisions . . ." Further on the rules state: "VK1 scores will not be included with VK2, nor VK8 with VK5," but in the Receiving Section: "VK1/VK2 and VK5/VK8 are considered to be the same area for scoring purposes."

The Call Book, page 56, shows that there are only six Divisions—being New South Wales, Victoria, Queensland, South Australia, Western Australia and Tasmania.

Now for the purpose of Commonwealth administration, Australia and its Territories are divided into 10 call-sign areas, and to make matters more complex, in some areas the call sign carries a different numeral to other call signs in the same political area, i.e. areas under the same State Government.

For instance, while Lord Howe Island carries the prefix VK2, being part of N.S.W., Macquarie Island carries the prefix VK0, although it comes under Tasmanian State jurisdiction. (Those living on Macquarie Island are entitled to vote in Tasmanian municipal elections, being considered Taswegians.)

I am not sufficiently familiar with the internal administration of the W.I.A. to know if VK1 is part of the N.S.W. Division, and so on, but it is obvious from the rules that transmitting Amateurs in VK1, VK8, VK9 and VK0 (except where their domicile is in a particular State) cannot compete fully in the R.D. Contest.

My solution to this problem, therefore, is to create another Division to be known as the Territories Division, in which all Amateurs in any Australian Commonwealth Territory would be included. The Call Book shows that there are about 200 such Amateurs.

It might be thought that administration of such a Division could be difficult, but the I.A.R.U. operates on a world-wide basis and I have no doubt that a really active Divisional Committee could make such a Division workable. Space does not permit going into details.

The second portion of the solution to the R.D. Contest problem is to include the registered W.I.A. S.w.l. members in his or her own Division's logs. (VK1, VK8, VK9 and VK0 where applicable in the proposed Territories Division.)

Lastly, it is necessary to revise the formula and I propose the following:

Average of top 12 transmitting logs plus average of top 6 receiving logs plus (Divisional logs entered divided by Divisional licences, multiplied by total points from all entrants).

I believe that these suggestions would allow all transmitting and s.w.l. Amateurs to participate to the fullest extent in the contest and make it more equitable between Divisions. It will be noticed that in the formula the word State has been replaced with the word Division, since the contest is not between States but between Divisions.

This proposal means that each transmitting Amateur and each W.I.A. registered S.w.l. has his individual score assisting his Division, whereas at present the scores of VK1 and VK8 transmitting Amateurs are excluded by the rules, whilst VK8, VK9 and VK0 apparently cannot be included in present formula as they are not Divisions as required in the first part of the rules. No doubt the poor response from VK1, VK8, VK9 and VK0 can be attributed mainly to this factor as this exclusion does not contribute to great enthusiasm for the R.D. Contest in these call areas.

I firmly believe that this proposal is the most democratic so far proposed although it cannot overcome the apathy in the R.D. Contest which appears to exist in some Divisions to a greater extent than in others.

—C. A. Cullinan, VK3AXU.

S.W.L. PARTICIPATION IN VK CONTEST

Editor "A.R.," Dear Sir,

After reading Mr. Trebilcock's letter in the July 1968 "A.R.," I decided then and there that I would participate in the VK/ZL/Oceania DX Contest despite the fact that at this time I had had my Lafayette HA230 only four months and my countries heard tally was about 25.

I participated, listened for a total of 12 hours, and heard 100 stations for 4575 points, and sent in my entry. I was surprised and pleased to receive a certificate. However, the discovery that only ten VK listeners sent in an entry bitterly disappointed me.

Overseas listeners sent in entries with scores like 48, 24, 12 (UP20388, UC20081 and HA5153 respectively). Much as I would hate to kill the ZL Contest Manager with work, I think it would help the spirit of the contest if even low-scoring listeners entered.

I may be forty years younger than Eric Trebilcock, but I wholeheartedly sympathise with his feelings as expressed in his letter.

—Colin Kilduff, WIA-L2342.

DEFINITE SUNSPOT NUMBERS FOR 1968

By M. Waldmeier, Eidgenossische Sternwarte, Zurich, Switzerland.

D.	Ja.	Fe.	Mr.	Ap.	My.	Jn.	Jl.	Ag.	Sp.	Oc.	No.	De.
1	119	208	108	122	126	139	55	98	78	75	89	104
2	123	211	110	108	144	134	37	91	82	73	76	109
3	128	199	92	98	143	121	30	92	119	108	76	113
4	137	170	86	96	138	114	26	94	118	119	81	116
5	152	137	77	89	127	115	28	94	111	118	97	118
6	150	114	67	85	142	129	41	95	96	126	92	117
7	164	86	58	79	135	138	54	100	90	135	92	116
8	182	97	67	82	128	119	89	113	106	112	89	122
9	200	95	65	94	122	103	91	98	128	87	105	130
10	198	92	74	104	117	99	99	90	138	70	111	117
11	154	89	85	95	106	87	124	104	145	95	106	101
12	144	76	87	83	82	105	152	116	150	99	94	68
13	139	67	89	60	91	108	147	142	153	70	94	75
14	107	69	67	96	80	114	138	165	113	76	85	81
15	94	87	59	110	95	107	123	172	88	90	84	84
16	78	85	46	114	103	103	129	170	84	88	84	67
17	68	94	59	91	114	113	117	160	81	82	82	77
18	60	78	59	63	136	121	96	148	85	108	77	93
19	58	65	53	53	138	107	102	136	88	112	80	101
20	55	72	60	63	140	103	93	122	84	114	92	102
21	55	79	70	64	142	108	93	138	90	122	84	107
22	69	82	91	68	143	94	86	143	99	134	81	114
23	75	93	113	50	149	101	93	126	118	136	76	114
24	93	119	132	48	165	113	101	108	149	139	67	125
25	90	161	143	64	146	111	124	86	187	138	80	131
26	87	150	141	50	121	107	130	77	184	133	89	140
27	88	126	146	57	139	102	127	67	176	138	87	148
28	140	124	138	82	133	111	118	49	149	118	73	139
29	175	120	127	71	135	94	129	64	137	114	73	139
30	185		154	96	126	88	115	68	91	112	83	119
31	209		134		136		93	63		99		117

Mean: Jan. 121.8, Feb. 111.9, Mar. 92.2, Apr. 81.2, May 127.2, June 110.3, July 96.1, Aug. 109.3, Sep. 117.2, Oct. 107.7, Nov. 86.0 Dec. 109.8.

Yearly Mean equals 105.9.

FINAL SMOOTHED SUNSPOT NUMBERS

July 1967	94.2
August 1967	95.4
September 1967	95.3
October 1967	95.0
November 1967	97.1
December 1967	100.6
January 1968	102.6
February 1968	102.9
March 1968	104.6
April 1968	107.2
May 1968	107.6
June 1968	106.6

Mean equals 100.8.

—Commonwealth of Australia Ionospheric Prediction Service.

NEW CALL SIGNS

NOVEMBER 1968

VK2FX—F. W. Nairn, 2/25 Delmar Pde., Gladesville, 2111.
VK2AGV—G. M. Dowse, 18 Davidson Ave., Woonona, 2517.
VK2AVV—Penrith High School Radio Club, Station: Penrith High School; Postal: 80 Great Western H'way, Springwood, 2777.
VK2BJC—J. Chessell, 2 Esplan Court, The Esplanade, Ashfield, 2131.
VK2ZGT—D. K. W. Bradbury, "Karana," Derriwong, 2745.
VK2ZJA—J. B. Bowmaker, 15 Akuna St., Keiraville, 2500.
VK2ZJI—J. F. Davis, R.A.A.F. Base, Richmond, 2753.
VK2ZKI—J. Thomas, 81 Hanbury St., Wentworthville South, 2145.
VK2ZKV—K. J. Cox, Sturt H'way, Forest Hill, via Wagga Wagga, 2650.
VK2ZLA—J. L. M. Andrews, 49 Lord St., Roseville, 2069.
VK2ZML—R. J. Mansfield, 33 Bundarra Rd., Bellevue Hill, 2023.
VK2ZNC/T—N. A. Dunn, 6 Pat Hargraves Pl., Maroubra, 2035.
VK2ZPX—P. W. Walton, Station: 99 Hardinge St., Deniliquin; Postal: P.O. Box 267, Deniliquin, 2710.
VK2ZSS—S. F. Wilson, Unit 2, 76 Laudendale Ave., Fairlight, 2094.
VK2ZZM—B. K. Boardman, 108 Chelmsford Ave., East Lindfield, 2070.
VK3BR/T—R. B. Russell, 1 Cedar Crt., Forest Hill, 3131.
VK3ACT/T—B. J. Lakey, 32 Giles St., Mirboo North, 3871.
VK3AEI—R. A. Hipwell, 57 Pier St., Dromana, 3936.
VK3AKQ—K. J. Echberg, Lot 10, Bahama Crt., Vermont, 3133.
VK3AOZ—G. O. W. Niele, 14 Elaine Crt., Springvale, 3171.
VK3ZDB—J. M. Shaw, Myrrnee, Wangaratta, 3732.
VK3ZEW—P. A. Stroude, Lot 38, Shelley Ave., Bayswater, 3153.
VK3ZOG—P. G. M. Bruer, Flat 11, 65 Tivoli Rd., South Yarra, 3041.
VK3ZPT—F. H. Birkbeck, 35 Richmond St., South Blackburn, 3130.
VK4AE—J. D. Elshoff, Station: 351 Rode Rd., Chermside, 4032; Postal: 394 Rode Rd., Chermside, 4032.
VK4DY—A. J. Chappel, D'Aguilar, 4513.
VK4HO—C. Churm, 1 Rolland St., North Ward, Townsville, 4810.
VK4IS—A. L. Stehn, 210 Alma St., Rockhampton, 4700.
VK4KC—G. J. Griffiths, 1 New St., Nerang, 4211.
VK4MU—T. W. Marks, 22 Renita St., Aspley, 4034.
VK4NO—E. T. Norris, 210 Hume St., Toowoomba, 4350.
VK4OB—Rockhampton District Boy Scouts' Radio Club, Station: Seeonee Park, Rockhampton, 4700; Postal: Fitzroy St., Rockhampton, 4700.
VK4OQ—P. J. Murdoch, 29 Sixth Ave., Palm Beach, 4221.
VK4QP—J. R. Godson, 35 Charles St., Gladstone, 4680.
VK4TK—I. H. Campbell, 31 Kamarin St., Manly, 4179.
VK4ZPM—P. J. Weir-Smith, MQ27, Borneo Barracks, Cabarlah, 4350.
VK4ZTR—T. Connolly, 28 Birubi St., Coorparoo, 4151.
VK4ZTS—G. T. Schott, Woondi Rd., Bell, 4408.
VK5EI—W. E. Dixon, 18 Mosterton Rd., Elizabeth Park, 5113.
VK5ZAG—E. W. Deakin, 109 French Tce., Port Pirie, 5540.
VK5ZAH—P. R. Parise, 53 Enterprise Rd., Elizabeth East, 5112.
VK5ZBU—H. J. Button, 10 Price Ave., Klemzig, 5087.
VK5ZCE—R. J. Sieber, 238 Victoria Tce., Hawthorn, 5062.
VK5ZCK—R. L. Reseck, 8 North Pde., Kingswood, 5062.
VK5ZCQ—J. A. McLachlan, 7 Austral Tce., Morphettville, 5043.
VK5ZSL—P. Lawson, 1 Doreen St., Prospect, 5082.
VK6ZDZ—A. P. Legg, C/o. Morris Hotel, Innaloo, 6018.
VK6ZEQ—A. W. Pike, 6 Latham St., Alfred Cove, 6154.
VK6ZFJ—S. J. Thornett, 1196 Acanthus Rd., Riverton, 6155.
VK8AF—J. S. Sisson, Station: 4417 Bulbul St., Ludmilla, Darwin, 5790; Postal: Box 2457, Darwin, 5794.
VK8AZ—B. Gardiner, 2012 Young Cres., Alawa, Darwin, 5790.
VK8PB—A. D'Arcey, 1950 Trower Rd., Alawa, Darwin, 5790.
VK8ZKA—P. M. Van der Velden, Flat 1, 2332 Austin Lane, Darwin, 5790.
VK9DH—D. G. Hallam, Station: Cassia Cres., Section 41, Lot 51, Lae, N.G.; Postal: C/o. O.T.C., Box 251, Lae, N.G.
VK9LA—Lae Amateur Radio Club, Station: Bugandi High School, Markham Rd., Lae, N.G.; Postal: C/o. Hon. Secretary, P.O. Box 799, Lae, N.G.

CANCELLATIONS

VK2AUW—P. R. Crosthwaite. Not renewed.
VK2BGG—G. J. Griffiths. Now VK4KC.
VK2BIH—J. H. Thompson. Not renewed.
VK2BMG—G. M. Browning. Not renewed.
VK2BWR—W. R. Rindone. Not renewed.
VK2ZGL—P. C. Kloppenburg. Transferred Interstate.
VK3RG/T—R. B. Russell. Now VK3BR/T.
VK3VO—R. J. Clark. Deceased.
VK3ACO—St. Annes Science Club C.E.G.S., Sale. Ceased operation.
VK3ZQC—B. J. Lakey. Now VK3ACT/T.
VK3ZXS—P. A. Stroude. Now VK3ZEW.
VK4AD—A. D'Arcey. Now VK8PB.
VK4BT—N. W. Atkinson. Not renewed.
VK4ZCA—A. J. Chappel. Now VK4DY.
VK4ZCI—I. H. Campbell. Now VK4TK.
VK4ZCK—R. W. J. Hazell. Transferred New South Wales.
VK4ZCL—C. C. Bunn. Ceased operation.
VK4ZET—E. T. Norris. Now VK4NO.
VK4ZLS—A. L. Stehn. Now VK4IS.
VK5DI—W. T. Lucas. Not renewed.
VK5NC—K. G. Ellis. Ceased operation.
VK5ZEA—I. C. Batty. Not renewed.
VK5ZET—E. R. Tuohy. Not renewed.
VK8ZEC—P. M. Van der Velden. Now VK8ZKA.
VK9JM—J. P. Meehan. Transferred to N.S.W.
VK0AL—A. Nickols. Left Antarctica.
VK0IA—D. P. James. Left Antarctica.
VK0JW—J. G. Kaarsberg. Left Antarctica.
VK0VK—V. J. Kitney. Left Antarctica.

DECEMBER 1968

VK1AD—G. M. Brown, Station: 5 Palmer St., Garran, 2605; Postal: P.O. Box 183, Manuka, 2603.
VK1LF—L. B. Fisher, 7 Elder St., Braddon, 2601.
VK1ZJH—J. Hyne, Station: 12 Perkins Pl., Torrens, 2607; Postal: P.O. Box 1271, Canberra City, 2601.
VK2ADE—F. N. Leverrier, 21 Allambie Rd., Castle Cove, 2069.
VK2AGJ—C. P. Daw, "Woodlands," Wombat, 2595.
VK2BAV—Cowra High School Radio Club, 6 Walker St., Cowra, 2794.
VK2BEW—E. A. Woodbridge, 2 Dorman Cres., Lindfield, 2070.
VK2BRU—S. A. Brunette, 51 Ilford Ave., Buttaba Heights, via Rathmines, 2283.
VK2BVR—V. A. Rochfort, 1 Hemingway Cres., Fairfield, 2165.
VK2ZDZ—D. J. Williamson, 16 Market St., Bankstown, 2200.
VK2ZFH—A. C. Counsell, 11 Allandale St., Beresfield, 2322.
VK2ZSV—B. S. Stevenson, 21 Glendower Ave., Eastwood, 2122.
VK2ZZQ—P. J. Wait, 25 Strathlora St., Strathfield, 2135.
VK3AZ—J. D. Lundy, 90 Dalny Rd., Murrumbeena, 3163.
VK5CW—P. A. Dennison, Station: 44 Johnstone Rd., Oaklands Park, 5046; Postal: Dept. of Physics, University of Adelaide, Adelaide, 5000.
VK5DZ—M. J. Groth, 75 Charles St., Prospect, 5082.
VK5PA—P. A. Matthews, 11 Gurr St., Goodwood, 5034.
VK5QG—G. E. Southgate, 203 Wright Rd., Valley View, 5093.
VK5ZCT—R. J. Cunningham, 59 Teusner Dr., Morphett Vale, 5162.
VK6FR—R. F. Frost, C/o. N.A.S.A. Space Tracking Station, Carnarvon, 6701.
VK6GT—G. J. Bedwell, 43 Pandora Dr., City Beach, 6015.
VK6WX—W. G. Garton, 5 "Santa Barbara", Hastings St., Scarborough, 6019.
VK6ZGH—C. P. Cearns, Station: Carnarvon; Postal: P.O. Box 98, Carnarvon, 6701.
VK7RR—B. J. Morgan, 110 Hampden Rd., Hobart, 7000.
VK7TC—Hobart Teachers' College Electronics Club, 2 Edward St., Glebe, 7000.
VK7ZCD—C. A. Danforth, 9A Philosopher St., Savage River, 7321.
VK8DA—Darwin Radio Club Incorporated, Station: 1 Kerin Pl., Rapid Creek, 5792; Postal: P.O. Box 1897, Darwin, 5794.
VK9KY—K. Yun-Hung Young, C/o. Ionospheric Prediction Service Station, P.O. Box 31, Cocos (Keeling) Island, Indian Ocean.

CANCELLATIONS

VK2HI—A. H. Brodrick. Transferred to N.T.
VK2JK—J. S. Vardy. Not renewed.
VK2WO—H. F. Owen. Not renewed.
VK2BLF—L. B. Fisher. Now VK1LF.
VK2BRF—R. C. Frosberg. Not renewed.
VK2ZAF/T—J. L. Harrison. Transferred to W.A.
VK2ZQM—G. V. Comber. Not renewed.
VK2ZSB—S. A. Brunette. Now VK2BRU.
VK3AZ—A. E. Avard. Not renewed.
VK3MK—J. D. Lundy. Now VK3AZ.
VK3AYH—E. A. Hayward. Not renewed.
VK5SL—N. L. Sjoberg. Ceased operation.
VK5ZBB—R. J. Langdon. Transferred to N.S.W.
VK5ZBH—M. R. Haskard. Ceased operation.
VK5ZDH—R. A. Jackson. Ceased operation.
VK5ZMG—M. J. Groth. Now VK5DZ.
VK5ZPM—P. A. Matthews. Now VK5PA.
VK6GD—H. R. Geldard. Deceased.
VK6ZEF—R. F. Frost. Now VK6FR.

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W.I.A. ANNUAL REPORT

(Continued from Page 24)

One feature of the year under review has been the stringent criticism the Executive has received from one Division. I do not believe that that criticism has on all occasions been unjustified, neither do I consider that we have received any generosity or understanding from that Division. The effect has been to divert much time and energy from productive activities to the, at times, seemingly interminable disputes. Another effect has been to magnify small matters to an importance they do not justify.

So, for the forthcoming year, we seek the consideration and understanding of all the Divisions. To expect the best from honorary officers subject to the unremitting pressure of the past year is unrealistic. There must be occasions when there is a legitimate and justified difference of view between a Division and the Executive, as there must be between Division and Division.

To resolve these differences, to reach agreements, to advise Executive in the execution of these agreements is the purpose of a Federal Convention. Except in the most unusual case, these cannot be satisfactorily resolved by the unilateral exercise of non-constitutional power by one Division.

Likewise, it should be remembered that at times when information is sought, the Executive will, in respect of the matter, not have completed its task. To demand that the Executive justify what it has only half done is not to exercise restraint and is unrealistic.

In the forthcoming year, then, let us all try to avoid a repeat of the past year; let us all exercise some tolerance and understanding and also above all, remember that in most cases there is room for two quite legitimate but different views on the same subject, but proper procedures exist whereby one part of the Institute can attempt to convince the Institute as a whole of the worth of its views. So Executive seeks the personal support of each Federal Councillor, who above all we believe should not engage in actions that are, whether justified or not, destructive of the Institute as a whole. We also hope that all parties to the Federal organisation will subvert their personal, divisional, or other unique viewpoints in the interests of the Institute as a whole, and allow the Institute as a whole to use its established procedures to determine for itself what is in the best interests of the "Institute". There is only one Institute—we are all but parts of it. No one part of the W.I.A. is greater than the W.I.A.!

In summary, gentlemen, I believe that this Executive has generally acted vigorously and competently as the Executive body of the Institute over the past year. In spite of difficulties, much has been achieved. However, we do not feel that we have always been given a "fair go"!

—JOHN B. BATTRICK, VK3OR,
Federal President, W.I.A.

TECHNICAL ARTICLES

Readers are requested to submit articles for publication in "A.R.," in particular constructional articles, photographs of stations and gear, together with articles suitable for beginners, are required.

VHF

Sub-Editor: CYRIL MAUDE, VK3ZCK
2 Clarendon St., Avondale Heights, Vic., 3034

Since the last issue went to print the VK6 two metre beacons have been heard on at least three occasions, but as yet no VK3 Amateur has been able to work the elusive VK6 on two metres, but it is reliably reported that VK5s have worked into Perth.

Other news is that Ray VK3ATN's two metre moonbounce record has been broken by a ZL1 and a SM7; the VK3 V.h.f. Group has a new committee; and at the time of typing these notes, the W.I.A. Federal Councillors are fighting it out at Canberra.

Hope to have more news for you next month. 73, Cyril VK3ZCK.

BEACONS

Addenda to the March 1969 list supplied by Brian VK5TN:

VK6VF/P—Albany, 144.500. VK6VF—Perth, 145.02 Mc.

VK5VF—Adelaide, 144.800 and 53.000 Mc.

ZE1JZA—Rhodesia, 144.015 format, 8-second key up, 36-second key down, 108 seconds of six call signs, and 280 seconds of key down.

Christchurch, New Zealand: Terry ZL3TAU states that the Christchurch two metre beacon is almost ready to go on the air. The frequency is 145.000 Mc. and will be using a horizontally polarised antenna, omnidirectional and fed with about 20 watts of r.f., keying will be f.s.k. of 800 cycles and the call sign of ZL3VF. (Reprinted from April Spectrum.)

VICTORIA

The March meeting of the V.h.f. Group coincided with the Group's annual general meeting and so much of the evening was devoted to the election of office-bearers for the forthcoming year. The results were as follows: Chairman, Gill VK3ZGS; Vice-Chairman, Neville VK3ZPN, Secretary, Noel VK3ZPQ; QSL Manager, Bill VK3ABP; Treasurer, Derek VK3ZUV; Publicity Officer, Peter VK3ZYO; Equipment Officers, Peter VK3ZAV and Cyril VK3ZCK.

A hearty welcome is extended to both Peter VK3ZYO and Derek VK3ZUV, who are newcomers to the V.h.f. Group Committee. A vote of thanks was extended to the retiring officers for the excellent work they have performed over the past twelve months.

Beacon Group.—Latest news of the group is the planning of completely solid state equipment including the keyer. Construction is well under way and we hope to have them operating on the air well before next summer.

6 Metres.—Activity in the metropolitan area on Sunday mornings (the only chance for a few hours peace on this band owing to the extended hours of operation of our Channel 0) is quite good with many new stations making contacts and the older ones just finding out if their gear still works. Brian VK3ZPU in Ballarat worked through to JA and QSL'ed JA1, JA7 and JA8, a total of eight rare DX stations; also heard working them were VK4s and VK5s.

2 Metres.—Quite a number of newcomers are appearing on the band, while Ron VK3AKC regularly works VK7WF and VK5ZKR. The only other reports of DX are that the VK6 2 mx beacons have been heard on many occasions.

432 Mc.— Activity here is diminishing now that the Ross Hull Contest is over, but regulars appear quite frequently and a number of stations are building gear for this band. Maybe 432 will become more active than 2 metres.

A.T.V.—Brian VK3ZPU has almost completed a 440 Mc. a.t.v. rig and will soon be checking out the path to Geoff VK3AUX's Mt. Dandenong QTH and will be interested to hear from any Amateur interested in a.t.v. 73, Peter VK3ZYO.

Geelong.—Max VK3ZQY, of Geelong, reports that the 2 mx band was really open on Saturday, 8th March, as he managed to work Max VK7MZ, Col VK7LZ, John VK7NZ and Den VK7DK with his MR3A, a ground plane, all from his 16 ft. runabout whilst doing a little bit of fishing! Also from Geelong, there appears to be some strange signals on or about 147.85, the same signals can also be heard on 145.854 Mc.

DX RECORD, 2 METRES, 11,370 MILES

This was an earth-moon-earth QSO on 4th March, 1969, at 1756 GMT. John ZL1AZR worked Kjell SM7BAE of Sweden. Gear used: ZL1AZR—tx p.p. 4/400s (grounded grids and screens), zero bias class B linear and p.o. 550-600 watts. Rx Digfet masthead pre-amp. into converter and 14 Mc. tunable i.f. Antenna, 96 element array made up of eight 6/6 slot fed yagis. SM7BAE—tx, 4CX250, 1500 watts input, rx 2N4416 masthead pre-amp. Antenna, 160 element array of 16 x 10 element yagis. (Reprinted from April Spectrum.) It is hoped that full details of this new record will be available later.

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Rhodesian Beacon ZE1JZA Back on the Air

AFRICA TO AUSTRALIA POSSIBLE ON TWO METRES

Since January 1968 a South Australian Amateur, VK5TN, has been attempting to analyse long range tropospheric propagation on two metres across the Great Australian Bight. This has been done by comparing the surface weather maps, together with the aerological sounding (temp.-height chart used to check the magnitude of temperature inversions) available from the Bureau of Meteorology, with the signal strength of the two metre beacon at Albany, Western Australia (VK6VF/P, on 144.500 Mc.).

Albany is particularly well situated for the experiments and in 1969, Amateurs in Albany, Adelaide and in the southern part of Australia have been noting the signals from VK6VF/P and VK5VF on about two days per week. On 3rd January, 1969, conditions were the best they had been for 12 months and Mick VK5ZDR contacted Wally VK6WG on two metres, achieving the fourth such VK5-VK6 contact on two metres since it was first accomplished in 1951 by Clem VK5GL and Bob VK6BO.

The advantages of making two metre contacts during long range tropospheric propagation conditions such as existed on 3rd Jan. '69 are that the openings can usually be predicted from the surface weather chart a day or so in advance (propagation via the back edge of cold fronts is not as easy to predict).

This procedure had been first noted by VK5ZDR as early as 1964 and had been recently revived by Brian VK5TN as a prelude to taking advantage of the large "high" that exists most of the time in the Indian Ocean area. Predictions for the Indian Ocean region are made possible by the twice daily weather maps which cover most of the Southern Hemisphere. These maps are available at the Bureaux of Meteorology in each capital city, together with the aerological soundings for places such as capital cities and Carnarvon.

Inspection of the Indian Ocean weather maps since 1st Jan. '68 has shown that tropospheric propagation should be good between Carnarvon and Tananarive, Malagasy Republic (formerly Madagascar) on about ten days in the period January through July and occasionally conditions will improve further south to enable v.h.f. tropospheric propagation between Perth and South Africa (especially in the vicinity of Rhodesia). Propagation as far to the east as South Australia could occasionally occur.

The announcement in the December 1967 issue of Electronics Australia, of the establishment of a Memorial Beacon Station ZE1JZA, together with information about the excellent long range tropospheric propagation in Jan. '68 and the existence of the Southern Hemisphere weather maps being realised, resulted in VK5TN commencing a programme of investigation to see whether the Indian Ocean could be spanned on v.h.f./u.h.f.

This programme of investigation has resulted in communications with the Radio Society of Rhodesia, which revealed that the beacon had been off the air from June 1968 to February 1969. By request from Australia, ZE1JZA has been repaired and put back into operation at its former site, 70 miles from Salisbury, Rhodesia, and the two metre transmission has been beamed to Australia from 1st March, 1969, 24 hours a day. Continuous beacon operation has been promised up to September 1969, as requested, after which time the beacon operation may be concluded if there are no positive results.

Amateur Radio operators situated within, say, 300 miles of the Indian Ocean, near Carnarvon and Perth are particularly requested to monitor the beacon which is identified in f.s.k. for 2½ minutes, followed by unmodulated carrier repeated every seven minutes. The frequency is 144.015 Mc. only (the 432 Mc. beacon is no longer on the air). The power output is 60 watts and the 16 element aerial beamed towards Australia has a gain of 15 db. over a dipole. It is expected that when a large high pressure region on the Indian Ocean extends from Africa to the Australian mainland, that signals received with a 12 db. gain two metre aerial should be available at a level of up to 20 microvolts in Western Australia and somewhat less in South Australia (conditions looked good on 10th and 11th March).

Verification of tropospheric propagation over these long distances (up to 7,000 miles) will provide further evidence to present research being undertaken in various parts of the world in v.h.f. microwave propagation and meteorology. Mr. Brian Tideman, VK5TN, would welcome further enquiries, or African signal reports to 33 Ningana Ave., Kings Park, South Australia, 5034.

Note.—The extensive f.m. broadcasting network of stations in South Africa may prove useful as additional more powerful beacons. These extend every 86 Kc. from Channel 1 on 87.740 Mc. to Channel 234 on 107.642 Mc. (Durban North).

Information about suitable v.h.f. transmissions preferably close to 144 Mc. from Malagasy Republic would be welcomed by VK5TN.

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AWARDS

CHRISTCHURCH AWARD

Beautiful colour award available to all Amateur Radio operators. ZLs to work 25 stations in Christchurch area. VKs to work 10 stations in Christchurch area. Rest of world 5 stations in Christchurch area.

Send list of QSOs, certified by two other Amateurs, to Award Manager, P.O. Box 1733, Christchurch, New Zealand. Cost: New Zealand, 50c. Rest of world, $US1 or equivalent.

TRIESTE AWARD

Issued by Trieste DX Club, I1HL. Basic award, 2 stations in Trieste, seal of Trieste, 2 more stations in Trieste. Cost $US1 or IRCs. Applications to I1HL with s.a.s.a.c.

QUARTER CENTURY AWARD

The Quarter Century Award is issued by the British Amateur Radio Teleprinter Group on the submission of satisfactory proof of two-way r.t.t.y. communication with 25 different countries.

Measuring 10 x 13 in. and printed in red and green, the certificate makes an attractive addition to any Amateur Radio station. Endorsement stickers are available for each additional 25 countries.

Application for the award may be made by the following methods:

(1) Submission of QSL cards for the countries being claimed. These cards are returned to the owner after checking.

(2) Submission of photostat copies or clear photographs of QSL cards. Such photographs should clearly show the call sign of the Amateur making the claim and also establish the fact that the contact was made using r.t.t.y. as a mode of communication. This type of claim must be witnessed and signed as accurate by TWO other licensed Amateurs.

(3) Claims may also be accepted based on a contest log submitted for any contest sponsored by the British Amateur Radio Teleprinter Group. The claim for the QCA Certificate should be made at the same time as the contest log is submitted.

The cost of the certificate is $US1 or 7/6 in International Reply Coupons.

Send your claims to: Ted Double, G8CDW, B.A.R.T.G. Contests and Awards Manager, 33B Windmill Hill, Enfield, Middlesex, England.

SOUTH-EAST RADIO GROUP OF SOUTH AUST.

ANNUAL CONVENTION

will be held over the week-end

SAT., SUN., and MON., 14th, 15th and 16th JUNE, '69

V.h.f. events including fox hunts, scrambles, transmitter hunts, plus events for ladies and children.

Hotel and motel accommodation arranged as required. ($2 dep. per person if needed.)

REGISTRATION FEE $3

All correspondence to VK5ZKR, Colin Hutchesson, Yahl, via Mt. Gambier.

DX

Sub-Editor: PETER NESBIT, VK3APN
32 The Grange, East Malvern, Vic., 3145
(All times in GMT)

ASSORTED

Report on the HK0TU DX-pedition. The party arrived at Malpelo Island on schedule and were signing /MM, but were unable to land because of rough seas. Following two unsuccessful attempts, they finally managed to reach shore the next day. While landing, one rig was lost and two operators were injured (HK3RQ and HK3HY) and had to be returned to the boat. A 20 metre dipole was quickly erected and on Sunday the 23rd at 05z the pile-up on 20 mx s.s.b. was terrific. Then followed a marathon c.w. stint from 07 to 13z.

Next morning the rest of the antennas (160 to 10 mx) were set up. The 20 mx beam suffered a bending when a bird crash-dived and bent one of the reflectors. On Sunday, the pile-up was as big as ever. On Monday from 00 to 06z, 14195 s.s.b. was used; however, very few VK/ZL stations answered. Return was scheduled for Wednesday, 26th February. Colombian newspapers gave much publicity to the event and while there the operators received radio messages from the President of Colombia and from Dr. Samaniego, Director of Telecommunications. On the whole, the expedition was an outstanding success and has helped remove Malpelo Island from the list of "Most Wanted Countries".

Heard Island: Bill W7ZFY was using the call VK0WR from the 11th to the 16th of March. Since he lost his beam in 80 m.p.h. winds that swept the island the first day, a dipole was used for the remainder of the operation. He was often working amid a terrific din caused by many stations "keeping the frequency clear". See below for the QSL address.

W4BPD DX-pedition: Gus is reported to be going strong, so far he has operated from ZD3A, 6W/W4BPD, VQ8CCB (St. Brandon), VQ8CCR (Rodriguez), VQ8CP (Mauritius), and others. No transport to Chagos is available at present, so it seems (at this moment) that Chagos is out. Frequencies are: c.w.—1827, 3525, 7025, 14025, 21025, 28025, s.s.b.—3795, 7095, 14195, 21245 and 28495. QSLs: Special arrangements will be used to distribute VQ8CCR and VQ8CCB QSLs via the bureau within a few days of the operation. Do not send your card to anybody; QSLs from stations contacted are not needed. It is hoped this will simplify matters for everyone concerned. If you do not receive QSLs within six months, send details of the QSO to W4ECI (address below).

New Prefixes: It is reported that new prefixes in JA land are JD1 and JR1. 6Y0A is a special call allotted to some lucky 6Y5 station. Tony 5L2AK reports that all EL stations are now allowed to use the prefix 5L.

Hearty congratulations to Stew W1BB for finally reaching his D.X.C.C. on 1.8 Mc. His hundredth D.X.C.C. country was HK0TU. Now he is truly "Mr. 160 metres"! Congrats. Stew.

The PJ7JC who has been knocking around the bands lately is none other than Jose, ex PJ2MI.

In a letter dated Feb. '69, the U.S.C.G. confirms that they have allowed no private individuals to visit Navassa Island since 1963, and this arrangement will continue indefinitely. This sort of sticks the pin in any idea of a DX-pedition to the place.

Ulli 7P8AR is now QRV on five bands, with a TH6DX beam at 75 ft. for 10/15/20; a 2 el. beam on 40; and a half wave vertical on 80. Quite a nice set-up.

As from the middle of March '69 and for a period of 12 months, VK9KY will be operating from Cocos (Keeling) Island. The operator's name is Ken Young, and his address Box 31. As Ken is a new operator, it is requested that the boys treat him gently for a start. It is anticipated that he will be operating around 10-14 and 23-24 GMT on 7050, 14050, 14150, 21050 and 21350. The QSL manager will be Syd VK2SG. S.a.s.e. is requested for QSL replies.

QSL MANAGERS

A2CAH—Box 17, Gaberones, Botswana.
AP5CP—Tiger A.R.C., C/o. Dacca Signals, Dacca 6, East Pakistan.
CR6BX—Box 2163, Luanda, Angola.
CR6GO—Box 10408, Luanda, Angola.
SV0WE—C/o. American Embassy, V.O.A.R., A.P.O. New York 09223, U.S.A.
UO5AA—Kagul Radio Club, Kagul, S.S.R., Moldavia.
VK9KY—C/o. VK2SG, S. Molen, 13 Pendle Way, Pendle Hill, N.S.W., 2145.
VK0WR—All QSLs to Lt. W. Rohrer, U.S.C.G.C. South Wind, F.P.O. New York 09501, U.S.A.
W4ECI—W.R.P.S.A., 3101 Fourth Avenue South, Birmingham, Alabama 35233, U.S.A.
YB0AC—Box 1056, Djakarta, Indonesia.
3V8AC—Box 323, Tunis.
5R8BP—Box 437, Madagascar.
5W1AD—D. Swift, Box 63, Apia, Western Samoa.
7P8AR—Box 194, Maseru, Lesotho.
7P8YL—As for 7P8AR.

AP2AR—W8QWI.	PJ8AA—W2BBK.
CR9AK—CT1BH.	PJ8AB—K7TMK.
EA6BG—DL7FT.	SV0WN—K3EUR.
EA6BH—DL7FT.	TA2EA—W9JXD.
FG7TG—W5BUK.	VP8LS—VE3DLC.
FM7WO—WB2SSK.	VR2DK—W2CTN.
FY7YR—VE3BYN.	W7UAF/KH6—DL7FT.
HS3DR—VE3DLC.	XE2YP—DL7FT.
HS3RB—DL7FT.	YA1KO—W7WDM.
KC6BW—WA3HUP.	ZA0II—I1KTJ.
KC6BY—WB9ALM.	ZS1ANT—ZS6N.
KC6JC—W2RDD.	3A2CN—DL7FT.
KL7EBK—DL7FT.	3A0CU—DL7FT.
KR8JT—DL7FT.	3V8BZ—DL7FT.
KW6EJ—W2CTN.	5L2J—WB2WOU.
MP4TAF—DL6AA.	5R8CJ—WA0RZB.
OA4DX—W4TKN.	5W1AS—WB6KBK.
PJ7JC—VE3EUU.	8P6AU—WB2FCI.

ACTIVITIES

Welcome to Jack VK3AXQ, a new contributor to the column. He is fairly new to the game and works when time permits, and is limited to 20 mx c.w. at the moment. He says:

"An unusual one—worked WA6MUT/MM on board S.S. Japan Bear (?), N.W. of Hong Kong; S6 both ways but bad QRM. Heard VK6OV working Ernst DL1ND, both nattering away at length in German—good for practice! A lone KM6DQ called CQ and raised a hornet's nest of stations replying, and not assisted by a UA who decided to hold his key down."

Jack says that VKs are noticeable by their absence around 08-10z. (Thanks Jack, please send more.—Peter.)

Reg VK4VX, a regular contributor, sent in a rundown on his activities, comprising a page full of recent QSOs. Once again they were all 20 mx c.w. 100w. to a 3-el. beam at 66 ft. produced the following: 8R1J, VK0WR, UM8KAA, OY2H, PY0EP, HK0TU, and EA6BH. Many others were listed, this being only a taste of the DX available. (Thanks Reg.—Peter.)

Fred VK4RF is another who has been bitten by the c.w. bug. Says he got a sudden urge for the key the other night, so hooked in a jack on the rig, dusted off the old Simplex-Auto, and then ploughed through scores of DX. In one week-end 77 stations were contacted, the majority of them Europeans worked via long path in two sessions. That is really travelling, considering that Fred hadn't had a c.w. QSO for 19 years! (Good on you, Fred, nice work.—Peter.)

RULES FOR THE WAZ AWARD

(Worked All Zones)

The object is to work each of the 40 zones in the world. The following rules apply: The official "CQ" WAZ Zone map will be used in determining zone boundaries. Confirmations must be accompanied by a list of claimed zones showing the call of the station worked and the mode. All contacts must be made with licensed, land based, Amateur stations. All contacts submitted must have been made within 250 miles of the original location. Altered or forged confirmations will result in permanent disqualification of the applicant.

Endorsements are available for s.s.b., a.m., or c.w. operation. Include with the application U.S. $1 or eight I.R.C's to defray the cost of the certificate. All applications must be sent to: The DX Editor, P.O. Box 205, Winter Haven, Florida 33881, U.S.A. Zone maps and/or WAZ applications are available from the above address on receipt of a self addressed envelope and one I.R.C.

This is a worthwhile award as it takes considerable skill to work all of the 40 zones. So good luck!

SUMMARY

The reduction in sunspot numbers has begun to take effect. This year the higher bands (10 and 15) have been very unpredictable—sometimes excellent, often very poor. Conversely, the lower bands have definitely improved with better long path openings on 40, and some excellent openings to Europe and the U.S.A. on 80. 20 seems much the same.

Thanks to those contributors who have helped out with news this month: DX News, LIDXA, ZL2AFZ, VK3AXP, VK3AUT, VK4RF, VK4VX and VK2SG.

73 and good DX, Peter.

HAMADS

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Extra words, 3 cents each.

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ANY OFFERS? Electronics 1962 S.s.b. Tx uncompleted. Most parts including spare 813, power supply and circuit. VK2ME, D. Sidey, Dog Trap Road, Yass, N.S.W., 2582.

BENDIX Frequency Meters: BC221 with in-built AC/DC power supply. In original sealed cartons and complete with charts, manual, headphones, cords and spare valves. Limited quantity. $70 cash with order. Advise shipping instructions. G. B. Lance, 123 Webster St., Ballarat, Vic., 3350.

FOR SALE: Galaxy V Transceiver, Galaxy Remote VFO, solid state power supply, $485 the lot. Clean condition and not over used. With instruction manuals. Phone 874-5632 or write. VK3UJ, 6 Barton Crt., Vermont, Vic., 3133.

FOR SALE: Geloso 222 A.M. Transmitter, in first class condition, $90 o.n.o. G. A. Van der Horst, VK5XV, 21 Dudley Cres., Marino, S.A., 5049. Phone 96-3136.

FOR SALE: Heathkit Amateur Band Receiver, Model HR-10, 240 volt a.c. operation, factory assembled, $80 or nearest offer. B. Ritchie, 1347 Gregory St., Wendouree, Vic., 3355.

FOR SALE: Heathkit SB-100. Excellent cond., with pwr. sup., mike, manual. Best cash offer over $430. Inspection welcomed. Also Kyoritsu S.W.R. Meter, as new, $15. 4-BTV multiband vertical (10 through 40), $42.50. University Graham sig. gen., 150 Kc. to 30 Mc., offers? Brinkley, 9 Faunce Cres., O'Connor, Canberra, A.C.T.

FOR SALE: Heath SB-301E Receiver, SB-401E Transmitter, SB-600 Speaker Box, 240v. operation, new Sept. 1968, excellent performers, $625. Sony Tape Deck TC-250, solid state, stereo, four track, two speed, 7 inch spools, as new, $115. L. A. Wade, 24 Ramsay Ave., West Pymble, N.S.W., 2073. Phone 449-3538.

SWAN 350, five bands, Transceiver, $400. Vox unit to plug in, $20. Home-brew heavy duty a.c. power supply and speaker, $25. Spare a.c. supply, $20. Heavy duty d.c. (12v.) power supply (4 x 2N458), fused and relay operated, $70. Helical Whips for 80, 40 and 20 with base balun, boot mounting, $30. Will accept $500 the lot. Can be seen working. R. E. Pope, 21 Hillcrest Ave., Kew, Vic., 3101. Phone 80-4279.

WANTED: Any information on AR8 Receiver, 3BZ Transmitter including modifications, also any parts. Particulars and prices, all replies acknowledged. E. Reynolds, 111 Northcliffe Dr., Lake Heights, N.S.W., 2502.

WANTED: AR7 Coil Boxes or parts, any condition. Godfrey, 64 O'Grady St., Albert Park, Vic., 3206. Phone 69-4989.

WANTED: Bendix Azimuth Indicator MN-40D or MN-22A with correct Selsyns. Must be unmodified and in excellent condition. Phone 86-5321 Ext. 388 (business), 878-4939 (private). P.O. Box 69, Kew, Vic., 3101.

WANTED: Frequency Meter BC221 or similar, with Calibration Book and Handbook if possible. Condition, particulars and price to J. N. Thornton, C/o. Telephone Exchange, Pialba, Qld., 4655.

WANTED, the following: Crystal Calibrator No. 10, original condition. Crystals 100 Kc., 455 Kc., 500 Kc. Circuit of R.C.A. Transmitter Type ET4336-H. VK2BEC, 265 Bent St., South Grafton, N.S.W., 2641.

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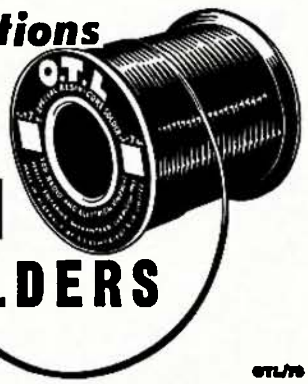

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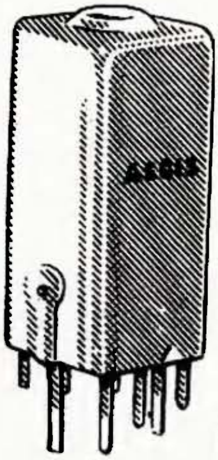

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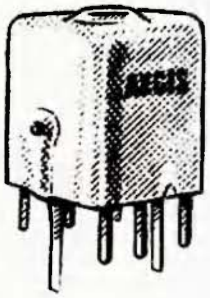

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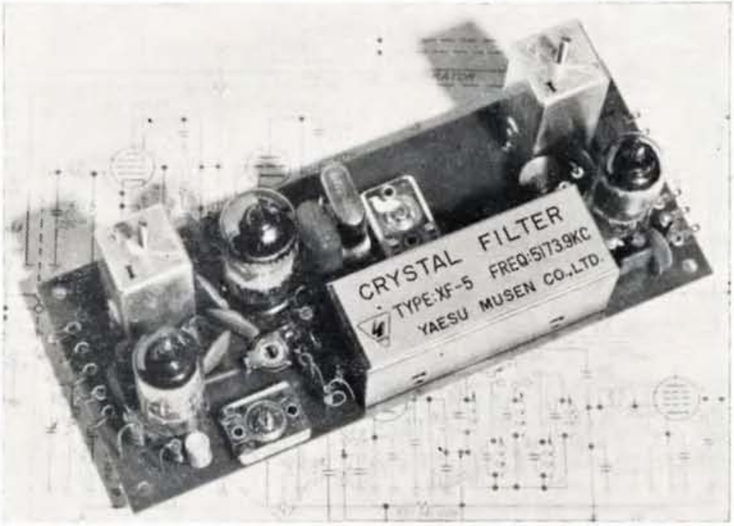
FOR HOME-BREW CONSTRUCTOR



Here is a pre-aligned crystal filter s.s.b. assembly to form the basis of an s.s.b. transmitter. It provides 1.5 volts r.m.s. u.s.b. output ready for heterodyning to h.f. or v.h.f. bands. For 80 and 40m. l.s.b. is obtained by proper choice of heterodyning frequencies. Makes it easier, doesn't it?

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Specially for Larger Battery Operated Tape Recorders.

TYPE PS104

SPECIFICATIONS

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Output Voltage	4.5V 6V, 7.5V 9V or 12V D.C. by Selector plug. Max. Current 0.5A.
Protection	Electronic Overload Protection.
Regulation	Approx. 10% on 12V Range Approx. 5% on all other Ranges
Ripple	Less than 100 mV R.M.S. under all conditions.
Circuitry	All silicon solid state.
Size	4 ins. wide by 2⅜ ins. high x 5¼ ins. deep
Weight	2 lbs. 7 ozs.
Approval	Approved by Electric Supply Authorities

Designed primarily for Tape Recorders where a regulated voltage supply is necessary to prevent speed variation with load changes. A versatile power supply with a range of output voltages making it ideal for design testing and repair of Transistor Radios, Amplifiers, Record Players, Test Equipments, etc. It is also eminently suitable for use in Schools, Universities, Government Departments and Industry.

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Changes for Mobile Radiotelephone Services

Licensees of V.H.F. land and harbour mobile radiotelephone services, now operating in 30 kc/s channelling areas, are advised that if they have not already installed equipment which meets the Australian Post Office 30 kc/s channelling specification, they must do so before 30 June, 1969.

This requirement has been brought about by the growing demand for V.H.F. mobile radiotelephone services in city areas which is taxing the existing channels available. The change to 30 kc/s channelling will enable more radiotelephone services to be brought into operation as they are required.

However, some changes to existing equipment will be necessary and the following programme for conversion, which is designed to cause the least inconvenience to all concerned, has been adopted:—

As from 30 June, 1969, licensees of V.H.F. mobile radiotelephone services operating in 30 kc/s channelling areas within the frequency bands 70-85 Mc/s and 156-174 Mc/s* will be required to make necessary changes so that:—

(i) All base station transmitter/receivers (both amplitude and angle modulated) employed in a base station installation shall be of a type complying with the relative Post Office specification and approved for 30 kc/s operation and shall be operated in accordance with the terms of that specification.

(ii) All angle modulated mobile transmitters shall be adjusted to function with a maximum deviation of ± 5 kc/s.

*This excludes the International Maritime Mobile V.H.F. Radiotelephone and the existing Australian Post Office Subscriber Services.

Early conversion will assist manufacturers in meeting delivery dates for equipment.

FURTHER DETAILS MAY BE OBTAINED FROM THE SUPERINTENDENT, RADIO BRANCH, G.P.O., IN YOUR CAPITAL CITY.

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- Nuvistor RF amplifier.
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SSB — AM — CW
80 Metres to 10 Metres

- Ultra-precision three-stage double gear tuning mechanism, completely free of backlash, spreads each 600 Kc. over 1.68 metres with 1 Kc. dial calibrations.
- Stability better than 100 cycles. "Vackar" type VFO. Voltage regulated power supply.
- Uses mechanical filter at 455 Kc. specially designed for SSB. Selectable upper or lower sideband. Carrier and sideband suppression 50 db. or more.
- May be connected with STAR SR-700A receiver for transceive operation.
- Fully adjustable VOX and ANTITRIP circuits for automatic transmission/reception.
- Press-to-talk relay, break-in keying and sidetone oscillator for CW monitoring.
- Automatic level control circuit assures high quality distortion free SSB.
- Built-in antenna relay.
- Final stage uses two 6146s in parallel with conservatively rated input of 250 watts PEP on SSB and CW, 100 watts on AM.
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- Power supply 220 to 240 volts AC 50 cycles.

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- Stability better than 100 cycles. "Vackar" type VFO. Voltage regulated power supply.
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- Noise limiter with adjustable clipping level operates on AM, SSB and CW.
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JUNE, 1969

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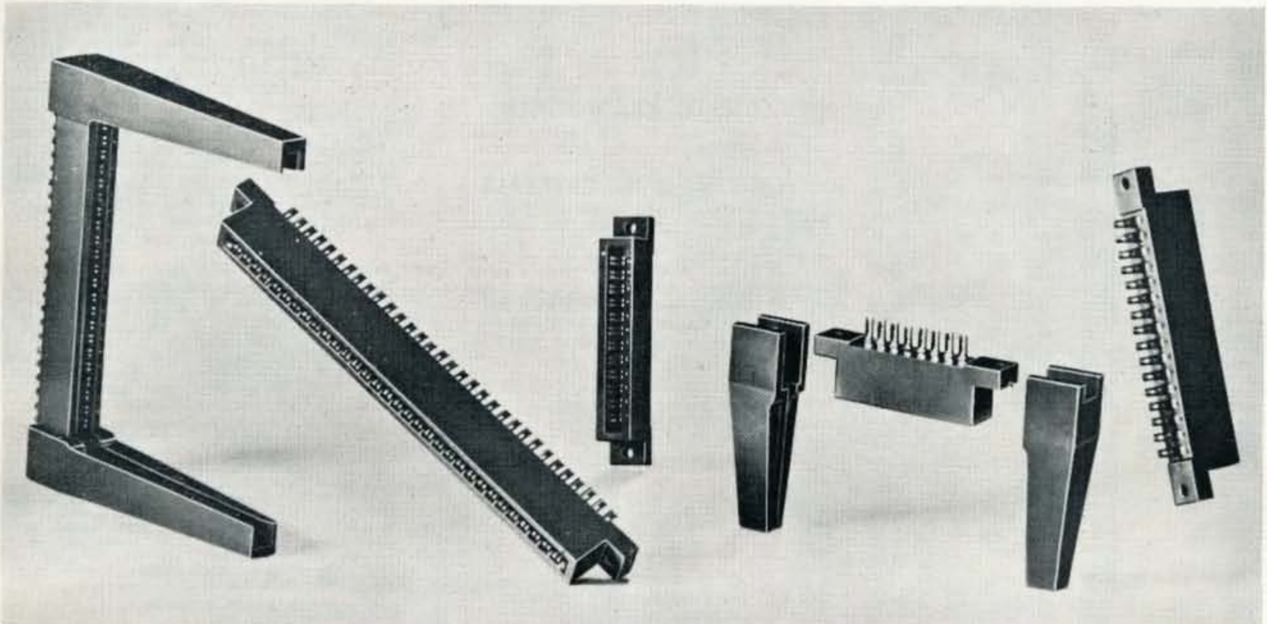

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1200 ft.	Mylar	$3.75
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amateur radio

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COVER STORY

This month's cover shows some of the range of edge connectors manufactured by Painton (Aust.) Pty. Ltd. Designed for use with a 1/16" thick board, these connectors are made from a robust moulding material, dark blue in colour, and have good mechanical and electrical properties. Socket clips are gold plated with a bell shaped opening to provide reliable electrical contact.

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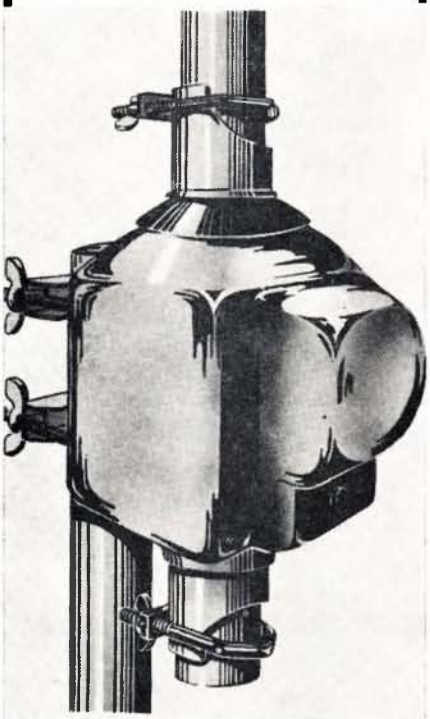

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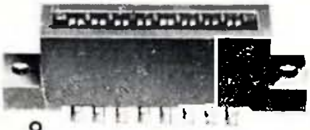

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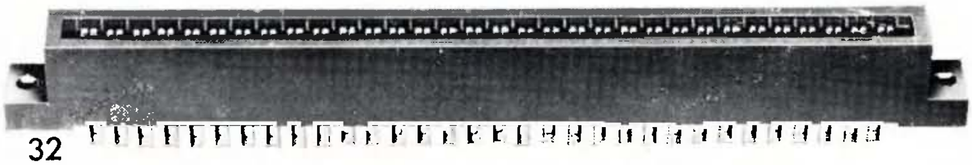

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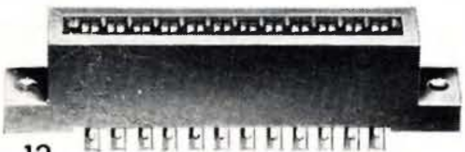

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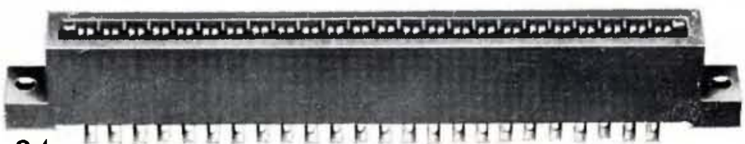

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PA102

FEDERAL COMMENT

In this issue you will find a report on the proceedings at the Federal Convention held last Easter at Canberra. I urge you to read this report as I hope that you will be interested in the work being done by your Federal organisation. I hope that you have already read the report of the retiring Federal President, John Battrick, VK-3OR, published in the May issue of "Amateur Radio".

I draw your attention in particular to those parts of the report dealing with I.A.R.U. Region III. Organisation and the P.M.G. and regulations.

I believe that the Federal organisation of our Australian Amateur Society must be an active organisation in order to perform its vital function of protecting our hobby. At times the W.I.A. has been criticised for not providing sufficient information as to its activities. At times I am afraid that I have, on reflection, been forced to agree with some of this criticism. If you read both these reports, I believe you will find that you are well informed on those matters that are of current concern. If you find that you desire more information on any particular topic, this is available. Once the formal Minutes of the Convention are completed, enough copies will be sent to each Division to provide one copy for each Divisional Councillor. So if you want more information, do not hesitate to approach either your Divisional Federal Councillor or any member of your Divisional Council.

But where do we go from here? The Federal Council determines policy—in some areas this must be necessarily determined very broadly indeed—in other areas a more precise direction can be given. It is the task of the Federal Executive to implement the policy and to undertake the various tasks allocated to it. In some cases the Executive will in turn allocate this function to another committee. Whatever it does, and whoever does it, the Executive will report back to the next Federal Convention offering such advice as it can and receiving in turn the Federal Council's direction as to the forthcoming year. In more specific terms, the Executive is at this time giving particular attention to the manner in which the W.I.A. will celebrate the Cook bicentenary year 1970, for that year also marks the 60th year of the W.I.A., the oldest radio society in the world. I am now very hopeful that we will be able to make an important announcement about this matter in the very near future.

Michael Owen, VK3KI

Liaison with the Central Administration of the Postmaster-General's Department continues. The interim Constitution accepted by the W.I.A. as a member Society has now been sent to the other national Societies involved. The c.w. test programme is being investigated. The constitutional matters resolved at Canberra have been referred to the Institute's solicitors.

In carrying out their duties, members of the Executive are in regular communication with Federal Councillors. By medium of the Federal Councillors, the Executive can to some extent keep in touch with the views of members in all Divisions.

This year I hope to have the opportunity of visiting as many Divisions as possible. I want the Federal Executive to be aware of the widest possible cross section of the views of members. I would welcome the opportunity to tell as many members as possible what the Federal Executive is doing and why it is doing it.

As you read this, I will be in New Zealand at the current invitation of the N.Z.A.R.T., attending their Conference at Gisborne. I will be representing the W.I.A. When I return, I shall be reporting to Federal Councillors on this visit, and I will also, I hope, be able to provide some information for "Amateur Radio".

Closer co-operation between the N.Z.A.R.T. and W.I.A. seems to me to offer tremendous advantages to both Societies. I regard this visit as a most important highlight of this Institute year which has just commenced.

—MICHAEL OWEN, VK3KI,
Federal President, W.I.A.

ELECTRONIC KEYER

L. VALE, VK5NO*

ELECTRONIC keyers are used in conjunction with a contact "paddle" of similar form to that used in semi automatic or "bug" keys, except that for use with an electronic keyer the paddle makes a separate pair of contacts when pressed either to left or right of the central position. The contacts made when the key is pressed to the right cause the keyer to make a series of dots, and the left hand contact a series of dashes. In addition, the type of keyer to be described automatically makes correctly spaced dots and dashes and completes the individual dot or dash even though the paddle has not been made for the full time—a brief touch of the dot contacts will make a complete dot at the speed at which the keyer is set and if the dash contacts are made for a longer time than a dot length a complete dash is made. Therefore, all the operator needs to do to produce perfect c.w. is to start the characters off, get his hand clear of the paddle before he produces a string of perfectly spaced dashes or dots and watch the spacing between letters and words.

It is believed that the first keyer of this type was made by W9TO and used valves. Several others have been described using transistors and, lately, integrated circuits. This is the third one made and used by the writer; the first, using germanium transistors, performed well for many years; the second using silicon transistors, has been in use until the third, which uses integrated circuits, and is the simplest of the three, was put into operation.

The use of integrated circuits is of very little advantage except that in this case they are cheaper and take less room than the corresponding transistors would. The particular units used—type 914—are inexpensive and readily available. Each contains a pair of dual NOR gates, which means that each contains four transistors and a few resistors, as shown in the 914 circuit diagram, Fig. 1.

The circuit diagram of the keyer is shown in Fig. 2. G1 is used as a free running multivibrator and makes the dots; G2 is a bistable multibrator that fills in the spaces between alternate pairs of dots in order to form dashes, and G3 contains the control gates. VT1 is used as the output inverter to develop about 25 volts d.c., which is sufficient to operate the keyer tube in the writer's transmitter. Should it be desired to use relay contacts at output, a suitable circuit is shown as in Fig. 3. It must be pointed out here that the relay chosen must be fast operating—one type used successfully here is the S.T.C. type 4184GD, which is available in surplus equipment.

The method of operation of the keyer is as follows (refer to Fig. 4): When neither the dot contacts nor dash contacts are made, both G1 and G2 are held in the off position (pin 7 of G1 and pin 6 of G2 near earth potential and pin 6 of G1 and pin 7 of G2 positive) via diodes D1 and D5 respectively, by the outputs of G3, which are in turn held in the earthed condition by the presence of positive voltage (via R5 and R6) on one input of each nor gate. When the dot contacts are made, voltage is removed from one input (pin 5) of G3. As the other input (pin 3) of this gate is earthed, the output (pin 6) rises to +3.9v., removing the clamp (D1) from pin 5 of G1. The multivibrator immediately changes state so that pin 7 becomes positive for the duration of a dot, as timed by the components in the multivibrator circuit and the amount of positive voltage supplied by the speed control VR1.

If the dot contacts are broken before the completion of the dot, D2 holds pin 5 of G3 at earth until the dot is completed. If the dot contacts are made for any period of time from a touch to less than twice a dot length, one complete dot is made.

If the components in the G1 circuit are balanced, the correct dot/space ratio will result, but it will probably be found necessary to adjust this ratio by placing a higher resistor in parallel with R2 or R4 because of tolerances in the capacities of C1 and C2. Previous keyers made here have included a potentiometer to vary the dot/space ratio or "weight", but once set they are generally left untouched.

Correctly spaced dashes are formed when the dash contacts are made, in the following manner—making the dash contacts earths the free input (pin 1) of G3. removing the clamp (D5) from

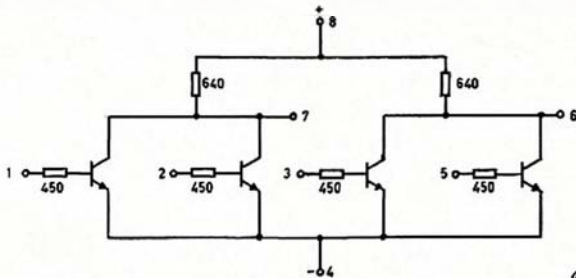

FIG.1. INTERNAL CIRCUIT OF 914. I.C.

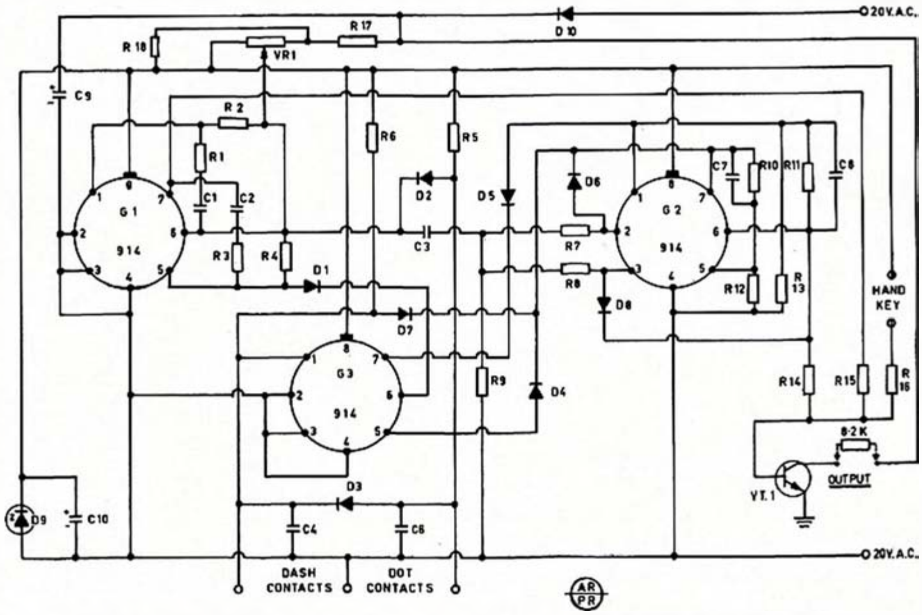

FIG 2 CIRCUIT DIAGRAM ELECTRONIC KEYER.

C1, C2—10 uF. 16v. electrolytic.
C3—0.056 uF.
C4, C6, C7, C8—0.1 uF. 25v. ceramic.
C9—100 uF. 64v. electrolytic.
C10—100 uF. 16v. electrolytic.
D1, D2, D3, D4, D5, D6, D7, D8—Fairchild AN2001 diodes.
D9—3.9 volt Zener 1w.
D10—Rectifier diode 200 p.i.v.

G1, G2, G3—Dual 2 input Nor gate—Fairchild 914.
R1, R3—1.5K ¼w.
R2, R4, R12, R13, R14, R15, R16—10K ¼w.
R5, R9, R10, R11—2.2K ¼w.
R6—1K ¼w.
R7, R8—4.7K ¼w.
R17—470 ohm 3w.
R18—75 ohm 1w.
VR1—500 ohm.

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pin 1 of G2. At the same time D3 also effectively makes the dot contacts, forming a dot. At the finish of the dot, a pulse is sent from pin 5 of G1 via C which changes the state of G2, so that pin 6 becomes positive and pin 7 becomes earthed. The positive voltage at pin 6 is fed to the output transistor, holding the output "on", and the earth potential at pin 7 holds both the dash circuit (via D7) and the dot circuit (via D4) on until the finish of the next dot, when another pulse from G1 via C3 turns C2 back to its original "off" state. If the dash contacts are kept made, G2 continues filling in the space between alternate pairs of dots, making perfectly spaced dashes, as illustrated in Fig. 4.

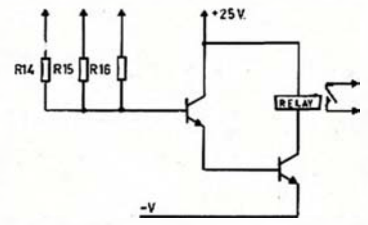


FIG.3. RELAY OUTPUT CIRCUIT.

The keyer is mounted, except for the speed control pot, on a piece of matrix board 4½" x 2½". The a.c. supply voltage is not critical and its value is dictated by the requirements of the electronic keying tube in the transmitter or the relay, whichever is used, provided that suitable adjustment is made to R17. The correct supply voltage for 914s is 3.24 to 3.96 volts, so the actual regulating voltage of D9 should be checked to see that it falls within these limits.

The paddle for the keyer is made from two small disposal Morse keys with their under-surfaces bolted together and mounted vertically, one key for dot contacts, the other for dashes. The particular keys are branded "Key W.T. 8 Amp. No. 2" on the base. The normal knobs are removed and flat pieces of bakelite are mounted in place in a similar manner to an ordinary bug key.

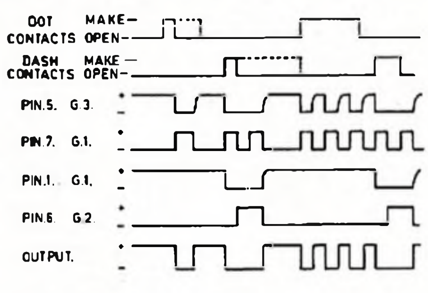


FIG. 4 WAVE FORMS ELECTRONIC KEYER

The values shown give a speed variation from about 12 w.p.m. up. Should slower speeds be required both C1 and C2 should be changed to a higher value. Provision is made for a hand key; this has been found necessary as a means of tuning the transmitter.

No type number is given for the output transistor. The one used by the writer is an obsolete NPN silicon type 2S002. Unless the values of the a.c. supply voltage or output resistors are changed substantially, almost any NPN silicon type of sufficient voltage would do.

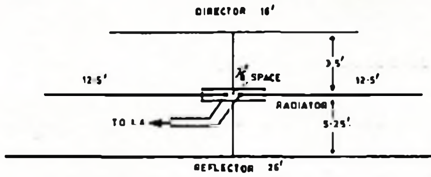
It had been intended that the discreet component circuit and the logic circuit for the keyer should be included but this was decided against because it was felt that it would make a very simple device appear more complicated.

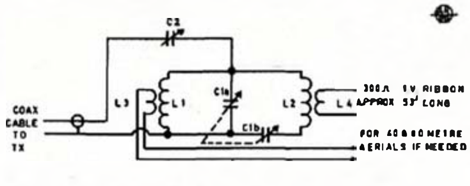
THE ZE4JJ SPECIAL 3-ELEMENT TRI-BAND BEAM

If you are looking for a tri-band beam with super high gain, front to back ratio and enormous bandwidth compared to commercially made ones, forget about this article and buy the latter one.

However, if you are looking for an extremely simple beam which is cheap and very light, constructed in an afternoon and compares reasonably well with commercially made ones, then this might just be the one you are after.

The idea came originally from an article in a booklet called "Technical Topics" released by the R.S.G.B. Under the section of "Aerial Topics" you find a small description of the ZE4JJ Special. It states that it provides excellent results as a tri-band beam. Fed with 300 ohm ribbon, untuned, it says that it can be coupled straight into the output of a pi-network. That all sounds very simple, but I am afraid that a few more things had to be done to get it right.





Z MATCH COUPLER.

C1A, B—Good quality, standard size broadcast condenser.
C2—Single gang, broadcast condenser, 470 pF.
L1—11 turns 14 s.w.g., 2 in. diam., 2¾ in. long.
L2—5½ turns 14 s.w.g., 2 in. diam., 1¼ in. long.
L3—6 turns 14 s.w.g., 2½ in. diam., 1½ in. long.
L4—5 turns 14 s.w.g., 2½ in. diam., 1¼ in. long.

Looking at Fig. 1 you can see that the boom length is only 8 ft. 9in. The radiator measures 12 ft. 6 in. each side and not 11 ft. 6 in. as described originally by ZE4JJ. I found that problems arose as far as matching the line to the driven element is concerned on 20 metres. By making it 12 ft. 6 in., an s.w.r. of 1:1 was easily achieved after tuning the coupler. The same s.w.r. should be achieved on 15 and 10 metres.

If you want to make the beam very light you could use telescopic lengths with a diameter of ¾" and ½". However, to give the beam a firm look with little sagging, I used centre sections with a diameter of 1" with the remainder lengths made up by lengths with a diameter of ⅞" and ¾".

The unusual feature is that the radiator is mounted 2" above the plane of the director and reflector. I stuck to this.

The driven element is split and is insulated from the boom. Originally, I used a piece of Western Red Cedar. This is the only type of wood which is not affected by weather and is light in weight. On a more permanent model, I used aluminium channel, 2" wide and 3 ft. long. The stand-off insulators are made by Q-Max and as they are of the hard plastic variety, cracking as with porcelain ones does not occur.

Proper results are not obtained unless you use some sort of an antenna coupler. In my case I used a Z-match coupler as described in the R.S.G.B. Handbook and A.R.R.L. Antenna Handbook. The length of the 300 ohm line, which is slotted t.v. ribbon, seems critical and it would be a good idea if you start off with a length of 53 ft. A commercially made balun from 300 ohms to 75 ohms was tried. Although there were no matching problems, on air tests were very disappointing.

All on-air tests were done at a height of 17 ft. with as comparison a TH-3Jr, at a height of 27 ft. My QTH is half a mile from the beach and QSOs on 20, 15 and 10 metres were made short path to Europe. As this beam is a compromise on 20 metres, a difference of 1 to 2 S points was noted with the TH-3Jr. On 15 and 10 metres the difference varied from nothing to 1 S point. Directivity on 15 and 10 metres is excellent, but not very good on 20 metres.

It seems that one could consider this beam as a close spaced two element array, i.e. radiator-director on 10, radiator-reflector on 15, and an improved dipole on 20 metres.

Whatever it may be, it compares very well with the TH-3Jr.

Its simple construction makes it quite an attractive proposition without wasting a lot of money. At least I had a great amount of fun experimenting with it. Good luck!

—ARN VK5XV.

Al Shawsmith, VK4SS, seated at the controls.

Improving Eddystone EC-10 as a Tunable I.F. for V.H.F. Converters

T. J. FISHPOOL, VK4KE*

WHILST the Eddystone EC-10 is excellent as a general purpose receiver, it is of little use for serious work on the h.f. bands, this is partly due to the poor bandspread inherent in such a receiver.

With a few simple modifications the EC-10 becomes a useful receiver to use in conjunction with v.h.f. converters. These modifications consist of fitting a co-axial socket for the input, adding a Noise Limiter, "S" meter, improving the mechanical stability of the oscillator and finally provision for reception of n.b.f.m.

CHOICE OF I.F. FOR THE V.H.F. CONVERTERS

A frequency coverage of 2 Mc. is required to cover 144-146 Mc., 432-436 Mc. and 1296-1298 Mc. It would be desirable to spread the 2 megacycles coverage over the full range of one band; this is not considered practicable and a compromise must be sought.

Band 4, 1.5-3.5 Mc. is 2 megacycles wide but such an i.f. would lead to a serious image problem to the extent of degrading the v.h.f. converter noise figure. There are two possibilities, 9-11 Mc. on Range 2 would be satisfactory for 144 Mc. converters only, but as the writer uses a 1296 Mc. converter, the i.f. adopted is 18-20 Mc. Also, the chances of i.f. breakthrough are reduced at the higher frequency.

AERIAL SOCKET

A co-axial type socket is fitted in place of the existing "A1" socket, the flange was soldered directly to chassis. To eliminate i.f. breakthrough, good quality co-ax with a tightly knit braid must be used to connect the converter to the receiver and the braid must make good connection at both ends.

OSCILLATOR STABILITY

Listening to a steady signal around 18 Mc., with the b.f.o., a gentle tap on the receiver will demonstrate the need for work around the local oscillator section. A dramatic improvement is made by shortening the oscillator collector lead. Locate the oscillator TR3 collector lead on the printed board and unsolder this lead together with the black flexible lead going to the same piece of copper. Remove this lead from switch S1j wiper. Connect TR3 collector lead directly to S1j wiper.

Further small improvements can be made by replacing the lead from the printed board to C48 oscillator section by solid wire. The "U" bracket holding the gang was earthed with solid wire to both the printed board and the adjacent side plate, also the bolt projecting through one of the vibration mount grommets is earthed the same way.

The calibration should be checked and reset if necessary as per handbook, only a small adjustment to C39 should be necessary at 29.0 Mc.

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Doubtless further minor improvements can be made but the receiver does not require to sit on sponge to copy c.w.!

"S" METER

A closed circuit 3 mm. jack socket is fitted above the earth terminal and is accessible through the existing hole in the cabinet. This jack is wired to the earthy end of R3 in the r.f. stage emitter and by-passed with a 0.01 uF. disc ceramic. A 1 mA. meter plugged into this jack reads full scale on zero signal and decreases reading with increasing signals. No attempt has been made to calibrate the meter in "S" units.

Note: The writer's receiver takes 1 mA. r.f. stage emitter current on zero signal and thus no "zero set" is required.

NOISE LIMITER

The amplitude noise limiter is shown in Fig. 1 and is of the series gate type, the diode can be any high back resistance germanium type. The components are mounted on a piece of veroboard, fitted by the r.f. gain control and held by the adjacent fixing screw for the handle. A miniature s.p.d.t. toggle switch fits 1" to the left and 5/16" below the centre line of the "phones" socket.

The limiter is quite effective in use although the audio level naturally drops with the limiter in. R34 and C74 were replaced by 10K ohms and 10 uF. to restore audio level.

F.M. DETECTOR

Increasing use is being made of n.b.f.m. on v.h.f. with the introduction of transistor p.a. stages and varactor multipliers. The writer fitted a discriminator for the purpose of receiving n.b.f.m. on 1296 Mc. from VK4ZT/P, the results compared to the usual slope detection amply justify the fitting of the discriminator. Full advantage of n.b.f.m. is not realised unless it is received with a suitable demodulator.

The circuit (Fig. 1) uses an FET i.f. amplifier and negligible loading is presented to the existing i.f. stage. The extra amplifier runs without a.g.c. to provide some limiting, also the receiver is run with a.g.c. off. The i.f.t. can be any type with tuned primary and secondary. The secondary tuning capacitor is removed and replaced by two series connected capacitors each double the value of the original capacitor. The two diodes are germanium type, e.g. OA79 or GEX34; it is very important that these diodes are accurately matched for forward resistance.

Alignment is best done with a voltmeter connected to the output, a useable deflection should be obtained on, say, the 3-volt range of a 10K ohms/volt multimeter. Tune in a strong carrier (for maximum deflection of "S" meter if fitted) and adjust the i.f.t. primary for maximum d.c. output from the discriminator. Peak up the receiver last i.f.t. for maximum d.c. output. Tune the secondary until the output polarity reverses, finally tuning for zero output. Note that slightly off tuning the carrier will give a d.c. output of polarity dependent on the direction of tuning.

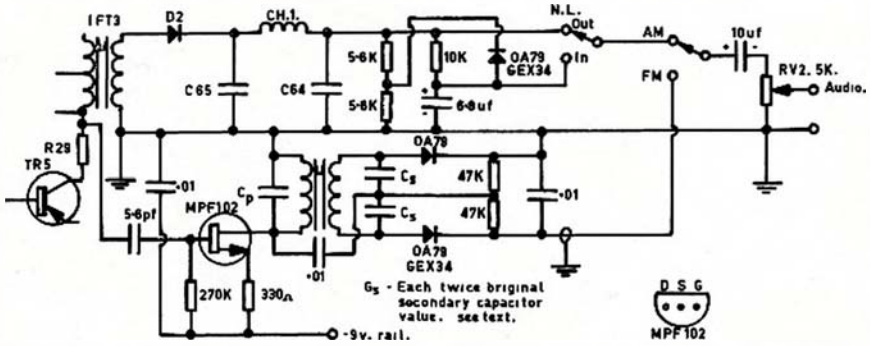

FIG. 1. CIRCUIT ALTERATIONS TO EDDYSTONE EC.10. RECEIVER. NOISE LIMITER & F.M. DETECTOR.

The writer's discriminator gives ±0.1 volt output for 465 Kc. ±10 Kc., the signal generator feeding directly to the additional i.f. stage.

The discriminator is built on a piece of tinplate 3¾" by 1¼" and is bolted to the i.f./audio assembly, beside the output transistor heat sink and parallel to the tuning scale.

The additional i.f. stage consumes 2 mA. at 9 volts and is left on. The a.m./f.m. switch fits 1" to the right and 5/16" below the "phones" socket, to match the noise limiter switch previously fitted.

The f.m. position is suitable for a transmitter deviation up to 3 Kc. It is not intended or suitable for wideband f.m.

Some of these modifications should interest EC-10 owners, however the guarantee on a new receiver would probably be invalidated by such modification.

PROJECT—SOLID STATE TRANSCEIVER

PART EIGHT

H. L. HEPBURN, VK3AFQ, and K. C. NISBET,† VK3AKK*

In this section of the article it is intended to describe the power amplifier stages in terms of practical design considerations.

Reference to the first article in the series, which appeared in the November 1968 issue of "A.R.," will show that the objective was to provide a power output of 15 watts (p.e.p.) into a 50 ohm load. In the amplifier to be described this objective has been achieved and, in practice, well in excess of 15 watts has been obtained. At a later time it may be that information will be made available to show how higher outputs can be obtained by minor modifications to component values and by specific tuning procedures.

Before describing the final form of the p.a./driver system used in the project, it is felt to be vitally necessary to cover some basic differences between valves and transistors used as power generators and what these differences mean in practice. Such a discussion should assist not only participants in the project, but also those who are thinking of going solid state in their transmitters.

TOLERANCES

A transistor is NOT tolerant to misuse like a valve.

In this statement lies the reason for the digression that will be made for a while on subjects such as impedances, component values and types, and power measurement.

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Carelessness apart, there are two main areas in which a transistor used as a p.a. is likely to be less tolerant than its valve counterpart. Voltage overload and heat susceptibility.

With a valve the short term application of plate voltages even double the manufacturer's rating will rarely mean its replacement. Excess plate current caused by overload, off resonance or lack of drive can be tolerated by a valve, at least for so long as it takes to reach for, and turn off, the power switch. In such cases there is usually plenty of external evidence by way of blushing anodes to trigger the operator into taking appropriate action.

This "time buffer" does not exist with transistors. It is the very first spike of excess voltage which kills the device. It is the first few watts over the rated dissipation which are the fatal ones.

However, provided that these two basic limitations are appreciated, their operating implications understood, and the appropriate safety procedures followed, then the transistor p.a. is as docile as its valve equivalent.

IMPEDANCES

In a valve used as a p.a. the plate or output impedance is given by the expression:

$$\frac{(0.8 \times \text{h.t. volts})^2}{2 \times \text{power output}}$$

Let us assume we have a valve giving 20 watts output with 500 volts on the plate and a plate current of 60 mA. (This is a class C case although this is not important here). The output impedance is thus:

$$\frac{(0.8 \times 500)^2}{2 \times 20} = \frac{400^2}{40} = 4{,}000 \text{ ohms.}$$

The output impedance of a transistor is given by a similar expression, viz.:

$$\frac{(\text{collector voltage})^2}{2 \times \text{power output}}$$

Again assuming a power output of 20 watts and further assuming a 13 volt supply rail, the transistor output impedance is thus:

$$\frac{13^2}{2 \times 20} = 4.2 \text{ ohms.}$$

For a similar power output then the transistor has an output impedance approximately one thousandth of the valve. The practical effect of this will now be discussed, especially as it affects matching arrangements and components.

COMPONENT VALUES

In the valve example the most usual current method (at h.f. anyway) of matching the valve to the antenna is by means of a "pi" network.

At 3.5 Mc. with a 50 ohm antenna the value of the "tuning" capacitor (C1) would be around 280 pF., the "loading" capacitor (C2) would be around 1,000 pF., while the matching inductance would be in the region of 15 microhenries.

Band mx	RFC1	C1 pF.	C2 pF.	L1	RFC2	L2	C3 pF.	C4 pF.
160	4 uH. 52 turns No. 26 B.S. on 2w. resistor	470	470	12 uH. 55 turns No. 33 B.S. F29 slug	2 uH. 16 turns No. 16 B.S. ½" I.D.	8.8 uH. 34 turns No. 16 B.S. ¾" I.D.	1000 + 20/220	4400 (2 x 2200)
80	4 uH. 52 turns No. 26 B.S. on 2w. resistor	220	220	6 uH. 45 turns No. 33 B.S. F29 slug	1 uH. 10 turns No. 16 B.S. ½" I.D.	4.4 uH. 19 turns No. 16 B.S. ¾" I.D.	500 + 20/220	2200 + 20/220
40	2 uH. 24 turns No. 26 B.S. on 1w. resistor	100	100	3 uH. 27 turns No. 26 B.S. F29 slug	0.5 uH. 14 turns No. 16 B.S. ¼" I.D.	2.2 uH. 16 turns No. 16 B.S. ½" I.D.	220 + 20/220	1000 + 20/220
20	1 uH. 20 turns No. 20 B.S. ¼" I.D.	50	50	1.5 uH. 20 turns No. 26 B.S. F29 slug	0.25 uH. 8 turns No. 16 B.S. ¼" I.D.	1.1 uH. 10 turns No. 16 B.S. ½" I.D.	100 + 20/220	425 + 20/220
15	0.75 uH. 18 turns No. 16 B.S. ¼" I.D.	33	33	1.0 uH. 16 turns No. 26 B.S. F20 slug	0.2 uH. 7 turns No. 16 B.S. ¼" I.D.	0.7 uH. 14 turns No. 16 B.S. 5/16" I.D.	47 + 20/220	330 + 20/220
10	0.5 uH. 14 turns No. 16 B.S. ¼" I.D.	22	22	0.75 uH. 12 turns No. 26 B.S. F29 slug	0.15 uH. 5 turns No. 16 B.S. ¼" I.D.	0.55 uH. 15 turns No. 16 B.S. ¼" I.D.	33 + 20/220	150 + 20/220

Table 1.—P.A. Coil and Capacitor Data.

Notes: (1) All coil inductance values are approximate only.
(2) Coils L1 are close wound on Neosid Type 722/1 bakelite formers and use an F29 slug.
(3) Coils L2 are close wound on a former of the diameter indicated and are self supporting.
(4) C1 and C2 are Philips ceramic beads.
(5) The fixed parts of C3 and C4 are silver mica.

The same approach to the problem of matching the 4 ohm transistor impedance to a 50 ohm antenna leads to impossibly high values of C1, C2 and the coil. Very approximately, one would require an 0.25 uF. variable, a 1.0 uF. variable and a coil around 0.01 microhenries. Not very practical values!

In order to use components of conventional size, it is necessary to seek alternative matching arrangements.

MATCHING

It is not possible, for space reasons, to cover all the alternative matching arrangements in this article. The reader is referred to the "R.C.A. Silicon Power Circuits Manual" for a very full and useful coverage of the subject. This publication gives many types of transistor matching arrangements and for each method gives full design equations.

CURRENT FLOWS

Another point of difference between valve and transistor circuits is worthy of comment because of the effect it has on the type of component used. It is the magnitude of the r.f. currents flowing in the p.a. tank circuit.

In the valve example the d.c. current input was 60 mA. The peak d.c. current is twice this or 120 mA. The peak current flowing in the various parts of the tank circuit will approximate to the peak d.c. current times the "Q" of the circuit. If a "Q" of ten is assumed (about par for the course) then the r.f. tank currents will be around 1¼ to 1½ amps. Currents of this magnitude are satisfactorily handled by the usual coils and fixed and/or variable capacitors used.

In the transistor example the same considerations apply but the peak d.c. input is now around 3 amps. for 20 watts out. At the same "Q" of 10, the r.f. currents flowing in the tank will now be around 30 amps. It follows then that any components used, be they fixed or variable, must be capable of handling very high circulating currents. It may sound peculiar to suggest that the tank coil for a 20 watt final be wound with very heavy wire or even copper tubing, but for even passable results, let alone best results, this is what is necessary.

POWER MEASUREMENT

In view of earlier comments on the susceptibility of the transistor to both voltage and power overload, it follows that the method of absorbing and measuring power output assumes great importance.

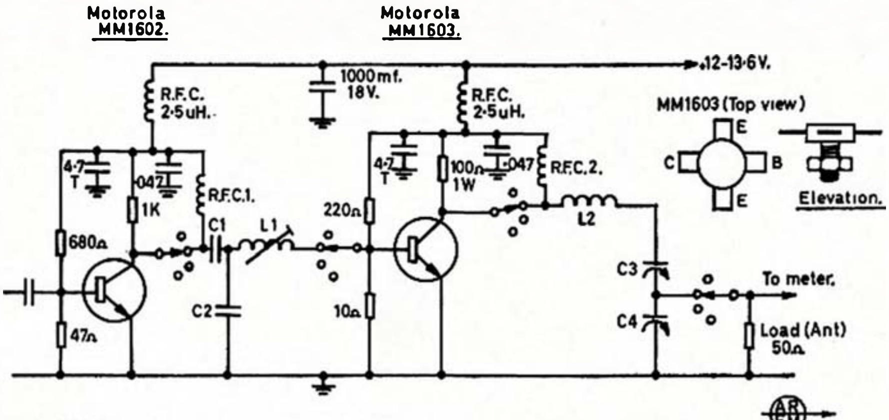


FIG. 23. 4 BAND TRANSISTORIZED TRANSCEIVER- P.A. AND DRIVER STAGES.

The text books dealing with valves in Amateur use have, for many years, recommended the domestic light bulb as a suitable load when commissioning or adjusting a valve transmitter.

A light bulb is most definitely NOT a suitable dummy load for a transistor p.a. Nor, for that matter, is an antenna of unknown impedance. In the writer's view—and experience—the only suitable dummy load is a resistive one. A resistive one moreover that is substantially non inductive at the frequency of operation. Additionally, this resistive dummy load should have an in-built means of measuring the power being absorbed by the load.

This last requirement stems from the fact that a d.c. meter in the collector circuit of the p.a. is of no real use in commissioning a transistor p.a. It is necessary as a current indicator and as a means of measuring total dissipation, but precise knowledge of **output** is necessary in order to tune up properly.

It is also necessary to clarify what the power output meter reads.

Two basic forms of power meters are in use. The first, or thermal, type of meter measures the r.f. current flowing through a fixed value of dummy load by means of a thermo-ammeter. This type of meter responds to, and is calibrated in, the r.m.s., or heating power averaged over a period of time. This type of meter is substantially independent of waveform.

The second type of meter measures the r.f. voltage appearing across the load. The voltmeter used consists basically of a rectifier diode, an integrating capacitor and a sensitive d.c. voltmeter. This type of power meter responds to the peak voltage appearing across the load and (within reason) the integrating capacitor "holds" the voltage at the peak value. The meter will indicate the peak rectified voltage **but is normally calibrated in terms of r.m.s. power.**

The distinction between the two types of meter is important when consideration is given to what one wants to measure. For reasons unimportant here, a sideband rig is rated in terms of peak envelope power or p.e.p. Note that p.e.p. refers to the r.m.s. value of power at the peak of one cycle of the modulating waveform. It is not the absolute maximum power that is reached momentarily at the extreme tip of the modulating waveform. The three sorts of power expression are given by the relationships:

Total or r.m.s. heating power	= P watts
Peak envelope power	= 2P watts
Absolute peak power (with a sine wave) ..	= 2.8P watts

Fig. 24 shows two waveforms. One is a c.w. signal and one is a two-tone test signal. Assume both to have the same total r.m.s. or heating power. The reaction of the two types of meter will be as follows:

(a) The thermal type of meter will read 10 watts on **both** waveforms.

(b) The diode type meter (assuming it is calibrated in r.m.s. power—the usual case) will register 10 watts on the c.w. waveform, **but 20 watts on the modulated signal.**

When using a power meter therefore it is important to know what type it is. If a thermal meter is used the reading on a two-tone test signal must be multiplied by two to give a p.e.p. reading.

If a diode type meter is used, the meter will read p.e.p. direct.

GENERAL DESIGN FEATURES

Getting (slowly to be sure!) a little nearer to the business in hand, refer-

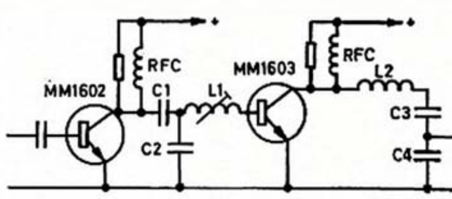


FIG. 22. BASIC P.A. CIRCUIT.

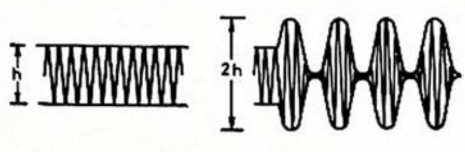


FIG. 24. ENVELOPE PATTERNS.

ence will now be made to the basic p.a./driver circuit given in Fig. 22.

Both transistors are shunt fed with L1/C1/C2 forming the interstage matching network, while L2/C3/C4 acts as a series tuned matching network into the 50 ohm antenna.

Both RFC1 and RFC2 are important. At the operating frequency their impedance should be no higher than five times the impedance seen at the respective collectors. If it is any higher than this, or if it has a self resonance at a frequency close to the operating frequency, then the resultant "mismatch" between choke and collector will be high, the voltages developed at the collector will be higher and, in the light of previous comments, the probability of reaching the transistor "sudden death" voltage limit is also high.

To keep the choke impedances low at frequencies other than the operating frequency they are loaded with parallel resistors. Note that separate RFCs are necessary for each band. The matching networks used were adopted from the R.C.A. publication referred to earlier.

SPECIFIC DESIGN

Fig. 23 gives the full schematic of the driver/p.a. section of the transceiver, while Table 1 gives all the appropriate component values and coil winding data.

It will be noted that a separate group of RFC1/L1/C1/C2 and RFC2/L2/C3/C4 are required for each band and are so switched.

Adjustment of the interstage coupling network is by means of the slug of L1 with C1 and C2 being standard values of fixed Philips ceramic bead capacitors.

The p.a. tank circuit uses a fixed value of inductance with C3 and C4 being made up of part fixed, part variable capacitors. The fixed capacitors are stacked silver mica paralleled with 20/220 pF. Ducon ceramic "stamp" trimmers.

H.t. to the two stages is obtained from a common rail through two decoupling networks. Each network consists of a 2.5 microhenry choke and a paralleled combination of an 0.047 uF. ceramic disc and a 4.7 uF. tantalum capacitor.

A very important component is the 1,000 uF. 18 volt electrolytic capacitor across the h.t. line. This is necessary to prevent low frequency parasitics building up on the line and damaging the transistors.

In order to complete the design, three more "bits" remain to be described. They are:

(a) The resistance coupled single transistor matching network between the transmit mixers and the driver.
(b) The circuitry associated with p.a. power output measurement.
(c) A protected a.c. power supply.

These must, because of space reasons, be left over until next month.

AVAILABILITY

The complete four-band three transistor power stage including metering, bandswitch and sub-chassis, together with all components and hardware, will cost $88.50. It is regretted that because of supply problems on one component it will be mid June before delivery can be made. If requested, the kit will be supplied in two halves. All components and sub-chassis except for the three transistors will cost $26.80, while the three transistors alone will cost $61.70.

DRAFT STANDARDS FOR COLOUR T.V.

In accordance with the undertaking given by the Postmaster-General in announcing that the PAL system of colour television will be used in Australia, the Australian Broadcasting Control Board has circulated draft system standards to the industry, and on 10th April held a first meeting in Melbourne with industry representatives to discuss the standards.

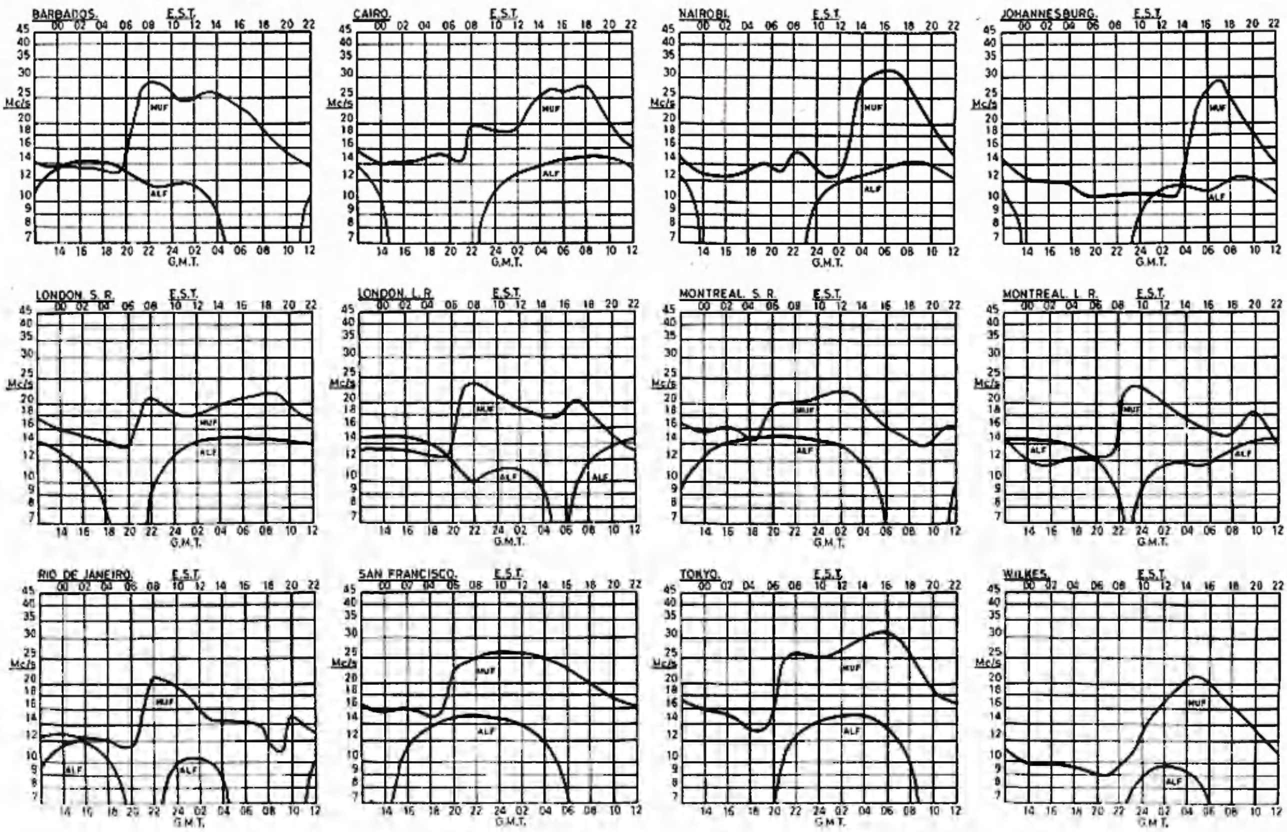
Forty-eight representatives from thirty-two organisations attended the meeting which decided to set up an industry committee to make recommendations to the Board on standards for radiated signals, required transmission tests, and (later) detailed equipment standards.

The committee initially will comprise a small "steering committee" and four sub-committees dealing with transmitters, receivers, relays, and studio equipment respectively. It is intended that the membership of these sub-committees be flexible with experts being co-opted as required, to utilise the services of all sections of industry with a contribution to make.

The meeting elected as chairman of the committee Mr. S. F. Brownless, Director, Technical Services, of the Australian Broadcasting Control Board, to whom all inquiries should be addressed. The committee will report initial progress at the second industry meeting which was to have been held in Sydney on 24th May.

PREDICTION CHARTS FOR JUNE 1969

(Prediction Charts by courtesy of Ionospheric Prediction Service)



NEW 1296 Mc. RECORD

On Sunday, 29th December, 1968, the present 1296 Mc. record of 46.8 miles, held by VK2ZAC and VK2ZCF/2 since 4th March, 1964, was broken. Contact was established over a 53-mile line of sight path between VK4KE/4 (Tom Fishpool) on Mt. Mowbullan, 3,600 ft., in the Bunya Mountains and VK4ZT (Neil Sandford) operating from a platform on the roof on his house at 18 Loch Street in Toowoomba. The contact was held from 1245 to 1335 E.S.T. with rock solid 5 x 9 signals both ways. 144 Mc. was used to establish contact with slightly lower signal strengths.

On Sunday, 5th January, 1969, the 53-mile record was extended to approximately 112 miles with VK4KE/4 operating from the same site at Mt. Mowbullan to VK4ZT/4 one mile south of Mt. Magnus in the Passchendaele State Forest. Initial signals were 5 x 9 both ways on 144 Mc. However, the 1296 Mc. signal was only 559 both ways with phone unsuccessful, due mainly to modulation problems.

An improvement was obtained when VK4ZT/4 moved his equipment about 30 ft. higher up the side of an abandoned fire tower, allowing two-way 4 x 4 phone contact from 1330 to 1500 E.S.T. Much of the time was spent setting deviation and generally optimising equipment. The major cause for the lower 1296 Mc. signals was due to obstruction at VK4ZT's end by Mt. Magnus and also to further obstruction by a large area of high ground in the centre of the path. The exact path length of this contact is not known due to delays in obtaining a suitable map of the area, so no formal claim was made for this record.

However, this problem was overcome on Sunday, 2nd February, 1969, by establishing contact over a distance of 138.2 miles (subject to confirmation) between VK4KE/4 on the top of Mt. Mowbullan and VK4ZT/4 on a site near Springbrook on the Queensland side of the N.S.W. border at 3,300 ft. elevation.

A VK2/VK4 contact was not possible as the border is close to a precipice and a few steps in that direction would have resulted in a drop of about 2,000 ft.

The 138-mile path is obstructed almost 1,000 ft. by the Ravensbourne Ridge, 50 miles from Mt. Mowbullan end. Maps showed that this ridge would be visible from both ends, so "knife edge diffraction" could be expected. Good solid contact was established on 144 Mc., but initial contact on 1296 Mc. resulted in 569 c.w. both ways with poor phone due to heavy QSB. This was thought to be due to foreground reflections at the Springbrook end, so the equipment was moved about 100 yards East and some 10 ft. lower in altitude to a position that gave an almost perfect take-off. The improvement in signals gave a solid 5 x 5 phone contact both ways with negligible QSB.

VK4KE/P at Mt. Mowbullan, Bunya Mts. 1296 Mc. equipment and corner reflector antenna; 3 el. 144 Mc. yagi. (53-mile contact with VK4ZT at Toowoomba.)

EQUIPMENT USED

VK4KE used his normal portable crystal controlled valved tx with a QQV03/10 final giving about 8 watts out at 144 Mc. of a.m., n.b.f.m., or c.w. 1296 Mc. output is produced by varactor triplers 144-432 Mc. with 4 watts output and 432-1296 Mc. with 2 watts output. The antenna on the first two attempts was a corner reflector with an estimated gain of 12 db. For the 138-mile contact a 6 ft. parabola, built in eight sections for ease of transport, was constructed with an estimated gain of 24 db. The feeder loss approached 1 db., giving an e.r.p. of around 400 watts.

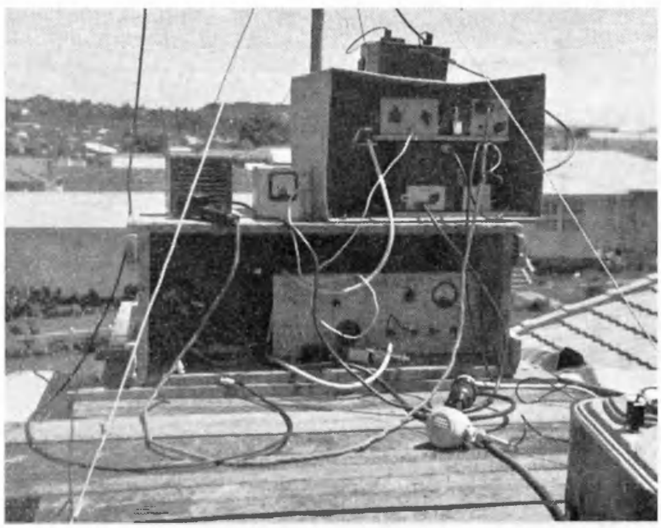
The receiver consists of a solid state crystal controlled diode mixer converter with noise figure of 10 db. The 18 Mc. i.f. is tuned by an Eddystone EC10, modified to improve frequency stability and also fitted with a n.b.f.m. discriminator for the last attempt. The overall bandwidth is around 6 Kc. and all equipment operates from the 12v. vehicle battery.

VK4ZT used all solid state equipment. The n.b.f.m. or f.s.k. c.w. crystal controlled tx produces 5 watts output at 144 Mc. from a 12v. supply. Varactor triplers similar to VK4KE's produce 3.2 watts at 432 Mc. and only 0.5 watt at 1296 Mc. The lower output at 1296 Mc. is due to the use of a cheap varactor intended for use up to 432 Mc.

The antenna used for all contacts was a 5 ft. parabola built with ¾" x ¾" timber and flyscreen mesh at a cost of about $4. It is built in one piece and carried on the vehicle roofrack. The estimated gain is 23 db. with negligible

(Continued on Page 14)

VK4ZT's 1296 Mc. set-up with VK4ZP in attendance. 144 Mc. yagi in corner.



VK4ZT's gear. 144 Mc. solid state 5 watt output tx in top of cardboard box. Modified BC454 rx and 144 Mc. converter below. 12v. supply in wooden box.

A FET GATE DIP OSCILLATOR*

PETER J. RODDA,† ZL1BEB

Recently I required a more portable GDO than the one I already had. The circuit, as shown in Fig. 1, was tried. At present the frequency coverage is 1.5 Mc. to 100 Mc. in four bands and coils will later be wound to cover down to 400 Kc. or lower.

Above 1.5 Mc. the FET functions as a Colpitts oscillator. As the high LC ratio tends to cause unstable oscillation below 1.5 Mc., the coils for these frequencies should be centre tapped, changing the circuit to a Hartley oscillator. If the amplitude of oscillation is too high, the taps should be moved nearer the gate end of the coil.

The oscillator is followed by a simple transistor d.c. amplifier to enable the use of a cheap 1 mA. meter.

The 2N3819 is a N channel FET and the MPF102, 2N3823 could also be used. The transistor is not critical and any NPN AF junction type can be used. If a P channel FET, such as the 2N3820, 2N4360, is used, reverse the supply polarity and use a PNP AF junction transistor in the d.c. amplifier.

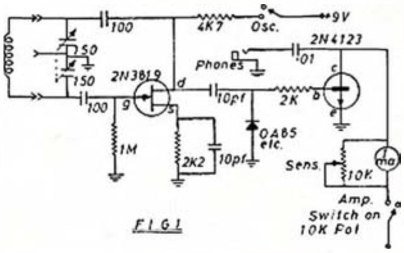


FIG 1

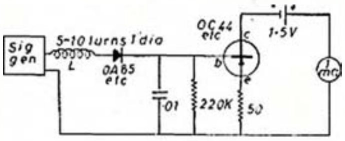


FIG. 2.

The coils are wound on ¾ inch plastic formers and are as follows:

1.5 to 5 Mc.—150 uH., 130 turns, No. 36 enamel, close-wound.

4.5 to 15 Mc.—17 uH., 29 turns, No. 30 enamel, close-wound.

13 to 36 Mc.—2 uH., 9 turns, No. 22 enamel, close-wound.

35 to 100 Mc.—0.5 uH., 4 turns, No. 18 enamel, close-wound.

This coil data is only approximate and will depend on the tuning gang available, layout, etc.

CALIBRATION

Calibration can be carried out using a general coverage receiver or the circuit shown in Fig. 2. (This circuit is from Technical Topics—which is a very worthwhile investment.)

When using a receiver care must be taken that you are not calibrating against a harmonic. If the circuit of Fig. 2 is used, no indication will be given on any harmonic.

Set the signal generator to the required range and adjust the output until a suitable meter reading is obtained. The GDO is then coupled to L and this should cause an increase in the meter reading except when the GDO frequency coincides with that of the signal generator, when a very sharp dip will occur. To find the exact centre of the dip, it will usually be necessary to increase the coupling to L.

LAYOUT

Layout is not critical although it pays to keep the leads in the oscillator circuit as short as possible.

The chassis dimensions of mine is 7 in. long, 2½ in. wide and 2½ in. deep. This is small enough for easy handling and has a reasonable size dial, but not so small as to have the controls cramped up.

* Reprinted from "Break-In," November 1968.
† Cape Brett Lighthouse, Private Bag, Russell, New Zealand.

INTRUDER WATCH GETS INTO GEAR

Intruder Watch is really under way. An Intruder Watch bulletin has been instituted, copies of this bulletin (of which there will be three or four issues a year) are being sent to Divisional Intruder Watch Co-ordinators for distribution.

One particular feature of the current Intruder Watch programme is an innovation introduced concurrently with the introduction of the Intruder Watch bulletin, that is the W.I.A. Intruder Watch will be paying particular attention to a particular band during a specified period. This concentration of effort is not intended to discourage observations on any other band.

However by paying attention to a particular band on an Australia-wide basis, maximum information on that band can be obtained and collated.

May, June and July is the period set aside for particular attention to be paid to the frequency segment 7.000 to 7.100 Mc. August, September and October is the period set aside for particular attention to be given to the 20 metre band.

Intrusions into Amateur bands apparently emanating from within the Commonwealth pose a quite different problem from intruders apparently emanating from overseas countries. Accordingly intruder watchers have been told to immediately and urgently pass on reports of any intruder station apparently located within the Commonwealth.

Amateurs observing such intruders should contact either their Divisional Intruder Watch Co-ordinator or write direct to the Federal Intruder Watch Co-ordinator, Box 36, East Melbourne, Vic., 3002.

A list of Divisional Intruder Watch Co-ordinators is set out below.

—David Wardlaw, VK3ADW,
Federal Intruder Watch Co-ordinator.

STATE INTRUDER WATCH CO-ORDINATORS

VK2—W. H. R. Treloar, VK2BPZ, 23/8 Fullerton St., Woollahra, N.S.W., 2025.

VK3—M. P. Davis, VK3ANG, 144 Tramway Pde., Beaumaris, Vic., 3193.

VK4—Cec Kenny, 19 Lithgow St., Wynnum North, Qld., 4178.

VK5—John Bulling, VK5KX, 297 Goodwood St., Kings Park, South Aus., 5034.

VK6—G. Allen, 283 Amelia St., Balga, Western Aus., 6061.

VK7—D. H. Kelly, VK7DK, 56 Upper Brougham St., Launceston, Tas., 7250.

NEW 1296 Mc. RECORD

(Continued from Page 13)

feeder loss as both triplers and the converter are mounted on the rear of the parabola. The e.r.p. is around 100 watts. In both cases the feed is a dipole with integral balun and half wave disc as a reflector. Three element yagis were used on 144 Mc. at both ends.

The receive equipment consists of a converter similar to VK4KE's with 10 db. n.f. The 30 Mc. i.f. is tuned with a modified BC454 Command rx. The front-end has been modified from the original 3-6 Mc. to tune 28-30 Mc., giving improved frequency stability with the use of FETs. The remainder of the receiver has been modified along the lines of the May "A.R." article except that all valve sockets have been discarded and the FET/transistors built into the appropriate cans. A n.b.f.m. ratio detector is also fitted. The overall bandwidth is 8 Kc. The total 12v. battery consumption is under 1 watt on receive and about 10 watts on transmit.

The success of this QRP project may be attributed mainly to the use of narrowband techniques. The crystal stability of the signals at 1296 Mc. would be adequate for s.s.b. and surpasses many of the 144 Mc. signals heard in the area. Articles for publication in "A.R." are currently under way in the hope that this will stimulate activity and also encourage the use of solid state techniques.

AMATEUR FREQUENCIES:

ONLY THE STRONG GO ON— SO SHOULD A LOT MORE AMATEURS!

A NEW 432 Mc. AMATEUR T.V. RECORD

BY M. J. LANE, VK5AO'T, AND A. W. PIERSON, VK5ZBP'T*

An earlier attempt at establishing a long distance 432 Mc. t.v. link-up was made on 9th October, 1966, when one-way t.v. communication was established between Willunga Hill and South Hummocks. This attempt was in the nature of a research project, aimed at establishing the feasibility of long distance line-of-sight communication, transmitting wide bandwidth information (e.g. a television picture) with low transmitter powers (in the order of 10-20 watts).

The experiment which was performed during a W.I.C.E.N. exercise (the staff at the receiving end were W.I.C.E.N. operators), proved eminently successful and although severe fading occurred, the received signal was at times very strong. As a result, we obtained some clear, noise-free photographs from the monitor screen at the Hummocks.

The crew at South Hummocks. T.v. gear was in car with receiver outside. Alternator was 200 feet away.

Heartened by this success, we decided to establish a t.v. distance record, with the added refinement of two-way picture communication and intercarrier sound on both vision transmitters. Our first two-way t.v. attempt was foiled, due to poor weather conditions (i.e. we were almost drowned), and a phantom fault in the gear, which we were unable to pin down exactly, but the end result was only one-way communication—in the same direction as before.

The successful attempt was carried out on 16th February, 1969. The prevailing weather conditions were very unfavourable, however. Hot, dry winds whipped across the up-track to the Hummocks, producing a thick layer of dust in which the wheels of our vehicles had almost no traction. We were towing a trailer full of gear, made additionally heavy by the presence of a large 2kva. alternator and internal combustion engine, both of which were not designed with lightness in mind. After a two-hour fight, we saw no possibility of reaching the Hummocks Trig. Point, so it was decided to make the attempt from a more accessible, but lower, hilltop.

The gear was set up four hours later than at first planned, but our spirits were high, since the presence of signals from the VK6 Beacon at Albany on 2 metres in Adelaide indicated very favourable v.h.f. conditions. Our hopes were rewarded as VK5ZEF/T was picked up with good signal strength approximately one hour after we selected our new position. VK5AO/T then returned with a transmission, establishing a two-way record for video and sound on 432 Mc. The exact distance, as accurately determined from government survey maps was 93 miles.

All gear concerned in the attempt was home-brewed, including the vidicon cameras which were used to send live pictures both ways. This added much interest and challenge to the exercise, since the cameras had to be set up accurately. We also learned the value of lightweight transistorised equipment, since Mait's camera is a valve chain and although an excellent performer in the studio, it proved a little cumbersome to manhandle around on our expedition.

Video equipment at Willunga Hill was provided by Alan Nation. His transistorised camera, camera control unit, converter and receiver were all operated from a 12 volt car battery. Ray VK5ZEF/T used a QQE06/40 running 30 watts. A 5.5 Mc. f.m. sound carrier was injected into the video modulator and was transmitted as part of the video signal.

Picture received at Willunga Hill. Camera and monitor was enclosed in a light-proof housing. The actual distance scaled from the Adelaide Land Department map was 93 miles.

Picture received at South Hummocks. The bars in the picture were from the alternator. Note stray light entering camera housing. Photography posed a problem as the exercise was carried out in mid afternoon. Distance from Adelaide Land Department map was 93 miles.

At the Hummocks, Mait VK5AO/T's transmitter ran 20 watts to a QQE03/20, but the method he used to produce intercarrier sound followed commercial practice, in that a separate transmitter

The crew at Willunga Hill.

Starting up the alternator.

generated the 5.5 Mc. f.m. sound signal. This unit ran 5 watts to a QQE02/5, the sound carrier being radiated from a separate 5 element yagi, whereas both ends used 16 element collinear arrays for transmission and reception of the 432 Mc. video signal.

Two metre communications were handled by Rick VK5ZFQ and Arno VK5ZAR at the Hummocks, whilst Jim VK5ZGV operated at Willunga Hill. Signals on 2 mx f.m. were strength 9 plus and saturating the receivers, proving that there is no substitute for a line-of-sight path!

BIBLIOGRAPHY

References to our first record attempt in 1966 may be found in "Siran" ATV issue, 1967, pages 39-40. Also "Amateur Radio" v.h.f. notes, S.A., Dec. 1966. "CQ" TV No. 63.

* Public Relations Officer, South Australian Amateur T.V. Group. Address: 1 Bindana Ave., Salisbury Park, S.A., 5109.

1969 John Moyle Memorial National Field Day Results

Certificate winners are indicated in bold type.

SIX-HOUR DIVISION

Section A

Call Sign	Score	Power
VK1ML/P	62 pts.	
VK2ASZ/P	**541 pts.**	
VK2AHV/P	225 pts.	
VK2RJ/P	115 pts.	
VK3AQP/P	429 pts.	
VK3AYZ/P	304 pts.	18 w.
VK3AIH/P	253 pts.	10 w.
VK3AOT/P	247 pts.	35 w.
VK4PJ/P	406 pts.	300 w.
VK4GT/P	268 pts.	120 w.
VK4OF/P	100 pts.	
VK5WV/P	172 pts.	
VK5XY/P	108 pts.	8 w.
VK5EK/P	76 pts.	
VK5ZEJ/P	66 pts.	15 w.
VK5QZ/P	56 pts.	
VK5TL/P	34 pts.	

Section B

VK2JM/P	**123 pts.**	
VK2YB/P	111 pts.	

Section C

VK3HE/P	**150 pts.**	8 w.

Section D

VK3KI/P	**729 pts.**	

Section E

VK3UG	30 pts.	
VK5TN	**120 pts.**	

24-HOUR DIVISION

Section A

Call Sign	Score	Power
VK3DY/P	**1019 pts.**	
VK3ADP/P	358 pts.	12 w.
VK3AQQ/P	273 pts.	15 w.
VK5ZBT/P	112 pts.	3/5 w.

Section B

VK3ALZ/P	160 pts.	
VK5ZF/P	**186 pts.**	

Section C

VK3EZ/P	**314 pts.**	15 w.

Section D

VK1ACA/P	2075 pts.	
VK2AAH/P	**7313 pts.**	
VK3ATL/P	4271 pts.	
VK3APC/P	4214 pts.	
VK3ATO/P	3210 pts.	
VK4IO/P	1365 pts.	
VK9XI/P	623 pts.	150 w.

Other logs for checking purposes: VK7PA and VK6MM.

RECEIVING (Section F)

6-Hour Division

L3366—D. Elkan	315 pts.
L3377—T. Hambling	310 „
L3369—K. Sutcliffe	185 „
L4018—C. Thorpe	185 „
M. Joyce	130 „
L5096—C. Hannaford	1015 „
L5015—W. Clayson	189* „
L5088—S. Ruediger	129* „

24-Hour Division

L2246—B. Beamish	445* „
L3308—K. Cox	430* „
L3042—E. Trebilcock	175 „

*Correct, scoring errors

LOCATION AND EQUIPMENT

VK1ML/P: Mt. Coree. MTR25, 9 el. yagi, Honda 300.

VK2ASZ/P: Camden. Drake TR3, f.m. tx/rx, petrol gen.

VK2AHV/P: Yanco Weir. 122 tx/rx, dipole ant.

VK2RJ/P: Newcastle. Galaxy V., Webster ant.

VK3AQP/P: Somers. Swan 140 modified, "VK Special" ant.

VK3AYZ/P: Mt. Macedon. 122 tx/rx, dipole ant.

VK3AIH/P: Mt. Clay. home-brew mobile and inverted "V" ant.

VK3AOT/P: Cobar Lookout. Home-brew mobile, Eico 753 rx.

VK4PJ/P: Calmslie. Galaxy V., Aztec p.s., dipoles.

VK4GT/P: Red Banks Plains. Eico 753, Pye Mk. 1.

VK4OF/P: Whites Hill. Swan 240, whip ants.

VK5WV/P: Steepacres. Pye and T.C.A. tx/rx's.

VK5XY/P: Tea Tree Gully. 122 tx/rx, long-wire ant.

VK5EK/P: Mt. Lofty. TCA1649, co-axial dipole.

VK5ZEJ/P: 40 miles east of Adelaide. Home-brew equipment.

VK5QZ/P: Chandlers Hill. Home-brew equipment.

VK5TL/P: Bellevue Heights. Pye Reporter.

VK2JM/P: Cape Banks. Converted Command equipment.

VK2YB/P: Cape Banks. ATR2B, windom ant.

VK3HE/P: Warrandyte. Type AMKS.

VK3KI/P: Red Hill. Galaxy V., Drake TR4, STC f.m.

VK3DY/P: Lake Glenmaggie. Galaxy V., dipoles, Honda.

VK3ADP/P: Mt. Waverley. No. 62 set.

VK3AQQ/P: Alfred National Park. Type 3 Mk. 2, home-brew bat. charger, petrol driven (till it seized up!).

VK5ZBT/P: Mt. Osmond. PTCA, TCA.

VK3ALZ/P: Pretty Sally. Home-brew tx, Halli. S29.

VK5ZF/P: Richmond. Home-brew tx/rx, inverted "L" ant.

VK3EZ/P: Macclesfield. Home-brew tx, Eddystone EC10.

VK1ACA/P: Mt. Ginini. 40m., Heathkit SB101; 80-15-10m., SR150 tx/rx; 20-15m., 7553 rx, 3251.; 6m. a.m., home-built tx/rx; 2m., 50w. f.m. base station; 2m. a.m., h.b. tx, FET con., 75S2; 70cm., 9w. h.b. tx, Nuvista con., 75S2.

VK2AAH/P: Bald Mountain. SW400, KWM2, home-built a.m.

VK3ATL/P: Peter's Hill. 80-40-20m., 120w. Y.M. FL50, Knight rx; 40-20-15m., 350w. Swan 350; 40-20-15-10m., 400w. FR100B, FL200B, FL2000; 6m., 10w. Pye Mk. 3; 144 Mc., 10w. h.b. equip.; 2m., Ch. A, B, 20w. TCA1674; 2m., Ch. A, B, C, 25w. TCA1674.

VK3APC/P: Myrniong. 160m., Eddy. EC10, h.b. 20w. tx; 80m., FL100, FR100; 40m., Galaxy V.; 20m., FL200, FR100, FL1000; 15m., FR-100, FL100; 10m., FT100B; 2m., 6m., 50/30w. h.b. tx.

VK3ATO/P: Tantraboo. 160m., Type 62; 80-40-20-15-10m., commercial equip.; 6m., Pye; 2m., MR3A and h.b.

VK4IO/P: Mt. Crosby. 80-40m., h.b. s.s.b.; 20m., Heathkit HW32A; 40-15m., Geloso 222; 6m. a.m., Contax Carfone; 2m. f.m., Pye Ranger.

VK9XI/P: Cliffside location. FT200, Hammarlund 170A.

COMMENTS

Again this year, queries have arisen regarding the Rules of the Contest. In an effort to overcome any misunderstanding, some re-wording will take place in next year's Rules. To give prior notice of the change, here they are:—

Under "Objects", new wording—in VK Call Areas and Overseas/Foreign Call Areas.

Rule 6, new wording to read: "The exchange of serial numbers, consisting of RS or RST report, plus three figures, commencing with 001 and increasing by one for each contact by the VK station, shall be proof of contact".

Rule 12, new wording to read, after "each section of each division; except section (f) where a certificate will be awarded to top scorer in VK for each division."

To VK2AAH/P go top marks for their excellent effort of 7,313 points. As to our commenting on their logs, their story is better told by VK2SG, whose comments were:

"And so another field day has come and gone, another score has been made, and, maybe another record has been created—who knows. In the main, the organisation was the same as for last year, in that all bands were worked from 80 mx through to 2 mx; in all, seven operators were in attendance plus two associates, making a team of nine persons. None of these had the pleasure of loafing or having lots of sleep for all personnel were organised to either operate or to look after the generator, re-fuelling same and to the re-fuelling of the operators.

"The site was the same as last year's operation on top of a 4,000 ft. mountain near Lithgow, about 52 miles west of Sydney. By this time we have become well known in the area and as soon as we arrived there the local flies welcomed us with open arms and called all their mates to join in the feast. If we had had as good communication as the flies, our score would have been three times as large, so maybe flies know more about communication than we poor mortals do!

"We arrived at the site early Saturday morning and proceeded to erect tents and aerials, ran power leads, and set up the 7.5kva. generator, and in general proceeded to prepare ourselves for the battle ahead. In between these activities we discussed what the bands would be like, who would be operating from other portable sites and what the weather would be like in the early morning, when it is usually cold and damp in the cloud tops that flow over the mountains. As most of us were doing all the usual setting up jobs, our appointed cook was bashing away at the evening meal. All I can say is that if his standard of cooking improves as it has over the last few years, I am afraid that we will have to stand guard over the camp to stop intruders from other portables stealing our food—or, worse still, stealing our cook.

"Our aerial systems consisted of the following: 3.5 Mc., bottom loaded vertical; 7 Mc., ¼ wave vertical; 14 Mc., two el. yagi 45 ft. high; 21 Mc., two el. yagi, 30 ft. high; 28 Mc., three el. yagi, 30 ft. high; 52 Mc., four el. yagi; 144 Mc., ten el. yagi, multi el. stacked co-linear; 146 Mc., four el. yagi.

"Power was supplied by a 7.5 kva. generator driven by a petrol engine. This engine was stopped every three hours for re-fuelling purposes. These re-fuelling periods were the only rest periods that some of the operators had for the 24-hour period.

"The equipment used consisted of two KWM2s, two SW400s. Three linears running 400w. output before anyone else spoke, because any time any of the other boys hit their linears the power kind of went down about 100w. On the v.h.f. bands, we had a large amount of home-brew gear as well as some f.m. sets. In the main we had the bands fairly well covered.

"At this point I would hate to mention the score that we put on record, because being a sensitive type I hate to embarrass people, but a thought keeps coming into my head—where the heck were the other VK stations that were supposed to be in the contest? Sure, we worked a few here and there, but I feel that there should have been a lot more around; maybe we missed them. But on second thoughts, some of the boys may like a breakdown of the score so that they may compare their efforts with ours, so here goes:

3.5 Mc.	200	points	27	contacts
7 Mc.	1219	„	212	„
14 Mc.	2920	„	574	„
21 Mc.	1231	„	244	„
28 Mc.	1142	„	228	„
52 Mc.	130	„	25	„
144 Mc.	471	„	101	„
	7313	points	1411	contacts

"As can be seen from the scores on the various bands, the aerials and the rigs worked well. I think it can be said that the operators worked well, too, though I still have the feeling that the bands were not as good as they were the year before. There were certainly not the dog-piles on 14 Mc. that there were last year, and yet the band seemed to be open for longer periods in that we were working W stations right through the daylight hours. Also, 10 metres did not open as it did last year, but other bands gave of their best and some of the lower bands gave us some good contacts, and from it all one gets the feeling that anyone who says that they cannot work DX on 40 or 80 metres are definitely not trying. On the v.h.f. bands the old adage has again been proved that given a high location and good aerials, nothing is impossible. By the way, we are looking at the v.h.f. side of the operation to see if we can get linears going on these bands to give us 400 watts on 52 and 144 Mc.; that should create a bit of a stir.

"We operated in the period from 1600 to 1600 which gave us ample time to set up and pull down, but as we were about 52 miles away from home most of us arrived home in the dark, and I think our main thoughts were of such things as a hot shower and sleep.

"Generally speaking, we feel that we have done a good job in the field day; we have organised ourselves a good team and a good set-up, but there is one thing that we cannot seem to organise and that is competition—I mean real stiff competition, someone that will give us a run for our money. We have tried various tricks to make people have a shot at us but so far no luck. We are not geniuses; surely someone can get themselves set up to do as we do. If there is anyone who wants some ideas on running a field day, well, if they get in touch with us, we will help them with the information.

"As you may notice, I have not made any mention of the operators concerned. Well, the operators know who were there and as such they are happy that they have done a good job, and they are looking forward to next year.

"And so, until next year when we will be 'at it again' with maybe a better score, all the best and hope to hear from you that we have some good competition."—VK2AAH/P, per VK2SG.

Another operator, VK5ZEJ, now VK-5LP, who, through his Federal Councillor, took me to task for not answering his comments with his logs, expressed disappointment at the low number of stations that participated in the Contest, particularly from the portable angle. This is a trend in Australia at least, as the W.I.A. sponsored contests appear to be losing participants.

VK3ATO gave a good account as a newcomer to the multi-op. station section. Operators were VKs 3AMZ, 3APB, 3AJX, 3VK, 3MO, 3APJ, 3YC, 3KO, 3DG, 3ZKV, 3ACT, 3AER, 3AGS, 3AAA, 3ZYX. They also sent in a very neat set of logs.

Operators of a rival VK3 multi-op. stations were VKs 3IC, 3AQR, 3ATF, 3ZUG, 3ADT, 3ASQ, 3ZIB, 3ZXY of VK3ATL, who found Peter's Hill in the Otway Ranges suitable for their operation.

For the information of VK1ACA and others, if a station works an operator as a mobile, then later as fixed, or vice versa, it may be considered as two separate stations. So therefore nine points were not deducted from your score, VK1ACA!

A definite ruling on working through a repeater has yet to be formulated. In the meantime, this method of operation will be allowed, but a note to its use when doing so is asked for to help the committee formulate a rule.

Not without mention was VK4IO operating at Mt. Crosby. Operators were VKs 4RG, 4HW, 4ZN, 4KO, 4ZLG, 4ZJE. A good first effort from them was noted.

And last, but not least, is the club station that could never have a headache. The list of operators is almost too long to print, but as other club operators have their call sign listed, one must do the right thing—VKs 3XK, 3ASL, 3KV, 3AKJ, 3APD, 3AFQ, 3LC, 3XV, 3CB, 3JI, 3VT, 3AYI, 3ARR, 3ZAK, 3AKK, 3ZNJ, 3ZOP, 3ARO, Bob Jordon, Ron Butler, Bruce Herbert and, quote, "also sundry unnamed male harmonics, blow-ins, girl friends, local councillors and other rubberneckers who contributed not one point to the score", unquote. These operators put the strong voice of VK3APC/P on the air.

And that's all for this year. CU again next year. 73, Neil Penfold, VK6ZDK, for F.C.C.

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REMEMBRANCE DAY CONTEST 1969

The Federal Contest Committee wishes to advise all Amateurs that the complete rules for the Remembrance Day Contest 1969 will appear in the July issue of "Amateur Radio".

A number of changes resulting from the 1969 Federal Convention at Canberra will be incorporated and in doing this there has been insufficient time to meet the June issue deadline.

The major changes may be summarised as follows. (Read the following in conjunction with the 1968 rules appearing in July 1968 "A.R.," pp. 12 and 13.)

Contest dates: 16th and 17th August, 1969.

Rule 9: "9th Sept. 1968" becomes "8th Sept., 1969".

Rule 10: A new scoring table as discussed at Canberra will be used this year.

Awards: Some changes involving the status of VK1, VK8, VK9 and VK0 stations will be introduced.

Receiving Section.—Rule 3: Delete the last sentence commencing "VK1/VK2 and VK5/VK8 . . ."

SOUTH-EAST RADIO GROUP OF SOUTH AUST.

ANNUAL CONVENTION

will be held over the week-end

SAT., SUN., and MON., 14th, 15th and 16th JUNE, '69

V.h.f. events including fox hunts, scrambles, transmitter hunts, plus events for ladies and children.

Hotel and motel accommodation arranged as required. ($2 dep. per person if needed.)

REGISTRATION FEE $3

All correspondence to VK5ZKR, Colin Hutchesson, Yahl, via Mt. Gambier.

THE 1969 FEDERAL CONVENTION—A REPORT

The 33rd Federal Convention of the Wireless Institute of Australia was held at the Hotel Canberra during Easter this year.

This venue represented a change in the practice of recent years of holding the Convention in each Division in rotation. The venue enabled more members of the Federal Executive to attend than would otherwise have been the case.

The Convention at Canberra was held with the concurrence of the New South Wales Division. That it was successful was due in no small measure to the ready assistance rendered by the Canberra Radio Society. The opening session of the Convention was devoted to the receipt of reports from the Federal President on behalf of the Executive, the Youth Radio Club Scheme, the QSL Bureaux, Intruder Watch, the Contest Committee, the Historical Officer, the Repeater Secretariat, the Federal Treasurer and the Publications Committee—a procedure that enables the review of all these activities that together constitute the area of Federal responsibility.

The agenda items were numerous and following the custom of the Federal body, were divided into six sections, namely constitution, administration, policy, I.T.U.-I.A.R.U., regulatory matters and contests. In relation to constitutional matters the Federal Council was requested by the Federal Executive to formulate an instruction to the Institute's solicitors to enable them to proceed with the incorporation of the new Federal Company.

Council had previously been advised by the Executive that the Victorian Attorney-General had raised objections to certain aspects of the proposed Articles of Association. Most of the objections were of a technical nature and offered little difficulty in their solution.

The Institute's solicitors had advised as to the alternative courses that were open. Most of the discussion turned on the Attorney-General's objection to the so-called "postal referendum provisions". In the hope that the relevant authorities in another State or Territory would take a different view of these provisions, it was decided to request the Institute's solicitor to consult with the solicitor for the New South Wales Division in order to further investigate this suggestion.

If no solution could be found, it was resolved to proceed with the incorporation of the Federal Company, omitting these provisions and otherwise proceeding on the basis of the solicitor's advice. These conclusions were reached unanimously.

The Federal Council then turned to several agenda items moved by the New South Wales Division seeking the amendment of the present Federal Constitution to delete references to a headquarter's division and to change a policy decision which had previously stated that Federal Executive should be located in Melbourne so long as the Central Administration of the Radio Branch is located there.

The New South Wales Division, through its Federal Councillor, pointed out that it was able and ready to provide a Federal Executive and was anxious to take a greater part in Federal affairs.

Ultimately, after careful discussion, these motions were all defeated. A motion designed to alter the Institute's financial year to coincide with a calendar year was passed. The object of the motion was to enable the easier presentation of audited accounts to the Federal Convention and to Divisional Annual General Meetings.

With the increasing complexity of the Institute's financial affairs, sufficient time was not at present allowed. The Federal Council then turned to those agenda items in the category of administration.

A price increase of 3c per copy in the cost of "A.R." to Divisions was agreed to by a majority. In the context of this discussion, reliance was placed on a report prepared by a sub-committee of Federal Executive, following the previous Federal Convention's direction. The Editor of "A.R.," Mr. Ken Pincott, addressed the Convention in relation to the magazine generally, reporting on the success of the new format and of the magazine's new advertising arrangements. He warned, however, that costs were expected to continue to rise.

A motion from the Tasmanian Division sought to clarify the position of the Secretariat appointed to co-ordinate v.h.f. repeater activities. It was suggested that this matter had already been sufficiently clarified, but a majority of the Federal Councillors felt that the matter should be put beyond doubt and it was made clear that the Repeater Secretariat stood in the same relation to the Secretariat as did the Federal Contest Committee and other Federal Committees. The Executive would appoint the Chairman of the Secretariat who would be responsible to the Executive. The Secretariat will continue to be provided by the New South Wales Division for the next three years.

The ambit of responsibility of the Repeater Secretariat was extended to include a general advisory function in the utilisation of the 144 and 432 Mc. bands. The Federal Executive was instructed to investigate the possibility of appropriate standards being adopted to control television receivers. This motion was introduced by the Victorian Division which argued that the introduction of solid state t.v. tuners with poor cross modulation characteristics, could prejudice Australian Amateurs.

Illegal operation on frequencies around 27 Mc. were discussed, and the Federal Council resolved to make clear its opposition to these practices.

Only three motions categorised as policy matters were raised. It was resolved by the Federal Council that a Division acting as a host Division to a Federal Convention could elect to hold a convention at a venue other than the capital city.

In the course of the Federal Convention last year, the President of N.Z.A.R.T., Mr. Harry Burton, invited the Federal President of the Wireless Institute to attend the 1969 N.Z.A.R.T. Conference at Gisborne. The Federal Council resolved to meet the Federal President's expenses in travelling to and from Gisborne. Federal Councillors expressed the view that a closer relationship between N.Z. A.R.T. and the W.I.A. was desirable and a closer understanding could only arise by personal contact.

Considerable time was devoted by the Convention to the question of I.A.R.U. The Federal Executive reported in detail on its activities in relation to this matter and the Federal Council ratified the action taken by the Executive.

These matters are referred to in detail in the retiring President's report published in full in May "Amateur Radio".

The general policy question as to whether or not it was appropriate or desirable for members of the Executive to undertake the dual role of also acting as members of the I.A.R.U. Secretariat was discussed in some detail.

The conclusion of the Federal Council was that at least in this interim period, this was the most appropriate course to adopt. It was resolved that the Federal Executive should nominate for appointment by the Federal Council, the W.I.A. Region III. Director, his appointment to run for a term of three years. It was also resolved that the Secretariat be appointed by the Federal Council in consultation with the Director. The members of the Secretariat could include voting members of the Federal Executive.

Expressing the sentiment of the Federal Council, the relevant motion stated that the Secretariat should be given the widest powers to develop the Region III. Association.

Under the category of regulatory matters, a motion requesting the Executive to approach the Postmaster General's Department to delete the words, "by voice" from paragraph 83 of the Handbook, was discussed and agreed to. Likewise it was decided to seek clarification of the activities that could be undertaken by recognised Amateur civil emergency networks.

In relation to this and a number of other matters, it was pointed out by the Executive that some of the matters raised were not questions of general principle but really the application of rules to particular cases. The Divisions were urged to keep this distinction in mind and where a particular case appeared to have received unfavourable treatment, that particular case could be referred by the Division to the Federal Executive.

A proposal that originated in 1962, that all call signs for Australian territories presently identified by VK9, VK2 or VK0 prefixes, be identified by a distinctive call to identify the area, was referred to Executive. Executive reported to the Council on the Department's previously expressed attitude and suggsted that on this matter the Council should not be over optimistic.

It was also pointed out that Amateurs in the areas concerned, may themselves, not wish to alter their present call signs.

A number of motions were discussed under the general heading of "contests". The VK3 160 metre band contest will now be adopted as a Federal contest of the Institute. The Federal Awards Manager will be asked to submit draft rules for a worked all bands award which will encompass all bands from 1.8 Mc. through to 21,000 Mc.

An amendment to the Australian DX, C.C. and V.H.F. Century Club Awards to allow credits for operation within a radius of 150 miles from a previous location was agreed to by the Federal Council. This motion was agreed to on the basis that a change from one call area to another (e.g. VK4 to VK2) across the border would be permitted. The present rules allow a licensee to move anywhere within his present call area which, for example in the Queensland Division, could be a distance of 1,500 miles.

Discussion also took place on the various proposals for the Amateur Service to celebrate the Cook bi-centenary. The Executive advised the Council of the steps that it had taken in relation to this matter.

Last, but not least, proposals to modify the rules and scoring arrangements for the Remembrance Day Contest were referred to the Federal Contest Committee.

At the opening of the Convention the Federal President, John Battrick, VK3OR, had announced that at the conclusion of the Convention he would retire both as Federal President, and as a member of the Executive. The Federal Council paid generous tribute to John's work as a member of Executive and as Federal President. With John's concurrence, however, the Council resolved to appoint him as W.I.A. Region III. Director.

Michael Owen, VK3KI, was appointed as Federal President, and David Rankin, VK3QV, was appointed Federal Vice-President.

The vacancy on the Federal Executive resulting from John's resignation was filled by David Wardlaw, VK3ADW. All these appointments were made unanimously.

A number of general business items were discussed; amongst these was a request for Executive to ascertain the Department's attitude to the requirement for metering points on equipment with low anode dissipations. The question of legislating for the prevention of ignition and allied interference was raised. The question of standards for Amateur colour t.v. was referred to Executive for further clarification.

Apart from the formal business of the Convention, all Federal Councillors and members of the Executive attended a dinner on Saturday evening, held in the Hotel Canberra. This dinner was also attended by members of the Canberra Radio Society and their wives. At this dinner, life membership was conferred on Arch Cox, VK1GU, the presentation being made by Pierce Healey, the New South Wales Federal Councillor.

On Sunday, a barbeque was held at the Cotter Dam. The Convention was formally closed on Sunday evening to enable the Western Australian Federal Councillor to return to his State on an early plane on Monday morning.

Those who were able to remain in the capital were taken on a conducted tour of the Tidbinbilla Deep Space Tracking Station, again by a courtesy of VK1 Amateur, Jim Weatherly, VK1QL.

The 1969 Federal Convention was certainly no less important than any of its predecessors. More ground was covered and more understanding reached than many hoped for.

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CONTEST CALENDAR

5th/6th July—R.S.G.B. 1.8 Mc. Contest.

5th/6th July—N.Z.A.R.T. Memorial Contest (3.5 Mc. only).

16th/17th August—Remembrance Day Contest.

23rd/24th August—All Asian DX Contest (the J.A.R.L. c.w. only).

4th/5th October—VK-ZL-Oceania DX Contest 1969—Phone Section.

11th/12th October—VK-ZL-Oceania DX Contest 1969—C.w. Section.

11th/12th October: R.S.G.B. 28 Mc. Telephony Contest.

25th/26th October—"CQ" W.W. DX Contest—Phone Section.

25th/26th October—R.S.G.B. 7 Mc. C.w. Contest.

29th/30th November—"C" W.W. DX Contest—C.w. Section.

6th Dec. '69 to 11th Jan. '70—Ross A. Hull Memorial Contest.

1st/2nd Feb. '70—John Moyle National Field Day.

Technical Data

CO-AXIAL RELAY

The Dow-Key DK60 series of co-axial relays are ruggedly built and will qualify for a multitude of applications, including industrial, commercial and Amateur fields.

The DK60-2C type illustrated has a special isolation connector in the de-energised position to reduce cross-talk to a minimum. Dimensions: 2¾" x 3¾" x 1⅛"; weight 9 oz. A range of coil ratings and voltages are available in the DK60 series with a choice of 50 ohm or 72 ohm loading.

Further information from R. H. Cunningham Pty. Ltd., 608 Collins Street, Melbourne, Vic., 3000.

R.F. METER

The model PM501/T r.f. meter by Norwood will provide transmitter power readings from 3 mW. to 50 W., and is suitable for a range of commercial and Amateur applications.

Specifications.—Input impedance: 50 ohms. Frequency range: 2 to 220 Mc. Accuracy: Within 5% full scale. Power ranges: 0-500 mW., 0-5 w., 0-50 w.,; 0-30 watts continuous, 30-50 watts intermittent (60 seconds). V.s.w.r.: Better than 1.5 at 220 Mc. Size: 9¼" w., 4" h., 4" d. Weight: 2.3 lbs. Price: $67.50 plus 15% sales tax.

Further information from: Radio Parts Pty. Ltd., 562 Spencer St., West Melbourne, or City and East Malvern (Vic.) branches.

NEW DUAL OPERATIONAL AMPLIFIER

A dual operational amplifier which provides a compact, low cost and low noise replacement for complicated discrete and electromechanical designs is now available from Fairchild.

The uA739, another of Fairchild's Second Generation linear integrated circuits, offers higher performance, added reliability and substantial savings over operational amplifier designs now in common use. The new product achieves high packing density through the use of a 14-lead Dual In-Line package, which contains two identical operational amplifiers on a single silicon chip.

Each amplifier of the uA739 has a differential input and a single-ended output capable of large swings (24 volts, peak to peak) without latch-up. Stable gain is maintained over a wide supply voltage range of ±4 volts to ±15 volts. The device provides high power supply rejection—50 microvolts per volt—which contributes to operating economy by reducing power supply filter requirements.

The input noise of this dual operational amplifier is typically 7 nanovolts per root Hertz and 1 picoampere per root Hertz at 1 Kc., or about half the level of the well known uA709. The uA739 also features a high slew rate of 1 volt per microsecond, bettering the 709 device by a factor of six.

Applications for the uA739 can be found in equipment such as instrumentation systems, audio units, telephone systems, process control systems, modulators, digital-to-analog converters, ground support equipment and computer peripheral equipment.

The uA739 is ideally suited for use as a stereo phono preamp., where it can replace up to 16 devices in discrete designs. Other application possibilities are as pulse generators, active filters, dual comparators, demodulators, integrators, oscillators, sense amplifiers, window detectors, stereo tape preamps., and level detectors.

Further information from Fairchild Australia Pty. Ltd., 420 Mt. Dandenong Road, Croydon, Vic., 3136.

INOUE 1C-700 TRANSCEIVER

Designed with the DX Amateur in mind, the 1C-700 covers all h.f. Amateur bands from 3.5 to 29.5 Mc. in 500 Kc. segments with 1 Kc. readout, plus WWV (10-10.5 Mc.) and three crystal controlled positions.

Receiver sensitivity is better than 1 microvolt. Bandwidth 2.4 Kc. and transmitter power input to 6146Bs a modest 150 watts for long life.

It operates on c.w. (with shifted carrier), s.s.b., a.m., p.t.t., vox and amplified a.l.c. are built in. Price $575 inc. sales tax.

Complete information on request to S. T. Clark, 26 Bellevue Ave., Rosanna, Vic., 3084. Telephone 45-3002.

TWO METRE CONVERTER

A number of Amateurs who have ordered 2 metre converters have written to us mentioning the delay they have had in obtaining their converter kits. For this unfortunate delay we sincerely apologise, but we must point out that this has been entirely out of our control. We were guaranteed delivery of sufficient r.f. field effect transistors to supply all kits, however in reality, due to the manufacturing and despatch delays in America, the expected delivery dates became non existent. From time to time small quantities of these devices were made available for kits and contrary to the belief of some Interstate Amateurs have been uniformly distributed to every State in Australia.

As we go to press, Motorola in America has assured us that our order will be delivered at the end of May and it is our firm conviction that all outstanding orders will be delivered during the first weeks in June.

Our policy has been to supply the best designed kits at the lowest possible price. This arrangement means that we can never absorb any increase in the price of components used in the kits without causing a loss to the W.I.A. As a direct consequence of this policy, the price of the 2 metre kit must rise to $13.50.

We anticipate an unlimited supply of kits will be available by the middle of June and that the problems encountered with this project will be circumvented with all future kits.

The next kit will be released in next month's "A.R." Watch for it! It's a ripper!

—VK3 V.h.f. Group.

VK3 V.H.F. GROUP

2 METRE CONVERTER

(As detailed in "A.R." February '69)

Kits available for this Converter $13.50 each, post paid.

Cash with order to Victorian Division, W.I.A., P.O. Box 36, East Melbourne, Vic., 3002.

This kit contains all components except crystal.

VK3 V.H.F. GROUP

6 METRE CONVERTER

Transistorised Kits as detailed in "A.R." November 1967, which includes FETs, transistors, coil formers and printed circuit board. No capacitors, resistors or crystal.

Basic Kit: $6.50, post paid.
Untuned output Kit: $8.50, post paid.
P.C. board with neutralising trimmer is available at $2.00, post paid.

Overseas Magazine Review

"BREAK-IN"

January 1969

Our colleagues in the Amateur Radio magazine publishing business in the "Shaky Isles" usually manage to produce a very readable magazine each month with something of interest for the majority of Amateurs.

In this issue are technical articles on a **"Low Power Transceiver for Eighty Metres," S.s.b. using Integrated Circuits,"** by ZL4LV. This little transceiver is only 8½ in. wide, 3 in. high and 5¾ in. deep, power output is about half a watt.

The second technical article is **"Printed Circuit Board Design"** by ZL1HV.

(It is interesting to note the make-up of the different magazines and the quantity of technical material that they publish each month. The Editor has recently conducted a survey of the likes and dislikes of the readers of "A.R." and before undertaking this, he had a good look at the magazines coming into the Publications Committee's hands, most of them in exchange for copies of "A.R." each month. The content varies widely and so does the advertising.)

March 1969

Ed Marriner, W6BLZ, one of America's best known authors on Amateur matters, describes a **"Modified Automatic Keyer using Mercury Wetted Relays"**. According to the editorial comment, Ed. donated this article in exchange for many hours of pleasure gained from reading "B.I." The keyer is all solid state.

Bryan Savell, ZL2RI, contributed the next article titled **"80 Metre Transistorised Tranceiver"**. He uses a low frequency filter with four crystals of the FT-241 type. Final transistor is a 40389, power input about half a watt. Complete circuit diagram is given if anyone is interested enough to want to build a similar unit and common transistor types are used.

The technical content is topped off by an article reprinted from Mullard Technical Communications on a solid state Electronic Aerial Switch, and ZL1HV then describes some RC circuits used to protect power diodes.

"CQ"

December 1968

The avid experimenters can dust off some of those old broadcast components they have been hoarding against the day of need—it is here in the shape of **"An Inexpensive Varactor Frequency Multiplier"** by W4YOT. This unit uses no fewer than six of those broadcast type variables, all two-gang. Three are 360 pF. per section whilst the others are those so beloved of U.S. b.c. set makers which have dissimilar gangs so that they didn't neet a padder.

W2EEY/1 discusses **"The Dual-Gate MOSFET"**. His summing up: "Semi-conductor developments produce many items of only passing interest. The dual-gate MOSFET, however, appears to be an item that is bound to have important and long term applications, particularly in receiver circuits."

"Keeping the Volt Legal" is the next article by David P. Smith. Very few articles of this type have appeared in the Amateur literature, perhaps because people believe there is little to be told. This article makes it quite plain that there is a great deal behind the definition of any of our electrical quantities.

W6ZWK then continues his **"Experiments with Three Arrays on One Boom."** Part 2 of the two-part article concludes with a discussion on isolation of the three arrays by line sections, isolation by networks, the effect on s.w.r., and the antenna patterns.

"A Continuous Motion Narrow Band Television System" is the title of the next article authored by Sid. Deutsch and Ray Simpson, WA2PYX. This is part 3 of a three-part series which described the principles and requirements of the slow scan t.v. transmitter and receiver. Part 3 provides the circuits necessary to construct the units.

Paul H. Lee, W3JM, continues his marathon **"Vertical Antennas"**. He describes several additional types in this, Part 7. Some of these can be adapted to Amateur use.

The last technical article in this issue is from the pen of W2AEF who offers **"More on Updated Improvements for 51J Receivers"**.

January 1969

For the benefit of those who are worried at the fact that reviews of "CQ" are running behind those of other magazines, the explanation is simply that "CQ" is arriving two months later than most of the others.

The January issue carries articles on the following. **"Variable Frequency Tuner for the Visible Light Band,"** Part 1 by W4AML. An earlier issue of "CQ" discussed the semi-fictional story of space communication via light. The article aroused quite a lot of interest and so the author proceeded to "home-brew" a monochrometer and detector that could be duplicated by the average Amateur. Part 1 reviews the principles of light, the operation of the light detector and describes the construction of both photo-cell and photo-multiplier tube detectors. Part 2 will describe the construction of the monochrometer.

"A 160 Metre Linear," W8QJH/7. Using four type 6LQ8s as high mu triodes, not quite zero-bias. Input runs to about 300w. d.c. for 600w. peak.

"A Primer on Diode Amplifiers," W2EEY/1. Diodes up until recent years have been regarded primarily as devices for rectification and signal mixing. Besides their use as switching devices, they are also now used extensively for signal amplification and possess some unique advantages over conventional vacuum tube or transistor circuits used for the same purpose.

"Antenna Traps using Linear Capacitors," W1ILV. Uses one metre of RG59U cable to form a capacitor of about 80 pF. to tune one of his traps and how to build a trap dipole for all bands, 80-10 mx.

"A Top Band Loop Antenna," W4UW. A loop antenna for receiving signals on 1.8 Mc. The main idea behind the design of this antenna is to improve the directional discrimination of the receiving system and so reduce interference from unwanted signals. An easily rotated receiving beam for 160.

"Vertical Antennas," W3JM. Part 4 dealing with directional arrays, aroused considerable interest. In this part the author discusses the design of a specific array and its feed system. This array is easily adaptable to multi-element switchable configurations for changing direction of transmission.

The rest of the issue is devoted to the usual "CQ" features.

February 1969

"AFSK FOR RTTY," W6FFC. The author describes a solid state r.t.t.y. converter for use on the Amateur bands.

"The W8 High Radio Frequency Short Beam," W8HRF. Compact end loaded two-element yagi for 20. Element lengths overall about 14 feet and spacing of 6 ft. 6 in. Truly a mini beam.

"A Simple Oscilloscope Calibrator," W6HDO. This small transistor unit provides the signals necessary for calibrating the usual uncalibrated Amateur class oscilloscope.

"T-Notch Filter for the BBR," W6HHT. Selective rejection of unwanted heterodynes. Seems like a handy gadget to fit into the usual i.f. channel. This one operates on 100 Kc.

"Limited Space Antennas and Methods of Coupling," W1ICP. Lew tells you how to put the power where it will do the most good even though your antenna is not optimum.

"Bridge Break," W0ZJY. Describes an all electronic system for c.w. use.

"Transmitting Converter for 50 Mc.," W8PMK. C.w. or s.s.b. on six with your h.f. exciter.

"A C.w. Clipper Filter using FETs," W2OWF. The title describes in detail what it is about.

"Automatic Letter Spacing for Ickey," by W1WCG. This article was promised in the Ickey article and tells how it is done.

"A Novel Antenna for 80 and 40 Metres," W1IR. Co-ax fed dual arrangement approx. 120 feet overall. Relay switched centre loading ensures low s.w.r. over whole band. Probably our narrower band okay.

"QST"

November 1968

"A Transceiving Converter for 160," W1CER. Doug describes a "Getter Downer" for those who wish to run a 6146 into a long piece of wire on "Top Band".

"Direct Conversion—A Neglected Technique," W7ZOI and W7WKR. This article could probably be retitled "Single Conversion Heterodyne Receiver" or "Direct from h.f. band to Audio". Shades of A9, M9, N9 and K5. Ex R.N. and R.A.N. operators will know what I mean.

"The 'Mobiloop'," W2OZH recipe. Take two mobile whips and add extensions to them so that they overlap by three or four inches above the centre of the top of your car and cover the lot with shield braid to increase conductivity. Fit tuning capacitors to resonate on 80 mx and, the author claims, you have a mobile antenna which is only about two "S" points worse than a full 132 ft. dipole. He states that it looks rather unconventional and I feel sure that if you were seen on the open highway with one some other motorists would indicate their amazement in no uncertain manner. Potential builders are referred to the article by ZL1AYN in "Break-In," May 1968, as his ideas may offer a simpler method of tuning.

"Absorptive Filter for TV Harmonics," by K0UVU and R. W. Carroll. Another method of ridding yourself of t.v.i.

"Ickey," W1WCG. As the name implies, this device is an electronic key using ICs. It uses quite a handful and has both dot and dash memories.

"Antipodal Reception of Oscar Signals," by K2QBW. This author discusses the reception possibilities of the "Oscar-Australis" satellite signals on 10 mx and postulates that it will be possible to read signals from this bird when it is behind mother Earth. (Most unlikely Australis will ever be launched.—Ed.)

"The Mainline FS-1 Secondary Frequency Standard," W6FFC. This small unit using a 4 Mc. overtone oscillator in a special circuit provides outputs which are useable up to the 450 Mc. band. All solid state.

"An R.F. Actuated C.W. Monitor," W1ICP describes a gadget which can be tapped onto your 50 ohm transmission line to pick off a bit of r.f. and use it to turn an oscillator on and off with the incoming signal. (It is powered by a battery—not the r.f.)

"The Square Rigger Mast," WB6QFE. Built from square section steel tubing 6 x 4 inches on a side respectively, this monster towers to 64 ft. in all its unguyed glory and is capable of being raised and lowered through a distance of about 25 ft.

"Break-In Key." With two old hacksaw blades and a little ingenuity, Harry K8ANV made himself a key which does more than just key the transmitter.

In the "Recent Equipment" section the Yaesu Musen FL-2000 Linear Amplifier is reviewed.

March 1969

"Phone Patching — Legitimately," W9NLT. The author discusses the various types of phone patch in use by Amateurs. The various types of telephone circuits and other details necessary for those who wish to phone patch, which, we understand, has recently become legitimate in the U.S.A.

"A CW Filter for the Collins 75S-1," WA4DID. The author cascades two FT-241 type crystals on 455 Kc. in two transistor stages using 2N706 or similar transistors to give his receiver a much narrower bandpass than that given by the 2.1 Kc. s.s.b. filter. The author commends the filter to c.w. men.

"Integrated Circuits in the Keyboard Code Machine," W5OGZ. In this article the author describes a semiconductor shift register for the W2QYW Keyer described in "QST" for August 1965.

"The 'Mega Rule'," Phillip H. Smith. This article is about a slide rule type device designed to simplify calculation of reflection factors, s.w.r. and dissipation in antenna feedlines.

"A Band Spotter and W1AW Marker," by W1ICP. This simple unit uses a FET and a number of crystals which are switched from one frequency to another to put Amateur band markers in any one of six places that they may be required. It operates from its own 9-volt battery.

"A Medium Power Transmitting Converter for 144 Mc.," W8PMK. The 6146Bs are cooled by a small fan and operated with 600 volts on their plates; the converter requires about 5 watts drive on 28 Mc. and then gives out on 2 mx.

"Antennas for Travel Trailers and Campers," W1DBM. For those whose XYL will tolerate Amateur Radio on holidays, this looks like an interesting article, especially if you tote a 30 ft. "caravan" with you to the camp site. Philip S. Rand is well known for his exhaustive work some years ago on t.v.i.

"A Two Metre Transmatch with SWR Indicator," W1CER. Many s.w.r. indicators do not perform too well at these frequencies, this one is a modified "Moni-match" designed to perform at 144 Mc. and the rest of the gadget is designed to match the antenna to the transmitter and/or receiver. One advantage is the additional harmonic suppression.

"A Tiny Frequency Standard with Big Ideas," by W7EFV/W2MYH follows and the unit described is designed to provide check points at intervals as close as 5 Kc. apart.

The technical content is rounded out by the usual "QST" features, "H. & K." a **"Receiver Offset Tuning Mod. for the Heathkit SB101"** and then VK2AOU completes the issue with a **"Triband One Loop Cubical Quad Element"**.

"RADIO COMMUNICATION"

January 1969

"**G3RNL Mini-5 Receiver**," G3RNL. Designed as a simple and cheap valve type receiver for s.s.b., etc., it uses modern miniature tubes and an i.f. of 5.2 Mc. with v.f.o. on 9 Mc. to tune 80 and 20 mx. By using a crystal oscillator and pre-mixer stage, the other bands between 1.8 and 30 Mc. are covered.

"**VHF SSB**." Editorial discussion of the requirements for satisfactory operation of stations on s.s.b. at v.h.f.

Technical Topics. G3VA discusses first of all methods of preventing Amateur signals from entering t.v. sets to cause t.v.i. Apparently most British t.v. lookers use co-axial feed systems to their sets instead of the 300 ohm ribbon so common in Australia. Voltages induced into the outer braid from a nearby Amateur or commercial transmitter can quite often be rather high, causing all sorts of trouble with the picture. A double faraday screened coupling transformer is suggested as a possible cure. One version uses a ferrite core in the line transformer. In a later issue of "R.C." (February) another type of ferrite filter is also suggested as a remedy.

"**Ideas in HF Receiver Design**." Our old friends, Eddystone, have recently designed a special solid state receiver for the low power small ships maritime service. Some design features are discussed.

"**Franklin Uniform Aerial**." An old design is resurrected.

"**3.5 Mc. Mini-Antenna**." A resume of the characteristics of a design by ZL1AYN in May 1968 "Break-In".

"**Modifying Receivers**" is the next topic where he discusses various modifications which are possible for up-dating some of the older receivers such as the SX28, Super Pro (and I suppose those old warhorses the B28) to make them suitable for s.s.b. work. The section concludes with short dissertations on a "**New MOSIC or MOSFET Oscillator**," "**Loop and Aerial Arrays**" and "**Pressure from Broadcasters**". The last article is an indication that Amateurs will have to fight very hard if they are to retain their present h.f. allocations for many years in the future. (The W.I.A. will accept all donations to the I.T.U. Fund.)

"**Sky Hooks**," GM3SIY. Author discusses the use of meteorological balloons of the type used to hoist radiosondes into the stratosphere.

"**Adjustment of a Two Metre Converter**," G3PKV. Author discusses method of adjusting converter so that minimum noise figure and maximum gain are achieved. Interesting for the v.h.f'ers.

"**SSB and Interference**," G3JGO. There has been an upsurge of articles on various aspects of t.v.i. in U.K. and U.S.A. in recent months. I have not been able to determine whether this is due to an increase of interference or just part of a plan to re-educate those who have forgotten the "Tennessee Valley Indians" or educate those who have never heard of them. One of the things that is pointed out in a number of publications is that each complaint appears to have a unique cure, which can be fully effective if the patient will co-operate and that the mere possession of a piece of commercial equipment is no guarantee that you will not offend someone.

February 1969

"**The Wirral NFD Transmitter**," G3CSG. A rig covering the bands from 160 metres to 10 metres. The final tube is a 2E26 with 250 volts on the plate. It is a c.w. only rig designed and built in the usual impeccable R.S.G.B. manner. Everything is conservatively rated and the final tank coils are wound on perspex tubing, 2 in. o.d., and probably capable of handling ten times the power out of the 2E26.

"**The Snowflake Transistor Transmitter**," by GW3DFF. Describes this as a cheap 144 Mc. transistor transmitter with reasonable power output for portable work. Using four Texas Instruments 2N2218 "Snowflake" transistors which the author purchased in U.K. for less than $1 each (Aust.)

Technical Topics.—The regular Pat Hawker feature ranges over some more proposals for killing t.v.i., the new Eddystone solid state h.f. receiver, 10 Kc. to 30 Mc. in 100 Kc. steps. He makes the comment that this triple conversion receiver is unlikely to find its way into Amateur shacks in quantity. If it costs as much as it looks as though it does, I am not surprised. "Direct Conversion," the article in Nov. '68 "QST" is also commented upon.

"SHORT WAVE MAGAZINE"

January 1969

"**Transceiver for the LF Bands**," G3OGR. Using miniature tubes and some parts from such disposals items as the SCR522, the author comes up with a compact transmitter/receiver on a common chassis for 160 and 80 metres—in a case 10 x 7½ x 7 inches.

Followed by "**More About Simplifying RTTY Control**" (G3WGM).

"**A Gated Dip Oscillator**," G3SRY. Uses a FET for this job. Using the Colpitts circuit, this unit which uses an audio FET only covers 450 Kc. to 15 Mc.

The final technical article in this issue is titled "**Fringe Area Harmonic Filters**" by G. Ellis, G3LFZ, who deals with the methods he used to ensure that he could enjoy his Amateur Radio even though he was located in a fringe t.v. area.

February 1969

In this issue G3LFZ continues his dissertation on "**Fringe Area Harmonic Filters**." This is an interesting approach to the t.v.i. problems some Amateurs are encountering. In the system propounded a series of suitable harmonic filters are built across the transmission line so that the harmonics will not be radiated.

G3SRY follows with "**Transmitter/Receiver in Solid State for Top Band.**"

This issue concludes with a short mention of "**Integrated Crystal Filters**" and what they can do. From this article it appears that GEC researchers have developed a filter which fits into an elongated style "D" can which is considerably better in characteristics than the older series using a number of discrete crystals. Their filter was centred on 10.7 Mc. and designed for a bandpass of about 12.5 Kc. Ultimate rejection of over 90 db. is achieved and the highest "pop-up" is down 90 db. A great deal of development is taking place in this field. Much of it is aimed at the "Mobile Radiotelephone" market, which, with its demands for more and more mobiles in narrow segments of the spectrum, are being plagued with a number of problems, many of these are to do with selectivity and I have seen where some companies are offering filters as high in frequency as about 210 Mc. so that a large part of the selectivity can be ahead of the first mixer.

"73" MAGAZINE

December 1968

"**Using the First Ham Integrated Circuit**," W6DNS. Includes several useful circuits.

"**Mouse Tunnels**," K6HKB. Describes how he hid the wiring in his shack and made it acceptable to his XYL.

"**Circular Modulation Monitor**," WA9IGU. Describes a monitor with a circular time base and radial deflection. When you have a bright spot in the centre you are overmodulating.

"**The Mini-Square**," WB6BIH. Square wave generator in miniature.

"**Add On FM Test Set**," K9STH. Simple to complex in easy stages.

"**The Elusive H Parameter**," WB6BIH. Not so elusive now. Perhaps an old thermionic valve-type like me can get converted.

"**Zero Temperature Co-efficient VFO**," by W6WQC. Sure stability.

"**75 Metre DSB Rig**," W3KBM. A step in the right direction.

"**A Novice FET Converter**," K6DBQ. A good building project for the novice.

"**Transceiver Review**" by the staff. Photos and information about the transceivers now available.

"**30 Watt Transistor Transmitter**," W5PAG. All transistorised. Modulated with the fingers operating an interrupter (key).

"**Care and Feeding of a Ham Club**," W5NQQ. Part 6 of the story.

"**Christmas Gifts for Hams**" by the staff. Present gifts under $US25.

"**Three Black Boxes**," W5EHC. What constitutes a station?

"**Facsimile and the Radio Amateur**," K6GKX. What is facsimile and how to do it.

"**Why SSB**," K3PUR. Required reading . . . . how s.s.b. is different.

"**Limitations on Antenna Reciprocity**," by WA4UZM. The answer to one-way skip.

"**Index to Articles Appearing in '73' in 1968**" by the staff.

January 1969

"**The Suppressor Compressor**," W3KBM. The neglected grid.

"**Putting the HW12 on 160 Metres**," W8FGB. With the new rules, this is important.

"**Tuning a Parasitic Beam**," W1EMV. This can really be fun.

"**Does Your Linear Need Help?**" W9VEY. This could solve the problems.

"**Some Thoughts on Voltage Control**," by VE4RE. A subject of some importance.

"**Solid State Monitoring**," W6JDD. A Heath modification of merit.

"**The Two Metre Transistor Transmitter**," K5WOR. Plus one tube.

"**The Yasme World Wide DX-Peditions**." Starting with Danny.

"**The LC Power Reducer**," W2EEY/1. Power reductions under same load.

"**Why RTTY**," WA8DCE. Very interesting.

"**Panadaptor/Spectrum Analyser**," W6DTR. How to lose friends by being honest.

"**The Six Net**," W5JSN. Transistorised receiver.

"**The Operating Console**," W6GDP. A place for everything . . . in its place.

"**RTTY Auto-Start**," W6ORG. Why monitor?

"**Oscillator Frequency Shift Calculations**," WA6DPD. Calculating drift.

"**A Ten Minute Forty Metre Rig**," WB2YOJ. On the air in a hurry.

"**UFO Interest**," K6MVH. Not restricted to Amateurs.

"**Quick and Easy QRP**," WB2YRQ. Low power can be fun.

"**Full Sequential Switching**," G3KPO. Using simple relays.

"**Drake R4A and T4X**," WB4EFA. Not new, but still great.

"**Operating the Twoer**," W6BLZ. Some hints for making it better.

"**The S.O.B.**," WA5SWD. Sightless operator's bridge.

"**Getting Your Advanced Class Licence**" by the staff. Part 10, last of this series.

"**Care and Feeding of a Ham Club**," W5NQQ. The last part.

European VHF," DL5QN. They use the bands too.

February 1969

"**A Fast Scan Vidicon in Slow Scan Camera**," K7YZZ. More on a.t.v.

"**A Cheap and Simple Linear Amplifier**," WB2PTU. More watts per dollar.

"**The Beatnote Basher**," WB6JXU. A selective audio filter.

"**The Unijunction Transistor**, VK3ZRY. What they are and what they do. (Previously published in "A.R.")

"**What's Out There?**" W1EZT. Probing the universe for life.

"**Velcro**," K3AQH. A new material with Amateur potential.

"**TVI Suit**," staff. Amateur sued for one million dollars.

"**Nikola Tesla**," Elkhorne. The master of electrical energy.

"**Go Mobile**," WB6ACM. Some pointers for new mobileers.

March 1969

The difference in format between the major Amateur magazines is quite remarkable. "CQ" and "QST" usually have four or five fairly lengthy articles on Amateur subjects and their usual features. "73" is quite different, especially where the technical content is concerned. In this magazine they specialise in the short snappy article and include a great variety of them to maintain the reader's interest.

"**Modifying the TCS Transmitter**," K3UUL discusses the modifying of one of the easiest pieces of surplus gear that one could wish to work on. Of simple straightforward design, the TCS covered 1.5 to 12 Mc. in three ranges and I have no doubt this could be changed to make it 1.8-14.5 or so if one were enthusiastic enough. Receiver was 7 tubes with r.f. stage.

"**A $4 Compressor Pre-amplifier**," W2EEY. More speech for less money.

"**Reactance or Impedance**," K9ZPZ and K9DRB. Answers to a lot of old questions.

"**Weather Snooper**," K9ZFV. Eavesdropping on the aircraft wx frequencies.

"**The Charmin' Keyer**," W9HXM. The solid state keyer.

"**Amateur Radio Knows No Borders**" by the staff. Saving a life across the Iron Curtain. Not technical, but interesting yarn.

"**A Better Balanced Modulator**," WA1FRJ. This intrigued me so I turned to page 36 to find that they do have some differences. The transformers are special and they even tell you how to make them.

"**Adjustable Power Supply**," WA0ABI. A must for building projects.

"**Save Your Money**," K6GKX describes his method of salvaging transformers.

"**Transistor Oscillators**," W9ZTK. A variety of circuits, old and new.

"**Heath HW-18 Review**." W8QUR reviews the 160 metre transceiver.

"**Cool It**," K9CNN. Blowers to cool tubes on u.h.f. Ideas will work at h.f. too.

"**A New Support For That Beam**," K1MYV describes a phone pole and a way of making the beam walk up and down.

"**The Case for the Half Wave Feed Line**," W5QRJ. Care and feeding of antennas.

"**Putting Creativity to Work**," VE3BUE. Making household articles work in the shack. Good tips for inveterate hoarders.

"**The Lamb Dyer**," WA1ABP. An amusing story about a new "old style one tube regenerative receiver".

"**I.F. Alignment**," K8ZHZ. Uses broadcast stations and their harmonics to accurately set the signal generator to the frequency required.

NEW CALL SIGNS

JANUARY 1969

VK1EM—E. J. Mulholland, 3 Oxley St., Griffith, 2603.
VK2BX—B. G. Warren, 142 King Georges Rd., Lakemba, 2195.
VK2NL—H. J. Freeman, 20 Nymboida St., South Coogee, 2034.
VK2SO—W. F. Nobles, 5/12 Longworth Ave., Point Piper, 2027.
VK2BAW—G. P. Viertelhausen, 61 The Esplanade, Balmoral Beach, 2088.
VK2BAX—B. L. Nielsen, 14 Atchison St., Crows Nest, 2065.
VK2BCG—G. A. Cruickshank, 26 Killara Ave., Riverwood, 2210.
VK2BFA—J. Farkas, 342 Shellharbour Rd., Barrack Heights, 2528.
VK2BHD—D. Hunziker, 41 Church St., Maclean, 2463.
VK2BHL—H. H. Laauw, Lot 443, William Beach Rd., Dapto, 2530.
VK2BJJ—J. P. Meehan, Station: Nicholsons Air Strip, Wee Waa, 2388; Postal: C/o. Nicholsons Air Services, Wee Waa, 2388.
VK2BMS—M. W. Sinclair, 63 Ray Rd., Epping, 2121.
VK2BSG—S. G. D. Martin, 6 Freeman Ave., Oatley, 2223.
VK2BSH—H. Schroder, 266 West Botany St., Rockdale, 2216.
VK2ZLD—L. W. A. Doolan, 67 Fitzwilliam Rd., Toongabbie, 2146.
VK2ZNB—B. G. Morley, 65 Carey St., Toronto, 2283.
VK2ZTW—A. W. Wyatt, 1 Bareena Ave., Wahroonga, 2076.
VK2ZVA—R. W. J. Hazell, 14 David St., Moree, 2400.
VK2ZVR—R. V. A. Johnson, 2 Neville St., Rutherford, 2320.
VK2ZWH—I. C. McWhirter, "Haddon Park," Anembo Rd., Berowra, 2081.
VK3ET—J. A. Clark, Lot 87, Greenslopes Dr., Mooroolbark, 3138.
VK4KL—P. D. Cox, 15 Rosemount Rd., Nambour, 4560.
VK4SU—S. C. Armstrong, Station: Kennedy H'way, Kuranda, 4870; Postal: P.O. Box 14, Smithfield, 4870.
VK4VL—T. R. Cuttle, Cumming St., Bongaree, Bribie Island, 4507.
VK4WV—W. van der Est, 148 Kenmore Rd., Fig Tree Pocket, 4068.
VK4ZJY—J. R. Yarham, 55 Sims Rd., South Bundaberg, 4670.
VK5LP—E. C. Jamieson, Forreston, 5233.
VK5QV—I. E. Huser, 68 Ninth Ave., Joslin, 5070.
VK5US—R. G. Atkin, C/o. 26 Symonds Cres., Modbury North, 5092.
VK5ZFF—M. Hanna, 2 Edgecumbe Pde., Blackwood, 5051.
VK6TD—T. Graham, 78 Grand Promenade, Inglewood, 6052.
VK6ZD—J. T. Kelly-Hart, Flat 4, Squire Flats, Morris Rd., North Innaloo, 6018.
VK6ZK—T. M. Stanicic, 20 Constance St., Mt. Yokine, 6060.
VK6ZGK—P. C. Kloppenburg, 11 Brown St., Carnarvon, 6701.
VK6ZJH/T—J. L. Harrison, 187 St. Brigid's Tce., Scarborough, 6019.
VK6ZKH—A. K. Hampel, Station Vernon Ave., Mundaring, 6073; Postal: P.O. Box 27, Mundaring, 6073.
VK7AX—A. I. Bedelph, 11 Fulton St., Ulverstone, 7315.
VK7UX—C. D. Walker, 122 Granville St., Launceston, 7250.
VK7ZEK—W. I. Hooke, 302 Nelson Rd., Mt. Nelson, 7007.
VK8BB—A. H. B. Brodrick, Hayes Creek Inn, Stuart H'way, via Darwin, 5791.
VK9AQ—N. A. Millar, Station: Lot 3, Section 3, Martrigogo, Hubert Murray H'way, Port Moresby, P.; Postal: C/o. P.O. Box 86, Port Moresby, P.

CANCELLATIONS

VK2GD—F. T. Clark. Transferred to Victoria.
VK2IW—F. A. Borchard. Not renewed.
VK2AIF—1st Signal Regiment Army Wireless Club. Not renewed.
VK2AOG—M. T. Gabriel. Deceased.
VK2AQJ—K. B. Pounsett. Transferred to Qld.
VK2ASF—S. E. Fletcher. Not renewed.
VK2ATX—I. E. Huser. Ceased operation.
VK2BBB—The Stedfast Radio Club. Ceased operation.
VK2BHC—La Hermandad de la Costa Radio Club. Not renewed.
VK2BHF—H. J. Freeman. Now VK2NL.
VK2BUG—F. D. Voight. Not renewed.
VK2ZDR—G. A. Cruickshank. Now VK2BCG.
VK2ZOS—H. Schroder. Now VK2BSH.
VK2ZQX—B. G. Warren. Now VK2BX.
VK2ZSO—S. G. Martin. Now VK2BSG.
VK3AVL—E. H. Connery. Transferred to W.A.
VK4ZAT—T. R. Cuttle. Now VK4VL.
VK4ZBU—W. van der Est. Now VK4WV.
VK5AV—E. J. Mulholland. Now VK1EM.
VK5AZ—B. E. Edwards. Not renewed.
VK5ZBF—R. G. Henderson. Transferred to A.C.T.
VK5ZEJ—E. C. Jamieson. Now VK5LP.
VK5ZJP—G. J. Perry. Not renewed.
VK5ZMH—I. W. Cowan. Transferred to Vic.
VK5ZPB—P. L. A. Burton. Not renewed.
VK6ZDA—J. T. Kelly-Hart. Now VK6ZD.
VK6ZDT—T. M. Stanicic. Now VK6ZK.
VK6ZBJ—W. R. Hines. Ceased operation.
VK7ZCW—C. D. Walker. Now VK7UX.
VK7ZXT—A. I. Bedelph. Now VK7AX.
VK8ZEB—E. S. Blackburn. Not renewed.

FEBRUARY 1969

VK1ZRH—R. G. Henderson, 12 Frost Pl., Page, 2614.
VK2OZ—A. R. Vanston, 34 Mulga Rd., Oatley, 2223.
VK2BFD—F. A. O'Donnell, 14 Edmondson Ave., Griffith, 2680.
VK2BIL—G. A. Pearse, 14 Macleay St., Greystanes, 2145.
VK2BJL—D. H. Mead, 22 Dowel St., Chatswood, 2067.
VK2BSA—Aust. Boy Scouts Assoc. (N.S.W. Branch), 265 George St., Sydney, 2000.
VK2ZKU—G. C. S. Jones, 2 Hillside Cres., Epping, 2121.
VK2ZLI—R. J. Langdon, 2 Clifton Ave., Glenbrook, 2773.
VK2ZME—M. E. Hood, 14 Crown St., Epping, 2121.
VK3FF—D. B. Sprow, C/o. The Sheraton Hotel, Spring St., Melbourne, 3000.
VK3JK—G. S. V. Frew, 13 Wellington St., Middle Brighton, 3186.
VK3AMM—A. C. Edwards, "Kuranda," 384 Glenferrie Rd., Malvern, 3144.
VK3AOX—C. W. Crook, 107 St. Andrews St., Brighton, 3186.
VK3AVF—Melbourne University Astronautical Society, University of Melbourne, Parkville, 3052.
VK3AYX—B. P. Bailey, "Selworthy," 298 Mitcham Rd., Mitcham, 3132.
VK3ZWS—H. Grant, Flat 7, 16 Newlyn St., Caulfield, 3162.
VK4HV—R. J. Thorn, 349 Margaret St., Toowoomba, 4350.
VK4IM—J. D. MacLean, 89 Thorn St., Kangaroo Point, 4169.
VK5EB—C. J. McCarthy, 31 Yallum Tce., Kilkenny, 5009.
VK5ZGB—A. C. Wallace, 23 Edgeworth St., Prospect, 5082.
VK5ZIP—I. J. Champion, 14 Pedlar St., Seaton, 5023.
VK5ZIT—I. T. Croser, 42 Price Ave., Lower Mitcham, 5062.
VK5ZRM—R. W. McCarthy, 92 David Tce., Kilkenny, 5009.
VK6FW—F. W. Beadle, 9 Pinaster St., Coolbinia, 6050.
VK6OR—Ockley Radio Club, C/o. J. Ellis, Secretary, 112 Ensign St., Narrogin, 6312.
VK6VL—E. H. Connery, 5 Clapham St., Cannington, 6107.
VK6ZGR—W. R. McGhie, 120 Robert St., Como, 6152.

CANCELLATIONS

VK2ZI—A. L. Glasscock. Not renewed.
VK2ACY—C. J. McCarthy. Now VK5EB.
VK2AIQ—A. Cant. Not renewed.
VK2AQY—F. W. Beadle. Now VK6FW.
VK3ZU—F. A. O'Donnell. Now VK2BFD.
VK4BS—Toowoomba Guide and Scout Radio Club. Ceased operation.
VK4OK—J. Makin. Ceased operation.
VK4WS—W. J. Sebley. Deceased.
VK5EU—H. S. Young. Not renewed.
VK5NK—R. J. Knight. Deceased.
VK5ZGO—G. K. Oates. Not renewed.
VK5ZMM—M. J. Mitchell. Ceased operation.
VK6CP—C. R. Cooke. Ceased operation.
VK6GT—G. J. Bedwell. Ceased operation.
VK6HK—D. E. Graham. Transferred to Vic.
VK6RR—B. M. May. Not renewed.
VK6ZAY—W. Frost. Not renewed.
VK7BX—M. G. Hooper. Transferred Interstate.

Book Review

HAM RADIO INCENTIVE LICENSING GUIDE

By Bert Simon, W2UUN

Although we cannot imagine any market for this book in Australia, we went through it as a matter of interest. We have concluded that the standard required to obtain a licence in Australia is extremely high, or the standard in U.S.A. is on the low side. We are quite sure any Australian licensee would fly through the extra class test, the 20 w.p.m. code test being the hardest part. The history contained in the book has already been well covered by the monthly magazines coming from the States.

TAB Book No. 469. Price $US3.95.

ELECTRONICS REFERENCE DATA BOOK

By Norman H. Crowhurst

An invaluable new reference containing the most often needed electronics data—clearly explains how to use electronics data in practical applications. This new book is much more than a simple collection of tables, formulas, graphs, equations, etc. In addition to the abundance of helpful information given, it provides specific guidance in the use of data. Numerous problems associated with every level of interest—from electronics theory (formulas, laws) to measurements, tests, and circuit design work—are covered. In so doing, the author explains how to use the data (from this or other volumes) for purposes other than those listed, and at the same time provides the help necessary to polish those "rusty spots" on certain fundamentals.

To facilitate the solution of problems involving a.c. voltages and currents, an entire chapter is devoted to applications of the "J" operator. As in all similar cases throughout the book, the author clearly explains how to apply vector analysis, using as examples the design of low-pass filters, a.c. bridges, sideband determination, etc. For more involved computations, another chapter contains exponential and trigonometric tables, plus data on the power series approach to waveform synthesis and analysis of asymmetrical rectangular waves. Other sections deal with attenuator, equaliser, and filter design, in which the author explains and illustrates how to design such devices.

An entire chapter is devoted to semiconductors (including FETs and ICs) and vacuum tubes, covering basic characteristics, operating parameters, gain calculations, applications, etc. Thorough treatment is given to the subject of feedback: purposes, distortion reduction, gain stabilisation, phase effects, and computation data. The final chapter deals with transmission lines, including a description of parallel and concentric conductors, waveguides, and matching devices. The accompanying tables list losses and loss vs. frequency for all principal cable types, impedance/conductor size and spacing, waveguide dimensions, and impedance for lines of various proportions.

Unlike most other data books, the information here will enable the reader to use data available from many other sources; also, it tells how he can develop additional data on his own. In every instance there are sufficient instructions on data development and application, showing why as well as how, to apply data.

There are over 100 illustrations, 232 pages, and 45 tables. TAB Book No. 488. Price: $US7.95 hardbound, $US4.95 paperbound.

PROVISIONAL SUNSPOT NUMBERS

FEBRUARY 1969

Dependent on observations at Zurich Observatory and its stations in Locarno and Arosa.

Day	R	Day	R
1	92	15	70
2	96	16	87
3	98	17	104
4	86	18	101
5	94	19	126
6	101	20	142
7	122	21	169
8	101	22	213
9	108	23	208
10	85	24	201
11	74	25	198
12	64	26	196
13	55	27	182
14	54	28	159

Mean equals 120.9.
Smoothed Mean for July 1968: 105.2.
Smoothed Mean for August 1968: 104.0.
—Swiss Federal Observatory, Zurich.

D X

Sub-Editor: PETER NESBIT, VK3APN
32 The Grange, East Malvern, Vic., 3145
(All times in GMT)

ASSORTED

K6KA has mailed QSLs to all those who sent him a s.a.s.e. for his FO8AA operation on 16th-21st February, 1969. Exceptions:

(a) Those not sending postage. These will be handled last.
(b) Cards that must be researched in the log, because they bear incorrect GMT times and dates. There was a high percentage of errors in QSLs.
(c) Cards for dates other than the 16th to 21st February.
(d) Cards sent to FO8AA direct—these may be batched by FO8AA, and mailed back to K6KA at the latter's expense within a year. However, it would be preferable to send a new card via K6KA to be certain of a reply.

D.X.C.C. credit will be given to Israeli stations operating within the Israel boundaries as they existed at June 6, 1968. In other words, there is no D.X.C.C. credit for 4X5 contacts.

Some time ago a licence was issued for operation of an Amateur station on Rockall Island by the G licence bureau, with a GM call being assigned. At the time it was assumed that any Rockall operation would count as Scotland. Since then, a review conducted by the A.R.R.L. Awards Committee uncovered the possibility that since Rockall Island is not part of Scotland, it might receive separate credit—issuance of a GM call did not result in the Island becoming Scottish Territory.

SK9WL was operated on April 12-13 from the "Free State of Morokulia". Operators were SM5CZY, 5EAC, 5FC, 7CRW, 7DQC. Morokulia is on the LA/SM border; as yet its country status is not clear. QSL via SM7CRW (address below) enclosing three IRCs for return via the bureau; four IRCs for return via surface mail; or five IRCs for reply via airmail. Three of the IRCs sent will be used for donations to several Charity Funds.

LG5LG, also operating from Morokulia, has a similar QSL procedure: 3, 4, or 5 IRCs for bureau, surface, or airmail replies respectively. The QSL manager is LA4YF, and his address is also given below.

Herb KV4FZ regularly makes short trips (usually Thursday/Friday) to other Caribbean spots. Frequencies to watch are 1826, 3501, and 7001 Kc. As VP2KK, Herb became W1BB's 104th country on 160 mx.

Marco Island: Two operators were said to have operated on Marco Island off Peru using the call sign 3K2A around mid-April???

HL9KQ skeds K4VGI daily 14240 s.s.b. at 1200z, also QRV 21050 c.w. at 2115/2215z. John will make week-day or week-end skeds for any band, c.w. or s.s.b. He will go QRT in mid-June.

C2A-C2Z is the new call sign allocation by the I.T.U. to Nauru (formerly VK9).

It has been suggested that DXers write to the Commandant of the U.S. Coast Guard expressing appreciation for the Coast Guard's help in putting VK0WR on the air from Heard Island, and request that U.S.C.G. operators may be permitted to operate from KC4, Navassar Island. Write to: The Commandant, United States Coast Guard, 1300 East Street N.W., Washington, D.C. 20591.

PQ, PR, PS, PT and PU: About 100 PY stations were allowed to use these prefixes in place of "PY" for the WPX S.s.b. Contest. Some operators were able to add two dozen or more new prefixes to their prefix score!

Carlo 7G1CG has been active on 21 Mc. Is this station legitimate? QSLs have been received via WA3HUP, but why is registered mail sent to the direct QTH given by Carlo (Box 33, Conakry) returned to the sender marked "inconnu"?

April "A.R." carried a report that the Victorian airport stations ML and LAV were prefix anomalies. Just to set the record straight, they are Aeronautical Navigation Identifiers, not true call signs; therefore they are not prefix anomalies. (Tnx L3042)

Pacific DX Net: This very efficient net is run by Ed de Young, KH6GLU, and gives the latest DX information on Fridays 14240 Kc. at 0700z. Anyone may join in.

When obtaining QSL cards from rare stations, it helps considerably if IRCs are included with the card. It helps still more if stamps are included instead (s.a.s.e.). The obstacle is getting the stamp of the DX country. W2SAW operates a stamp service, and stocks unused stamps of most countries. Further information may be obtained from the man himself, W2SAW, S. Ringler, DX Stamp Service, 466 Weaver Road, Webster, New York, U.S.A. 14580.

160 metres does have DX possibilities . . . VK5KO reports that over the past few years, he has chalked up over a hundred different W/VE stations on 160.

W4BPD DX-pedition: Gus has announced frequency changes. The new frequencies are: 21248 s.s.b., listening 21300 up; 7015-7025 c.w.; and a few kilocycles above or below 3520. All other frequencies remain the same, refer to April "A.R." page 18. This DX-pedition is certainly putting a few rare countries on air. The trouble is that he moves from place to place so quickly, and rarely gives hints as to where/when his next stop will be, so it takes a very active and alert operator to follow his movements. Personally, I feel that this is being unfair to the majority of Amateurs (like me) who don't have the time to sit tuning for him all day, and conflicts with his earlier statement that he would make the art of DXing "as lively as it was a few years ago".

Another new country? The A.R.R.L. has been asked if the "Kingdom of Lundy", which was written up in "The National Observer," March 31, 1969, will qualify. Lundy is a tiny island in the Bristo Channel off Britain's Southwest coast which has been independent for centuries. I wonder if the people of Lundy suspect that soon, they might be invaded by hoardes of Radio Amateurs, each one trying to be the first on air?

NEW DX SUB-EDITOR

These notes are the last to be supplied by Peter Nesbit, VK3APN, who has had to relinquish his task due to pressure of business.

As from the July issue, DX Notes will be supplied by Don Grantley, whose address is **P.O. Box 222, Penrith, N.S.W., 2750**, to whom all DX information should be sent.

The Publications Committee extends thanks to Peter Nesbit for his assistance during the last year.

4K1ITU is a rare call used by Swiss Amateurs when they are working in I.T.U. on International Callbook compilations.

For the benefit of any VKs who are contemplating DX-peditions, it is necessary for them to submit to the A.R.R.L. proof of authority to operate, as well as proof of presence.

Dick GC8HT will be active on the following dates and frequencies: 1973 Kc. s.s.b. 1800z June 30; 7043 Kc. c.w. at 0830z June 2; 7083 Kc. s.s.b. at 1800z June 3; 14043 c.w. at 0900z June 9; 14243 s.s.b. at 0730z 9th; 21013 c.w. at 0730z 16th; 21343 s.s.b. at 0900z 16th; and 28013 c.w. at 0730z 23rd. Here is a good chance to pick up Guernsey on a few bands.

QSL MANAGERS

CR6CA—VE3GNM	VR2DI—VE6TK
EL2J—WB2WOU	VS6DR—W2CTN
ET2DA—W2MXB	ZF1AR—W8ROF
F9UC/FC—DL9PF	ZF1FT—WB4BND
FO8BW—W6JFM	ZF1GC—VE4XN
GD6UW—W2GHK	ZF1KV—WA0QOI
HC8FN—WA2WUV	ZF1RD—K8LSG
HL9KQ—W4YWX	3V8AC—W8ROF
KC6CS—W7BUB	3V8AD—DL1DA
KC6CT—W9VW	4X4CY—WB2WOU
KG6SM—W2CTN	4X4QL—WB2WOU
MP4TCR—R.S.G.B.	4X4SK—WB2WOU
OE2ZON—W8IMZ	4X4SO—WB2WOU
PA9IF—W8IMZ	4X4UL—WB2WOU
PJ6AA—KV4AM	4X4WL—WB2WOU
VK9WD—W2CTN	4X4WP—WB2WOU
VP2KF—VE3DLC	4Z4AQ—WB2WOU
VP2KM—VE3EUU	4Z4HF—WB2WOU
VP2LA—VE3EUU	4Z4HQ—WB2WOU
VP2MF—VE3GCO	6Y5GB—VE3DLC
VP2SO—WB2WOU	9H1BL—G3VPS
VR1L—W6NJU	9H1BN—W2CTN
VR1Q—ZL2AFZ	9N1MM—W3KVQ

CP1GN—C/o. U.S. Embassy, La Paz, Bolivia.
FB8XX—Prior 6/1/69: FR7ZD
FB8XX—Since 6/1/69: F2MO
FB8ZZ—Since 1/1/69: F8US.
GC8HT—R. Taylor, La Cour de Longue, St. Saviours, Guernsey, Channel Islands.
LG5LG—LA4YF, Hans Kinck, 3800 B0 i Telemark, Norway.
SK9WL—SM7CRW, John Iwar Winbladh, Box 24, 560 12 Waggeryd, Sweden.
VK9LB—via Berry Research, Box 287, Norfolk Island.
9J2XZ—via WA9PRE/2, 5 Pennypacker Drive, Willingboro, N.J. 08046, U.S.A.

ACTIVITIES

Hello again to Jack VK3AXQ, who is still busy on 20 mx c.w., apparently having quite a bit of fun. Although handicapped by a dipole which is end on to Europe, he has managed to work a few Europeans, among others. He has been hearing: Owen VR2DK, who vanishes as quickly as he appears; YJ8JM, buried deep under a dogpile; ZF1KV, on a vacation to Cayman Isl., being ruthlessly called by stations left, right and centre; HL9UU, who is usually swamped by JAs calling CQ DX on top of him. John says that 20 mx conditions are still holding up, although QRM is grim at times. VKs are still conspicious by their absence. (Thanks John—Peter.)

George L6042 is still keeping an ever-watchful eye on 160 mx. He reports conditions as below par, although on March 16 K1PBW/8, W5HW and W9PNE were coming through; and on April 4 K9YWO showed up briefly on 1805 Kc. Since then not much has been heard. (Thanks George—Peter.)

SUMMARY

Many thanks to this month's contributors: DX News, LIDXA, ZL2AFZ, VK3AXQ, VK-3AUT, L3042, and last but not least, L6042. Please keep the news coming fellas, remember the deadline for news is the 1st of each month. Meanwhile, good DX hunting. 73, Peter.

AUSTRALIAN RESULTS OF 9th ALL ASIAN DX CONTEST (1968)

Call	Band	Score
VK2GW	M	1590 points
VK3AXK*	28 Mc.	70 points
VK3RJ	28 Mc.	10 points
VK3QV	28 Mc.	9 points
VK3APJ*	21 Mc.	978 points
VK4CK	21 Mc.	524 points
VK3KS	21 Mc.	485 points
VK2APK*	14 Mc.	1793 points
VK4SS*	7 Mc.	102 points

* Oceania Leader—single band.

PROVISIONAL SUNSPOT NUMBERS

JANUARY 1960

Dependent on observation at Zurich Observatory and its stations in Locarno and Arosa.

Day	R	Day	R
1	68	16	116
2	75	17	100
3	72	18	85
4	98	19	73
5	117	20	76
6	128	21	85
7	146	22	105
8	150	23	88
9	152	24	103
10	154	25	102
11	138	26	99
12	137	27	78
13	124	28	79
14	119	29	82
15	116	30	80
		31	95

Mean equals 104.5.
Smoothed Mean for July 1968: 106.0.
—Swiss Federal Observatory, Zurich.

TRANSCEIVERS

Trio TS-500 complete with PS-500 AC power supply and VFO-5 separate VFO. Details items 1 and 2 "A.R." March '69 p.24. Brand new and with personal guarantee. Buyer benefits to extent of getting VFO-5 for only $1. **Price $590**. Finance may be possible.

Inoue Transceivers still coming in. Does the other brand have 500 Hz. bandwidth on c.w.? Inoue has. Special **$505**. Fully guaranteed.

QUAD CANES

16-18 ft., $1.25 ea. or eight for $8. Smalls from 20c each. 100 lb. Nylon line, $2 55-yard reel.

S. T. Clark, 26 Bellevue Ave., Rosanna, Vic., 3084. Phone 45-3002

VHF

Sub-Editor: CYRIL MAUDE, VK3ZCK
2 Clarendon St., Avondale Heights, Vic., 3034

TO THE MOON AND BACK

A Journey into Space and Back by John ZL1AZR and Kjell SM7BAE

Readers of May 1969 "A.R." will have read of the new two metre moon-bounce record of John ZL1AZR and Kjell SM7BAE, this short article tells how it was achieved.

John ZL1AZR arranged skeds with Kjell SM7BAE during the latter half of Feb. '69, but proved a little difficult because of the very short overlap of mutual moon visibility. However, suitable times were worked out and frequencies and other details finalised. The frequencies decided upon were 144.0030 Mc. and that the antennae would have to be pointed to within 2 degrees of the moon.

"On our first sked on 3rd March we heard each other at a just detectable level, the next day at 1728 G.M.T. call signs were partially copied and at 1746 G.M.T. signals peaked to 12-15 db. above the noise and in the next few minutes call signs and signal reports exchanged to comply with the accepted standards required to constitute a QSO.

"The total useful period was about eight minutes, the moon's elevation was 9 degrees, and we think that the extra 3-6 db. ground reflection gain due to low angle radiation greatly assisted."

The equipment used is as follows:—

SM7BAE: 1500w. to a 4CX250R and 16 ten element yagis, and a 2N4416 mast head pre-amp. to the receiver.

ZL1AZR: Zero bias class B 4/400 in push pull running linear with an output power of 550-600 watts, and the antenna eight bays of 6/6 slot fed yagis. The receiver used a DIGFET mast-head pre-amp. into a converter and a tunable i.f. of 14 Mc. and a bandwidth of about a couple of hundred cycles.

"A point worth mentioning is that a further series of skeds on 22nd, 23rd and 24th March were ruined by very strong over modulated local signals (could very well apply in Melbourne—Sub-Editor) and as most moon-bounce activity is below 144.010 I would like to see the V.h.f. Groups press for a N.Z. wide restriction on this tiny segment of two metres."

The signal report system used was a code containing the letters "T", "M" and "O", and the number "5". This system was used because of the vertual impossibility of copying dots except when conditions are very good.

"T" means weak signals present.
"M" means partial call signs copied.
"O" means both call signs and signal report copied.
"5" means almost perfect copy, thus allowing dots to be used.

For the purpose of a contact to be claimed, signals of an "O" level are considered adequate by overseas M.B. groups. The distance involved was 11,370 miles around the earth's surface compared with Ray VK3ATN's 10,417 miles.

"In conclusion it only remains to say that there is no easy way with moon-bounce. Anyone deciding to have a try must be prepared to stop being a communicator and, as our Amateur licence states 'become an experimenter'." 73, John ZL1AZR.

Reprinted after being precied from "Spectrum," the journal of the Auckland V.h.f. Group, New Zealand.

INFORMATION FROM DIVISIONS

Well it is v.h.f. news time again, there is not very much to report, but I have had requests from time to time for the following:

(1) Dates of Divisional and V.h.f. meetings.
(2) The main 6 and 2 metre net frequencies in use.

As this information can only be supplied by the Divisions concerned, it would be appreciated if the officers responsible in each State could let me have it at their earliest convenience, as there are many Amateurs travelling Interstate these days who would like to meet fellow Amateurs on their trips.

Hoping for copy for this column from all Divisions in the very near future, 73, Cyril VK3ZCK.

V.H.F. REPEATERS/TRANSLATORS

The following two metre repeaters/translators have been planned for VK3:—

Channel 1—Melbourne.
Channel 4—Traralgon and Geelong.

The two Channel 4 listed have their units in an advanced state of construction and are applying for P.M.G. licences.

Other known systems in or about to come into operation shortly are: Sydney Channel 4, Newcastle Channel 4, Orange Channel 1, Wagga and Wollongong Channel 1, Albury Channel 1.

Northern Tasmania, Mt. Barrow, Channel 4.

To use these repeaters/translators, mobiles should TRANSMIT on the following frequencies:—

Channel 1 — 146.10 Mc.
Channel 2 — 146.20 Mc.
Channel 3 — 146.30 Mc.
Channel 4 — 146.40 Mc.

Mobiles will then RECEIVE on:—

Channel 1 — 145.60 Mc.
Channel 2 — 145.70 Mc.
Channel 3 — 145.80 Mc.
Channel 4 — 145.90 Mc.

This information was gleaned from "E.A." and Divisional Newsletters.

Information regarding the installation and allocation of frequencies can be obtained from Divisional Headquarters in each State.

In VK2 apply to V.h.f. Repeater Committee, Wireless Institute Centre, 14 Atchison Street, Crows Nest, N.S.W. 2065.

In VK3 apply to V.h.f. Repeater Committee, Wireless Institute of Australia, Victorian Division, P.O. Box 36, East Melbourne, Vic., 3002.

OBITUARY

GEORGE BATY, VK3AOM

George Baty, VK3AOM, died suddenly on Sunday, 13th April, 1969, at the age of 76 years.

As Secretary to the Publications Committee, George was well known to all correspondents by his precise letters, either in his flowing hand writing or knocked out on his trusty old typewriter.

George joined the Publications Committee early in 1957 and completed his last task for "A.R." the day before he died by posting back the corrected proofs for the May issue.

Although his interest in radio went back to the 1920s, George did not take out a licence until his son Ray was posted to Fanning Island in 1954 and operated under the call of VR3A.

During his last year as Headmaster of the Sunshine State School, George spent all his spare time with a copy of the A.R.R.L. Handbook and with his carefully prepared volume of questions and answers. At an age of 65, George passed the full A.O.C.P., surely an example to the many who consider themselves too old to tackle the examination.

George was always quick to admit that he was not a "technical type". However, he constructed a 100 watt all band phone transmitter that would have been a credit to any Amateur. On 20 metres, George's signal was well known around the world and in particular to his many friends in the United States.

With the decline of a.m. on 20 and also a difficult case of t.v.i., George was relatively inactive from 1962 until early 1967 when he acquired a small sideband transceiver. Although only running around 100 watts p.e.p., he took up from where he had left off with the old a.m. gear.

Only a month before his death he received his "Worked All Pacific" award and had also qualified for the U.S. "Worked All States" award. Sadly he missed gaining D.X.C.C. by only two countries.

On 40 metres he was regular in the lunch time nets and was known to all listeners with his daily contacts with his son Ray, now VK2ANB, and living in Sydney.

Apart from Amateur Radio, he had many interests in life. He was a member of the Bundera Road, Methodist Church, where he sang in the choir for many years.

George's garden was always his pride and joy, and was surely one of the neatest in the district.

It is perhaps fitting that his last contact on the air was with his son Ray on the morning he died.

George's passing leaves a gap that will be hard to fill. He enjoyed and served his hobby well.

We extend our sincere sympathy to George's widow, Gladys, to his son Ray, and daughter-in-law Joan, and to his grand children.

Vale George.

SILENT KEY

It is with deep regret that we record the passing of the following Amateurs:—

VK3AJQ—J. R. Kling.
VK3ZAD—R. Bowen.

VICTORIA

As usual for this time of the year a large amount of constructional activity is under way in preparation for next season. U.h.f. equipment seems to be the main undertaking along with the usual beam repairs and other modifications.

Late April provided VK3s with an exceptionally long opening lasting almost a week and covering all parts of the State.

Country stations worked included VKs 3ATN, 3ZMS, 3AJX, 3AJM, 3ZFS, 3AXV, 3ZXI, 5HP/3, and the Interstate VKs 5BC, 5ZDY and 2RS. Signals from the Orange district f.m. translator station on Mt. Canopolis were heard in Bendigo and some QSOs were made from Geelong to the Orange district via the translator. Ray VK3ATN QSO'd several local stations on 432 Mc.

The VK3 Beacon Group has had an offer of a site in Oakleigh for proposed 144 and 432 Mc. beacons. If anyone has any constructive suggestions or comments to make regarding this matter could they get in touch with Peter VK3ZYO.

1296 Mc.—Currently three Melbourne stations and one Northern Tasmanian station are engaged in constructing gear for this band. It may be possible that some time in the near future we will see the first VK7/VK3 QSO on this band and perhaps a new Australian record.

Allan VK3ZHU and Ian VK3ALZ have worked each other over a distance of 50 miles from Mt. Buninyong where Allan was operating portable, and Glenroy, Ian's home QTH. This contact is as yet an unconfirmed VK3 record. 73, Peter VK3ZYO.

W.I.A. D.X.C.C.

Listed below are the highest twelve members in each section. Position in the list is determined by the first number shown. The first number represents the participant's total countries less any credits given for deleted countries. The second number shown represents the total D.X.C.C. credits given, including deleted countries. Where totals are the same, listings will be alphabetical by call sign.

Credits for new members and those whose totals have been amended are also shown.

PHONE

VK5MS	317/340	VK5AB	298/314
VK3AHO	312/326	VK4FJ	285/304
VK6RU	311/336	VK4KS	283/298
VK4HR	307/325	VK4TY	275/278
VK2JZ	305/322	VK2APK	272/277
VK6MK	304/323	VK3TL	271/277

New Members:

Cert. No. 96—VK3IP 122/122
Cert. No. 97—VK3SX 129/132

Amendments:

VK3ZE	217/220	VK4PX	201/202
VK4DO	216/228	VK3JW	175/176

C.W.

VK2QL	300/322	VK3YL	270/287
VK3AHQ	292/306	VK3ARX	268/277
VK4FJ	290/314	VK2APK	266/274
VK3CX	289/312	VK6RU	266/289
VK2AGH	282/296	VK3NC	264/277
VK4HR	279/302	VK3XB	264/277

Amendment:

VK4DO 187/204

OPEN

VK4HR	312/336	VK4TY	301/315
VK6RU	312/337	VK4FJ	298/322
VK2AGH	311/331	VK3ARX	290/299
VK2VN	306/323	VK2APK	289/299
VK6MK	305/324	VK3TL	287/293
VK2EO	302/325	VK3XB	286/274

Amendments:

VK4KS	284/303	VK4PX	221/226
VK4DO	236/254	VK3SX	138/141

Correspondence

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers.

A.T.V. LONG-DISTANCE RECORD

Editor "A.R.," Dear Sir,

I wish to apply for the attainment of an Amateur Television long-distance record of 93 miles, established by Ray Foxwell, VK5ZEF/T, and Maitland Lane, VK5AO/T.

The exercise was carried out on 16th February, 1969, between Willunga Hill and South Hummocks. Video with inter carrier sound was successfully transmitted on the 432 Mc. band both ways.

—M. J. Lane.

[This is the first claim to be received for a record involving television transmissions and as such VK5ZEF/T and VK5AO/T are to be congratulated on achieving such a fine performance. The original claim will be kept on file and if sufficient interest is shown and other claims received, then such claims can be included in the VHF/UHF Records Box that appear in "Amateur Radio" from time to time.—D. H. Rankin, VK3QV, Federal Executive, W.I.A.]

FEDERAL AWARDS

CHANGE OF ADDRESS TO WHICH APPLICATIONS FOR AWARDS ARE TO BE SENT

In future all applications for Awards, enquiries, etc., should be addressed to:—

Federal Awards Manager, W.I.A.
P.O. Box 67,
East Melbourne, Vic., 3002.
Australia.

No further applications should be sent to Box 2611W, G.P.O., Melbourne.

"ELECTRONICS AUSTRALIA" AMATEUR BAND NEWS AND NOTES

Amateurs are advised that recently the Australian DX Century Club Award and the Australian VHF Century Club Award have received publicity in "E.A." under the Amateur Band News and Notes section by VK2APQ. The articles appeared in December 1968 p. 156-157 and April 1969 p. 155.

As neither of these articles was authorised by the Federal Awards Manager W.I.A., no responsibility can be taken for the accuracy of the information given. Any inconvenience caused to Amateurs by the publication of incorrect information is regretted and it is hoped that in future no material will be published relating to Federal Awards without the prior approval of the Federal Awards Manager.

—Geoff Wilson, VK3AMK, Manager.

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CHANGE OF ADDRESS

W.I.A. members are requested to promptly notify any change of address to their Divisional Secretary—not direct to "Amateur Radio."

FEDERAL QSL BUREAU

The composition of the team which successfully concluded the recent DX-pedition to Malpelo Island was as follows: Dale W4DQS, Enos W4VPD, Bill HK3RQ, Bob W0DX, Jose HK5BFJ, Gab HK3HY, Carlos HK3VA, Pacho HK3BAS, Carlos HK5EV, Luis HK5ACI, Enrique HK5ASF and Don K6JGS/HK3. The trip was full of incident and the landing extremely difficult. After a lot of urging by Enos W4VPD, it was decided to manhandle the gear up to the plateau, 350 ft. above sealevel. This move paid big dividends and gave HK0TU a clear take off both paths to most areas. Enos is not happy with the attitude of many VK stations who ignored his requests for assistance in contacting VK0WR, then on Heard Island. After giving most VK stations a new country, their reluctance to assist him similarly has left a bitter taste in Enos' mouth.

VK2AGO, H. G. Wilson, of 31 Glenview St., Greenwich, N.S.W., 2065, advises he is the QSL manager for VK9RY. All cards should go direct to above address or via VK2 Bureau.

Alan Brown, VK3CX, kindly supplies details of the ceremony surrounding the closing down of the last Morse circuit in the Victorian Railways on 3rd March last. The circuit was to Mildura.

Don Shaw, VK3PV/VK6PV, of O.T.C. Rockbank, supplies details of the proposed visit to VK towards end of June by Cliff Nelson, W1IDA, of Goreham Maine. Cliff, accompanied by his XYL, will spend his Sabbatical year in Cardiology research at the Royal Melbourne Hospital. He proposes to bring a rig with him if space permits and anticipates seeing as much of VK as he can fit in. He has expressed the wish to meet up with the VK gang. Don expected he would be able to meet the Nelsons on their arrival, but the O.T.C. have now decided to completely close down the Rockbank and Fiskville stations and Don expects he will be transferred away from Victoria. Don states that any invitations and courtesies extended to the Nelsons will be personally appreciated.

Pierre Galtier, REF15906, of Bat X Vieux-Fort 94, Vincennes, France, who I mentioned in this column some months ago, again complains of his inability to secure QSLs from VK stations. As at 1st April, he had received only five replies from 30 reports sent out. Whatever your feelings as regards unsolicited s.w.l. reports, it is discourteous and dishonest to ignore the enclosed I.R.C. If too lousy or lazy to write out a reply card, it is easy to endorse confirmation on the s.w.l. card and return it to sender. According to the complainant, the following VK stations have not replied to his reports with I.R.C. enclosed: 1KB, 2AGP, 2AMD, 3AKA, 3AD, 3OD, 4NN, 4TW, 4KS (2), 5GG, 6RU, 6FZ.

Results of the Danish OZ-CCA Contest for 1968 does not list a single VK station. The 1969 Contest was held on 3rd and 4th May, 1969. Logs should be sent to Contest Committee, P.O. Box 335, Aalborg, Denmark.

Congratulations to Al Manwaring, VK2QK, of Cootamundra, on surviving major abdominal surgery at the Wagga base hospital in early March. As of 19th April, Al advises he is slowly getting into shape again and may resume light work very soon. He also hopes to resume his daily 7 Mc. c.w. sked with VK2YL.

The annual CHC QSO Party is set down for 23z Friday, 6th June, to 06z Monday, 9th June, 1969. Any Amateur may participate. Full details may be had from this Bureau.

Ray Jones, VK3RJ, Manager.

HAMADS

Minimum $1 for forty words.
Extra words, 3 cents each.

HAMADS WILL NOT BE PUBLISHED UNLESS ACCOMPANIED BY REMITTANCE.

Advertisements under this heading will be accepted only from Amateurs and S.w.l's. The Publishers reserve the right to reject any advertising which, in their opinion, is of a commercial nature. Copy must be received at P.O. 36, **East Melbourne, Vic., 3002, by 5th of the month and remittance must accompany the advertisement.**

BENDIX Frequency Meters: BC221 with in-built AC/DC power supply. In original sealed cartons and complete with charts, manual, headphones, cords and spare valves. Limited quantity. $70 cash with order. Advise shipping instructions. G. B. Lance, 123 Webster St., Ballarat, Vic., 3350.

BUY SSB Transceiver. Require commercially made unit similar to Yaesu FT50 or Eico 753. Please state make, model, condition and modifications. Best offer to T. Moore, 23 McGuinness Cr., Lenah Valley, Tas., 7008.

FOR SALE: AR7 Receiver, complete with power supply and speaker, coil boxes B, C, D and expanded E, $60. VK3ABP 6 metre Converter, complete, xtal and power supply, $10. L3324, 19 Princes Highway, Trafalgar, Vic., 3824.

FOR SALE: BC221 Freq. Meter, good condition, reg. pwr. supply, $55. National Comm. Rx NC33, 540 Kc. to 30 Mc., 7 valves, S meter, suit beginner, $45. Heathkit Transistor Radio Navigator, $40. VK5OD, 2 Claring Bould Rd., Christies Beach, S.A.

FOR SALE: Complete Power Supply 2000v. 300 mA. 5v. 13a., —100v. bias. Fully fused and overload protected. Commercially built. Ex FMB 4000 base station. Also spare 2000v. transformer for above. N. Stewart, 131 Bradfield Rd., West Lindfield, N.S.W., 2070. Phone 46-3299.

FOR SALE: FT50 5-band s.s.b. Transceiver and v.f.o., complete, $300. VK3AUN, 171 Cheddar Rd., Keon Park, Vic., 3078. Ring Melb 46-4200 after 6 p.m.

FOR SALE: Galaxy V. Transceiver with power supply and vox, $425. Commercial SWR Bridge, $12. HRO Receiver (9 coil boxes), $40. BC348 Receiver, $40. 2 mx Tunable Converter, $8. MCR1 Receiver, $3. R. N. Ferguson, 23 Floral Ave East, Mildura, Vic., 3500. VK3AGF.

FOR SALE: Harvey-Wells Bandmaster de luxe Type TBS-50D. Covers all bands 3.5 to 144 Mc. with single band change switch and built-in VFO or xtal control. 40 watts input on a.m. phone or c.w. into pi-coupler output. Home-brew regulated power supply for above. Compact black crackle finish cabinet in excellent condx. with original handbook. Suit newly licensed Ham or mobile opr., $125. R. B. Monfries, VK5RB, 975 Main Rd., Modbury, S.A. (phone 64-2317).

FOR SALE: Heathkit SB-101 Transceiver, as new, complete with HP-23E 230-110 volt a.c. power supply and HP-13 12 volt d.c. power supply, $565. C.w. filter, $20. E. Penikis, 8/11 Northbourne Flats, Canberra City, A.C.T., 2601.

FOR SALE: Pye Mk. IV. Carphone, 6BW6 final, relay mute, trans. p.s., complete with xtals and operating 53.032 net, $40. 20 metre full size three element beam, gamma matched, good s.w.r., inspection invited, $40, o.n.o. Mike Trickett, VK3ASQ, 8 Matlock St., Herne Hill, Geelong, Vic., 3218. Phone 71886.

FOR SALE: Receiver Drake 2A with step-down transformer and loudspeaker, $170 or offer. O. Sass, VK2SI, 12 Ruswell Ave., Speers Point, N.S.W., 2284. Tel. 58-1996.

FOR SALE: Yaesu Musen FL200B transmitter, condition as new, with microphone, $295. D. Johns, VK3AZJ, 15 Rowell St., Rosanna, Vic., 3084. Phone (business hours) 62-9336.

FOR SALE: 1 Palec Model VCT-2 Valve Tester with built-in Multimeter, $20. 1 Philips 2 in. CRO Type TA155, needs some attention, $20. Will sell or exchange for 6 or 2 mx transceiver in working order. G. Fella, 8 Hilton St., Glenroy, Vic., 3046. VK3ZZV.

FOR SALE: 70 ft. Telescopic Tower, galvanised, three sections with pipe extension. On rail at Kyabram, $65. VK3AHO, Bill Hempel, 7 James Street, Kyabram, Vic. Tel. Kyabram 522194.

FOR SALE: 109 Tx/Rx 2.5-5 Mc. with a.c. power pack, mike and speaker, $30 or offer. Gilco Type R.P. 12 volt d.c. to 240 volt a.c. Rotary Converter, $20 or offer. C. Richardson, 45 Dimboola Road, Horsham, Vic., 3400.

SELL: 20 mx SSB Transmitter and Receiver, power supplies, complete with spare tubes; best offer. Wanted: FT50 or similar SSB Transceiver in good working condition. Price and particulars to VK3APP, Apprentice Squadron, R.A.A.F., Laverton, Vic., 3027.

WANTED: Collins 51J1-2-3 or 51J4 receiver, 51J2 preferred. Must be clean, electrical condition secondary. Similar style receiver such as Racal considered. Price and details to VK3IB, Box 35, Dimboola, Vic., 3414.

WANTED TO BUY: Shielded Receiver with external antenna connection capable of tuning 1500 Kc. for use with 2 metre converter. Disposals receiver for preference such as Command, BC342 desirable. A.c. power supply essential. Roth Jones, 1 Albert Road, Melbourne, Vic., 3004. Telephone 26-6811.

WANTED TO BUY: Trio JR500SE. Sell Lafayette 230 $60. Knight. Tel. 93-6909 (Melb.).

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Commercial—0.02% $7.25, 0.01% $7.55, plus Sales Tax.
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Whether transmitting or receiving, in most cases an aerial requires a balanced feed with respect to ground, and it is therefore necessary to use a device which converts the unbalanced connection of a co-axial cable to the balanced connection required by an aerial.

This device also prevents the wave which has been contained within the cable from tending to "spillover" the extreme end and travelling back over the outer screen of the cable.

To prevent this, a balance-to unbalance transformer (commonly called a balun) is connected between the feeder cable and the aerial. These take a number of forms, but the following Toroid Baluns are very useful in matching a transmitter to an antenna or an antenna to a receiver and at the same time providing a 1:1 or a 1:4 impedance change. The result of a better signal transmitting or receiving is well worth the modest outlay.

TOROID BALUNS

350A—Impedance ratio 1:1. 75 ohms unbalanced to 75 ohms balanced. 3 to 30 Mc. For use at centre of a dipole antenna with co-axial cable feed line or at base end with 75 ohm twin line. Co-axial connector is Belling & Lee L604/S and lug terminals. $4.70 inc. sales tax.

351A—Impedance ratio 1:4. 75 ohms unbalanced to 300 ohms balanced. 3 to 30 Mc. For use at centre of a folded dipole antenna with co-axial feed line or at base end with 300 ohm twin line connector and terminals as 350A. $4.70 inc. sales tax.

353B—This is a type 350 with a co-axial socket SO239 (Amphenol screw type). $5.40 inc. s.t.

354B—Type 351 with SO239 co axial socket. $5.40 inc. sales tax.

Power Rating: Types A and B 200w. or 400w. p.e.p., provided the s.w.r. is less than 2:1. Balun dimensions: 2 in. diam. x 1 in. plus socket and lugs. Weight: 3¼ or 4 oz.

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ALL-NEW "HAMCAT" (for HF bands):

- **WIDEST BANDWIDTH**
- **HIGHEST POWER HANDLING**
- **LOWEST HEAT DRIFT RATIO AVAILABLE**

The "Hamcat" has a shake proof sleeve clutch that releases a fold-over hinge. The base swivels. This makes it quick and easy to change bands and to fold your antenna to garage it. The highly polished mast is a hefty ⅝ inch diameter solid heat-treated aluminium rod.

We've also done away with the old fashioned plastic shrink tubing and sealed the light-weight precision wound coils in an indestructible epoxy-fibre glass sleeve. All fittings are heavy chrome plated brass.

The new "Hamcat" combines higher "Q" with wider bandwidth performance, without using a lossy heat generating coil typical of all previous Ham mobiles. You get the widest bandwidth coupled with the highest power handling and at the same time get the lowest heat drift ratio available.

Another great and outstanding achievement of the "Hamcat" is that you get a nominal 52 ohm impedance on all bands. This means that you do not have to have any special matching. (Any length of co-ax. will work.)

ELECTRICAL SPECIFICATIONS:
Nominal 52 ohm impedance—no special matching device needed. Widest bandwidth, highest power handling — vs. — heat drift ratio available. Lowest VSWR available. Power rating—will handle any Ham mobile transceiver made without excessive heat or drift.

MECHANICAL SPECIFICATIONS:
Turn-over mast is hefty ⅝ inch diam. solid rod of highly polished heat-treated aluminium. All connections are standard ⅜ x 24 thread. Mast folds over, swivels, and turns over. You can mount it on bumper or deck. In addition, this flexibility makes it easy and simple to change coils. Stainless steel swivel base. Coil and tip rods are a one-piece assembly; one assembly for each band. Coil diameters are constant, only lengths change.

THE "QUICK CHANGERS" COIL AND TIP ROD ASSEMBLIES

Spectacular performance from a team of light-weights! These beautiful, lightweight, precision wound coils are sealed in an indestructible epoxy fibre glass sleeve. It's a distinctive white that teams with the heavy chrome plated brass fittings to accent the beauty of any modern automobile. The new "Hamcat" coil and tip rod assemblies combine higher "Q" with wider bandwidth performance, without using lossy, heat-generating coils that you will find in others. So the "Hamcat" not only has the looks that you are waiting for, it also has the performance that you've been waiting for.

Bumper and body mounts are available for the "Hamcat".

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MW-150 Roof mounting quarter wave (108-470 Mc.).

MAG-150 Magnet mount (108-450 Mc.), comes with 18 ft. of RG-58U and connector).

Other Mobile Whips available on order.

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HH6BK 6 metre Halo, including telescoping mast and stainless steel bumper mount.

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TRIO

SSB transceiver

200 watts PEP–7 Bands–A M & C W and Power Supply and Speaker Unit

PS 500 AC

TS 500

SPECIFICATIONS:

Frequency:

80m Band	3.5-4.0 MHz
40m Band	7.0-7.5 MHz
20m Band	14.0-14.6 MHz
15m Band	21.0-21.6 MHz
10m A Band	28.0-28.6 MHz
10m B Band	28.5-29.1 MHz
10m C Band	29.1-29.7 MHz

Communication Method: SSB (A3j) AM (A 3H) CW (A1)

Maximum Input Power: (Xmitter final stage) 200W (PEP)

Standard Input Power: (Xmitter final stage) 180W (PEP) 120W on 28 MHz band only

Antenna Input Impedance: 50-75 ohm

Carrier Suppression Ratio: More than 40 dB

Single Side Band Ratio: More than 40 dB

Mic. Input Impedance: High impedance (dynamic or crystal mic. recommended)

Xmitter Audio Frequency Characteristics: 300-3,000 Hz (-6 dB)

Receiver Sensitivity: 1uV S/N 10 dB (14 MHz)

Receiver Selectivity: 2.7 kHz (-6 dB) 5.0 kHz (-55 dB)

Spurious Rejection Ratio: More than 45 dB

Image Ratio: More than 60 dB

Undistorted Power Output: More than 1W

Receiver Output Impedance: SP 500 ohm PHONE 8 ohm

Power Consumption (using PS-500AC): 450W (At maximum power output) 250W (Receiving Mode)

Tubes and Transistors used: 17 TUBES, 3 TRANSISTORS, 15 DIODES

Dimensions: W: 13⅛"; H: 8⅞"; D: 11⅞"

Weight: 17.6 lb

FOR/FOA SYDNEY: TS 500, $491.00; PS 500 AC, $98.00

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DM71 indicator tube, **40c ea.** or **6 for $2.**
6F33, **30c** ea.

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STAR ST-700 TRANSMITTER

SSB — AM — CW
80 Metres to 10 Metres

- Ultra-precision three-stage double gear tuning mechanism, completely free of backlash, spreads each 600 Kc. over 1.68 metres with 1 Kc. dial calibrations.
- Stability better than 100 cycles. "Vackar" type VFO. Voltage regulated power supply.
- Uses mechanical filter at 455 Kc. specially designed for SSB. Selectable upper or lower sideband. Carrier and sideband suppression 50 db. or more.
- May be connected with STAR SR-700A receiver for transceive operation.
- Fully adjustable VOX and ANTITRIP circuits for automatic transmission/reception.
- Press-to-talk relay, break-in keying and sidetone oscillator for CW monitoring.
- Automatic level control circuit assures high quality distortion free SSB.
- Built-in antenna relay.
- Final stage uses two 6146s in parallel with conservatively rated input of 250 watts PEP on SSB and CW, 100 watts on AM.
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- Power supply 220 to 240 volts AC 50 cycles.

Price: $519.50

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3000 TYPE RELAYS
large range
Only 50 cents ea.

VACUUM SEALED RELAYS
mainly 24 volts
50 cents ea.

TRANSISTORISED COMPUTER BOARDS
from **$3**

FULL RANGE OF MULTIMETERS

STAR SR-700A RECEIVER

SSB — AM — CW

- Ultra-precision three-stage double gear tuning mechanism, completely free of backlash, spreads each 600 Kc. over 1.68 metres with 1 Kc. dial calibration.
- Stability better than 100 cycles. "Vackar" type VFO. Voltage regulated power supply.
- Triple conversion. IF's 1650 Kc. and 55 Kc. First and third oscillators crystal controlled.
- Imagine ratio better than 60 db. on all bands. Beat interference below noise level.
- Variable selectivity band pass filter at 55 Kc. provides steep cut offs and a good shape factor. Four positions: 0.5, 1.2, 2.5 and 4 Kc. (at 6 db. down).
- T-notch filter provides better than 50 db. attenuation.
- Variable decay AGC. Variable BFO tuning.
- Output terminal on VFO for transceive operation.
- Product detector for SSB/CW. Diode detector for AM.
- Noise limiter with adjustable clipping level operates on AM, SSB and CW.
- Built-in 100 Kc. crystal calibrator (crystal included). Zero adjustment on VFO.
- Sensitivity better than 0.5 uV. for 10 db. S + N ratio on SSB and CW, better than 1 uV. on AM.
- Power output, 1 watt. Impedance, 4 ohms.
- 13 tubes, 6 diodes.

Price: $461.50

MARCONI TF885A VIDEO OSCILLATOR
Price: $120

SANSEI SE405 S.W.R. BRIDGE
1 Mc. to 150 Mc., also doubles as a Field Strength Meter
Price: $21 inc. tax

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The instrument is intended to provide the Service Technician engaged in the installation and maintenance of Communications Equipment with a low cost robust unit which can be used to give clear readings of transmitter output power from as low as 3 mW. to 50 Watts. This covers the modern communications requirements from low power Transceivers to Base Stations in the Mobile Radio Service, as well as Marine and Aircraft Equipment.

The instrument contains a 50 ohm load housed in an all metal case to minimise radiation; power is indicated on a large easy-to-read scale, using a peak reading R.F. Voltmeter to sample the voltage across the load.

The use of a terminating R.F. Power Meter greatly facilitates tuning and adjustment of transmitters on the bench, and permits the technician to rapidly assess performance.

The PM-501/T will find many uses in experimental and production line testing, direct measurement of loss in co-axial cables and high power attenuators, etc.

Specification: Model PM-501/T.
Input Impedance: 50 ohms.
Frequency Range: 2 to 220 Mc.
Accuracy: Within 5% full scale.
V.S.W.R.: Better than 1.5 at 220 Mc.
Dimensions: 9¼" w. x 4" h. x 4" d.

Power Ranges: 0-500 mW.
0-5 Watts.
0-50 Watts.
0-30 watts continuous
30-50 watts intermittent
(60 seconds)
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amateur radio

Vol. 37, No. 7

JULY, 1969

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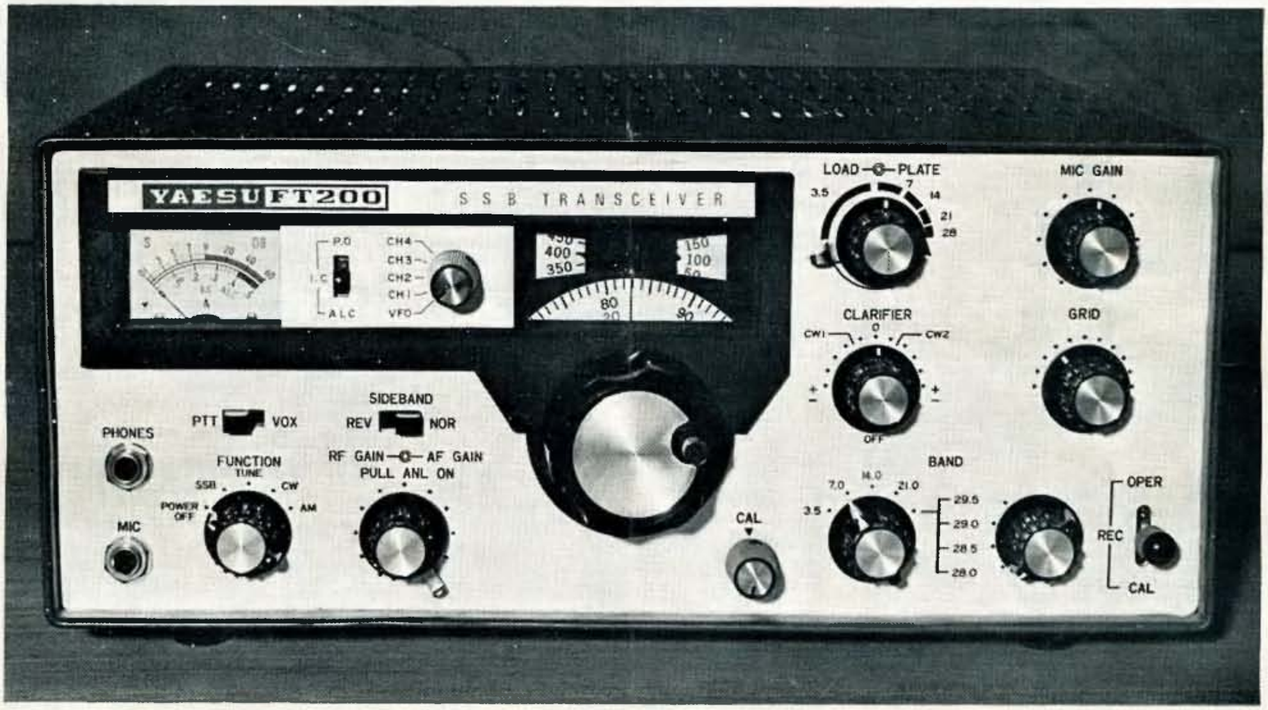

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COVER STORY

Our cover picture this month shows the Yaesu FT-200 s.s.b. transceiver, details of which are presented by Bail Electronic Services on page 5. Technical data is given on page 24.

VHF COMMUNICATIONS

A PUBLICATION FOR THE RADIO AMATEUR
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VHF COMMUNICATIONS, the International Edition, printed in English, of the well established German Publication UKW-BERICHTE, is an Amateur Radio magazine catering especially for the VHF, UHF and Microwave enthusiast.

VHF COMMUNICATIONS will follow the same path as UKW-BERICHTE, by specialising in the publication of exact and extensive assembly instructions for VHF, UHF and Microwave transmitters, receivers, converters, transceivers, antennas, measuring equipment and accessories, which can be easily duplicated. The latest advances in semiconductors, printed circuits and electronic technology are described in great detail. For most articles, all the special components required for the assembly of the described equipment, such as epoxy printed circuit boards, trimmers, coil formers, as well as metal parts and complete kits will be available from the Australasian Representative.

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VHF COMMUNICATIONS is a quarterly, published in February, May, August and November. Each edition contains roughly sixty pages of technical information and articles.

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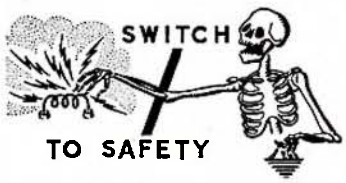

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All equipment I handle, **Yaesu-Musen, Swan, Galaxy,** etc., is fully guaranteed under standard factory warranty conditions for a period of **one full year**. Valves, tubes and transistors are excluded on overseas supplies, except for very obvious cases. I carry a stock of components, including **crystal filters**, that may require replacement, although most sets manufactured these days need little warranty attention.

Sometimes I am asked to supply a set in factory sealed, unopened cartons. I cannot do this as all new supplies from overseas have to be checked for damage upon arrival, need some adjustment and alignment and therefore have to be opened. I could not claim damage sustained in transit from overseas if it is not reported immediately and a buyer would be in extra trouble if he bought a set that was not checked before it was dispatched to him. What I sell has never been sent on a "demo", is all fresh stock and at the prices I sell new arrived stock does not last long, sometimes has to be waited for till new supplies arrive.

How fresh the stock is can be checked from the serial numbers on the sets, provided one knows the factory code! Here is the code for the Yaesu-Musen serial numbers: Serial No. 9031277 means the set was completed in 1969 (the first figure 9), in the month of March (the figure 03), on the 12th of the month (the figures 12), and set number 77 produced of that type during that day. A simple matter, but it tells a tale!

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FT-DX-400 Transceiver $550
FT-DX-100 Transceiver $525
FV-400 External Second VFO $100
FT-200 Transceiver $375
A.C. Power Supply for FT-200 .... $80
FL-DX-2000 Linear $250
FL-DX-400 Transmitter $375
FL-DX-400 Receiver $375
FL-DX-400-SDX Receiver, with 2 and 6 Metre Converter, C.W. and F.M. Filter $475

All Yaesu-Musen sets are inclusive of all the necessary plugs, and the transceivers include a ceramic P.T.T. microphone.

SWAN

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SW500C Transceiver $675
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A.C. Supply-Speaker Unit $100
VOX Unit $30

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BN-86 Balun $20
TH3JR Junior 3 el. Tri-band Beam $110
14AVQ 10 to 40 Metre 4-Band Vertical $45
18AVQ 10 to 80 Metre 5-Band Vertical $75
Hy-Gain 3-Band Cubical Quad $150

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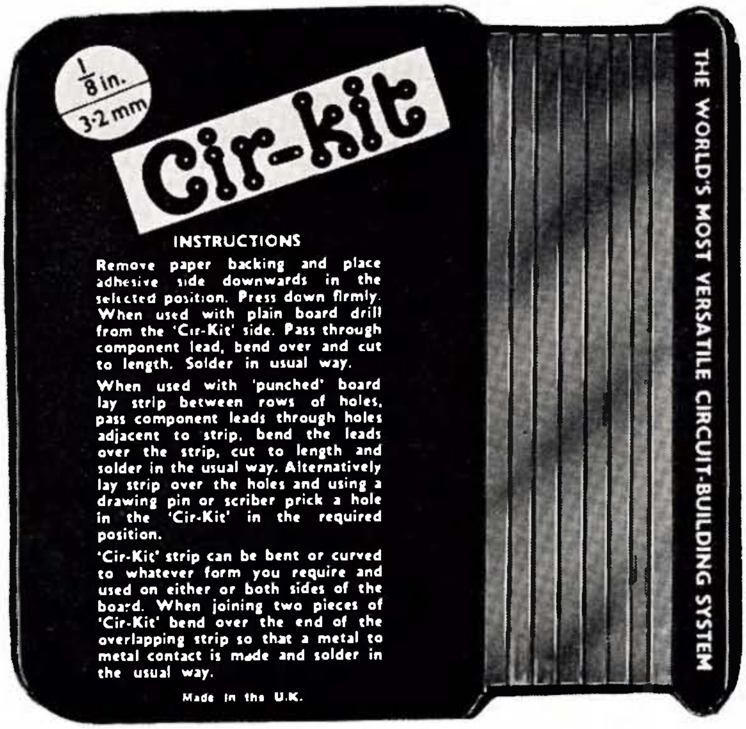

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FEDERAL COMMENT

The 43rd Conference of the New Zealand Association of Radio Transmitters was held this year at Gisborne, over the New Zealand Queen's Birthday week-end, 30th May to 1st June.

The then President of N.Z.A.R.T., Harry Burton, ZL2APC, invited the Federal President of the W.I.A. to attend this Conference at the conclusion of the I.A.R.U. Region III. Congress held in Sydney at Easter 1968. By a decision of the Federal Council at Easter 1969 this invitation was formally accepted, and so it was my privilege to represent the W.I.A. at this Cook Bi-Centenary year Conference.

This "Federal Comment" is being written whilst I am still in New Zealand, and whilst perhaps many of my impressions are still jumbled.

Amongst my outstanding impressions are the warmth and hospitality of the New Zealanders, the fact that 300 people sat down to the Conference Dinner on Saturday night (a dinner which boasted of what must surely have been one of the longest toast lists of any dinner) and that many of those who attended drove for more than eight hours to get there over roads far worse than many in Australia.

I realise now how little I knew about N.Z.A.R.T. It is very different in terms of organisation from the W.I.A.

It is made up of "Branches", 64 in all, each serving a relatively small area. Each Branch may send a delegate to the Conference. Prior to the Conference, the formal motions (remits) are published and considered by the Branch. Then the delegate exercises a vote (either with or without a discretion to use his own judgment) that is proportional to majority for and against the motion at remit night, expressed as a proportion of the total voting membership of the Branch.

For example, if there are 100 members of a Branch, and on "remit night" 25 turn up, and 20 are in favour of a particular motion, the delegate from that Branch exercises 80 votes in favour of the motion—it all seemed a little confusing at first.

Individual members may attend at Conference, speak, and, if they have given prior notice to their Branch delegate, exercise a vote.

N.Z.A.R.T. is governed by a Council between Conferences, consisting of a number of Councillors elected from each Call District. Presided over by the President (who is elected by all the members), the Council meets in person once a year at Conference time. Otherwise its meetings are conducted over the air on 80 metres, on the basis of circulars sent out by the President.

I was invited to attend the Council meeting and was able to discuss with the Councillors a number of matters of a common interest. Agreement has been reached on the mutual exchange of publications. "Break-in" maintains a high standard, and will probably be of interest to many Australians. Soon I expect that an announcement will be made as to how members will be able to obtain their subscription through the W.I.A. In addition, some samples will be distributed for those who have not seen this publication.

So far as Region III. is concerned, I have had some very valuable discussions, both with Tom Clarkson, ZL2AZ, the N.Z.A.R.T. Director, and with Harry Burton, ZL2APC, the Assistant Director. I now understand N.Z. A.R.T. views much better in a number of respects.

I have found that most New Zealand Amateurs know very little about the W.I.A., but are very interested to learn more. Few have seen "A.R."

As a Federal system is so foreign to them, they found our organisation a little hard to understand at first.

High praise was given to W.I.A. Contest Manager, Neil Penfold by a number. Some concern was expressed at the slight delays in some W.I.A. correspondence, though this related not to the present time.

These then are a few of my first impressions. No doubt we in the W.I.A. can continue to live without N.Z.A.R.T., as they can live without us, however there is every reason for our two Societies to work together. The New Zealand influence on the Region III. organisation can be considerable. It is a large Society with sophisticated views. We can learn much from them, and together, within the framework of the I.A.R.U. organisation, we can achieve more than we can alone.

Michael J. Owen, VK3KI,
Federal President, W.I.A.

CONVERTING THE AR88 FOR S.S.B.

G. A. VAN DER HARST, VK5XV*

Many AR88s are still in use by Amateurs and S.w.l's throughout Australia. This is not surprising as it is a first class general coverage receiver. It still does quite a reasonable job for the Amateur as a main receiver too. However, it is a pity that for s.s.b. copy it means manipulating the r.f. gain control and even then there is still some distortion. It must be possible to switch from a.m. to s.s.b. without any re-adjustment of the r.f. gain control. This has been done and although it might take you a few evenings to do it, it is well worth while. So here we go.

The following steps have to be taken:

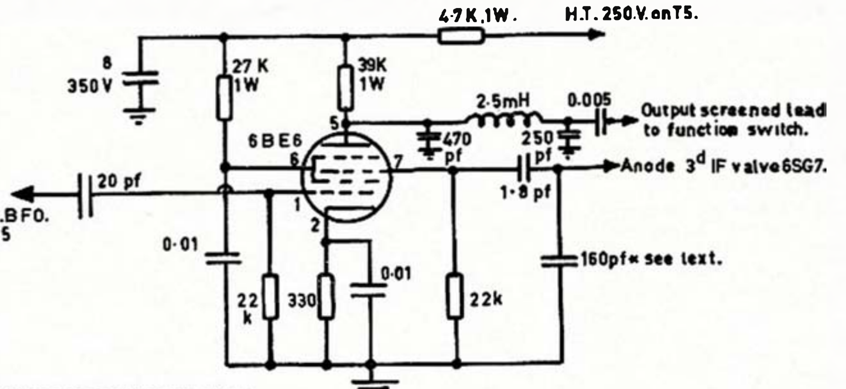
(a) A product detector has to be added.

(b) A different wafer has to be mounted on the "Off-Trans.-Rec. Mod.-Rec. CW" switch.

(c) A 1-pole 2-position switch has to be mounted on the front panel to switch a.g.c. constants (adjustable decay time).

THE PRODUCT DETECTOR

The product detector circuit in Fig. 1 is a conventional one. It is a very easy one to get going, not only in the AR88, but in any receiver. Here is what you have to do.



Values of resistors in ohms.
Values of condensor in uf unless stated.

FIG.1. PRODUCT DETECTOR.

1. Remove the condenser block which consists of C79, C84 and C92, each of 0.1 uF. Replace these with Polyester pigtail type of 0.1 uF., 400v.

2. Drill a hole for the 6BE6 valve base right behind T10 (b.f.o. transformer), this being the spot where the block condenser was in the first place.

Making this hole is not an easy matter. The thing to do is, get a screw punch for a 7-pin valve base. Mark the spot with a punch where the centre is going to be and make a circle with a compass, the diameter being that of the valve base. Drill the centre hole. Then drill smaller holes right around on the inside of the circle diameter. Insert the screw punch and you will find that it will just do the job, making a clean hole.

Just putting the screw punch in without all the holes around the circle will not do it as the chassis steel is quite a heavy gauge.

Drill holes for the mounting screws in such a way that pin 1 will be facing the b.f.o. valve base. Mount valve base.

3. Wire the product detector as per diagram in Fig. 1. H.t. is taken from the mounting lug of T5 (junction h.t. and 1K resistor). Filament is taken from V9.

The value of the condenser marked * has to be adjusted so that switching from a.m. to s.s.b. gives the same output. The value should be close to that given in the circuit diagram.

A few tag-strips were used to mount the associate components. Do not connect the output lead of the product detector yet.

THE WAFER

A different wafer has to be mounted on the function switch as the present one has not enough contacts. The wafer used is a three-pole, four-position wafer which has two poles on one side and one pole on the other side. This may be a bit hard to get, but no difficulty was found after searching a bit in surplus stores.

The contacts on the back of the receiver (term. 3 and 4) for relay switching purposes are made inoperative in this case. However, if you can find a single wafer with four poles four positions, you can leave them on.

The following has to be done:

1. Remove the function switch and unsolder the leads, but remember where they are going to. This is easy as all leads have a different colour.

2. Cut the two green leads which go to term. 3 and 4 on the back of the receiver at the switch end. Put some insulating tape on them and tuck them away under the loom.

3. Dismantle the function switch. Remove the wafer. Transfer the spacers so that the longer ones are in front and the shorter ones are at the back of the new wafer. Mount the wafer so that the two poles are at the back and the remaining pole on the front.

4. Remove the lead of the condenser which goes to the centre contact of the a.f. gain control and solder this to a one-lug tag-strip which can be mounted near the a.f. gain control. Then solder a shielded wire from that tag-strip to the new wafer.

Now solder the rest of the leads as per diagram in Fig. 2, including the shielded wires from the output of the product detector and the one going to the a.f. gain control.

5. Mount the function switch back in position.

THE A.G.C. SWITCH

Having gone this far, one will find that s.s.b. copy is excellent except that on very strong signals the a.g.c. is "pumping" quite a bit due to the relative fast decay time. This can be cleared up by making the decay time adjustable, i.e. by adding a 1 uF. condenser to the a.g.c. line. Proceed as follows:

1. Drill a 3/8 inch hole in the front panel, straight above the selectivity switch and at the same height as the b.f.o. adj. knob.

2. Insert a one-pole, two-position switch.

(Continued on Page 24)

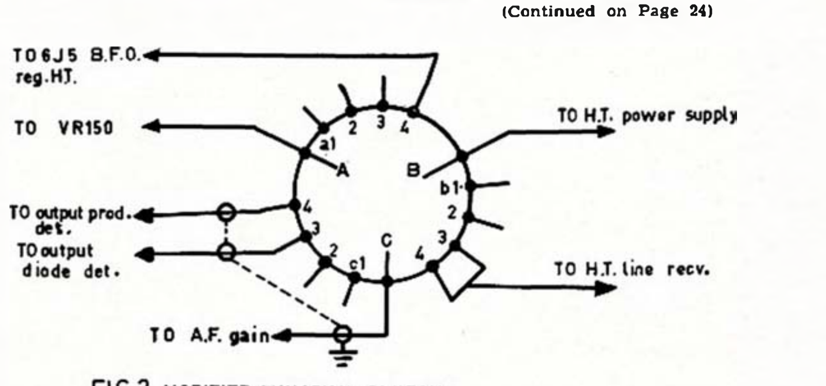


FIG.2. MODIFIED FUNCTION SWITCH.

* 21 Dudley Crescent, Marino, S.A., 5049.

*Making Cabinets for Home-Built Gear**

PRACTICAL METAL-WORK FOR THE CONSTRUCTOR—FABRICATION, FINISH AND SPRAY-PAINTING FOR THAT PROFESSIONAL APPEARANCE

J. E. AUSTIN, G3REM

MANY Amateurs spend a great deal of time on the chassis layout and wiring of their home-built equipment, but are rather stuck when it comes to finding a suitable cabinet into which the completed unit can be fitted. In some cases the unit remains as an open chassis, and in others a surplus cabinet is purchased. An open chassis is unsightly, can be dangerous and is an efficient collector of dust. Finding a surplus cabinet of the correct dimensions is not always easy and all too often one ends up with something which is larger than necessary, displays unwanted holes and possibly some damage.

The writer has a professional interest in sheet metal work and feels he could suggest an improvement in the **outside** appearance of home-built gear. The ever-present problem of t.v.i. anyway demands adequate screening of transmitting equipment and a snugly fitting cabinet can be a great help in this respect. The cabinet described was made at home and houses a 2/TT21 linear amplifier.

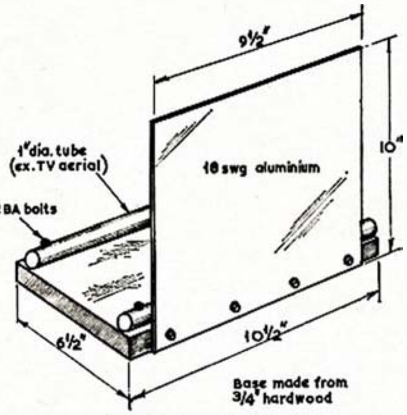


Fig. 1.—Bending jig.

Tools used are unsophisticated but good results can be obtained. In order to save the reader a lot of reading and the writer a lot of writing, the accompanying drawings are self-explanatory as far as possible.

For hand working, the most convenient gauge of aluminium sheet is 18 gauge, and this is used for the cabinet sides and bottom cover. The lid and front and rear panels are made from 16 gauge, cut with a metal cutting blade similar to the well known "key hole" saw. The appearance of any station can be greatly enhanced if all the cabinets are matched and in the present example that of the Sphinx Tx was adopted.

A start was made by constructing a simple jig on which to shape the two side panels (see Fig. 1). The base board was cut, planed and squared to the exact height of the panels and some 2 in. longer. The one-inch tube was then bolted on level with the edge of the board, with one bolt at each end. Next, cut the aluminium sheet to the exact length required but allow about 3 inches in the height for primary fixing and bending losses. Drill the sheet near the edge and screw to the jig, as shown. Now pull the sheet down over the first form and secure in a carpenter's vice, clamping it down on top of the tubes. Next, pull the sheet round the second form. Make the other side panel in the same way, then trim off the drilled edges (Any "spring back" effect can be corrected after removal from the jig.)

Eight angle pieces are required next and these were made in a folding iron designed by the writer and made by the local blacksmith (see Fig. 2). Use 16 gauge aluminium sheet and bend over with a piece of smooth hardwood, tapping with a heavy hammer.

The front and rear side pieces can now be rounded at the ends to fit inside the side panels (see Fig. 3). As the front panel is to be set back 3/8 in. the front angle pieces must go in by that amount **plus** the thickness of the front panel, say a total of 7/16 in. The rear side angle pieces are set in by the thickness of the rear panel so it fits flush to the rear edge of the cabinet. Use a scrap piece of 16 gauge as a gauge.

Where the fitting of any part is known to be permanent, it is good practice to use rivets. They are quick, neat and easier than small nuts and bolts. Countersunk 1/8 in. ali. rivets are used to secure the angle pieces to the side panels. Where quick access may be required anchor nuts are rivetted in to save fiddling with small nuts and bolts in odd corners (we've all had some of that!). Anchor nuts are fitted to the angle pieces for later assembly work. The other four angle pieces can now be trimmed to size and the anchor nuts fitted as shown (see Fig. 4).

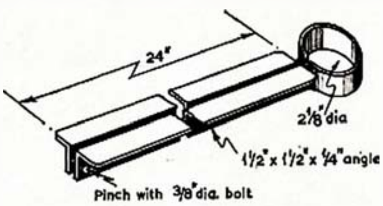


Fig. 2.—Bending irons.

Strips of 16 gauge are next rivetted on to the bottom edges of the side panels to take the bottom cover. The cabinet can now be assembled and squared up, using short screws where the feet are to be put on later (see Fig. 5). Now cut out the front and rear panels and file to a good fit for the cabinet.

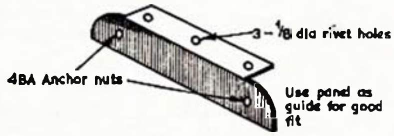


Fig. 3.—Side angle pieces—four off.

After drilling, the panels can be worked into place, using chromed mushroom head screws on the front panel and round head on the back. The lid also is cut from 16 gauge ali. and dimensioned to cover cabinet assembly screws on the top. Rivet a strip of 18 gauge to the front to complete the "frame" to the side panels (see Fig. 6). Holes for vent grilles can be punched out if required. Slot in a length of piano hinge as shown and fit the lid into place, using countersunk BA screws. A strip of 16 gauge goes over the rear web of the hinge to level it with the lid. Mark the position of the lid fixing screw and drill the hole for it; the screw can be made captive by tapping the hole 4BA and then filing off a few threads below the head of the screw.

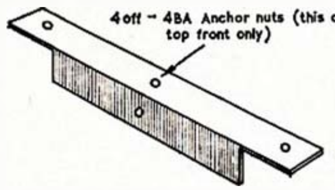


Fig. 4.—Top and bottom angle pieces—four off.

The bottom cover is cut from 18 gauge and held in place by small self-tapping screws. Vent grilles can also be pierced in the bottom if necessary. The feet are made from brass bar and rubber buffers, secured by long 4BA screws into the corner anchor nuts.

The cabinet is now complete and if any service work is necessary at a later date a side panel can be removed very quickly. In fact, the whole cabinet can be dismantled in a matter of minutes.

* Reprinted from "The Short Wave Magazine," March, 1969.

Anchor nuts can be purchased at good D-I-Y shops and they are rivetted into place like countersunk rivets. (An old ball bearing is very useful for starting off the rivetting action.) If the side of a hole breaks away when fitting an anchor nut, make a new angle piece twice the required width and trim off surplus metal after the nut is in place. Piano hinge can also be purchased at D-I-Y shops, in standard lengths and several different finishes, including chrome.

The completed cabinet can be spray-painted to match the colour of other units in the shack. Small pressure cans of quick drying paint are ideal for this purpose. A surprisingly good finish can be obtained.

PAINTING THE WORK

There is no doubt that a nicely painted item of equipment looks vastly superior to one which is left unpainted. Since the advent of the pressurised can a whole new vista of possibilities has presented itself to the home constructor. Though these pressurised cans of paint or cellulose can give a finish of professional standards, some practice is necessary. It may not be generally understood that the quality of any paint finish is determined by the efficiency of the preparation work rather than by the application of the final colours, as any competent home decorator knows!

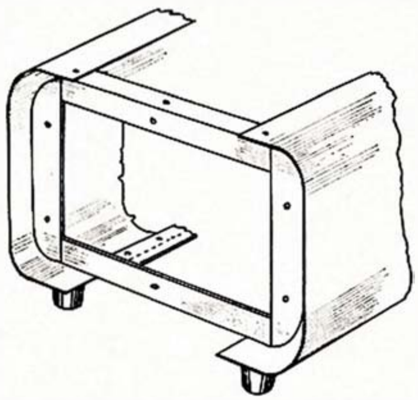


Fig. 5.—Diagram showing angle pieces in position and feet.

Cellulose and other quick drying materials tend to settle for some time after application, thus any mark in the metal or undercoats will show through the final colour. For this reason, the surface to be painted should be free from marks, scratches, etc., before the final colour coats are applied.

Choice of colour can be determined by that of the central item of equipment in the shack, such as the Rx or Tx. The appearance of the station will be much enhanced if the gear is all matched in colour.

The range of colours on sale for touching up work on cars is very wide and one can be sure of obtaining a repeat at a later date. As there is a tendency for a general range of colours to appear in cycles, it should be possible to obtain a close match to the desired pattern colour.

Aluminium is the most widely used material for radio constructional work and also presents special problems with regard to a paint finish. Aluminium oxidises very rapidly and it is for this reason that paint does not adhere too well.

Special primers are made for aluminium and these are known as "etching primers". As the name implies, this type of primer tends to eat into the metal, thus getting through the surface oxides and adhering more firmly. The writer has not up to now found any etching primer for aluminium available in the popular cans, but is ever hopeful. In the meantime, the method outlined below has been adopted.

PREPARATION

Prepare the surface by rubbing over with fine steel-wool until the top shine has been removed—get down to the "dull". Now clean off any dust and blow out the odd corners, finally treating with a de-greasing agent if necessary.

Next, spray on a thin coat of **metal** primer or primer/filler and allow to dry thoroughly. When dry, spray on at least three further coats. If rivet or screw heads are present give each one a separate local coat of paint before spraying the complete surface, and do the same to sharp edges. (This is to reinforce the paint thickness against later rubbing down operations, as these points will be sensitive to rubbing paper.)

The paint should now be left to dry and harden right off, preferably overnight. When hard, rub lightly with fine "wet or dry" rubbing paper, using plenty of water. The idea is to level off any surface dust or pigment. Take care not to break through the paint surface at any point, or the colour may sag or run later on. If the aluminium was unmarked at the start of the job it should now look smooth and level.

RUBBING OUT SCRATCHES

However, if there were some scratches in the metal proceed as follows:

Before rubbing, spray on a dust coat of contrasting colour, say, black on grey primer. The primer should just be speckled in black and not covered completely. The black will fall into any scratch marks and these will show up as rubbing proceeds. Rub until all the black guide coat has gone from view, proving that the surface is now level. Do not rub a scratch mark **locally**, but over the general area surrounding, otherwise a depression larger than the scratch will result! Deep scratches will require filling with knifing stopper, which must be left overnight to harden. To level the stopper, dust with black, then wrap a piece of rubbing paper round a flat wood block and rub until level. Spray two coats of filler over any stopper to seal it. When dry, rub lightly to remove spraying dust around the area. Use a black guide coat if necessary.

Having made sure the undercoats are hard, clean and free from dust, prepare to spray the final colours. Choose a warm, dry location which is free from draughts and lightly sprinkle water over the floor (if it is likely to be dusty).

Spray on three or four coats of colour, reinforcing over screw heads and edges as before. When dry and hard (overnight), inspect for quality of finish. If the colour is smooth and shiny it may now be cut down to a fine finish with metal polish and then wax polished.

FINISHING

If, however, the well known "orange peel" effect is in evidence, take a piece of very fine rubbing paper (500-grade or finer) then fold in half and rub against itself to dull the sharpest grits. Wet the paper, then rub soap into it to prevent clogging as rubbing proceeds. Rinse and re-soap frequently, rubbing until the colour has a matt appearance all over. The shiny colour will act as a guide against the matt rubbed sections. When clean and dry, spray on a final coat of colour. After cutting down with metal polish and waxing, the finish should be of a high standard.

Wax polish is chosen because some types of liquid polish contain silicones and these would react unfavourably with the paint during any later touching-up operations. The writer is also of the opinion that good wax polish produces a superior, lasting finish to that produced by the so-called "quick," "all in one," "shines itself" type of polish.

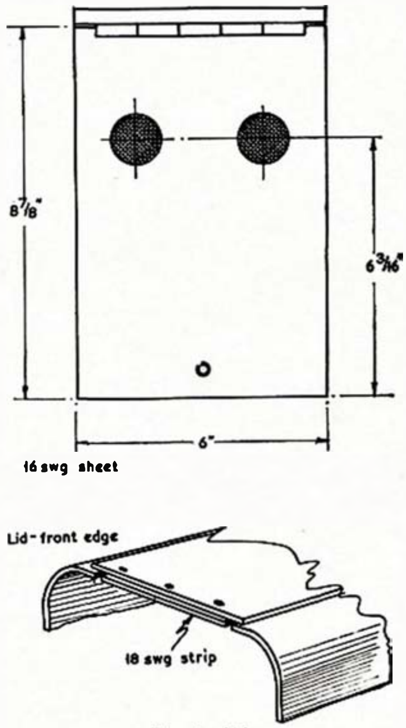


Fig. 6.—Lid.

NOTES ON PAINT SPRAYING

Colours are usually given a name and a reference number, which is printed on the can. They are obtainable from any good garage or service station.

The thickness of the material may vary from can to can and it is advisable to spray a test piece with each can before use to see how it goes. If the paint is thin, spray on one or two extra coats. Thicker paints should be sprayed on as wet as possible and then be left to settle for **up to two days.**

(Continued on Page 11)

VK3 V.H.F. GROUP V.H.F. PRE-AMPLIFIER

BY THE PROJECT COMMITTEE OF THE VK3 V.H.F. GROUP

In keeping with the function of the Project Committee of the VK3 V.h.f. Group, that is to develop "state of the art" projects for v.h.f. enthusiasts, a v.h.f. pre-amplifier has been developed. The pre-amplifier is suitable for use on either six or two metres.

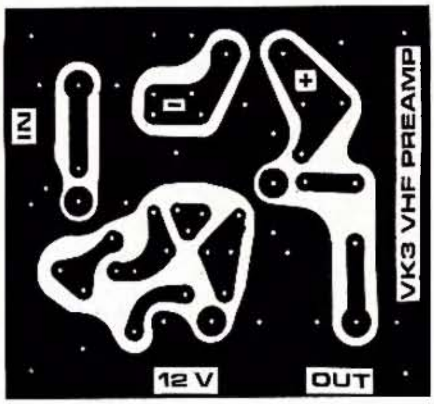
The design objectives for the pre-amplifier were:

(a) Best noise figure possible consistent with reasonable cost.

(b) Sufficient gain so that system noise figure is determined solely by the pre-amplifier.

DESIGN CONSIDERATIONS

Minimum noise figure dictates the use of bipolar transistors or field effect transistors (FETs) in the v.h.f. range. There is little to choose between FETs and bipolar transistors on the basis of noise figure, however other factors make FETs the logical choice. Low cross-modulation, lower susceptibility to "r.f.-burnout" and low cost are three of these factors.



In general, while the lowest possible noise figure is desirable at v.h.f., there is a limit to the minimum useful noise figure. In addition to noise due to thermal agitation in the radiation resistance of the antenna and the input stage of the receiver, external noise is received by the antenna.

At v.h.f. external noise is made up of man-made electrical noise, atmospheric noise and cosmic noise. In quiet locations cosmic noise is the limiting factor. As the noise figure is lowered, noise introduced by the receiver becomes insignificant in relation to external noise, and further reducing the noise figure brings no real benefit. This minimum noise figure is 6-8 db. at 52 Mc. and 2-2.5 db. at 144 Mc.[1] An important exception occurs in the case of an exceptionally long or lossy transmission line between antenna and receiver in which case even the best "low noise" converter will be internal noise limited. Under these conditions only a mast-head pre-amplifier will ensure that reception is limited by external noise. More comprehensive discussions of noise may be found in References 2 and 3.

DESCRIPTION

The pre-amplifier uses an MPF106/2N5485 or MPF107/2N5486 JFET (Motorola) in neutralised common source configuration. Neutralisation is accomplished by adjustment of L2, which resonates with the drain to gate feedback capacitance to form a high impedance parallel tuned circuit at the operating frequency.

A supply of 6-15 volts is required. The design voltage is 12 volts, at which it draws approximately 4 mA. Positive and negative supply rails are d.c. isolated from earth, allowing operation with either polarity earth. The input and output impedances are 50 ohms although the mismatch of a 70 ohm termination is negligible. The pre-amplifier may be left on during transmission periods. This will prevent changes in junction temperature detuning the pre-amplifier at switch-on.

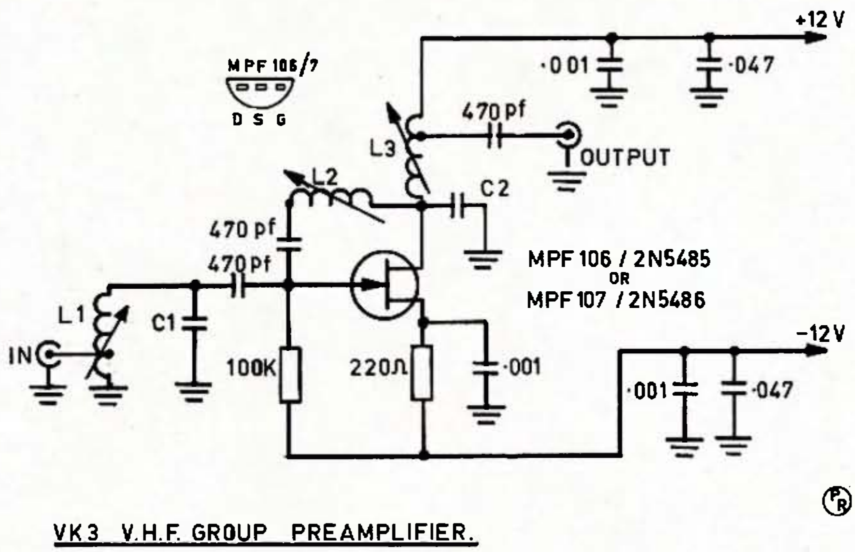
The pre-amplifier is constructed on a small (2" x 2¼") glass epoxy board. All capacitances below 1000 pF. are NPO disc ceramics. Above 1000 pF., Hi-K disc ceramics are used. Resistors up to ½ watt rating are suitable.

even the best valve type front ends, and most transistor and FET converters. In addition, the pre-amplifier may be employed to increase overall gain to a satisfactory level.

A great improvement will result when the pre-amplifier is used ahead of the front-end of "carphones".[4] Most "carphones" use a 6AK5 r.f. amplifier. The best noise figure that can be expected of this tube on 2 metres is 8 db., but a more likely figure is 11 db.[1] The improvement at 6 metres is less pronounced but nevertheless worthwhile.

A word of warning is necessary in connection with "carphones". Some "carphones" do not use an antenna change-over relay. Unless a change-over relay is installed the pre-amplifier will be damaged by excessive r.f. voltage. Installation of a change-over relay in these cases is recommended.

Similarly the change-over relays used in a few higher power "carphones"—mainly to 25w. 3/20 type—have inadequate isolation between contacts. Damage may be prevented by connection of back-to-back diodes from input socket to earth, on the copper side of



VK3 V.H.F. GROUP PREAMPLIFIER.

The coil formers used are Neosid Type A (single assembly) with F29 (v.h.f.) slugs. The bases usually provided have not been used, so as to maintain high unloaded tuned circuit Q. Instead, the boards are drilled 7/32" and the formers glued in. Coil details are given elsewhere.

PERFORMANCE

Noise figures better than 2 db. have been obtained on both 2 and 6 metres. Gain on two metres of typically 18 to 22 db. and slightly more on six metres.

APPLICATIONS

Use of the pre-amplifier will result in an improvement in noise figure over

the printed circuit board. Almost any small signal diode, such as the OA95, will be adequate. This addition results in only a slight decrease in performance.

CONSTRUCTION

The Neosid coil formers should be mounted first. File off the locating lands and glue the formers in place, making sure that the slugs will line up with the position of the cans. When the glue has hardened, the coils may be wound and the cans soldered in place, after which the remaining components may be mounted.

Ensure that all earth connections to the board are removed prior to soldering in the FET. Although no special handling precautions are necessary, for best performances the FET should be pressed down to within 1/8" of the board. For soldering, a Scope soldering iron with clean pointed instrument tip is suitable.

COIL DETAILS

Two Metres

C1—3.3 pF.

C2—3.3 pF.

L1 (input coil)—22 gauge s.w.g. tinned copper wire, 5¼ turns tapped ¾ turn from cold end (cold end of coil being closest to board). Turns are spread slightly.

L2 (neutralising coil)—30 gauge B. & S. enamelled copper wire, 15 turns close wound.

L3 (output coil)—22 gauge s.w.g. tinned copper wire, 5½ turns tapped 1¾ turns from cold end (cold end of coil being closest to board). Turns are spread slightly.

Six Metres

C1—10 pF.

C2—10 pF.

L1 (input coil)—26 gauge B. & S. enamelled copper wire, 10 turns tapped 2¾ turns from cold end (cold end of coil being closest to board). Turns are spread slightly.

L2 (neutralising coil)—30 gauge B. & S. enamelled copper wire, 38 turns single layer, close wound.

L3 (output coil)—26 gauge B. & S. enamelled copper wire, 11½ turns tapped 3 turns from cold end (cold end of coil being closest to board). Turns are spread slightly.

ALIGNMENT

With the pre-amplifier mounted in its final position, connect the supply voltage. Peak L1 and L3 for maximum gain (or in a "carphone" maximum limiter current on a weak signal), adjusting the neutralising coil (L2) where necessary to restore stability.

A number of kits will be made available by the Disposals Committee of the W.I.A., Vic. Div. Only one type of kit will be assembled, each kit containing two superfluous capacitors for the band not required. Kits will include all components—board, resistors, capacitors, FET, wire, sockets, etc. The cost will be $5.40 including postage.

Enquiries should be addressed to:
"V.H.F. Pre-amp.,"
W.I.A., Vic. Div.,
P.O. Box 36,
East Melbourne, Vic., 3002.

REFERENCES

(1) Orr and Johnston: "V.H.F. Handbook."
(2) "The Real Meaning of Noise Figure," Kennedy. "Ham Radio," March 1969.
(3) "VK3 V.H.F. Group Two Metre Converter," "Amateur Radio," February 1969.
(4) Goodman: "Improved F.M. Operation," "Amateur Radio," April 1969.

SUBSCRIPTIONS DUE

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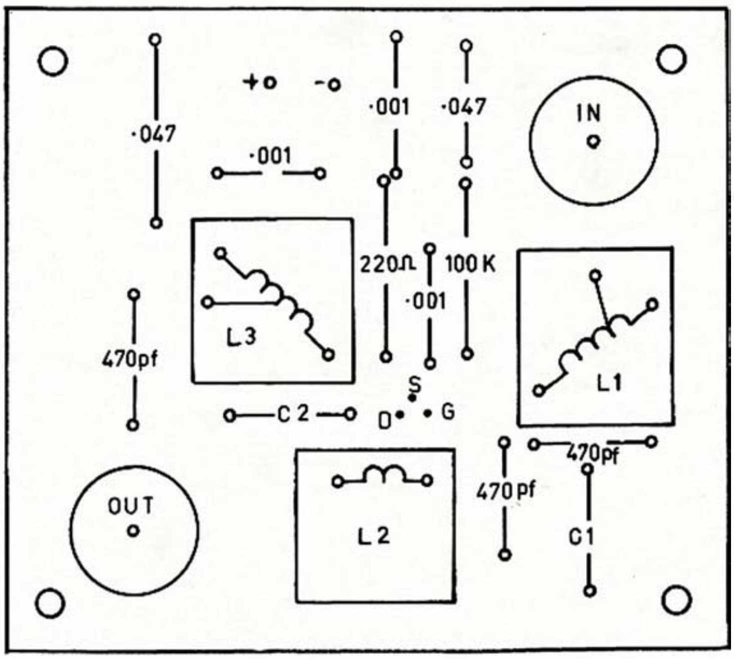

LAYOUT OF V.K.3 V.H.F. GROUP PREAMPLIFIER.

MAKING CABINETS

(Continued from Page 9)

Some paints will continue to settle for a week or two and the longer it is left before cutting down and polishing, the better the finish.

Do not spray in a cold, damp or humid atmosphere or the paint may "bloom". This effect is caused by absorption of moisture and black, for instance, will exhibit patches of whitish hue. (The only cure is to rub with fine paper and soap and spray over again!)

Where two colours are to be sprayed on to one panel, spray the lightest colour first. When dry and hard, mask carefully with sticky tape and brown paper, then spray on the other colour.

Inside surfaces should always be sprayed first and then masked up with paper. Stick tape on the inside of any screw holes before spraying the outside.

Where a co-ax. socket is to be fitted later, use an old socket as a mask, to leave a clean metal area of the correct shape on which to bond the final socket. Run a sharp knife carefully round the edge of the masking socket before removal. This will prevent peeling of the paint if it has bonded to the socket. Other fittings can be allowed for in the same way.

Small areas of knifing stopper will need rubbing level with 240-grade paper and a rusty steel chassis with 100-grade. Both are used with water.

Reds and maroons are difficult to get "solid" as they tend to be transparent, resulting in a streaky appearance. This can be overcome by giving the job a coat of black first.

Use light colours on battered items, because dents, etc., will show up less than if dark colours are used.

When spraying in a damaged patch, rub around the area for a few inches with fine paper, to bring the surrounding area of good paint to a matt finish. Bare metal should be primed and this can be done with a small pencil brush if the area is not great. Knifing stopper should be used if necessary to build up the paint level. Rub the stopper as before and seal with primer/filler. When dry, apply the guiding dust coat, then rub until smooth and clean, taking care to remove any dry spray dust around the area.

The surrounding colour should now have a matt finish, into the centre of which is merged the built-up area. When clean and dry spray in the colour. Give three coats, starting on the primer and moving outwards with each successive coat until the edge of the matt area is reached.

When dry and hard, cut down with metal polish until the new colour merges with the old. (If the new colour is a good match it will be difficult to detect the previously damaged area.)

Finally, remember that care and patience are necessary. Do not hurry the job. Allow plenty of drying time for each stage and do not be tempted into doing the lot in one fell swoop. The quality of finish obtainable is well worth any effort put into it.

FINDING TRUE RECEIVER SENSITIVITY*

The rated receiver sensitivity may be drastically changed when the receiver is used in an actual installation. How to determine the extent of this change by using a few simple charts is detailed in this article. Also, the area of how a preamplifier can improve receiver performance is explored in terms of preamplifier placement and required performance. If a receiving set-up is desired that will really be able to detect the "weak ones," the basics presented will tell you how to go about developing it.

JOHN J. SCHULTZ, W2EEY/1

If a transmitter has an output of 100 watts and is used with a matched transmission line having a 3 db. loss on a certain band, the power output at the termination of the transmission line will be 50 watts. The calculation is extremely simple using a power db. graph. If more power into the antenna is desired, one can either raise the transmitter output power or reduce the transmission line attenuation.

But, what about the receiving situation? How much is receiving sensitivity affected by the transmission line and other losses? Of what value might a preamplifier be and where should it be placed? These questions can all be answered once an analysis is made of a given receiving set-up. By a few simple calculations and using some of the original charts developed for this article, one can determine which is the best and least expensive method to improve the receiving side of a station set-up.

The material presented is applicable to all bands from 160 metres through u.h.f. Naturally, the reader has to use some judgment in determining how sensitive a receiving capability on a given band is useful. For instance, an ultra-sensitive capability on 160 metres may prove of little value since atmospheric noise will mask weak signals anyway. On u.h.f., on the other hand, increased sensitivity will often result in a direct increase in receiving range. Perhaps the best criteria to use in judging how far one can go in improving receiving sensitivity is to compare the set-up with the best that can be found in a given locality and under generally similar antenna locations.

NOISE FIGURE AND SENSIVITITY

The terms **sensitivity** and **noise figure** are used constantly in the article. One should have a good understanding of their meaning. Sensitivity is a combined measurement of the noise quality and amplification of a receiver. A stated sensitivity **only** has meaning when **both** the output signal-to-noise ratio and bandwidth are stated. Noise figure is purely a measure of the noise producing quality of an amplifier as compared to a theoretically noiseless unit.

Most good quality commercial receivers clearly state the conditions under which the sensitivity is measured. Some lower priced equipments simply state "sensitivity of 2 microvolts". Such information is useless and one must try to learn from the manufacturer the rest of the details under which the sensitivity was measured before judging how the receiver can best be improved.

By means of examples, the following paragraphs show how various receiving set-ups can be analysed. The method used is applicable, however, to any situation with different values of receiver sensitivity, losses, etc.

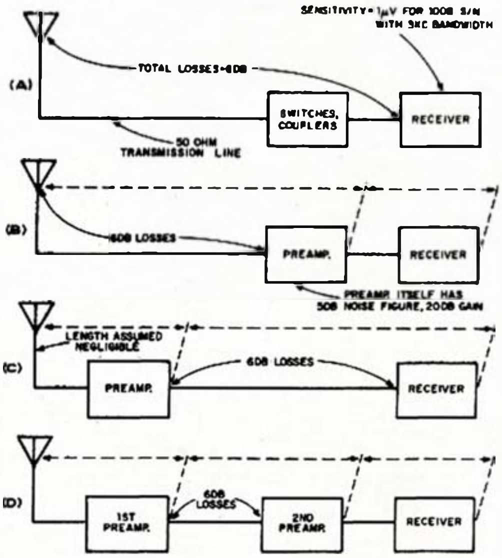

Fig. 1.—Various placements of preamplifiers discussed in the text.

BASIC RECEIVER SET-UP

Fig. 1A is typical of the usual receiver or transceiver installation. The receiver sensitivity shown is typical for many commercially available units.

The first step in evaluating the **total** receiving system sensitivity is to sum all the line losses between the receiver and the antenna. This includes the normal transmission line loss for a given length of cable on a specific band as well as the connector, send-receive switch, other switches and measuring and filtering device losses. There is also an additional loss if the transmission line is not operating at unity s.w.r. (which will be the same under receiving conditions if the receiver has a 50 ohm input). This additional loss can be determined from the graph of Fig. 2 and should be added to the db. sum of all the other losses.

The second step is to convert the receiver sensitivity to unity signal-to-noise ratio output and also to express the sensitivity in dbm. This is necessary because receiver sensitivities are expressed by manufacturers for a multitude of signal-to-noise ratios and the only way to compare them is to reduce or convert them to a common base.

From Fig. 3, for the receiver sensitivity shown in Fig. 1A, it is seen that the 1 microvolt sensitivity is equal to —107 dbm. Since this sensitivity is for a 10 db. signal-to-noise ratio output, it must be improved to 10 db. less or —117 dbm. for unity signal-to-noise ratio sensitivity. The direct reduction in sensitivity with decrease in signal-to-noise ratio is possible because a receiver is a linear amplifying device. If the receiver sensitivity were stated for 15 db. signal-to-noise ratio, for instance, —15 db. would be added to the value determined from Fig. 3. From Fig. 4, then, using the bandwidth stated in Fig. 1A for the receiver sensitivity value, one can draw a line between 3 Kc. on the left scale and —117 dbm. on the centre scale to find the noise figure at 21 db. Such a value is fairly typical of medium grade receivers but not really obvious from just the sensitivity figure.

To determine the effect of the cable losses, one has only to degrade the sensitivity and noise factor figures by the appropriate db. value. The sensitivity at the antenna terminals is then —111 dbm. for unity signal-to-noise ratio and the corresponding noise factor is 27 db. One can use the charts

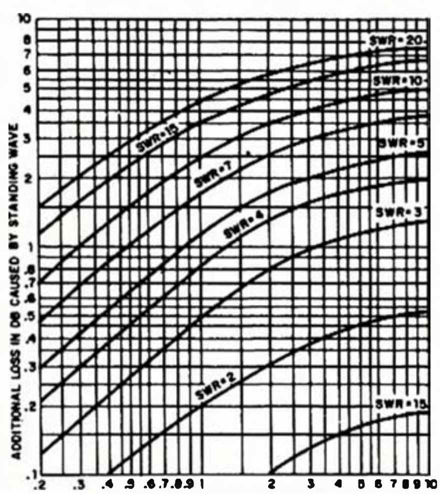

Fig. 2.—Additional transmission line loss introduced by various standing wave ratios. This additional loss in db. must be added to the sum of all other line losses in db.

* Reprinted from "CQ," November 1968.

"backwards" to convert the sensitivity into whatever form of expression is desired. For instance, for a 10 db. signal-to-noise ratio, 10 db. is added to the sensitivity (producing —101 dbm.) and from Fig. 3 this is found to be 2 microvolts. Thus, two times the voltage is required at the antenna to produce the equivalent of a 10 db. signal-to-noise ratio at the receiver. In this simple case, this factor should be obvious from the transmission line loss since a 6 db. drop will produce half the terminal voltage.

PREAMPLIFIER AT RECEIVER

One idea that may come to mind to correct the relatively poor receiving situation shown in Fig. 1A is the use of a preamplifier at the receiver as shown in Fig. 1B. A fairly good preamplifier, at least for the high frequency bands, having a noise figure of 5 db. and gain of 20 db. is used. No change is made in the transmission line between the preamplifier and the antenna, and the transmission line between the preamplifier and receiver is assumed to be of negligible length and loss.

Microvolts	dbm.
0.1	—127.0
0.2	—121.0
0.3	—117.5
0.4	—115.0
0.5	—113.0
0.6	—111.5
0.8	—109.0
1.0	—107.0
2.0	—101.0
3.0	—97.5
4.0	—95.0
5.0	—93.0
6.0	—91.5
7.0	—90.0
8.0	—89.0
9.0	—88.0
10.0	—87.0

Fig. 3.—Microvolt to dbm. conversion scale for a nominal 50 ohm receiving system.

Calculating the overall receiver system sensitivity is done by first regarding the portion from the preamplifier back to the antenna the same as the situation shown in Fig. 1A. Thus, the preamplifier noise figure is raised by the line loss to 11 db. and its gain reduced by the line loss to 14 db. The noise figure of the original receiver (21 db.) remains unchanged. The total noise figure is found from the following formula which relates the individual noise figures of several successive units to an overall figure:

$$NF_{TOTAL}\ (db.) = 10 \log \left(NF_1 + \frac{NF_2 - 1}{G_1} + \frac{NF_3 - 1}{G_1 G_2}\right)$$

Since only two stages are involved in this case, the part of the expression, $NF_3 - 1/G_1G_2$. drops out and the resultant expression is:

$$NF_{TOTAL}\ (db.)$$
$$= 10 \log \left(11\ db. + \frac{21\ db. - 1}{14\ db.}\right)$$
$$= 10 \log \left(12.5 + \frac{130 - 1}{25}\right)$$
$$= 12.5\ db.$$

The formula is simple to use as long as one remembers to convert the db. values for NF_1, NF_2 and G_1 into numerical ratios, using a simple power db. scale, before inserting these values into the formula.

The resultant noise figure (12.5 db.) is a considerable improvement although it does not equal the 5 db. which the preamplifier alone is capable of producing. The overall sensitivity can be found from Fig. 4 as —127 dbm. This assumes that the preamplifier bandwidth is not narrower than the 3 Kc. receiver bandwidth which, of course, would be the actual case. The —127 dbm. figure, if converted into a microvolt sensitivity, would produce about 0.3 microvolts for 10 db. signal-to-noise ratio.

If one wanted to still further improve the overall receiving sensitivity, several choices are possible. One could replace the transmission line and other components in it with types having a significantly lower loss. One could also replace the preamplifier with an advanced type having only a 1-2 db. noise figure. One could also try to locate the present preamplifier in such a manner, that its 5 db. noise figure is used to better advantages. Assuming that the transmission line loss cannot be economically reduced and building of a significantly lower noise level preamplifier is not practical, the next situation considers the effect of relocation of the preamplifier.

PREAMPLIFIER AT ANTENNA

Since the preamplifier noise figure is increased by the attenuation of the transmission line between it and the antenna, the logical location to preserve the preamplifier's noise figure would seem to be at the antenna itself, as shown in Fig. 1C. In this location the noise figure and the gain of the preamplifier are not degraded by the line loss preceding the unit. The transmission line loss does, however, degrade the basic receiver noise figure, the same as in Fig. 1A. The resultant total noise figure and sensitivity can be calculated using the formula previously given. In this case, considering no line losses added to the preamplifier and the 6 db. line losses added only to the original receiver noise figure, we have:

$$NF_{TOTAL}\ (db.)$$
$$= 10 \log \left(5\ db. + \frac{27\ db. - 1}{20\ db.}\right)$$
$$= 10 \log (8.2)$$
$$= 9.14\ db.$$

The corresponding sensitivity is —130 dbm., or converted into terms comparable to the given receiver sensitivity, 0.2 microvolt for a 10 db. signal-to-noise ratio. This resultant

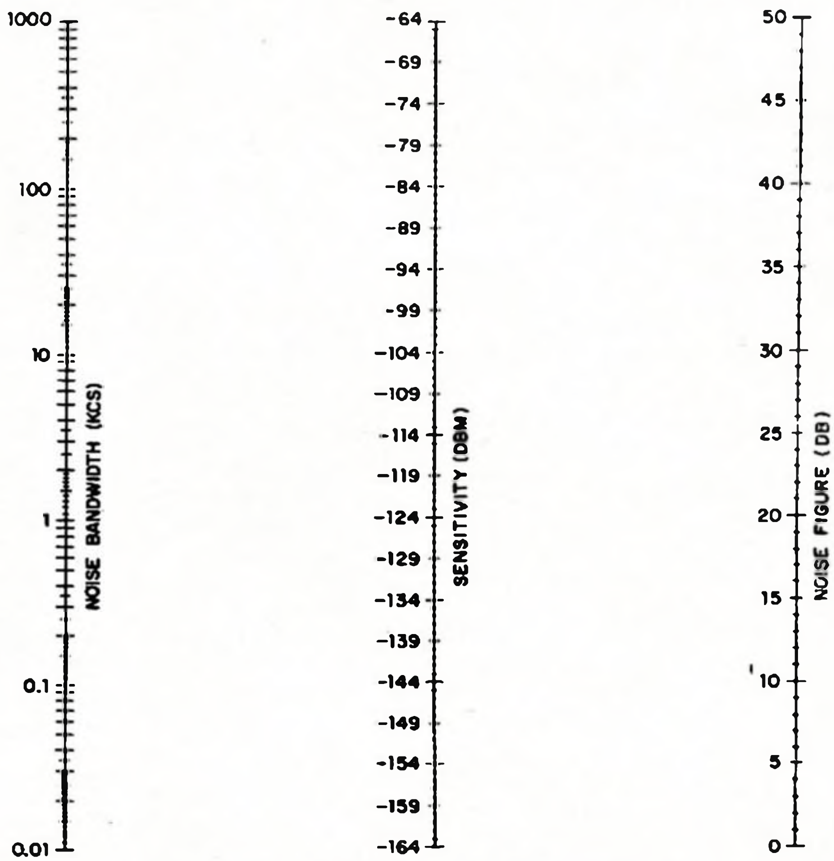

Fig. 4.—Nomograph for dbm. sensitivity and noise figure comparison.

noise figure and sensitivity is certainly an improvement over the situation outlined for Fig. 1B.

If one wished to consider still further improvements in the overall receiver system sensitivity, the practical approaches begin to narrow rather rapidly. For instance, the use of a really advanced type of preamplifier having a noise factor of 1-2 db. (and the same 20 db. gain) would only produce a total noise figure of 8.2 db. (or a sensitivity of 0.19 microvolt for a 10 db. signal-to-noise ratio). Certainly the effort required to build this type of preamplifier would hardly be worth the minor gain in sensitivity that would be achieved.

The other possible approaches to improved system receiver sensitivity involve again either the reduction in the transmission line losses or the use of an additional preamplifier (or post-amplifier as it is called when installed in conjunction with a preamplifier). Assuming that economic factors obviate the first possibility, it is interesting to consider the advantages derived from the installation of two amplifiers.

COMBINED PRE AND POST AMPLIFICATION

Fig. 1D shows the use of two amplifiers, one at the antenna as a preamplifier and another at the receiver or a post-amplifier. If possible, the preamplifier should be of better quality than the post-amplifier but it is assumed for this example that both amplifiers are of the same quality in order to derive some direct comparison to the use of the amplifier in the foregoing examples.

Looking "backwards" from the preamplifier to the antenna, the noise figure and the gain data remain the same as in Fig. 1C. Also looking "backwards" from the post-amplifier to the preamplifier, the noise figure and gain data for the post-amplifier are the same as that for the preamplifier in Fig. 1B. The noise figure of the receiver remains unchanged. Combining these noise figures into the previously given formula, we have:

$$NF_{TOTAL} \text{ (db.)} = 10 \log \left(5 \text{ db.} + \frac{11 \text{ db.} - 1}{20 \text{ db.}} + \frac{21 \text{ db.} - 1}{20 \text{ db} \,.\, 14 \text{ db.}}\right)$$

$$= 10 \log (3.32)$$

$$= 5.2 \text{ db.}$$

Thus, an overall noise figure almost exactly equal to that of the preamplifier can be achieved with this arrangement. Converted into a sensitivity figure, the noise figure produces —134 dbm. or, otherwise stated, 0.13 microvolt for 10 db. signal-to-noise ratio.

If one looks closely at the formula, it will be noted that the overall noise figure goes closer to 5 db. as the post-amplifier is moved along the transmission line closer to the preamplifier. If one were dealing with an extremely long and lossy transmission line, it might well prove worthwhile to locate the post-amplifier in the middle of the transmission line run and even use a second post-amplifier at the receiver. Also, it should be obvious that the amplifier with the lowest noise figure should be used as the preamplifier if two amplifiers are available and physical conditions permit this type of placement. To use the lower noise figure amplifier as the post-amplifier would be wasting its advantage.

GRAPHING SYSTEM PERFORMANCE FOR ONE PREAMPLIFIER

From the data which has been presented, it should be possible for anyone to calculate their receiving system sensitivity and to understand what steps might be taken to improve it. Deciding upon which steps are the most economical, both in terms of effort and equipment expense, can often be resolved by graphing the various possibilities as shown in Figs. 5 and 6. Both graphs are based upon the conditions noted on the graphs but similar ones can be produced for any given receiving situation.

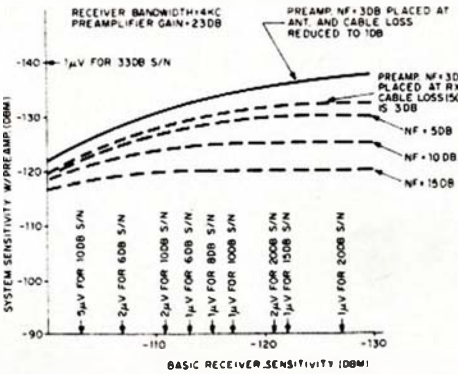

Fig. 5.—Resultant overall sensitivity as the result of the use of various preamplifiers.

Fig. 5 relates the improvement in overall receiver system sensitivity to the use of receivers with different sensitivities with various quality preamplifiers. Several conclusions can be drawn from an examination of the graph. First, almost any type of preamplifier, no matter where it is placed, can considerably improve the performance of a really poor receiver. Also, the use of an extremely low noise figure preamplifier with a poor receiver produces a negligible improvement as compared to the use of an easier to build and less expensive preamplifier having only a moderately good noise figure.

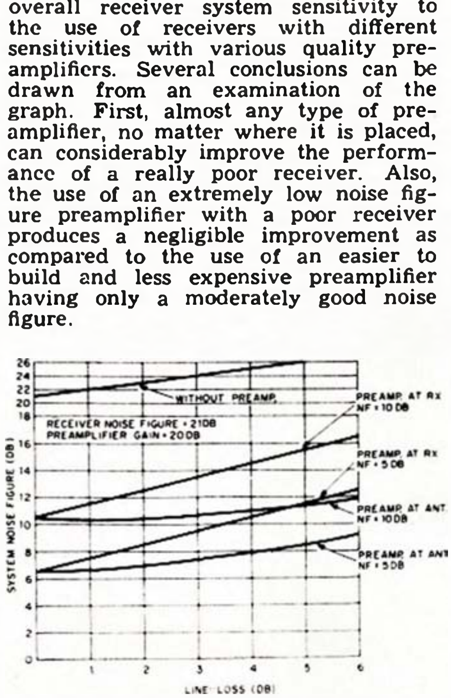

Fig. 6.—System noise figure as affected by line loss, preamplifier noise figure and preamplifier placement.

Secondly, the inept use of a preamplifier of poor quality with a good, sensitive receiver can actually degrade the overall receiving system sensitivity. It is important to realise that this condition may not really be obvious when the preamplifier is used. The preamplifier provides gain and an "apparent" increase in signal strength will be observed for moderate to strong signals but actually very weak signals will **not** be heard as well as before. For instance, note from Fig. 5, the use of a preamplifier having a noise figure of 10 db. with a receiver having a sensitivity of 1 microvolt for a 20 db. signal-to-noise ratio. For the conditions shown, the total receiving sensitivity is actually reduced 5 db. by using the preamplifier.

Thirdly, the graph provides some indication of how worthwhile it is to reduce the preamplifier noise figure to the lowest possible value. Again, for the conditions shown, there is a notable gain achieved in reducing the preamplifier noise figure from 15 db. to 10 db. or from 10 db. to 5 db. There is a smaller gain in reducing the noise figure from 5 db. to 3 db. and, although not shown on the graph, an almost non-existent gain in reducing the noise figure from 3 db. to 0 db. As the noise figure of the preamplifier becomes less and less, the only way to squeeze still better performance from the receiving system is to either relocate the preamplifier or reduce the transmission line losses.

Fig. 6 presents still another interesting view of a receiving set-up. In this case, the total receiving system noise figure is plotted as a function of the transmission line loss and the use of preamplifiers of different noise factors at both the antenna and at the receiver.

A number of conclusions can again be formed from examination of the graph. The use of the lowest noise figure preamplifiers at the antenna produces the lowest overall system noise figure, but only as long as the transmission line attenuation remains high. Which is the most convenient and economical approach in a real situation, to put a preamplifier at the antenna or to place it at the receiver but replace the transmission line with one having lower losses? A preamplifier of moderate quality (10 db. noise figure) placed at the antenna will perform slightly better than a preamplifier having a 5 db. noise figure placed at the receiver, as long as the transmission line attenuation does not fall below 5 db. for the situation shown.

Another interesting point learned from the graph is that a preamplifier having a 10 db. noise figure will perform just as well at the receiver as one having a 5 db. noise figure, providing transmission line losses are reduced to a minimum. So, the question of which course to follow depends upon whether it is more economical and convenient to build a lower noise preamplifier or to replace the transmission line. As noted before, it is really useless to carry both factors to their ultimate and some choice or balance between the two must be made in any given situation.

(Continued on Page 17)

MOON BOUNCE

Arising out of the Convention held at Birchip in the Victorian Western Zone on Saturday and Sunday, 2nd and 3rd November, 1968, a desire was expressed that Moon Bounce information should be made available.

These experiments, carried out by Ray VK3ATN, began early in 1966 with Mike Staal, K6MYC (in California), K2MWA/2 (a club station in New Jersey) and K0IJN (in Minessota) using 144.090 Mc. (2 metres).

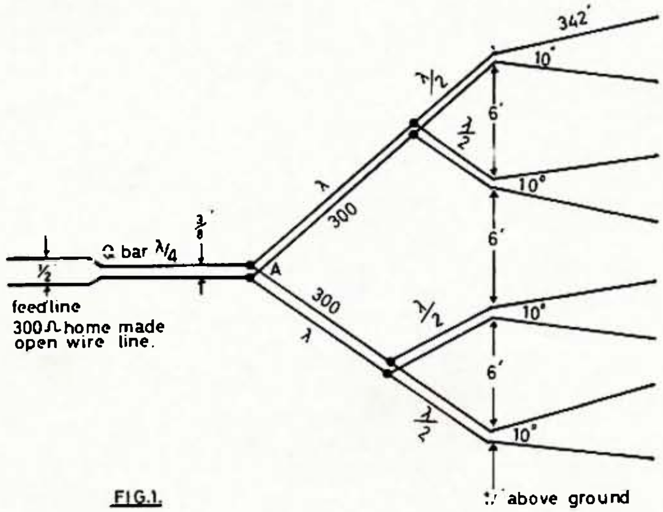

FIG.1.

N.B.—No transpositions in the feeding harness. Reason: can be used for 52 or 432 Mc.

At first, two stacked rhombics were used, each side being fifty wavelengths (342 feet), but the echos received in March and April 1966 were weak. To overcome this, an additional two rhombics of the same dimensions were added to the stack.

The times of the Moon Bounce were used to calculate the relation of the antenna at Birchip to the moon's orbit and also to determine when the moon will be in the "window" for that antenna.

Ray was able to copy every try made by Mike K6MYC from May 1966, but Mike was not able to receive the signals sent from Australia until Mike made some adjustments to his equipment.

The first two-way contact by way of the moon's surface was made with K2MWA/2 on 26th November 1966. This club, which includes Dick Turrin, Rodger Alison, Ed. Chinnock and others, used a sixty-foot commercial dish running 1,000 watts from Crawford Hill in southern New Jersey. This contact created a new world record of 10,417 miles, using any frequency for the Moon Bounce technique by either commercial or amateur stations.

It will probably stand for a long time because it is difficult to get much further away and still have a "window" in which the moon would appear for both stations at the same time.

As a result of this achievement, the A.R.R.L. (American Radio Relay League) Technical Award for 1966 was shared by Ray with W. (Bill) Conkel, W6DNG. The award was presented to Ray by the W.I.A. at a dinner in 1967. It reads: "Presented to W. (Bill) Conkel, W6DNG, and T. Ray Naughton, VK3ATN, for advancing the frontiers of Amateur Radio, proving communications via Lunar reflection to be within the realm of conventional amateur operation."

So far four stacked rhombics with sides 342 feet long and having a width of 59 feet 3 inches have been used to concentrate the signal on the moon's surface when the moon appears in the antenna's window for a brief period twice in twenty-nine days. The moon is approximately over the Hawaiian Islands when this occurs. During this limited period the stations use a minute for sending the call and a minute for giving the report, i.e. two minutes transmitting period followed by two minutes receiving period.

The moon does not reflect like a mirror because of its curved and varied surface, but the bounce is more in the form of a splatter and only a very small amount of the signal is returned to the earth. Therefore the echo from the Moon Bounce may be heard by the sending station as well as any other station which has the moon in its "window".

Because the rhombics are so long and the moon crosses the sky on a different course from day to day, only limited use of Moon Bounce can be made at present, using this fixed antenna technique. To overcome the limitation of the fixed rhombics, a fifty-foot diameter dish which can follow the course of the moon and other bodies in space is under construction. This will lift the useful time of transmission and reception from eight to twelve minutes twice a month, to whenever the moon is above the horizon (approximately 10 hours every day).

The second two-way contact from Australia was made with Mike K6MYC at the end of December 1966 and regular skeds have been maintained. Mike's contact is important in that home-made equipment was used at both ends.

The stacked rhombic antennae are supported by four steel towers. They are made of hard drawn copper wire (14 s.w.g.) which is kept at a constant tension of 125 lbs. by means of 23 lb. concrete weights at the two side towers. These concrete weights are a few feet off the ground and are connected to the side insulators of the rhombics by ⅛" diameter nylon rope halyards running through 1½" nylon pulleys attached to the towers.

To adjust the shape of the rhombics a theodolite was set up beneath the feed point and the included angle was

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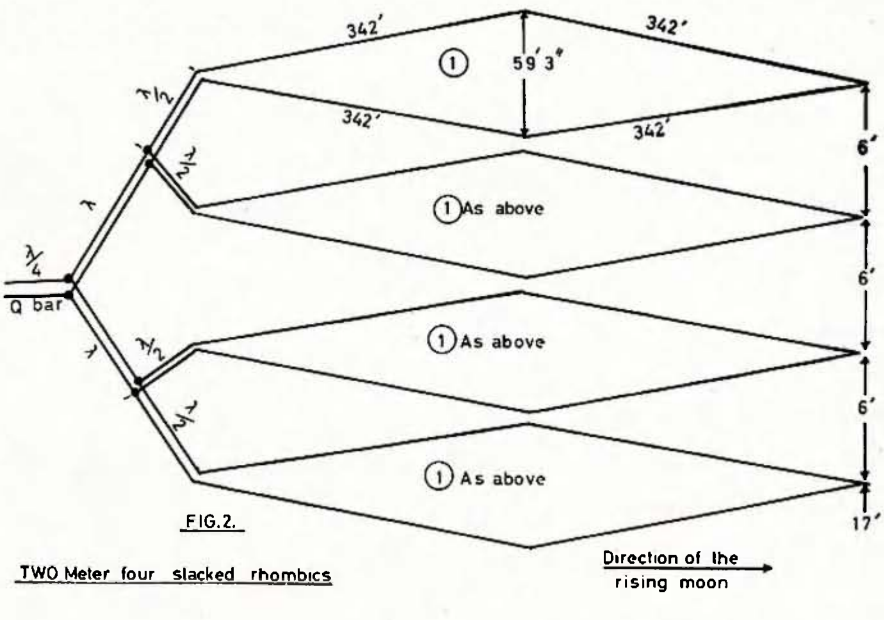


FIG.2.

TWO Meter four stacked rhombics

A 300 W. P.E.P. 2 METRE S.S.B. TRANSMITTER

A. S. LUNDY, VK2ASI*

Following on from the 6 metre s.s.b. transceiver ("A.R.," Sept. '68), it was decided to try a similar unit on 2 metres. In this case high power was required as extended ground wave was contemplated using stacked 10 element yagis. Owing to the larger p.a. box needed to accommodate the parallel line tank circuit and the extra stages involved in double conversion, it was only possible to fit a transmitter on the same size chassis as the 6 metre transceiver. The author already had an all transistor receiver on 2 metres, so this was no disadvantage.

CHASSIS

The chassis was formed from half hard 16 gauge aluminium sheet. The dividing partitions are 3" high with a ½" turned at right angles top and bottom to allow riveting to the chassis and the attachment of the v.f.o. box and p.a. box lids with self-tapping screws.

The v.f.o. drive is two 6-to-1 Jackson verniers and knobs, same as in the 6 metre unit. The 6/40 final is mounted horizontally and adequate ventilation must be provided for in the chassis under it and in the lid above it.

* 36 Otho Street, Inverell, N.S.W., 2360.

The p.a. tuning capacitor is a butterfly condenser from a SCR522 unit, which has been double spaced by removing every second rotor and stator plate, then re-positioning the stator plates. It has three rotor and two stator plates left per side.

CIRCUIT

The circuit up to the first mixer is similar to the 6 metre unit, except that a 6BL8 is used as an audio amplifier to give a bit of gain in reserve. A valve circuit is used as a carrier oscillator instead of a transistor.

A 6BE6 is used as a first mixer to combine the 6 Mc. u.s.b. signal with the 15.1 to 15.3 Mc. from the v.f.o. to give 21.1 to 21.3 Mc. Checking of the signal quality and initial calibration can now be done using a 15 metre receiver.

The 6 Mc. filter was "home-brewed" using disposal FT243 crystals, and, as a couple of hundred were available on this frequency to work with, this frequency was chosen. Some mounted and aligned filters are available at $7.

The 21 Mc. signal is inductively coupled from L4 to L5 which is spaced ½" away. L5 provides a push-pull signal to the grids of a 6J6 twin triode which runs as a balanced mixer. An injection frequency of 123 Mc. is used so as to come out on 144.1 to 144.3 Mc. u.s.b. The overtone oscillator circuit is the one supplied by the 61.5 Mc. crystal manufacturer. Doubling to 123 Mc. occurs in the plate circuit.

It was necessary to use a cathode follower stage between the overtone oscillator and the balanced mixer to prevent pulling of the crystal by the 21 Mc. s.s.b. input. This overtone circuit seems to be easily pulled by circuit variations, so make sure that the slugs in the series inductance and the plate coil are firmly secured.

Inductive coupling is used through to the final, the driver and final grid circuits L10 and L12 are connected first and are resonated on 2 metres with the valve input capacitance. The valve screen and cathode capacitors must be connected and resonance should be achieved by slight adjustment of the turns spacing.

The balanced mixer and driver plate coils L9 and L11 are then connected and adjusted for maximum output by means of the 0-6 pF. trimmers. Also adjust the turns spacing so as the trimmers are almost at maximum so as to get capacitive balance with the 5 pF. mica capacitor at the other side of the coil.

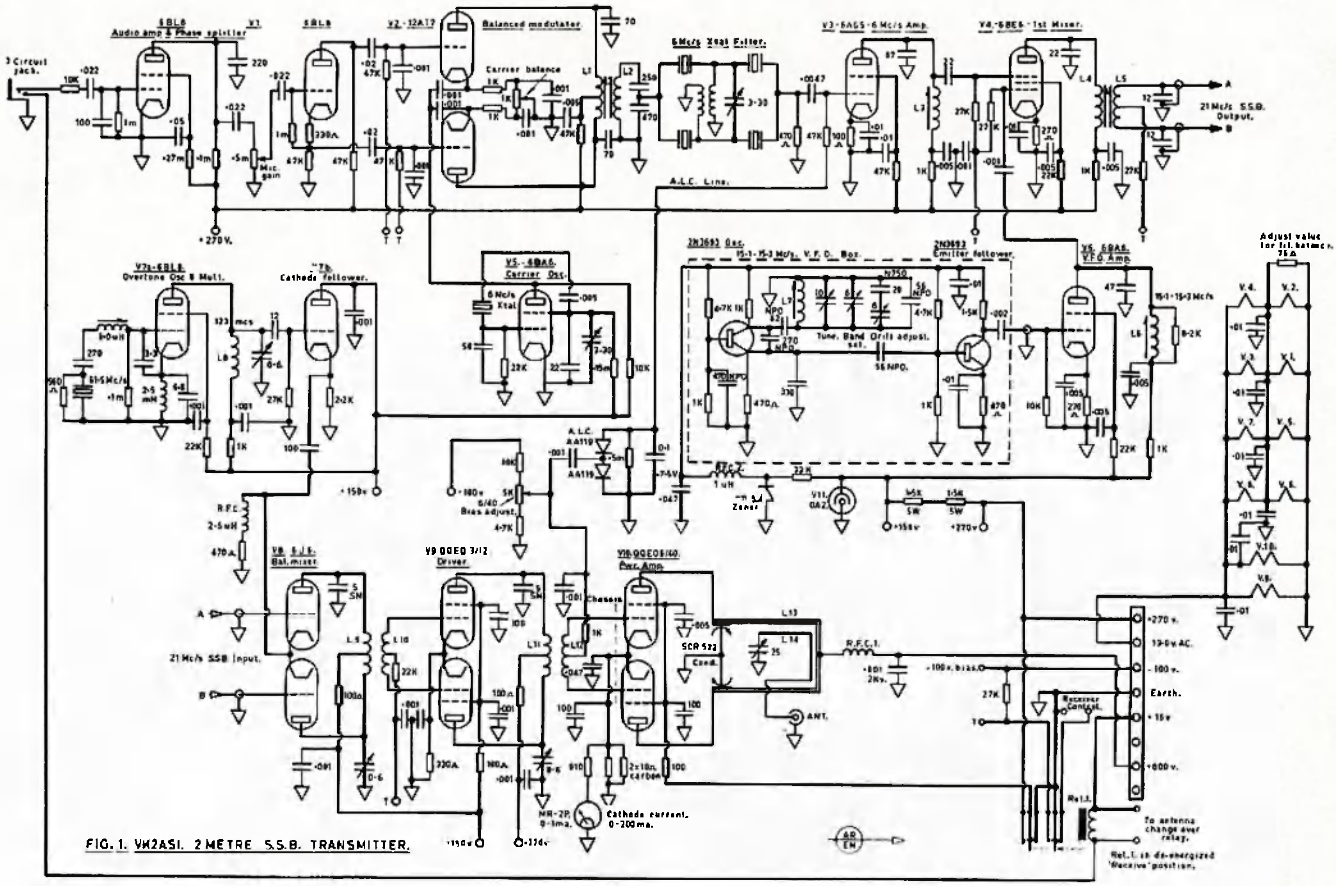


FIG. 1. VK2ASI. 2 METRE S.S.B. TRANSMITTER.

L9 and L10 only need slight coupling but L11 and L12 need to be coupled into each other to get sufficient drive.

The final has a parallel line tank circuit made from 3/16" copper tubing which was silver plated, and the tuning condenser stator plates also form part of the line. Flexible copper braid connects from the tuning condenser to the final plate pins.

The 100 pF. capacitors on the driver and final screens have ½" leads which make them a series tuned circuit on 2 metres.

Output should be detectable at 6 Mc. (V3), at 21 Mc. and at the balanced mixer, using the g.d.o. as a detector. The 6/40 bias is set so as to give 30 to 35 mA. standing current (screen current less than 1 mA.) and should go up to 180 to 200 mA. on long syllables with the meter used, which responds fairly quickly. Screen current will then be about 20 mA.

No instability problems were encountered with the driver or final, but if it is desired that maximum r.f. occur at minimum current, then some external neutralisation of the final will be necessary.

When first tried, the s.s.b. signal put out by the unit was not resolvable, this was a threshold effect in that as long as the 2 metre output was kept below about 5 watts, or the final disabled, no trouble was experienced, but as soon as the output exceeded this threshold the signal on 2 and 15 metres immediately degenerated into an unintelligable snarl.

This effect was traced to the v.f.o., and I assume that the 2 metre output was being rectified by the transistor junction and causing severe f.m. or what-have-you in the v.f.o. The v.f.o. circuit, which was built on a piece of matrix board was removed from its position under the chassis and placed inside the v.f.o. box. This cured the trouble.

COIL DATA

The following coils are found on 7 mm. slug-tuned formers:

L1—2 x 20 turns bifilar 30 B. & S.

L2—20 turns 30 B. & S., same former, spaced 3/16" from L1.

L3—35 turns 30 B. & S.

L4—16 turns 28 B. & S.

L5—20 turns 28 B. & S.

L6—16 turns 28 B. & S.

L7, v.f.o. coil—10 turns 20 B. & S. on ½" former, coat with Araldite.

The following coils are 3/8" inside diameter, wound with 20 B. & S.

L8—4 turns 3/4" long.

L9—6 turns 5/8" long.

L10—4 turns close wound.

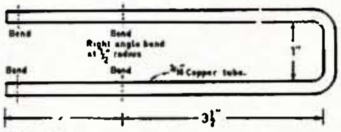
L11—6 turns 3/4" long.

L12—3 turns 1/2" long.

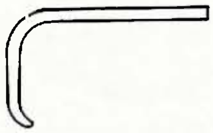
L13—3/16" copper tubing as per diagram.

L14—1/8" copper tubing hairpin, 2" long each leg.

RFC1—28 B. & S. close wound on 1/4" former 1/2" long.



L13. PLAN.



L13. SIDE VIEW.

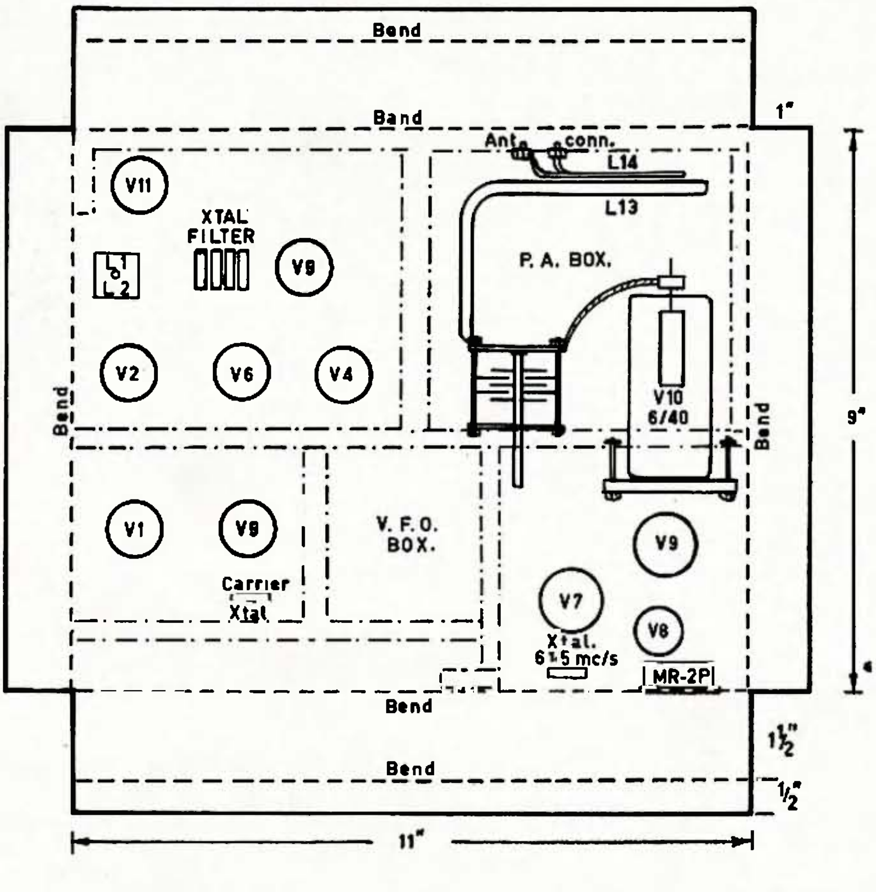


FIG. 2. CHASSIS LAYOUT.

FINDING TRUE RECEIVER SENSITIVITY

(Continued from Page 14)

SUMMARY

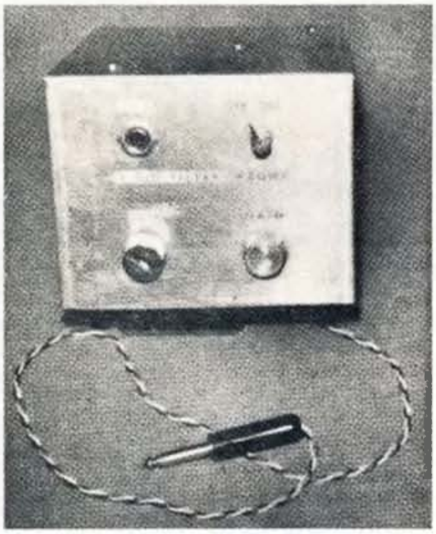
This article has tried to present a method, using the minimum of mathematics, by which any Amateur can calculate or graph what is really happening with his receiving set-up. The material presented is only valid absolutely for 50 ohm (transmission) line systems but the relative results are applicable to other impedance systems also. Some technical inaccuracies are present in the methods used but they really are of a minor nature and probably will never be of concern in an actual situation. For instance, signal-to-noise ratios instead of signal-plus-noise to noise ratios were used for the receivers.

There may also be other reasons present in a specific situation for the choosing of a location for a preamplifier or post-amplifier. For instance, in a situation where noise pickup by the transmission line is fairly high, the use of a preamplifier by the antenna might show actual results far better than those indicated by strict formula analysis. In another situation where only part of a transmission line is subject to a severe noise field, it might be best to place a preamplifier and post-amplifier in the line immediately before and after the affected section.

No matter what the situation is, however, an initial analysis using the methods described in this article will produce a clearer picture of what the overall situation is like and, hopefully, produce some ideas on the best way to go about hearing the weak ones with a minimum of strain.

AMATEUR FREQUENCIES:

USE THEM OR LOSE THEM!



Front view of the Clipper-Filter. From left to right: J1 and S1 are at the top and R1 and R2 are at the bottom.

A C.W. CLIPPER-FILTER USING FETs*

R. W. FISH, W2OWF

The photographs and drawings show a c.w. clipper-filter that uses N-channel FETs. Although this device was designed primarily as an experiment in the use of solid-state circuits, it is quite practical, particularly when used with the present-day transceiver that offers only 2,500 cycles selectivity for c.w. work. Having a bandwidth of about 90 cycles at 10 db. down and approximately 450 cycles at 40 db. down (see Fig. 2), the gadget does a very nice job even with receivers having 500 cycles selectivity. There is no ringing or instability evident in the clipper-filter, and the power drain from a self-contained 22½ volt battery is only about 7 mA.

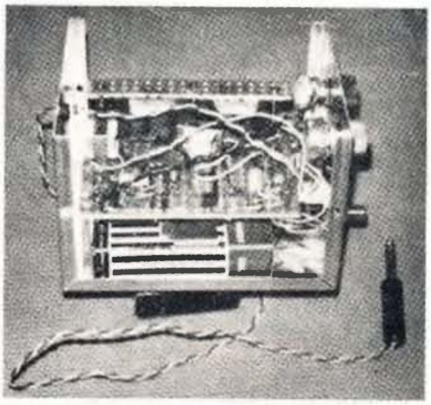
CIRCUIT DETAILS

The circuit is based on time-proven vacuum-tube designs described in "QST" in recent years by Grammer,[1] Campbell[2] and Albert.[3] Referring to Fig. 1, CR1 and CR2 are positive and negative series diode limiters. Positive voltage is applied to the anodes of CR1 and CR2, forward biasing the diodes into conduction. Positive pulses above the bias level set by R1 are clipped by CR1, and negative pulses by CR2.

Q1 through Q4 are audio amplifiers. To avoid possible overload, the source resistors of Q1 and Q2 are not by-passed. Additional overload protection is provided by an a.l.c. circuit between the drain lead of Q4 and the cathode of CR2. A portion of the signal developed across the primary of T4 is rectified by CR3, and the resulting d.c. voltage is used to reverse bias CR2.

Between each of the amplifiers is a series resonant circuit (e.g. L1/C1/C2 between Q1 and Q2) that peaks at about 950 cycles, and a parallel resonant circuit (e.g. L1/C1 between Q1 and Q2) that presents an audio notch at approximately 1,800 cycles.

T4 matches the collector impedance of Q4 to high impedance (2,000 ohms or more) headphones.



View of the Clipper-Filter showing the battery and main circuit board.

CONSTRUCTION

The c.w. clipper-filter was constructed in a 4 x 5 x 6 inch minibox. L1, L2 and L3 were made from 7-hy. filter chokes by removing the frame and "I" laminations (bar) from each inductor. Because the resulting inductances were not identical, slightly different values of capacitance were used with each choke.

The tuned circuits were adjusted before assembly and then checked and re-peaked where necessary by slight alteration of capacitor values. Very little re-peaking was actually required.

As measured, the chokes used ranged in value from 1.54 to 1.69 hy., and each inductor had a Q of 14. C1, C3 and C5 measured from 0.0047 to 0.0069 uF., and C2, C4 and C6 measured from 0.012 to 0.018 uF.

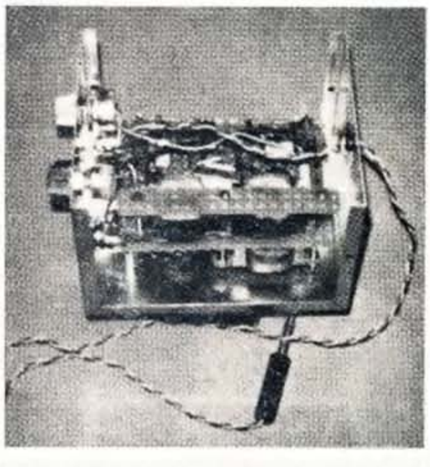
As shown in the photographs, perforated circuit board was used to support the parts. A metal chassis should not be used because it will adversely affect the Q of the chokes, resulting in a loss of gain and selectivity.

TESTING AND USE

If suitable test equipment is available for measuring inductance and capacitance, it's no chore to resonate the series-tuned circuit between each stage at 950 cycles and to resonate the parallel-tuned circuit between each stage at 1,800 cycles. However, if the test gear cannot be obtained, it is best to build the clipper-filter using the minimum capacitance value for each range mentioned previously and then add small amounts of capacitance as necessary until the desired band-pass curve is obtained. Proceed as follows:

So that no clipping occurs, set the arm of R1 at maximum resistance above ground. Connect the output of an audio generator to P1 and connect an oscilloscope or an a.c. v.t.v.m. across J1. Use a 2,200 ohm ½ watt composition resistor as the output load for T4. Vary the frequency of the audio generator from

(Continued on Page 19)



Side view of the Clipper-Filter showing L1, L2 and L3 sandwiched between strips of perforated board.

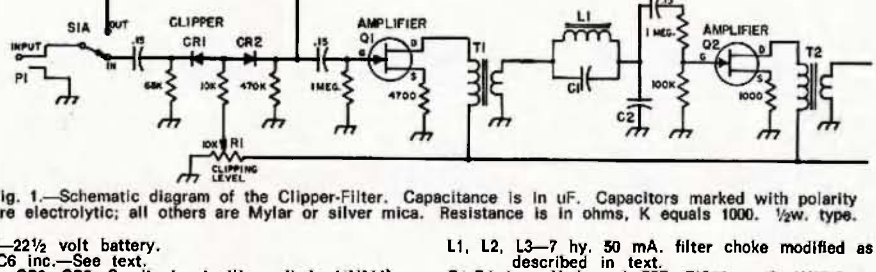


Fig. 1.—Schematic diagram of the Clipper-Filter. Capacitance is in uF. Capacitors marked with polarity are electrolytic; all others are Mylar or silver mica. Resistance is in ohms, K equals 1000. ½w. type.

BT1—22½ volt battery.
C1-C6 inc.—See text.
CR1, CR2, CR3—Small signal silicon diode (1N914).
L1, L2, L3—7 hy. 50 mA. filter choke modified as described in text.
Q1-Q4 inc.—N-channel FET. T1S14 used. 2N3819 or MPF102 suitable.

* Reprinted from "QST" for February 1969.
1 Grammer, "An Accessory for C.W. Reception," "QST," July 1950, p. 11.
2 Campbell, "Modernising the C.W. Clipper-Filter," "QST," December 1956, p. 36.
3 Albert, "Greater Selectivity with the C.W. Clipper-Filter," "QST," September 1957, p. 24.

PROVISIONAL SUNSPOT NUMBERS

MARCH 1969

Dependent on observations at Zurich Observatory and its stations in Locarno and Arosa.

Day	R	Day	R
1	132	16	158
2	111	17	170
3	103	18	211
4	108	19	192
5	117	20	196
6	123	21	204
7	115	22	207
8	108	23	157
9	113	24	146
10	107	25	152
11	101	26	149
12	85	27	156
13	88	28	141
14	90	29	142
15	114	30	158
		31	138

Mean equals 138.5.

Smoothed Mean for September 1968: 107.1.

—Swiss Federal Observatory, Zurich.

C.W. CLIPPER-FILTER

(Continued from Page 18)

500 to 2,000 cycles while making a graph of the output voltage. If necessary, change C1 through C6 to obtain the desired peak, notch and bandpass. For example, if the peak frequency is too high, increase C1, C3 or C5, or any combination of these capacitors as necessary. If the notch frequency is too high, increase C2, C4 or C6, or any combination of these capacitors as necessary. Be careful not to overload the clipper-filter or the gadget will appear to have a very broad bandpass.

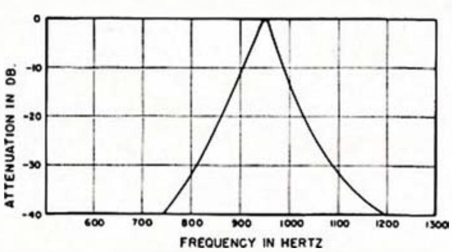


Fig. 2.—Selectivity Curve of the Clipper-Filter.

To use the clipper-filter, set R1 as mentioned above. Insert P1 in the receiver headphone jack, and plug high impedance (2,000 ohms or more) headphones in J1. Then adjust R2 so that there is no apparent difference in the strength of a c.w. signal with the unit switched in or out. Finally, set R1 at the desired clipping level.

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MOON BOUNCE

(Continued from Page 15)

adjusted by means of turn-buckles in each of the four steel halyards at the driven end tower. Thus, with the concrete weights at the sides and the buckles at the end, the shape of the rhombics are maintained in spite of temperature variations and the wind.

The stacked rhombics begin seventeen feet from the ground and are spaced six feet apart so that the total height is thirty-five feet. Experiments were made with the included angle by adjusting it between eight and twelve degrees. So far ten degrees has given the best results.

Since the antenna was originally installed with a fixed azimuth heading four fifteen-foot long "barn door tracks" have been mounted horizontally at the terminated end tower. This enables the azimuth to be varied by a little more than one degree of arc which enables the antenna to be more accurately pre-set in a position so that the moon will cross the "window" at the centre of the main lobe.

It was found that this azimuth change upset the level of the rhombics at the centre supports and this has been overcome by having the side tower halyard pulleys so attached to the supporting tower by means of hooks which can be attached to pre-set positions, depending upon the azimuth heading of the main lobe or main axis.

The antennae are fed by halfwave sections which in turn are fed by fullwave sections, as can be seen in the sketch. A quarter-wavelength "Q" bar connects the system to an open feedline. The spacing of the feedline is a half an inch and the spacing of the "Q" bar is 3/8 inch approximately, which can be varied to give lowest v.s.w.r. of about 1.05:1. In this way the impedance of about 170 ohms at "A" is matched with the 300 ohm impedance of the transmission line.

It should be noted that every effort has been made to have the whole system built as efficiently as possible, thus the reason for home-made open wire feeders with spreaders approximately 8 ft. apart and the line held taught with 200 lb. strain. This gives an essentially air spaced line approximately 120 feet long with a loss below ½ db.

—Compiled by Ronald E. Allengame, VK3AIS.

NON-DELIVERY OF "A.R."

If you are not receiving your copy of "A.R." please follow these steps which will ensure the correct procedure is followed; any attempt to short circuit the system will only further delay matters.

Write to your Divisional Secretary advising non receipt of "A.R."; do not write to "A.R." The Divisional Secretary should write to the Circulation Manager "A.R.," P.O. Box 36, East Melbourne, Vic., 3002, advising him of the problem. Unless this advice is received before the 5th of the month, a further month must elapse before the member can be re-instated upon the circulation list.

Please ensure that you always advise your Divisional Secretary in writing, verbal advice will not do.

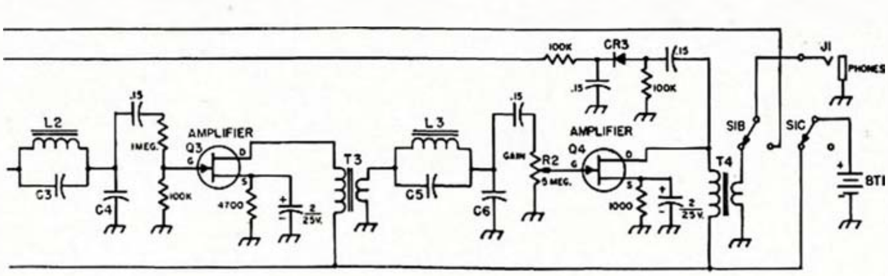

Fig. 1 (continued)

R1—10,000 ohm control, linear taper.

R2—5 megohm control, audio taper.

T1, T2, T3—Output transformer, 2,000 ohm primary to 10,000 ohm secondary.

T4—Driver transformer, 10,000 ohm primary to 2,000 ohm secondary.

REMEMBRANCE DAY CONTEST, 1969

A perpetual trophy is awarded annually for competition between Divisions. It is inscribed with the names of those who made the supreme sacrifice, and so perpetuates their memory throughout Amateur Radio in Australia.

The name of the winning Division each year is also inscribed on the trophy and in addition, the winning Division will receive a suitably inscribed Certificate.

Objects

Amateurs in each Call Area will endeavour to contact Amateurs in other Call Areas. In addition, Amateurs will endeavour to contact any other Amateurs on the authorised bands above 52 Mc. (i.e. intrastate contacts will be permitted on the v.h.f./u.h.f. bands) for scoring purposes.

Contest Date

0800 hrs. GMT Saturday, 16th August, 1969, to 0759 hrs. GMT Sunday, 17th August, 1969.

All Amateur Stations are requested to observe 15 minutes' silence before the commencement of the contest on the Saturday afternoon. An appropriate broadcast will be relayed from all Divisional Stations during this period.

RULES

1. There shall be four sections to the Contest:—
   (a) Transmitting Phone.
   (b) Transmitting C.w.
   (c) Transmitting Open.
   (d) Receiving Open.

2. All Australian Amateurs may enter the Contest whether their stations are fixed, portable or mobile. Members and non-members will be eligible for awards.

3. All authorised Amateur bands may be used and **cross-mode operation is permitted.** Cross-band operation is not permitted.

4. Amateurs may operate on both Phone and C.w. during the Contest, i.e., Phone to Phone or C.w. to C.w. or Phone to C.w. However only one entry may be submitted for sections (a) to (c) in 1.

An open log will be one in which points are claimed for both phone and c.w. transmissions. Refer to Rule 11 concerning Log entries.

5. For Scoring, only one contact per station per band is allowed. However, a second scoring contact can be made on the same band using the alternate mode. Arranged schedules for contacts on the other bands are prohibited.

6. Multi-operator stations are not permitted. Although log keepers are permitted, only the licensed operator is allowed to make contact under his own call sign. Should two or more wish to operate any particular station, each will be considered a contestant and must submit a separate log under his own call sign. Such contestants shall be referred to as "substitute operators" for the purposes of these Rules and their operating procedure must be as follows:—

Remembrance Day Contest Trophy

Phone: Substitute operators will call "CQ RD" or "CQ Remembrance Day" followed by call of the station they are operating, then the word "log" followed by their own call sign, e.g., "CQ Remembrance Day from VK4BBB log VK4BAA."

C.w.: Substitute operators will call "CQ RD de" followed by the group call sign comprising the call of the station they are operating, an oblique stroke and their own call, eg., "CQ RD de VK4BBB/VK4BAA."

Contestants receiving signals from a substitute operator will qualify for points by recording the call sign of the substitute operator only.

7. Entrants must operate within the terms of their licences.

8. Cyphers—Before points may be claimed for a contact, serial numbers must be exchanged and acknowledged. The serial number of five or six figures will be made up of the RS (telephony) or RST (c.w.) reports plus three figures, that will increase in value by one for each successive contact.

If any contestant reaches 999 he will start again with 001.

9. Entries must be set out as shown in the example, using ONLY ONE SIDE of the paper and wherever possible standard W.I.A. Log Sheets should be used. Entries must be clearly marked "Remembrance Day Contest 1969" and must be postmarked not later than **8th September, 1969.** Address them to "Federal Contest Manager, W.I.A., G.P.O. Box N1002, Perth, 6001, West. Aust." Later entries will be disqualified.

10. Scoring will be based on the table shown.

SCORING TABLE

To

From	VK0	VK1	VK2	VK3	VK4	VK5	VK6	VK7	VK8	VK9
VK0	–	6	6	6	6	6	6	6	6	6
VK1	6	–	1	1	2	3	5	4	6	5
VK2	6	3	–	1	2	3	5	4	6	5
VK3	6	4	1	–	2	1	4	3	6	5
VK4	6	3	1	2	–	3	6	5	4	3
VK5	6	5	2	1	3	–	4	3	3	6
VK6	6	6	2	1	4	2	–	3	5	6
VK7	6	5	1	1	3	2	5	–	5	6
VK8	6	5	1	1	2	3	6	4	–	3
VK9	6	5	1	2	3	4	5	6	1	–

Note.—Read table from left to right for points for the various call areas.

In addition, all intrastate contacts on bands 52 Mc. and above are worth 1 point each.

Portable Operation: Log scores of operators working outside their own Call Area will be credited to that Call

EXAMPLE OF TRANSMITTING LOG

Date/ Time G.M.T.	Band	Emission and Power	Call Sign Worked	RST No. Sent	RST No. Received	Points Claim.

Note.—Standard W.I.A. Log Sheets may be used to follow above form.

EXAMPLE OF RECEIVING LOG (VICTORIAN S.W.L.)

Date/ Time G.M.T.	Band	Emission	Call Sign Heard	RST No. Sent	RST No. Received	Station Called	Points Claim.
Aug. '69							
16 0810	7 Mc.	A3 (a)	VK5PS	58002	—	VK6RU	1
16 0812	"	"	VK6RU	59007	—	VK7EJ	4
16 1035	52 "	A3	VK4ZAZ	56010	—	VK5ZDR	2
16 1040	"	"	VK3ALZ	59025	—	VK3QV	1

Note.—Standard W.I.A. Log Sheets may be used to follow the above form.

Area in which operation takes place, e.g. VK5ZP/2. His score counts towards N.S.W. total points score.

11. All logs shall be set as in the example shown and in addition will carry a **front sheet** showing the following information:—

Name ....Section ....
Address ....Call Sign ....
........................Claimed Score ....
No. of Contacts ....

Declaration: I hereby certify that I have operated in accordance with the Rules and spirit of the Contest.

Signed ....
Date ....

All contacts made during the Contest must be shown in the log submitted (see Rule 4). If an invalid contact is made it must be shown but no score claimed.

Entrants in the Open Sections must show c.w. and phone contacts in numerical sequence.

12. The Federal Contest Manager has the right to disqualify any entrant who, during the Contest, has not observed the regulations or who has consistently departed from the accepted code of operating ethics. The Federal Contest Manager also has the right to disallow any illegible, incomplete or incorrectly set-out logs.

13. The ruling of the Federal Contest Manager of the W.I.A. is final and no disputes will be discussed.

Awards

Certificates will be awarded to the top scoring stations in Sections (a) to (c) of Rule 1 above, in each Call Area. There will be no outright winner for Australia. Further Certificates may be awarded at the discretion of the Federal Contest Manager.

The Division to which the Trophy will be awarded shall be determined in the following way.

To the average of the top six logs shall be added a bonus arrived at by adding to this average the ratio of logs entered to the number of State Licensees (including Limited Licensees), multiplied by the total points from all entries in Sections (a), (b) and (c) of Rule 1.

$$\text{Average of top six logs} + \left\{ \frac{\text{Logs Entered}}{\text{State Licensees includ. Z Calls}} \times \begin{matrix}\text{Total Pts. from}\\ \text{all Entrants in}\\ \text{Sect. (a) (b) (c)}\end{matrix} \right\}$$

VK1 logs and scores will be added to VK2, similarly VK8 to VK5, and VK0 to VK7.

Also VK9 logs and scores will be added to the Division which is geographically the closest, e.g.

New Guinea, Papua and New Britain .... to VK4
Norfolk Island .... „ VK2
Christmas and Cocos Islands „ VK6

Acceptable logs for all Sections shall show at least five valid contacts.

The trophy shall be forwarded to the winning Division in its container and will be held by that Division for the specified period.

RECEIVING SECTION
(Section D)

1. This section is open to all Short Wave Listeners in Australia, but no active transmitting station may enter.

2. Contest times and loggings of stations on each band are as for transmitting.

3. All logs shall be set out as shown in the example. The scoring table to be used is the same as that used for transmitting entrants and points must be claimed on the basis of the State in which the receiving station is located. A sample is given to clarify the position.

It is not sufficient to log a station calling CQ—the number he passes in a contact must be logged.

It is not permissible to log a station in the same call area as the receiving station on the m.f. and h.f. bands 1.8-30 Mcs., but on bands 52 Mcs. and above such stations may be logged, once only per band, for one point. See example given.

4. A station heard may be logged once on phone and once on c.w. for each band.

5. Club receiving stations may enter for the Receiving Section of the Contest, but will not be eligible for the single operator award. However, if sufficient entries are received a special award may be given to the top receiving station in Australia. All operators must sign the Declaration.

Awards

Certificates will be awarded to the highest scorers in each call area. Further Certificates may be awarded at the discretion of the Federal Contest Manager.

NOTES ON 1969 N.F.D. — AS SEEN BY THE VK2AAH/P GROUP

The VK2AAH/P expedition this year was similar in form to those of 1966, 1967 and 1968.

All antennas were transported to the site (a 4,000 ft. mountain, 60 miles west of Sydney) on the ski bars of two cars.

These antennas comprise:

- A two element 14 Mc. Yagi.
- A two element 21 Mc. Yagi.
- A three element 28 Mc. Yagi.
- Two ¼-wave verticals for 7 Mc. (one becomes base loaded for 3.5 Mc.).
- A four element Yagi for 52 Mc.
- A four element Yagi for 146 Mc.
- A ten element Yagi for 144 Mc.
- An umpteen element stacked colinear for 144 Mc.

We arrived at the site at 10 o'clock local time and by 1400 hours all was ready.

The scattering of antennas was a pretty sight, and a good sound to hear was the purr of the 7.5 KVA alternator with its 12 h.p. four-cylinder "donk".

The sun was blazing down on the scene as our cooks prepared the first field day meal. Great dollops of stew, with a pint of mashed potatoes each! Sweets? Yes! Plum pudding and cream, washed down into one's innards with a pint of black coffee.

Did I say cooks? I mean Chefs!

At the witching hour of 1600 hours local, all stations opened up.

Carl VK2BKM on 7 Mc.
Syd VK2SG on 14 Mc.
Charlie VK2KM on 21 Mc.
David VK2ZVW on 144 Mc.
Wal VK2AXW on 52 Mc.

Harold VK2AAH was looking over 3.5 Mc., but it was expectedly dead.

7 Mc. ran well at all times, with split frequency W contacts giving us ample points during hours of darkness.

14 Mc. was hot all the time except for a few daylight hours on Sunday. Nearly 3,000 points on this band tells its own story.

21 and 28 Mc. behaved reasonably well, with over a thousand points for each band.

The v.h.f. men performed great feats to knock out six hundred points.

Little 3.5 Mc., with its barefoot mobile KWM2, gave us 200 points, and the interesting thing was that no equipment gave any trouble at all.

This included two KWM2s, two SW400s, three linears, and a fair bit of home-brewed v.h.f. gear.

All antennas stayed up, the weather was excellent, and what more could one want, with a bunch of good chaps, bags of operating available, plenty of food (cornflakes, followed by sausages and eggs Sunday morning, and a nice salad at midday) and even a little time for ragchewing now and again.

But after the feast, the reckoning.

At 1600 hours local, all the above goodies had to be taken down. One feels a little sad at this time, but because of approaching darkness, one hurries about multifarious tasks.

Anyway, by 1800 hours, we were ready to go, and what were our thoughts as we drove the 85 miles back to Sydney?

Mine ran along something like: Be terrific to fall into bed (most of us had almost no sleep at all)—Jolly good score, I think—Wonder if the others (competitors) caught the 21 and 28 Mc. openings?—Good food this year—Not many real dogpiles this time—Hope Carl VK2BKM enjoyed his first Field Day—Better watch these speed limits carefully, the Datsun seems a little frisky in the mountain air—I don't—Hope Syd's okay (VK2SG) driving that VW with the 7 KVA generator in the trailer—Glad Peter and Steve were there (our S.w.l's)—Good old Laurie VK2ZJC got the 14 Mc. Yagi 42 ft. up in the air again.

And then we reached home, and Peter and I unloaded my car in the darkness. Didn't you go Field Day-ing this year?

W.I.A. Federal President's Speech to N.Z.A.R.T. Conference

(The following is the text of a speech delivered by the Federal President of the Wireless Institute of Australia (Mr. Michael J. Owen, VK3KI) at the Gisborne Conference of the N.Z.A.R.T. on Saturday, 31st May, 1969.)

May I, at this first formal opportunity, express the thanks of the Wireless Institute of Australia and my personal thanks for your invitation to attend this Conference.

When your President in Sydney, Australia, at Easter 1968, invited the Federal President of the Wireless Institute of Australia to attend your Conference, I, like everyone else, was confident that our incoming President, John Battrick, VK3OR, would be here today. No doubt by now many of you know that for personal reasons John was forced to resign as Federal President last Easter after only one year in that office, though he remains the Institute's Region III. Director. To him and to our present Federal Secretary, Peter Williams, VK3IZ, Amateurs in this Region owe a great debt.

The Region III. Congress from which so much has stemmed, may not have come about so soon without the dedication of these two men. For this reason, I am sorry that John is not able to be here himself today.

Whilst I am talking of people, may I, without presuming to intrude on either his personal affairs or the affairs of N.Z.A.R.T., refer to your President, Harry Burton. I confess I had to read April "Break In" twice before I discovered that Harry had decided not to seek re-election this year. I would like to assure you that as an ambassador on behalf of N.Z.A.R.T., your President is extremely effective. I know he made many good friends in Australia. He sold Amateur Radio effectively, and I believe has done much to cement relationships between the W.I.A. and N.Z.A.R.T.

AMATEUR RADIO IN AUSTRALIA

Your President suggested that I should tell you something of Amateur Radio in Australia. There is much similarity in the manner in which Radio Amateurs are regulated in our respective countries. Like you, we exist by reason of suborinate legislation—regulations. In Australia this means we are effectively under the control of the Postmaster General's Department. No doubt, should the need arise, our voice would be heard in the Federal Parliament. We prefer, however, to rely heavily on our very cordial relationship with those officers who are responsible for the administration of Amateur Radio at an administrative level.

The whole trouble with this sort of system is that we become over-dependent on the personality of the individual administrator. Yet I do not see any real alternative.

It may well be that a quasi judicial system, such as the American Federal Communications Commission, with its legalistic rule-making procedures, is a luxury that our country can hardly afford. It is certainly a luxury that the Amateur Service could not afford.

Our long term security, perhaps, lies more in the hands of our national Radio Societies such as N.Z.A.R.T. and W.I.A. Strong representative and responsible Amateur organisations are, I think, a very important part of our Amateur Radio security.

Whilst I suggest that a strong national radio society is important to us all, there are, of course, some dangers in a society which is over-influential. There is a great temptation when confronted with a problem on Amateur bands, to seek to solve it by regulation.

The W.I.A. has always had a strong distaste for such a solution; indeed we seek less regulation than more—we never reject a privilege. Perhaps our attitude is partly reflected in the fact that there is no regulation of modes within different segments of our bands, though this has been suggested from time to time as a solution to specific problems.

For our sub-bands we rely on what we call a gentleman's agreement. Whilst we are not all really gentlemen, the system works remarkably well. As a basic philosophy, I think the Institute's philosophy is a very sound philosophy. The temptation to solve a particular problem by a general regulation seems so often to result in a restriction that has effects that were unforeseen. More important, self-discipline is surely better than a police imposed discipline.

● At the time of going to press, the Federal President of the W.I.A., Michael Owen, VK3KI, is on his way home from the N.Z.A.R.T. Conference, which was held over the week-end of 31st May/1st June. Michael's attendance was at the invitation of the N.Z.A.R.T. President made when he was in Australia last year.

Many subjects were listed for discussion with our New Zealand friends, not the least of which was the Region III. activities.

Michael Owen, VK3KI, Federal President, W.I.A.

SURVEY BY "A.R."

To give you any general picture of Amateur Radio in Australia is hard. However, it may be of interest to you if I tell you of a survey that was conducted by the Publications Committee of the Institute's journal, "Amateur Radio". This survey is probably the only reliable source of information in recent years. It is based on a staggering response equal to 30.3% of the magazine's total circulation.

This reveals that over all, 53.2% of Australian Amateurs use mainly home-made equipment and 30.6% use mainly commercial equipment. 16.2% say they use a 50-50 mixture.

This percentage of commercial gear ranges from 39% in Western Australia to 19.3% in South Australia.

In terms of money, those conducting the survey concluded that Australian Amateurs each spend an average of $132 each year on their hobby. In other words, in Australia, Amateurs, we believe, will spend this year around $560,000 on their hobby. No doubt it can be anticipated that this sum will increase a little each year, a very persuasive argument when one is seeking new advertisers in one's publications. I understand the position in New Zealand is perhaps a little different because of your import restrictions and that, therefore, there is a higher percentage of home-made equipment used in this country. I wonder whether you are really the poorer?

"AUSTRALIS" PROJECT

One aspect of Amateur Radio in Australia that has caused much interest is the "Australis" project. This project was initiated by a group of university students whose aim was to produce an Australian designed and fabricated satellite on Amateur frequencies. The W.I.A. was one of a number of sponsors to the project. In addition, the Institute has provided other assistance as requested.

The technical standard attained has attracted favourable comment from overseas. It represents a technical achievement by a small independent group that is in the best traditions of Amateur Radio. It is exactly the sort of project that our national Amateur Societies should do all in their power to foster without necessarily attempting to take over the technical initiative.

For some time now, the project has looked as though it would ultimately fail as it seemed that the satellite would not be launched due to difficulties in obtaining space on a suitable vehicle. By last Christmas, nearly all hope had been abandoned.

Now I am very pleased to be able to tell you that I now believe that this satellite will be a feature of our skies before the end of 1969. If so, it will represent a great achievement for Amateur Radio and perhaps demonstrates that the Australian Amateur is still capable of technical achievement despite an apparent fondness for commercially built equipment.

This, we believe, is only the second satellite built in Australia. The first was "WRESAT", a satellite produced by the Weapons Research Establishment, largely from imported components. The Australis satellite is built almost wholly from Australian components. If my prediction turns out to be accurate, then it is probable that the satellite would be placed in a 1,000-mile polar orbit circling the earth once every 1 hour 54 minutes. It will pass in range of New Zealand Amateurs six times a day—three times in the morning and three times in the evening.

As you can no doubt appreciate, what I can say to you is severely restricted at this time. A firm announcement can be expected within the next few months. I suggest that you prepare on the basis that this satellite will fly, as the notice in fact may not be great. I can assure you that it is the wish of the Australis group that all the information possible is given to all Amateurs and immediately they can do so, all the information in their possession will be made available as widely as possible.

I.A.R.U. REGION III.

But now I would like to speak to you on the I.A.R.U. Region III. Association. It gives me great pleasure to tell you as the President of the Society that is presently providing the Secretariat, that the Interim Constitution proposed by the Secretariat following the Sydney Congress has now been accepted by three out of the four Societies concerned. The fourth Society, the Philippines, has already indicated that it would have no objection to the incorporation of the amendments proposed to the first draft. This means that we are now confident that within a matter of weeks, the I.A.R.U. Region III. Association will come into actual, formal existence.

I have no doubt that your overseas liaison officer will tell you that we have gone perhaps a little further in formulating a detailed Constitution than was expected by the delegates at the Congress in Sydney. Perhaps this is true. May I assure you of two things. Firstly, the Federal Executive reached the conclusion after a most careful examination of the problem, that a formal Constitution was an absolute essential, to establish the procedural validity of what we did, to enable funds to be transferred from one country to another, and to establish a framework within which we can work.

Remember, no "club" can exist except by virtue of its own rules.

Secondly, in propounding an Interim Constitution, we did not intend, as the Wireless Institute, to in any way impose ideas that represented the ideas of the Institute only on the other Societies involved. What we intended to do was to follow as precisely as we could, the somewhat broad decisions of the Congress, inserting such additional detail as was necessary. I believe that the document that has now been accepted, achieves this. If the first draft Constitution submitted did not, then this was the fault of the draughtsman, not of the Wireless Institute of Australia.

The significance of the adoption of this Constitution is considerable; it represents for the first time a precisely formulated area of agreement within the region—it is a great step forward to say that this soon, after the initial meeting of our Societies in Sydney in 1968, we have a formal association with detailed formal rules.

Let us not, however, underrate the difficulty of the adoption of a final Constitution. The divergence of fundamental views expressed in some of the correspondence to the Secretariat is considerable. The Directors at their next plenary meeting will face, I think, a far more difficult task than the task they faced in Sydney. Not only will agreement with a degree of precision be required, but it will be necessary to reduce this agreement to writing.

But now, having said that, can I also say this?

There are few organisations in my experience more constitution conscious than Amateur organisations. I note with some amusement that a concern for your own constitution is reflected in some of the pages of "Break In" during the last year. We, in the W.I.A., have devoted a quite unreasonable time to our own so-called constitutional problems.

Let us, in Region III., not devote a disproportionate part of our time and energy to our constitution. The constitution is only a framework. An organisation with the best constitution in the world cannot succeed without the right men both as its members and as its leaders. Organisations are people, not rules. Let us look to people, not words. Let us do a workman-like job with our own constitution, but let us not distort the importance of it.

It seems to me more important that we seek new members from the Societies in the Region, that we establish a means of communication such as a regional bulletin and that we generally further the objects of the I.A.R.U. throughout the Region. We, in the W.I.A., are now considering whether the next plenary meeting should not be held, next year, in 1970, rather than in 1971.

It seems generally recognised that there is a real risk of an I.T.U. Conference in late 1970—or more likely early 1971. What can our association do in terms of our region? I do not presume to answer that question—but I do suggest that if we are to do anything, we must think in terms of a meeting before such a conference.

Please forgive me for devoting so much time to the Region III. Association, but for us in Australia, this represents one of the most important dedevelopments in Amateur Radio in recent years.

We realise how easily it could fail. We believe, given N.Z.A.R.T. support, as well as the support of the other Societies in this great region, we can, in the long term, achieve more for the protection of Amateur Radio, and in particular for the protection of our frequencies by a Regional Society than by any other means.

In conclusion, may I now refer to the significance of my visit to this N.Z.A.R.T. Conference.

At Easter 1968, your President extended an invitation to the President of the W.I.A. to attend the Conference. Last Easter, the Federal Council of the W.I.A. considered whether or not the expenses associated with such a visit could be justified. I would be less than frank with you if I did not tell you that this question was given some anxious thought—as no doubt was the question of whether or not N.Z.A.R.T. would, itself, participate in the Region III. Congress in Sydney last year.

Like you, we considered that this sort of visit was a proper expenditure of our funds.

To me it is now obvious that this decision was absolutely right. I have been able to discuss Region III. matters with your officers. I have been able to talk about greater co-operation between our Societies in relation to our respective publications. "Break In" maintains a quality that surely would make it attractive to many Australians if it was readily available. I hope that many of you would think of subscribing to "Amateur Radio" if it was likewise readily available to you.

These are tangible things.

But New Zealand is our nearest neighbour. In terms of distance, in fact, you are no further from us than is Perth. Your country can boast of the highest number of Amateurs per thousand population in the world.

N.Z.A.R.T., J.A.R.L. and W.I.A. are, in terms of membership and resource, among the few really significant national Amateur Radio Societies in this Region and must therefore, be prepared to take the responsibility of leadership in the Region.

We just cannot afford not to have a real mutual understanding .

We cannot achieve this without personal contact—and as officers and ideas change, so that contact must continue.

Gentlemen, I shall go back to Australia and shall advise the Federal Council that in my opinion this visit has achieved much, both in terms of mutual understanding and tangible co-operation.

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PROVISIONAL SUNSPOT NUMBERS

APRIL 1969

Dependent on observations at Zurich Observatory and its stations in Locarno and Arosa.

Day	R	Day	R
1	156	16	144
2	143	17	155
3	143	18	148
4	122	19	128
5	101	20	124
6	78	21	122
7	82	22	90
8	77	23	72
9	90	24	81
10	85	25	81
11	92	26	78
12	91	27	78
13	122	28	72
14	139	29	60
15	140	30	63

Mean equals 105.2.

Smoothed Mean for October 1969: 109.6.

—Swiss Federal Observatory, Zurich.

New Equipment

AUDIO SIGNAL GENERATOR

The 'Rapar' Model A-1 audio signal generator is a ruggedly constructed instrument that will find many applications in the Amateur shack. Housed in a metal case with crackle grey finish, the instrument is fitted with a large vernier dial and has a flexible carrying handle.

Specifications.—Freq. range: sine, 20 cycles to 200 Kc.; square, 20 cycles to 30 Kc. Cal. accuracy: ±2% + 1 c.p.s. Output voltage: sine, max. 21v. p/p; square, max. 24v. p/p. Distortion: Less than 1% (at 20 Kc. and below). Tube complement: 12AT7, 12BH7A, silicon diode, thermistor. Power supply: AC 50 c.p.s. 230v. Trade Price $35.20 plus 15% S.T.

Further information from Radio Parts Pty. Ltd., 562 Spencer St., Melbourne, or their city depot and East Malvern branch.

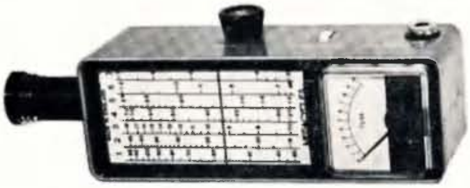
"GRID-DIP" OSCILLATOR

From Eddystone is a versatile, battery operated, solid state "grid-dip" oscillator with a wide range of functions. Named the "Edometer," the instrument performs as an absorption wavemeter, standard dip oscillator, heterodyne wavemeter, simple signal generator (modulated or unmodulated), modulation monitor, and audio signal source.

Used as a dip resonance indicator, the frequency coverage is from 1700 Kc. to 115 Mc., with two additional coils being provided for signal generation over the range of 390 Kc. to 1600 Kc. Normal "dip" operation is available at all frequencies above 1.25 Mc. (ranges 1-5).

Silicon transistors are used in both stages, the oscillator being a FET (Texas 2N3819), and the audio oscillator/amplifier a planar transistor (T1407).

Constructed of light steel, with grey hammertone finish, the instrument is



housed with its seven plug-in coils in a handsome, dove-tailed jointed wood case, and is complete with instruction book. Price: $92.73 plus 15% S.T.

Further information from R. H. Cunningham Pty. Ltd., 608 Collins Street, Melbourne, Vic., 3000.

ADHESIVE COPPER STRIP

Branded "Cir-kit" is an adhesive backed copper strip designed for fast wiring of prototype equipment and servicing of printed circuit apparatus. Available in length of 100 ft. and 500 ft., widths of 1/8" and 1/16".

Further information from Zephyr Products Pty. Ltd., 70 Batesford Road, Chadstone, Vic., 3148.

FAIRCHILD POWER TRANSISTORS

Released by Fairchild is a series of six NPN power transistors, the AY8108 and AY8109 (20 watt), AY8110 and AY8111 (25 watt), and the AY8115 and AY8116 (6 watt). All silicon power transistors, these are the first of a new family from Fairchild to be made in Australia, and will be followed shortly by the release of two high speed switches, one a 300 volt 7 amp., and the other a 150 volt 5 amp.

Further details from Fairchild Australia Pty. Ltd., 420 Mt. Dandenong Road, Croydon, Vic., 3136.

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FAIRCHILD-ELCO AGENCY

Effective July 2, Fairchild Australia Pty. Ltd. announce their appointment as sole Australian agents for Elco Corporation, Pennsylvania, U.S.A. From this date, all enquiries for electrical connectors should be directed to Elco Customer Service Department, Fairchild Australia Pty. Ltd., 420 Mt. Dandenong Road, Croydon, Vic., 3136.

Technical Data

YAESU S.S.B. TRANSCEIVER

Model FT-200 s.s.b. transceiver for 80 metres down to 10 metres, operates from a separate 230v. a.c. power supply available as an extra. Cabinet is finished in grey lacquer and features a satin finished, etched front panel.

Specifications.—Emission: s.s.b., c.w., a.m. Input power: 240w. two-tone p.e.p. (s.s.b., c.w.), 75w. a.m. Freq. ranges: 3.5-4.0, 7.0-7.5, 14.0-14.5, 21.0-21.5, 28.0-30.0 Mc. Stability: after warm up, drift within 100 c/s. Output imped.: 50-120 ohms, unbalanced. Carrier suppression, better than —40 db. Sideband suppression, better than —50 db. Rx sensitivity: 0.5 uV. input, S/N 10 db. Selectivity: 2.3 Kc. (—6 db.), 4 Kc. (—60 db.). I.f. and image ratio: more than 50 db. Audio: output, 1w.; impedance, 8 or 600 ohms. Tubes and semiconductors: 16 tubes, 12 diodes, 6 transistors.

Price of FT-200, $345 inc. S.T. Imported matching power supply with speaker, $90 inc. S.T.

Further information from the factory authorised agents: Bail Electronic Services, 60 Shannon St., Box Hill North, Vic., 3129.

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CONVERTING THE AR88

(Continued from Page 7)

3. Mount a one-lug tag-strip on the screw and nut nearest to the front of the receiver on which the C48, C109, C110 block condenser is fitted.

4. Connect a 1 uF. condenser from the lug of the tag-strip to chassis.

5. Solder two insulated hook-up wires of about 15 inches long to the switch. One to the common contact, the other one to one of the two remaining contacts.

6. Twist the two wires all the way, as you do with filament lines, and pass them through the hole right in the corner of the chassis nearest the a.v.c.-a.v.c. n.l.-man. n.l.-man. switch.

7. Cut off surplus lengths and connect one of the wires to C48 (nearest to the front of the receiver). Connect the other one to the 1 uF. condenser on the one-lug tag-strip.

The modification is now complete except for re-peaking T9 (the final i.f. transformer) and for marking the a.g.c. slow-fast switch with Dymo tape. Knobs looking almost identical to the ones used on the AR88 are commercially available. They are made by a Japanese firm.

It is not a quick and easy modification, but it is well worth while and you will find that your AR88 is capable of giving a first class copy of s.s.b. signals just by the flick of a single switch.

If, after all this, it does not work, may I suggest that you buy a new receiver and throw your AR88 away . . . in my direction please. I will gladly take it! Good luck.

New Amateur Radio Satellite Group negotiating for Australis Launch

By RICHARD TONKIN, Chairman, Project Australis

Two years ago, in June 1967, the first Australian-built Amateur Radio satellite was loaded aboard a jet in Sydney, bound for San Francisco. With the satellite, named **Australis-Oscar A** (AO-A), travelled the hopes of a small group of people who had put over two years' part-time work into the design and construction of a 17 x 12 x 6 inch box which, it was hoped, would make a worthwhile contribution to Amateur Radio satellite technology.

Following the arrival of AO-A at Project Oscar headquarters in California, the satellite was checked out and attempts were made to secure a launch. Unfortunately, despite a lot of hard work by Project Oscar over the past two years, it was not possible for them to obtain a launch for AO-A.

On 3rd March this year, a new organisation was incorporated in Washington, D.C., with the aims of building and obtaining launches for Amateur Radio satellites. The new group is the Radio Amateur Satellite Corporation (AMSAT). AMSAT's members are drawn from such organisations as the Communications Satellite Corporation, the NASA Goddard Space Flight Centre, the FCC, RCA, NASA Headquarters, IBM, etc. AMSAT has the blessing and support of Project Oscar.

The AMSAT organisation hopes to build and launch advanced Amateur Radio communications satellites, with the emphasis on a sub-synchronous orbit such that the satellite would drift slowly around the equator at an altitude of about 20,000 miles. Such a satellite would stay in range of any one Amateur Station for about two weeks at a time and would make trans-Pacific VHF and UHF Amateur communications possible.

On 14th April, following agreement between Project Oscar, AMSAT and Project Australis, the AO-A satellite arrived at AMSAT's Washington, D.C., headquarters. At the present time, the satellite is being tested and evaluated by AMSAT and AMSAT is discussing with NASA the possibility of launching AO-A as a secondary payload on a NASA vehicle. We are hopeful that the satellite (to be named **Australis-Oscar** 5 in orbit) will be launched into a fairly low polar orbit later this year. AO-A will transmit seven channels of telementary on 144.050 Mc. (50 mW., continuous) and 29.450 Mc. (250 mW., on command). It is hoped that propagation measurements can be made by observing signals from the two transmitters. The satellite also carries a magnetic stabilisation system designed to partially stabilise it in orbit. The AO-A satellite has already been described in a previous issue* and a further description, including updated telementry calibration data, will be published in a forthcoming article.

Further information about the Australis-Oscar A satellite and the latest news about launching plans may be obtained from the State Oscar co-ordinators:—

Queensland: Laurie Blagbrough, VK-4ZGL, 54 Bishop St., St. Lucia, 4067.

New South Wales: V.h.f. and T.v. Group, 14 Atchison St., Crows Nest, 2065.

Victoria: Don Graham, VK3BAC, 38 Murray Drive, Burwood, 3125.

Tasmania: Peter Frith, VK7PF, 181 Punchbowl Rd., Launceston, 7250.

South Australia: Brian Tideman, VK-5TN, 33 Ningana Ave., Kings Park, 5034.

Western Australia: Kevin Bicknell, VK6ZBC, 48 Sanderson Rd., Lesmurdie, 6076.

Project Australis activities encompass a wide range of endeavour and include intrastate, interstate and overseas ground-based communications networks (both voice and RTTY), ground-based VHF and UHF translators and repeaters, administration, publicity, satellite tracking and data acquisition, fund raising, satellite transmitter, receiver, telemetry, command, stabilisation and power systems, satellite repeaters and translators, and so on.

The Project invites both Radio Amateurs and those who, while they may not be licensed Amateurs are, nevertheless, interested in the work that is being done, to participate in these activities. Membership of Project Australis is open to all interested individuals and groups, both within Australia and overseas. Write to Owen Mace, Secretary, Project Australis, 84 Bowen Crescent, Princes Hill, Victoria, 3054, for membership form and further details.

* Australis Oscar A User's Guide, "Amateur Radio," Feb. 1968, p. 3.
Australis Oscar A User's Guide, "Amateur Radio," March 1968, p. 10.

THE JOYS OF R.T.T.Y.

STARRING JIM VK3DM

The pictures tell the story far better than words could ever do.

Left: "What the hell has gone wrong?"
Below left: "The trouble could be here."
Below right: "Ah!! That has fixed it."

FRED BAIL OVERSEAS

Mr. Fred Bail, of Bail Electronic Services, is at present visiting Japan and the Far East. In Tokyo, Mr. Bail will call on their principals, the Yaesu Musen Co., to inspect their factory and laboratory and the latest techniques in construction, testing, etc., of Yaesu s.s.b. equipment.

He will return to Australia via Hong Kong, Bangkok and Darwin early this month.

Overseas Magazine Review

"CQ"

February 1969

"CQ" was apparently held up in the mail or the issues were running a little later than "QST" and "73". This month we have February and March issues to review.

Introduction to IC Logic, F. B. McWilliams. Complete with lots of diagrams, the author discusses computer type logic. He attempts to rectify deficiences in Amateur knowledge by describing the circuit elements and building blocks of binary logic. A logic pulser and sine to square wave converters are described as novel construction projects.

Variable Frequency Tuner for the Visible Light Band. W4AML continues the series begun in January "CQ". In this issue he describes the construction and calibration of the monochrometer that can be used to tune across the light band.

Put Up Your Beam To Stay, W6BLZ. Ed has apparently been worried by the elements at his Coastwise location causing corrosion of his beam elements and found that the best solution was a coating of PVC electrician's tape. (Perhaps shrink fit tubing would work just as well and not require so much winding and unwinding?)

The W8NWU Teeter Tootter Tuners, W2EEY-/1. John says that following on from his article on T networks in "CQ" May '68 he had correspondence with various Amateurs who developed T network designs. One of the most interesting was W8NWU's series of tuners which added variety to the theme.

Measuring Power Input and RF Power Output, D. P. Smith. As modulation waveforms become more complex, perhaps some day including digital forms, one's view of power measurements requires a more generalised approach in order to avoid confusion.

Two Weeks in a Goldfish Bowl, Sylvia Margolis. In her usual racy fashion, Sylvia tells the story of GB2LO.

Co-axial Cables: S.W.R. Readings, Testing and Installation, W2EEY/1. The s.w.r. indicator at the transmitter never indicates the exact s.w.r. between the transmission line and antenna. Most often, however, the reading is close enough to be useful. This article explores what can cause erroneous s.w.r. readings on co-axial lines and how such lines can be tested and installed to prevent problems in them.

An Audio Limiter Circuit, WB4CVF. Described here is a distortion free limiter circuit capable of handling a wide dynamic range. Originally intended for r.t.t.y. use, the addition of a pre-amplifier has made it suitable for low level inputs.

Vertical Antennas, W3JM. Part IX. of a series, discusses a simple directional array which can be built in an equilateral triangle form and which gives a gain of 5.2 db. when using any two elements. (Looks interesting.)

The Galaxy R-530 Solid State Receiver. W2AEF reviews this new production. (It looks like quite a block diagram and if the receiver performs as well as the review suggests, then even at the Australian price it would be well worth while.)

March 1969

"Please Don't Call It A Transceiver." The adv. on page 11 is headlined and a new company called Signal One announces the arrival of its brain child which they have dubbed an "Integrated Station". Their CX7 seems to be crammed with goodies like nixie frequency readout, two v.f.o's built in, electronic keyer, etc., etc. They do not tell the reader what the price is. From the mouth watering advertising line, I have no doubt that it will out Collins by a considerable margin.

The Voice of Apollo 8, K4DSN writes about the communications system used to back the moon flights which are very topical right now with Apollo 10 in orbit around the moon as I write.

A Phase Modulator for Crystal Controlled VHF Transmitters, W6AJF. Thirty years ago I used to lap up the writings of Frank C. Jones who was famous for his "Super Gainer" receiver designs. He has converted himself to solid state and in this article describes a very useful device with an 8 Mc. output for multiplying into the v.h.f. region.

Two Weeks in a Goldfish Bowl. Sylvia Margolis concludes the story of GB2LO commenced in the February issue.

Communicating Through Moonray, WA2QMC. Nick Marshall, W6OLO, President of Nastar, was formerly Technical Director of the Oscar programme and he and the group are preparing submissions for Nasa to transport a five-pound weight 432 Mc. translator to the moon in the third Apollo/LM lunar mission in the early 1970s. Details of the requirements are given for all sections of a working circuit. It appears that communicating via the translator will be a cinch for VK3ATN with his 30 ft. dish as the minimum is stated to be a 10 ft. dish.

How About a Mini Transmitter Hunt, W9IWI. Describes very simply made transmitters to be hidden in a room and sought out using a b.c. band transistor radio. The author states that his unit is 3/8 x 1-1/8 inch and has a range of a "foot or two".

The 2 & 2 Dial for the HW-100. WA8ASQ considers that Heath's new all-band low-priced transceiver is definitely lacking and with some Jackson and Swan parts from Swan, he does something about it. (Perhaps Swan are not too happy to find their spares being used to modify a competitor's product, or maybe they are complimented.)

Vertical Antennas, Part X, W3JM. This month Capt. Paul Lee discusses how a folded unipole antenna less than a quarter wave long can be used to transform the low input resistance of a short vertical antenna to a resistance which is more reasonable to match and drive. The author further discusses the operation and design of the folded unipole antenna in this installment.

A Home-Made Slot Antenna for 432 Mc. by K4ZQR. Just what it says.

"CQ" reviews the **Paxitronix IC-3 Frequency Divider** for 25 Kc. markers and the **Caringella Compressor/Pre-amplifier, Model ACP-1,** by W2AEF.

"RADIO COMMUNICATION"

March 1969

Portable on Slieve Donard. GI3VJS describes how a group of Amateurs lugged a 4 mx station up to the top of a 2,796 foot mountain to attain contacts from some 300 kM. away. (Australian weather is kinder than that in Northern Ireland.)

A Single Sideband Transverter for 144-146 Mc. G3LUB describes a tube unit with a QQV06/40 in the output with 650 volts on the anodes.

Technical Topics by G3VA. Pat Hawker offers his usual interesting dissertation on the technical articles which have appeared recently in a number of publications. He covers some more cures for t.v.i., transistor frequency divider, a.f. filters, and a high gain JFET voltmeter.

Using the QRA Locator, A. J. Gould. The QRA locator is a system used in Europe for the rapid exchange of location information between v.h.f. stations.

As Steady as a Rock, G3JGO. Describes the operation of several types of crystal oscillators as well as the basic theory behind all oscillators. Valve and transistor circuits are shown.

JOE KILGARIFF, VK5JT

Joe, who celebrated his 83rd birthday on 3rd May, 1969, is believed to be one of the two oldest active Amateurs in Australia.

Whilst we do not have full details of his equipment, we do know he runs 100 watts and uses a TA33. His receiver is an AR88.

We wish him many more years of happy DX hunting.

"SHORT WAVE MAGAZINE"

March 1969

Variations on the Vertical, G8PG. Describes the means of adapting a 33 ft. system two-band coupler for the h.f. bands.

Making Cabinets for Home-Built Gear, G3REM. Describes the simple tools and equipment one would expect an Englishman to use to make his cabinets.

More About the No. 19 Set, G3TKR. Despite its age, this type of transceiver is still very useful for work on 160 and 80 metres. This article describes a conversion which could probably be applied to Australian number 19s. Some of the ideas could be of use in the later ex-Army sets also.

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Book Review

RADIO AMATEUR'S HANDBOOK

For many years, the A.R.R.L. Handbook was like a well known small motor car. All changes and improvements were gradually made over a long period of time. However, in the last few years, the A.R.R.L. have changed their policy, and the 1969 edition of this Handbook, which has been published continuously since 1926, has more changes and improvements than probably any other issue.

The theory sections, which are used as standard manuals by many others than Amateurs, have undergone considerable revision, and much more emphasis has been placed on solid state devices, including dual gate MOSFETS, solid state product detectors, and transistorised oscillators. Numerous brand-new construction projects have been included. Among them are such items as universal-type power supplies for all voltage ranges from 3 to 1,000. Solid state transceivers have been added. Transmitting and transceiving converters for s.s.b. are described, and transmitting equipment for the 160 metre band has been added. Treatment has also been given to v.h.f. f.m. repeater stations and satellite communications.

Regardless of whether you are a beginner or an Amateur of many years standing, this book is a must on your bookshelf.

The review copy was supplied by the A.R.R.L.

V.H.F. COMMUNICATIONS

Published by Verlag UKW-Berichte, West Germany. Soft paper cover 6 x 8½ inches, 64 pages.

The first edition Feb. '69 represents the beginning of a new Amateur Radio magazine, devoted entirely to v.h.f.-u.h.f. and microwaves. It is essentially the English version of the German Amateur Radio magazine UKW-Berichte and will be useful to the group of Amateurs working in the frequencies of 144 Mc. and above.

It is interesting to note that this magazine is written in the fashion of a technical publication rather than in the more common form directed at the local Amateur scene. Its international market probably accounts for the absence of advertisments, club news, DX notes, etc., and has allowed the contents to be entirely devoted to providing instructions for building transmitters, receivers and test equipment. Towards this end, the publishers claim that printed circuit boards and special components mentioned in the articles will be available through the Australian distributors, but one ponders the cost and delay that must be incurred due to importing such items.

The technical articles in this first edition deals with the construction of a 2 metre converter and compares the performance with the commercially made units, the construction of a phase locked oscillator, a 144/432 Mc. low power transverter and antennae for v.h.f.-u.h.f. One notable highlight is an article written by R. Lentz, on a solid state converter for 1296 Mc. A clearly written article with excellent coverage of the electronic and construction details of the co-axial tuned cavities. The diagrams of the metal work are easy to follow, provided that you remember all dimensions are in millimeters.

A well written magazine to be recommended to all interested in v.h.f. techniques, and a notable addition not only to the libraries of those experienced Amateurs operating in this portion of the spectrum, but also to those commencing their activities as limited operators in the v.h.f.-u.h.f. bands.

Our copy was received from the Australian representative, 2 Beaconview St., Balgowlah, N.S.W., 2093.

DX

Sub-Editor: DON GRANTLEY
P.O. Box 222, Penrith, N.S.W., 2750
(All times in GMT)

I guess it is not very often that an S.w.l. compiles the DX page for an Amateur Radio magazine, and I trust I am able to do the job in the manner of my more capable predecessors. We will continue with the present format, however I would appreciate any assistance other members can give me, not so much with DX worked, but with items of general interest. My postal address is P.O. Box 222, Penrith, N.S.W., 2750. I am on the staff of the Penrith Post Office, where I can be contacted at Penrith 20660, home phone is Springwood 511364. Finally, I can be contacted by tape using twin track 3¾ i.p.s.

Information for this issue is per courtesy of International Short Wave League (England), Newark News Radio Club (U.S.A.), Geoff Watts (U.K.), George ZL2AFZ, Larry DX1AAV, George L6042, Mac Hilliard, Steve L5088, Jack VK3AXQ, Long Is. DX Assn., GC8HT, W2GHK.

HERE AND THERE

Further news on the DU call signs comes from DX1AAV. Only three DX calls were issued, they were DX1HMI, DX1BJ and DX1AAV. It appears that W and DU are about to sign a reciprocal agreement, and all calls issued will be in the DU1ZAA series, the DX prefix being retained for use by the DU gang for expeditions.

GC8HT on Guernsey supplies his sked information and QSL particulars. For VK, send direct to home QTH: Richard H. Taylor, La Coure de Longue, St. Saviour's, Guernsey, C.I., enclosing SAE or IRC. Cards via the bureau will be overstamped "confirmed by GC8HT" and returned.

List of DX worked and heard by Jack VK3APN is really outstanding, however he missed out on a beautiful contact with PA0RIH who was 599 and out in the open, when his power supply blew up.

Did you notice during the Heard Is. operation of VK0WR, an adjacent operation by UA0WR? Made things somewhat confusing for a while. Whilst on the subject, UV0ED and EX are both Sakhalin Is., Zone 19, UA0EH also Zone 19, whilst UA0YE is in Zone 23.

CR8AG has been reported active from Portuguese Timor, using a 25 watt a.m. signal.

Frank VK2QL, writing in the VK2 Divisional Bulletin this month, mentions an incident whereby Karl VK2BKM was approached by a would-be QSL manager from Italy whose main interest seemed to be how much the task would be worth to him. This happens, however there are many sincere chaps who would take on the task of QSL manager for a DX station, and Arther Miller, 62 Warwards Lane, Selley Oak, Birmingham 29, England, who is editor of "Monitor," has a list of these persons. A letter to him will assist anybody who needs assistance with their QSL chores.

Recent visitor to this country was Jack Dale, WB2TIU, of New Jersey. Jack is a radioman on the "African Star" and well known in v.h.f. circles in that area.

160 metres has dropped off in VK6 from a DX point of view, however George Allen, L6061, has logged several VK3s on that band, namely 3CV, 3AUJ, 3ARL, 3AXH?, 3ACA, 3ACH and 3GU. George has offered to supply these chaps with further particulars if they are interested. 283 Amelia St., Balga, W.A., 6067, is his QTH.

VS9MB again active with Brian G3XGY as operator. He has not been active on 80 mx, and the operator using this call since the departure of Malcolm last September is a pirate.

Further on the YB0 situation. YB0AAC, K3JJG/YB0, AAE and AR have been reported, and I heard YB1BC with a 599 signal on 20 early in May. Time was 1400z. Any information on this operation would be appreciated.

Cards for 7G1CG have been delayed, but Carlo intends mailing his logs to manager WA3HUP when he leaves at the end of May.

Cards for PA0MM, CX2CO, PY2PA, PY2PE and GD6UD, the latter for operation by Cambridge University from Mar. 17 to 24, are being processed by DX-pedition of the month, Box 7388, Newark 07107, N.J., U.S.A. A reminder on QSL procedure for this group may be in order at this stage. All QSLs to above address and all replies are sent via the return bureau unless return postage is supplied.

I note, too, a reminder from Dick GC8HT re writing the name of the month in QSLs. Many countries, particularly U.S.A. and Russian operators, when using figures reverse the position of the date and month, thus we date a card 3/11/69, they read it as March 11, can't locate it in the log and have to take valuable time in searching or else return the card as incorrect. S.w.l's are unfortunately offenders in this matter.

Bob Lane, G5AAM, who operated under the DX-pedition of the month banner last year and gave us some good call signs, has now returned to the States.

Surface mail embargo imposed on the Eastern States of America has been lifted, and their QSLs should be coming through.

Gus W4BPD has chartered a boat from 7th June for Algalea, Farquahar, Wizard Reef, Aldabra, Glorieuses (if licensed), Geyser Reef, and Madagascar, where he expects to arrive mid-July. He will operate /MM between stops and "reef" operation will depend on the wx.

3A2CL and EE will be operating May 25 and 26. QSL via F9RM.

1N2A ops. made 500 QSOs from Marco, and will return for further operations if the A.R.R.L. grants separate status; QSL to W4VPD.

Looking for 5R8? Try 5R8AN on 14270 s.s.b. at 0430 or 21335 0400z when in sked with QSL manager who is K4IE.

Operation by DU2NSJ on May 10-18 was the National Scout Jamboree, also DU0DM on May 20-June 1 was the annual expedition to Corregidor.

Who said a.m. died? Eskil Eriksson, who is most likely the highest scoring S.w.l. in the world with nearly 330 countries heard, recently heard three new ones, all on a.m.

Probable operation from Navassa by WB6HBK and IWS if permission granted. Transport has been arranged for mid-June, with later operation from KB6, KP6 and VR3.

QSL DETAILS

Bernard Hughes, of the I.S.W.L., sends the following list of stations who can be QSL'd through the I.S.W.L. Bureau at 87 Dunnington Rd., Wootton Bassett, Swindon, Whilstshire, England. HL9HQ, HS1TA, FP8AS, KP4BJD, KS4AAZ, KP4AZN, MP4BCU and BCV, MP4-TBO and TBU, PJ3AO, TG9EP, VP2AB, VP3AA, VP5RS, VP7CC, ZD8CC, YS1JL, XE1YG, XE-2BM, XE0GFJ, QDC and RZW, VP7NQ, VQ8AD, VS6EC, 9V1LP, 9K2AY, 9J2BC, 8RIP, 9M4MV and 9L1TL.

From "Monitor" a run-down on the YAs.

YA1AB—Chas Bennett, C/o. Pan American, Box 76, Kabul, Afghanistan.
YA1DAN—E. Daniels, U.S.A.I.D., U.S. Embassy Mail Room, Kabul.
YA1EKZ—C. Green, U.S.A.I.D., Illinois Uni., C/o. U.S. Embassy Mail Room.
YA1GNT—Ed Popko, Pan American, Box 76, Kabul.
YA1HD—H. Decker, Box 389, Kabul.
YA1KO—H. Koski, Harza Eng. Grp., U.S.A.I.D., Kandahar, C/o. U.S. Embassy.
YA1YB—Wes Baldwin, U.S.E.T./U.S.A.I.D., Embassy Mail Room, Kabul.
YA1ZA—G. Craig, Robt. Nathan Assc., U.S. A.I.D., Embassy Mail Room.
YA1ZC—John Wallace, U.S. Eng. Team, U.S. A.I.D., Embassy Mail Room.
YA2HWI—P. Larger, U.S.A.A.I.D./Sth. Ill. Uni., U.S. Embassy Rail Room.
YA5RG—Wolfgang Renner, Box 279, Kabul.

C2JW (ex VK9RJ)—R. Wirth, C/o. O.T.C., Nauru Is., Central Pacific.
CE8AA—A. Nielsen, Cas 464, Punta Arenas, Chile.
DX1NY—B. J. Smith, C/o. S.E.A.C.R., A.P.O. San Francisco 96274, U.S.A.

It is essential to use the zip code on all mail to the U.S.A., particularly those C/o. A.P.O's., there are many different zip codes shown care of A.P.O. San Francisco, and if the number is omitted, the card is returned to the sender.

QSL MANAGERS

CE9AT—CE3ZN.	HU1P—WB4BOJ.
CE0AJ—DL9KRA.	HB0AFM—HB9AFM.
CR3KD—WA4PXP (ssb) W2CTN (cw)	HB0GJ—HB9GJ.
CR6KT—W3HNK.	JZ5CI—W2CTN.
CR6LF—W3HNK.	KS6CX—K4ADU.
CT6AW—DJ2IB.	MP4BGX—G3XHE.
DU1ZAG—WB6GFJ.	OY2A—DL7FT.
EA6BG—DL7FT.	PJ2CC (for Mar. 21 to Ap. 2)—W1BIH.
EP2FD—WA5ERS.	PY0RE—PY1HX.
EP3AM—W3GJY.	WA6QGW/PX—K6VVA.
FG7XT—K5AWR.	ZL3ABJ/C—W5BRO.
GB2DCF—G3KQB.	

AWARDS

Afghanistan Award is issued for working YA stations from Jan. 1, 1966. Asian stations need four YA's, Africa and Europe need three, other continents need two, in all cases at least one must be on a different band. QSLs plus a dollar or 10 IRCs to YA5RG, Box 279, Kabul.

Malaysian Award.—You need ten 9M2, ten 9V1, one VS5, one 9M6, also one 9M8. Check list to Box 777, Kuala Lumpur, Malaysia.

Apollo Special Event Certificate.—Awarded by Kennedy Space Centre A.R.S. for QSOs made during each manned Apollo space mission (presumably with club members). Club operates on 3975, 7275, 14340, 21340 s.s.b., and 21100-250 c.w. Operation begins at time of Saturn V. space booster lift off, and continues for about 10 hours. QSL and IRCs to WB4ICJ, P.O. Box 21073, Kennedy Space Centre, Florida, 32815.

LATE FLASH

Thor Heyerdahl, who hopes to cross the Atlantic in a reed boat, will be using the call LI2B, and will be QRV on 20 metre phone.

SUMMARY

Having been away in VK4 for the past two weeks, I have done little listening, however from various reports, in particular Mac Hilliard over in Campsie, it would seem that conditions are on the wane. Mac reports 10 is out, but much more early morning activity on 40 c.w. from Europe. I heard some good signals on 80 c.w. about 4 a.m. local time a few days ago. George ZL2AFZ reports the predictions for June and July are 91 and 90, with January confirmed at 104 against 100 predicted.

73, Don L2022.

CONTEST CALENDAR

5th/6th July: R.S.G.B. 1.8 Mc. Contest.
5th/6th July: N.Z.A.R.T. Memorial Contest (3.5 Mc. only).
16th/17th August: Remembrance Day Contest.
23rd/24th August: All Asian DX Contest (J.A.R.L., c.w. only).
4th/5th October: VK/ZL/Oceania DX Contest 1969, Phone Section.
11th/12th October: VK/ZL/Oceania DX Contest, 1969, C.w. Section.
11th/12th October: R.S.G.B. 28 Mc. Telephony Contest.
25th/26th October: "CQ" W.W. DX Contest, Phone Section.
25th/26th October: R.S.G.B. 7 Mc. C.w. Contest.
9th November: International OK DX Contest (c.w. only).
29th/30th November: "CQ" W.W. DX Contest, C.w. Section.
6th December, 1969, to 11th January, 1970: Ross A. Hull Memorial Contest.
1st/2nd February, 1970: John Moyle National Field Day.

HELVETIA XXII.

In order to create a healthy emulation between its members and to intensify the contacts with foreign Amateurs, the U.S.K.A. donates a diploma, **Helvetia XXII**. This diploma is attributed to foreign Amateurs who certify having contacted once each Swiss canton.

To be valid, these contacts should be made on c.w. or phone (mixed QSL are acceptable), exchanging the RS (T) and QTH. Foreign Amateurs are to submit 22 QSL cards, i.e. one for each canton.

This regulation is in force as from 15th April, 1948. Any QSO made prior to this date is not valid. No delay has been fixed to realise this performance.

The following is a list of Cantons to be contacted:

1. Zurich	ZH	12. Schaffhouse	SH
2. Berne	BE	13. Appenzell	AR
3. Lucerne	LU	14. St. Gall	SG
4. Uri	UR	15. Grisons	GR
5. Schwyz	SZ	16. Argovie	AG
6. Unterwald	NW	17. Thurgovie	TG
7. Glaris	GL	18. Tessin	TI
8. Zoug	ZG	19. Vaud	VD
9. Fribourg	FR	20. Valais	VS
10. Soleure	SO	21. Neuchatel	NE
11. Basel	BS	22. Geneve	GE

Address for awards: U.S.K.A. Award Manager, Henri Bulliard, HB9RK, P.O. Box 384, 1701 Fribourg, Switzerland.

VHF

Sub-Editor: CYRIL MAUDE, VK3ZCK
2 Clarendon St., Avondale Heights, Vic., 3034

Not much in the way of general news this month, but would like to appeal to Divisional Secretaries again for the dates of the Divisional meetings and V.h.f. Group meetings, as I am always getting requests for this information.

I would also like details of the MAIN net frequencies and the Translater frequencies that are to be used.

Well that's all for now, 73 Cyril VK3ZCK.

VICTORIA

This month (May) lacks any DX of note, but making a welcome appearance again on two metres after a long break while re-building is Allan VK2ZEO, who resides in the southern N.S.W. town of Deniliquin. Allan can be worked almost nightly by Melbourne stations and has a very healthy signal. Another signal which can be heard occasionally is the Albany beacon VK6VF/P. This signal can be heard via Meteor scatter, and because of its permanent emission and its location, is one of the few that can be heard by this media.

432 Mc. is still a very popular band in VK3 and should have an increased population before very long. The following is a list of the boys in this State who are equipped to operate two-way on this band: VKs 3AUX, 3BAS, 3AKC, 3ZBZ, 3AGV, 3ZPU, 3ZSJ, 3ZYO, 3ATY, 3ZBJ, 3ZHW, 3ZYT, 3ZEO, 3ABP, 3AY and many more who only transmit or who can only receive.

Les VK3ZBJ and Ron VK3AKC have been experimenting on 1296 Mc. between shacks which are about 40 miles apart, and are having most encouraging results. Signals have been around the S5 to S9, but experiments were cut short when Ron was taken ill and is now taking an enforced rest. Best wishes Ron and we all hope that you are back on deck again soon.

Over the Queen's Birthday week-end a large gathering of Amateurs from VK5 and VK3, together with their YLs, XYLs and harmonics, attended the South-East Radio Group annual convention at Mount Gambier. A very good time was had by all. Fuller details in next month's "A.R." 73, Peter VK3ZYO.

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NEW CALL SIGNS

MARCH 1969

VK1NR—J. B. Scott, 39 Empire Circuit, Forrest, 2603.
VK1WA—W. A. Bell, 27 Guilfoyle St., Yarralumla, 2600.
VK2HI—N. A. Jeffery, Christian Bros. School, Church St., Wagga Wagga, 2650.
VK2KR—K. C. Mattei, 174 Kissing Point Rd., Turramurra, 2074.
VK2MK—E. C. Sloss, 205 Deepwater Rd., Castle Cove, 2069.
VK2BJM—J. R. Martin, 114 Iluka Rd., Palm Beach, 2108.
VK2BMW—M. F. Wiedyk, 290 Forest Rd., Kirrawee, 2232.
VK2BNM—N. C. McMillan, 3 Long St., South Strathfield, 2136.
VK2BRB—R. L. Close, Station: C/o. W. Connick, Goodnight, 2739; Postal: P.O. Box 8, Goodnight, 2739.
VK2BTB—T. S. Barnett, 20 Elizabeth St., Fairy Meadow, 2519.
VK3FC—F. T. Clark, 4 Carroll St., Leopold, 3221.
VK3QF—P. J. Dettman, 45 Hutton St., Kyneton, 3444.
VK3AAK—H. A. McLachlan, 1521 Heatherton Rd., Dandenong, 3175.
VK3AEJ—G. W. Brain, Federal St., Rainbow, 3424.
VK3AJU—H. Jupp, 20 Webster St., Dandenong, 3175.
VK3AMA—T. J. Van Staveren, 18 Agnew St., South Blackburn, 3130.
VK3AMO—R. L. Warnecke, "The Springs," Merricks North, 3926.
VK3APL—A. Campbell-Drury, 10 Colchester Dr., East Doncaster, 3109.
VK3ARI—J. W. Hart, 171 Henty St., Reservoir, 3073.
VK3ASE—L. E. Martin, Flat 8, 245 Warrigal Rd., South Oakleigh, 3167.
VK3ASO—Midlands Experimental Radio Group, Bendigo Institute of Technology, Macrae St., Bendigo, 3550.
VK3ASU—St. Paul's College Radio Club, Chambers and Blackshaws Rds., Altona North, 3025.
VK3AXM—L. De Vries, 167 Lloyd St., Moe, 3825.
VK3AXN—A. G. Thornton, "Yaralin," Kangaroo Ground Rd., Warrandyte, 3113.
VK3AXQ—J. R. Dunne, 13 Hanlon St., Tatura, 3616.
VK3AYB—J. A. Robb, 2 Wemberly Crt., Glen Waverley, 3150.
VK3AZI—G. P. Chamberlain, 17 Glenda St., Doncaster, 3108.
VK3AZQ—P. Broughton, 9 Andrews St., Burwood, 3125.
VK3AZU—D. M. Laws, 102 Mimosa Rd., Carnegie, 3163.
VK3ZCF—J. G. Telfer, 40 Lucerne Cres., Alphington, 3078.
VK3ZCV—C. J. Chippindall, 7 Morack Rd., Vermont, 3133.
VK3ZDD—R. V. Reid, 17 Norman St., East Doncaster, 3109.
VK3ZDW—I. W. Cowan, Flat 2, 41 Melrose St., North Melbourne, 3051.
VK3ZHQ—B. P. Kreymborg, 7 Sir Garnet Rd., Surrey Hills, 3127.
VK3ZKK—D. R. Riglar, 12 Palmerston Crt., Greensborough, 3088.
VK3ZKY—T. Johnson, 34 Kathleen St., East Preston, 3072.
VK3ZKZ—D. V. Hambleton, Flat 8, 134 Neerim Rd., Carnegie, 3163.
VK3ZLA/T—H. H. Chittock, 11 Little Myers St., Geelong, 3220.
VK3ZLF—V. P. Hunt, 18 Rose St., Box Hill, 3128.
VK3ZMV/T—H. A. Kellock, Flat 10, 7 Kenilworth Pde., Ivanhoe, 3079.
VK3ZNC—G. D. Kuck, "Ramanyuck," Perry Bridge, via Stratford, 3862.
VK3ZNR—E. J. Haydon, 550 Pascoe Vale Rd., Pascoe Vale, 3044.
VK3ZOA—A. J. Wighton, 6 Marcella Crt., Glen Waverley, 3150.
VK3ZOJ—A. W. Taggard, 31 Nisbett St., East Reservoir, 3073.
VK3ZOL/T—B. L. Young, 6 Stockdale Rd., Traralgon, 3844.
VK3ZPO—T. M. Porritt, 10 Morden Crt., Nunawading, 3131.
VK3ZQU—B. T. Dingle, 13 Theodore St., Bendigo, 3550.
VK3ZQX—P. R. Rodeck, 137A Mont Albert Rd., Canterbury, 3126.
VK3ZSN—W. Chandler, 48 Noble St., Newtown, 3220.
VK3ZSQ—C. E. Middleton, Flat 3, 1A Ross St., Bentleigh, 3204.
VK3ZTA—D. J. Laidlaw, 5 Kyle Ave., Belmont, 3216.
VK3ZTT—V. Alilou, 6 Grandview Ave., Maribyrnong, 3032.
VK3ZUJ—B. S. Jarrett, 103 Tucker Rd., Bentleigh, 3204.
VK3ZVI/T—I. C. Batty, 327 Banks St., South Melbourne, 3205.
VK3ZVP—R. A. Rhone, 485 Bluff Rd., Hampton, 3188.
VK3ZVV—R. D. Miller, Flat 6, 234 Nicholson St., Abbotsford, 3067.
VK3ZWG—P. M. Simpson, 5 Laurence St., Glenroy, 3046.
VK3ZYF—C. J. Holliday, 30 Gardenia St., Blackburn, 3130.
VK3ZYY—A. M. Goode, 92 Mont Albert Rd., Canterbury, 3126.
VK3ZZL—G. M. Strickland, 61 Glenoreme Ave., Ormond, 3204.
VK3ZZV—G. Fella, 8 Hilton St., Glenroy, 3046.
VK3ZZX—G. J. Zimmer, 12 Munro St., Malvern, 3144.
VK4DQ—B. V. Stockwell, 1 Jimbour St., Eagle Junction, 4011.
VK4LI—E. R. Lundquist, 32 Marshall Lane, Kenmore, 4069.
VK4QY—K. B. Pounsett, Flat 3, 12 Bouchard St., Chermside, 4032.
VK4TI—T. W. A. Halley, 1/24 Tarcoola Cres., Chevron Island, Surfers Paradise, 4217.
VK4TZ—A. E. Taylor, Officers' Mess, R.A.A.F. Base, Townsville, 4810.
VK4YZ—W. H. M. Hoyle, 21 23rd Ave., Mt. Isa, 4825.
VK4ZBO—A. R. Tarbit, Station: Mt. Nebo, 4520; Postal: P.O. Mt. Nebo, 4520.
VK5PI—G. Preston, 413 Montague Rd., Modbury, 5092.
VK5QC—W. H. J. Francis, 19 Morphett Rd., Camden Park, 5038.
VK5VJ—I. B. Werfel, 23 West Tce., Ardrossan, 5571.
VK5ZDU—D. R. De Cean, 2 Danby St., Torrensville, 5031.
VK6PD—Western Aust. Institute of Technology Amateur Radio Club, Hayman Rd., Bentley, 6102.
VK6ZEU—V. Mathews, Lot 169, Mereworth Rd., Thornlie, 6108.
VK7ZWD—D. Whent, 14 Kurrajong St., Grassy, King Island, 7256.
VK8ZBQ—B. R. Williams, Station: Flat 17, 92 Smith St., Darwin, 5790; Postal: C/o. H.F. Broadcast Project, P.M.G. Department, Box 2562, Darwin 5794.

CANCELLATIONS

VK1KM—K. C. Mattei. Now VK2KR.
VK1PI—W. L. Pitts. Deceased.
VK2CA—R. M. Harnett. Not renewed.
VK2KP—A. Fox. Deceased.
VK2RL—A. R. Litchfield. Not renewed.
VK2AFE—A. Magennis. Deceased.
VK2AXZ—W. A. Bell. Now VK1WA.
VK2BAP—V. L. Shillcock. Ceased operation.
VK2BIP—J. Pernu. Not renewed.
VK2BNR—J. B. Scott. Now VK1NR.
VK2BRD—R.A.A.F. (Richmond Amateur Radio Club). Ceased operation.
VK2ZNI—N. A. Jeffery. Now VK2HI.
VK2ZNL—R. N. Lee. Transferred to T.P.N.G.
VK2ZNW—W. Nicholl. Deceased.
VK2ZSI—R. L. Close. Now VK2BRB.
VK2ZSZ—D. T. Stevens. Transferred to S.A.
VK3LJ—J. P. Baker. Transferred to Qld.
VK3MA—W. R. Edwards. Transferred to Northern Territory.
VK3XO—L. A. Paul. Deceased.
VK3APJ—P. J. Dettman. Now VK3QF.
VK3ATR—T. B. Rodda. Transferred to Qld.
VK3ZSS—L. De Vries. Now VK3AXM.
VK3ZTC—A. N. Richardson. Transferred to Tas.
VK3ZVT/T—D. S. Thomas. Transferred to Canberra.
VK4HS—H. G. Scott. Deceased.
VK4ID—I. G. Dawson (Rev. Fr.). Transferred to W.A.
VK5GU—G. B. Hunt. Ceased operation.
VK5QT—H. F. Treharne. Deceased.
VK5SE—J. L. Schuler. Not renewed.
VK5ZBQ—B. R. Williams. Now VK8ZBQ.
VK5ZIW—I. B. Werfel. Now VK5VJ.
VK6DF—M. A. T. Du Feu. Not renewed.
VK7KC—L. Cordell. Transferred to Qld.
VK7ZFB—B. A. Butler. Transferred to Vic.

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1969 B.A.R.T.G. CONTEST RESULTS

No.	Call Sign	Points	Contin-ents	Diff. C'tries	Total C'ntacts
1	W2RUI	64,800	4	23	118
2	G3MWI	60,320	4	20	128
3	I1KPK	59,136	4	20	125
4	SM4CMG	49,680	3	18	108
5	VE7UBC	45,252	4	18	95
6	WA6WGL	44,814	4	18	87
7	W9HHX	41,664	4	17	128
8	VE2HL	34,216	3	16	67
9	I1CQD	31,326	4	16	61
10	DL5PQ	30,636	4	16	58
11	W5VJP	29,964	4	16	133
12	K2KFV	29,856	4	15	66
13	VK3NR	29,568	4	16	64
14	I1RRE	28,350	3	16	79
15	XE1YJ	28,260	4	10	77
16	I1KFL	22,952	4	16	48
17	SM5CLW	22,640	4	14	38
18	W2DIZ	20,824	4	15	36
19	I1EVK	19,532	3	14	46
20	W8CAT	18,942	3	13	51
21	K4VDM	17,918	4	12	31
22	PA0GKO	17,884	3	15	46
23	VE3RTT	17,490	4	9	39
24	K1GYF	17,366	3	12	45
25	VE6MM	14,952	4	9	47
26	DJ8BT	13,860	3	12	39
27	HB9P	13,022	2	13	39
28	WA8IQZ	12,992	3	13	34
29	WB6JSY	12,974	4	9	43
30	W6FFY	11,676	3	10	37
31	G3IYG	11,570	3	11	29
32	KH6GLU	11,070	4	9	43
33	SM0KV	8,944	2	10	32
34	W6AEE	8,808	3	7	23
35	ZL2ALW	8,016	4	8	21
36	OZ6OB	7,920	2	10	23
37	W0HAH	7,680	3	8	32
38	I1LCF	7,110	3	9	19
39	W2HAJ	6,696	3	9	20
40	W9CTX	6,462	3	9	23
41	VO1EE	5,440	2	7	28
42	ZL2AFE/3	5,072	2	6	25
43	F3PI	4,992	2	8	23
44	HA5FE	3,618	1	9	21
45	WA6TLA	3,348	2	3	35
46	DJ9XB	2,150	1	4	23
47	I1JOE	1,460	1	4	10

Check Logs were also received from DL3NO, G8CDW and ON4BX.

The British Amateur Radio Teleprinter Group will be on the air this year from the R.S.G.B. International Radio and Communications Exhibition to be held in London between 1st and 4th October inclusive. The call sign in use will be GB3RS and the frequency on or around 14.090 Mc.

Operation will be confined to Exhibition hours and in conjunction with s.s.b. transmissions from the R.S.G.B. stand on the h.f. bands. Although specific times of operation cannot be given, it is expected that RTTY will be heard from the Exhibition between 10.00 and 13.00 GMT, and again between 16.00 and 19.00 GMT. Special B.A.R.T. QSL cards will be issued to confirm RTTY contacts.

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THE 9th INTERNATIONAL CONGRESS OF RAILWAYMEN RADIO AMATEURS

FEDERATION INTERNATIONALE DES RADIO AMATEURS CHEMINOTS

(International Federation of Railwaymen Radio Amateurs)

Letter from DJ3UN (translated by VK2AOU)

The world wide common professional activities of railwaymen brought it about that those who are also Radio Amateurs founded the F.I.R.A.C. This activity is supported by the various railway authorities in many countries, and especially in the larger cities railway Radio Amateur clubs were formed on railway land which operate club Amateur stations (like DL0DD in Hamburg, Germany).

The F.I.R.A.C. was founded in 1960 when French and Swiss Radio Amateurs met in Geneva. International congresses were held since 1962 to establish personal contacts and friendship between railwaymen, and the organisation was established. A constitution was worked out, the administration was organised, an annual call book printed, and a rapid-call-book prepared.

For the last three years two contests were held annually in April and November respectively. The F.I.R.A.C. award is being prepared. There are regular weekly radio contacts on all bands, and the number of participants is increasing all the time.

The following national groups belong now to F.I.R.A.C.: From DL, F, G, HB, I, LA, LX, OE, OH, ON, OZ, PA, SM and YU, as well as from the U.S.A. (Baltimore and Ohio/Chesapeake and Ohio Railroads Amateur Radio Club), VE, 5N2 and 6W8. Colleagues from the following countries have been invited to join: CT, EA, JA, PY, SV, TJ, VK, YO, ZL, ZS, 4S7 and others.

Many national F.I.R.A.C. groups have their own club stations (at the moment 18 in West Germany), where training of beginners in all fields of Amateur Radio is carried out like c.w., regulations, home construction of the rx, tx and other gear.

The next international congress will be held at the German alpine village of Grainau (resort place at the foot of Germany's highest mountain, 9,000 feet). The meeting place is "House Hammersbach". 200 members from 14 countries will participate.

There will be three congress meetings and several sight seeing trips. The call sign of the congress station will be DL0CF. It is being operated from 21st to 25th September, 1969, and from 29th September to 2nd October, 1969. The operating times (suitable for contacts with VK) are 0930 to 1100 GMT 14,345 Kc. and 14,200 Kc. A special QSL and postage stamp is being issued, as well as a special postcard. The official opening of the congress is on 25th September, 1969, 1 to 7 p.m.

Further information may be obtained by writing to H. Windelband, DJ3UN, 2 Hamburg, 63, Stuebelheide 170, West Germany. Phone 595-003 or 591-255, Ext. 306.

Those railwaymen Amateurs who happen to have their long service leave and are on the continent next September can be sure of a great time if they would attend this congress.

HAMADS

Minimum $1 for forty words. Extra words, 3 cents each.

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FOR SALE: Collins Mechanical Filter, 2.1 Kc. bandwidth, 455 Kc., with matching Pye crystals, perfect order, $30 o.n.o. C. Jenkins, VK4QJ, P.O. Box 199, Roma, Qld., 4455.

FOR SALE: Collins S Line complete, consisting of 32S3 transmitter, 75S3C receiver, 62S1 vh.f. transmitter/receiver converter, 516F2 a.c. supply. These are current models and in top condition. The receiver, which will not be sold separately, is fitted with switchable Collins 600 cycle mechanical filter for v.h.f. DX work. These units were purchased new from Collins by advertiser. $2,150. Alec Swinton, VK2AAK, P.O. Box 1, Kulnura, N.S.W., 2251.

FOR SALE: Galaxy V Transceiver with commercial power supply and VSWR bridge. CW monitor included in power supply. Mint condition, $425. Phone Melbourne 83-9355 evenings.

FOR SALE: Geloso G4/215 Ham Band only Receiver, 3 years old, in mint condition. Suit Ham or discriminating S.w.l. $125. Well built complete 2 mx a.m. Transmitter, $60. R. TV & H 1963 R-C Bridge, $10. VK3AXM, L. De Vries, 167 Lloyd St., Moe, Vic., 3825.

FOR SALE: Imported Parkes 432.3 U.h.f. Converter as used on recent moon bounce tests, low noise level. TIXMO 5 and TIXMO 7 transistors, in-built regulated supply, as new, $54. Alec Swinton, VK2AAK, P.O. Box 1, Kulnura, N.S.W., 2251.

FOR SALE: Megacycle Meter by Measurements Ltd., New Jersey (see A.R.R.L. Handbook ad.), Model 50 UHF Head, $100. Power supply for meter, $60. Alec Swinton, P.O. Box 1, Kulnura, N.S.W., 2251.

FOR SALE: Solid state power supply as used on Hallicrafter HA-2 2-metre transverter, 750v. at 150 mA., 250v. at 125 mA., and —60 volt. $80. Alec Swinton, P.O. Box 1, Kulnura, N.S.W., 2251.

FOR SALE: Table Top five-band a.m., c.w., f.m. commercial tx. 95 watts r.f. O/P all bands, in-built power supply. As new. Ideal for conversion to double sideband. See Adv. "A.R.," April '69. Inquiries VK3XD, ph. 439-9862. $125 o.n.o.

SELL: Channel Master H.D. Automatic Rotator, 240v., with cables and ball race thrust bearing, as new in carton, $50. Wanted: Vox Board, suit Galaxy Transceiver. D. J. Fisher, P.O. Box 53, Dapto, N.S.W., 2530. Phone Wollongong 61-2144.

SELL: National NCX-A Power Supply. Matches NCX-3 and NCX-5 Transceivers. Post Office Box 69, Kew, Vic., 3101.

SWAN 350, full 10 mx coverage, plus Swan-type 1,000 volt heavy duty a.c. supply; like new condition with original carton, $375. Pair SCR536F Walkie-Talkies, with xtals on 80 mx plus spare chassis, $25 with handbooks. VK2ASI, 6 Victoria St., Inverell, N.S.W., 2360.

SWAN 350 with a.c. power supply, 100 Kc. calibrator. $430, or offer. VK4KE, 106 Taylor St., Toowoomba, Qld., 4350.

VK3AOD is clearing out his shack and is offering the following for sale. R.C.A. AR88 Receiver, fitted with P/D for SSB reception, perfect order, spot on calibration, complete with matching speaker and instruction book; bargain at $150. Wilcox Gay VFO, 1 to 10 megs., beautiful job made for U.S. Forces to drive Command Transmitters; very stable, fitted in solid copper case, 807 output metered, complete with instruction book; best offer over $30. Astor Model T.V.1 3-inch CRO, very little used; time base 2 c/s. to 50 kc., with instruction book and circuit, $50. Palec Model TVM vac. tube voltmeter, complete with EHT probe, etc., very little used since new, lab. job; bargain, $50. National Model RS772 Stereo Tape Recorder, 3-speed 4 tracks, perfect order; this is the big daddy job incorporating all necessary refinements, cost over $400; bargain at $150. For any trial or inspection given on the above. Phone Warragul 22771: after hours or week-ends phone 21106. Home QTH: 67 Latrobe St., Warragul, Vic.

WANTED: Manual, circuits or any information on AMT150 Tx and its power supply. A. J. Greenham, VK4AG, 21 The Crescent, Kallangur, Qld., 4503.

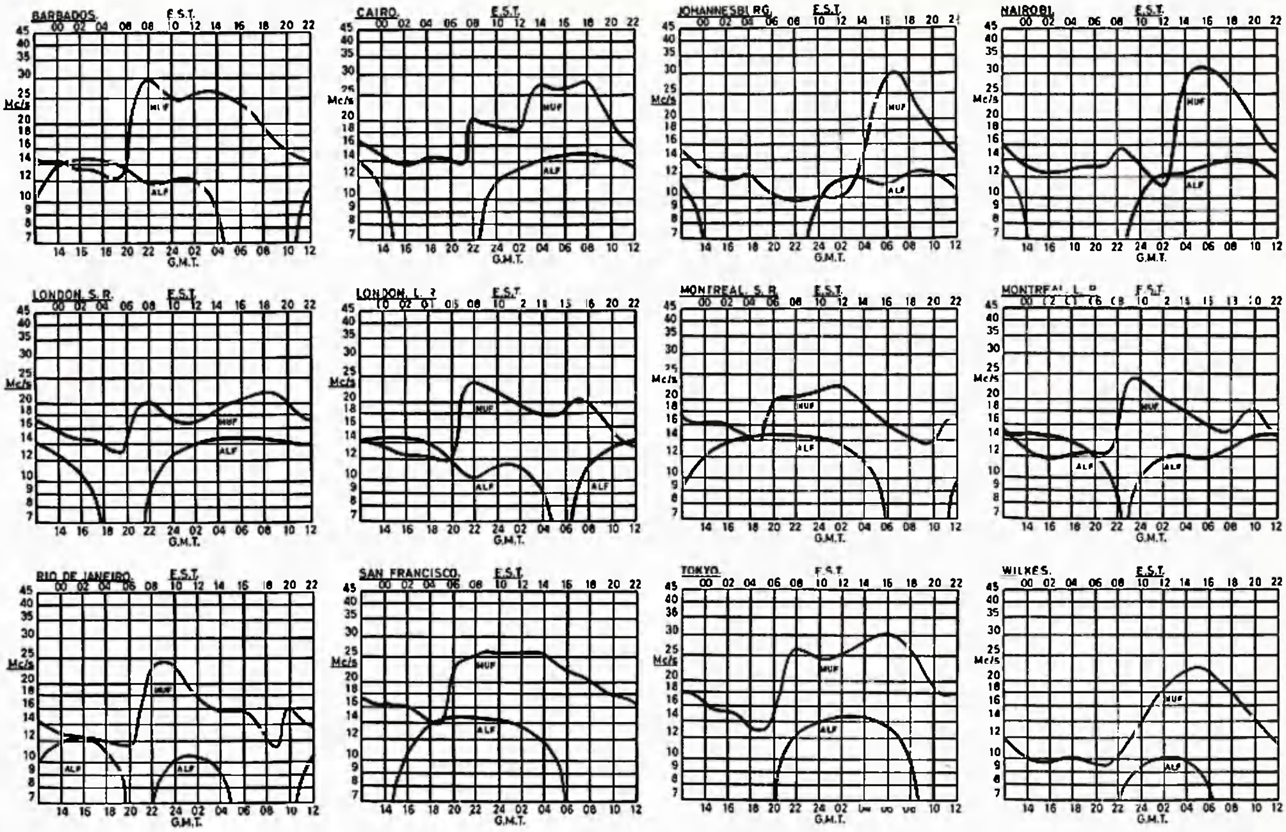
WANTED: Test Equipment in good condition. Sweep and Marker Generator or Sweep Generator and Marker Adder Unit. Also TV Pattern Generator. Full particulars to Col. Harvey, VK1AU, 16 Leane St., Hughes, A.C.T.

WANTED: 12v. d.c. Supply for Swan; also Ant. Mount for mobile use. Sell: Geloso VFO, pair 807s mod., 813 p.a., including power supply. Please write to VK3ATF, Grant Street, Point Lonsdale, Vic.

WANTED TO BUY: Any Coil Boxes for AR7 Receiver. Also any Ceramic American Loctal Sockets or Sockets (2) to suit 4CX250. Ring S. Gregory, Melb. (9-5) 379-3132.

PREDICTION CHARTS FOR JULY 1969

(Prediction Charts by courtesy of Ionospheric Prediction Service)



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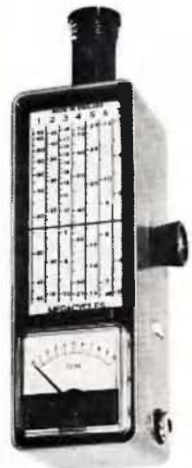

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Vol. 37, No. 8

AUGUST, 1969

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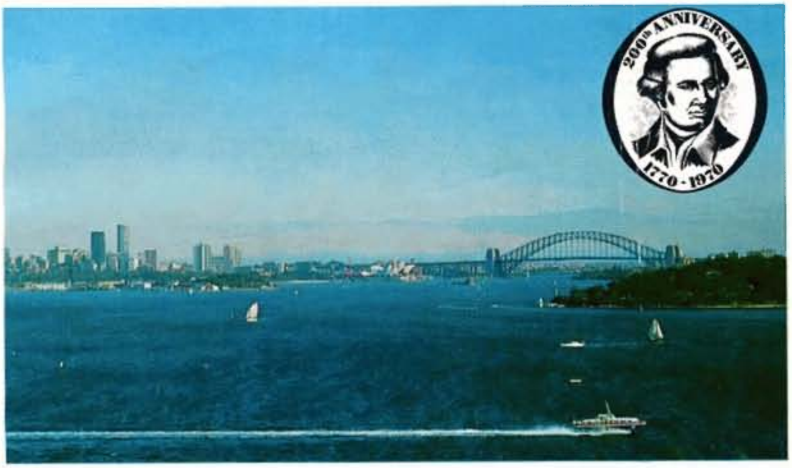

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6A8G	$2.00	6SA7GT	$2.20
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6AC7	50c. or 5 for $2	6SF5	75c
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6AK5 (EF95)	$2.55	6SQ7GT	$2.10
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CONTENTS

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Displayed in multi-colour are two of the Special QSL Cards to celebrate the Cook Bi-Centenary and the Diamond Jubilee of the Wireless Institute of Australia. Further details are given on page 7.

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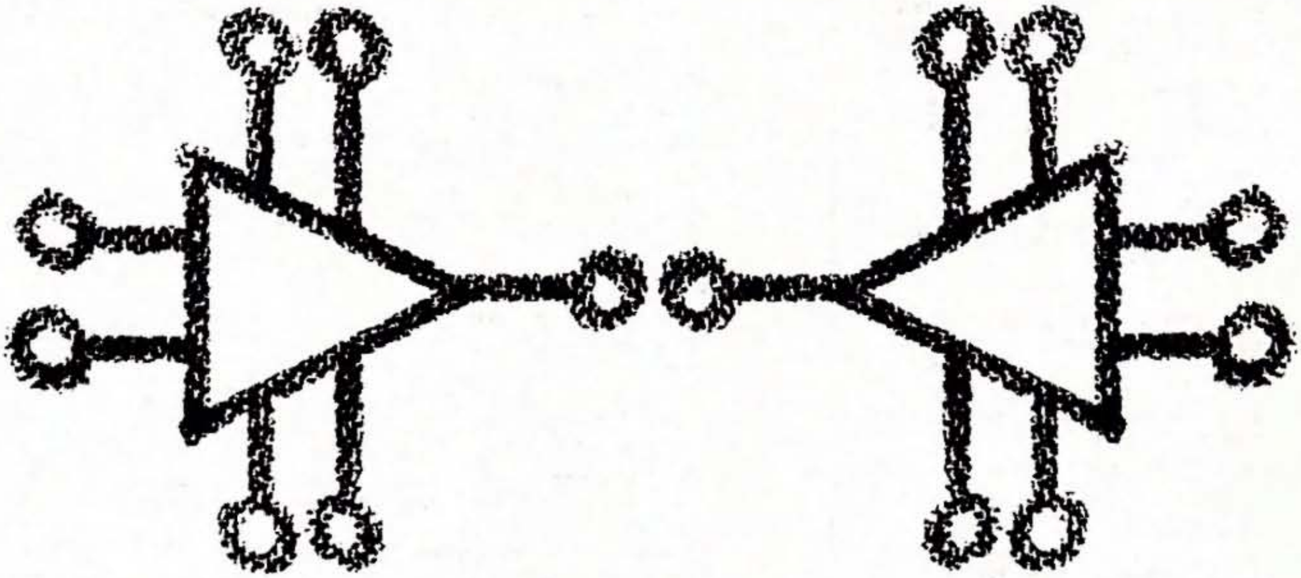

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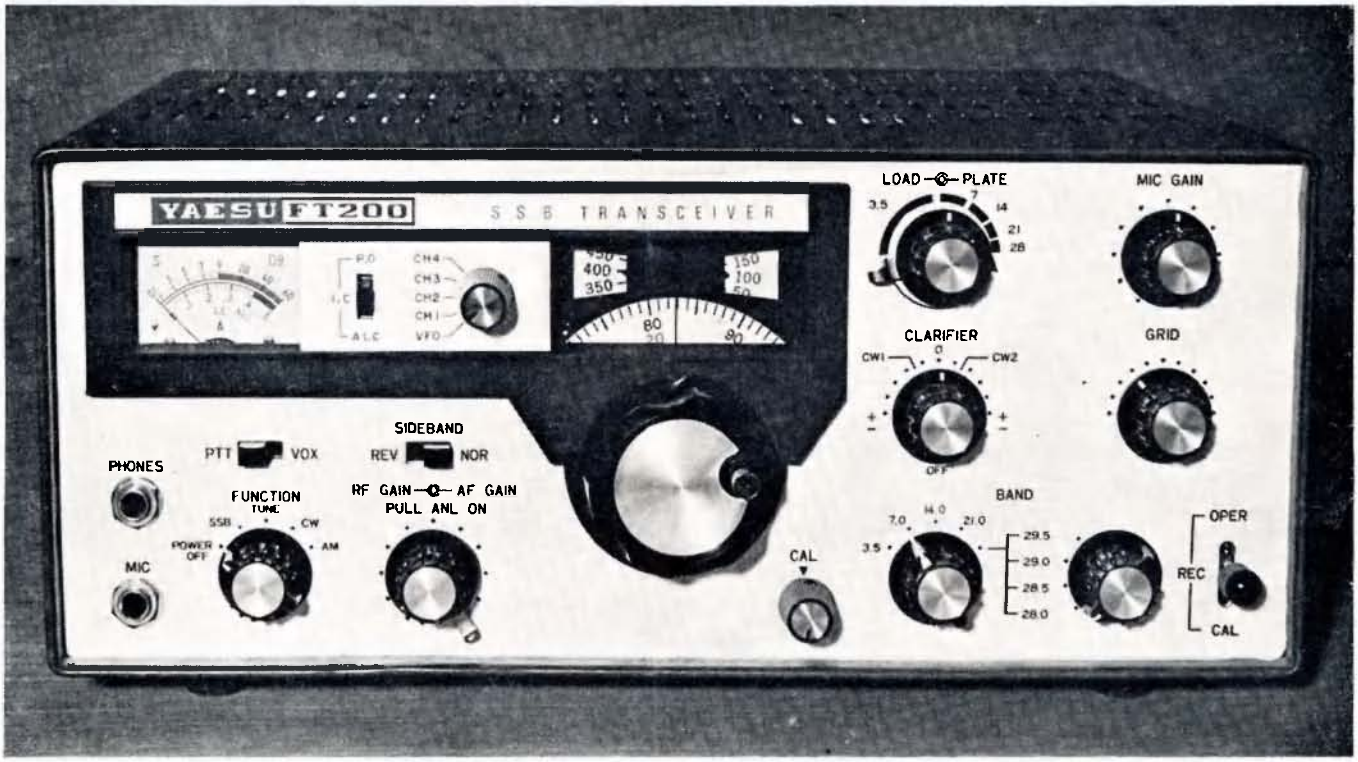

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Wireless Institute of Australia
Victorian Division

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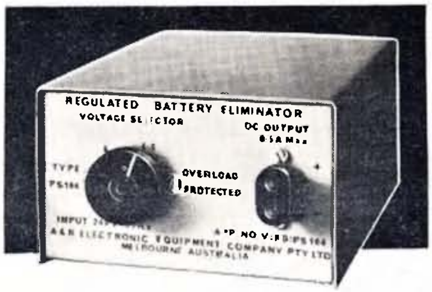


TYPE PS 104

Designed primarily for Tape Recorders where a regulated voltage supply is necessary to prevent speed variation with load changes. A versatile power supply with a range of output voltages making it ideal for design, testing and repair of Transistor Radios, Amplifiers, Record Players, Test Equipment, etc. It is also eminently suitable for use in Schools, Universities, Government Departments and Industry.

SPECIFICATIONS

Input Voltage	240 Volts. 50 Hz.
Output Voltage	4.5V 6V, 7.5V 9V or 12V D.C. by Selector plug. Max. Current 0.5A.
Protection	Electronic Overload Protection.
Regulation	Approx. 10% on 12V Range Approx. 5% on all other Ranges
Ripple	Less than 100 mV R.M.S. under all conditions.
Circuitry	All silicon solid state.
Size	4 ins. wide by 2⅝ ins. high x 5¼ ins. deep
Weight	2 lbs. 7 ozs.
Approval	Approved by Electric Supply Authorities

Manufactured by

A & R ELECTRONIC EQUIPMENT COMPANY PTY. LTD.

42-46 LEXTON ROAD, BOX HILL, VIC., 3128

Phones 89-0238, 89-0239

AGENTS IN ALL STATES

N.S.W.: SOANAR ELECTRONICS PTY. LTD. 82 Carlton Cres., Summer Hill. Ph. 798-6999.
QLD.: R. A. VENN PTY. LTD. 71-73 Doggett St., Valley, Bris. Ph. 51-5421.
S.A.: SCOTT THOMPSON PTY. LTD. 93 Gilles St., Adelaide. Phone 23-2261.
W.A.: EVERETT AGENCY PTY. LTD. 17 Northwood St., W. Leederville. Ph. 8-4137.

SIDEBAND ELECTRONICS ENGINEERING

To the stock listed below I have this month added a new local product, an **SWR-Power Output Meter**. Housed in an attractive 4" x 4" x 9" cabinet, with a 3" square meter, it reads what a normal SWR meter does plus power output in two ranges, 0-100 and 0-500 watts of R.F. power, good for use on all H.F. Amateur bands from 3.5 to 30 Mc. Individually calibrated, the price is only $35.00 each, for 52 ohm lines.

My next project for local production is a copy of the Hy-Gain type BN-86 full kw. power rating Balun, to be used to feed 52 to 75 ohm symmetrical loads with unsymmetrical co-axial cable.

For our unfortunate sightless fellow Amateurs, my meter audio translator continues to be available at cost price, custom built to requirements.

Ample stocks now of all items advertised. Prices are net, cash Springwood N.S.W., sales tax included. Descriptive literature on all is available, also spare parts and valves for all sets, including **Crystal Filters**, for warranty and service.

YAESU-MUSEN

- FT-DX-400 Transceiver $550
- FT-DX-100 Transceiver $525
- FV-400 External Second VFO $95
- FT-200 Transceiver, with complete matching A.C. Power Supply Kit $425
- FL-DX-2000 Linear $250
- FL-DX-400 Transmitter $375
- FR-DX-400 Receiver $375
- FR-DX-400-SDX de luxe Receiver, with 2 and 6 Metre Converter and C.W. and F.M. Filters $475

All Yaesu-Musen sets are inclusive of all the necessary plugs and connectors, and the Transceivers include a ceramic P.T.T. microphone.

SWAN

- SW350C Transceiver $550
- SW500C Transceiver $675
- 14-230 volt A.C./D.C. Swan Supply $150
- A.C. Power Supply-Speaker $80

GALAXY

- Latest GT-550 Transceiver $575
- External VFO $100
- A.C. Supply-Speaker Unit $80
- VOX Unit $30

A.C.I.

- ACITRON 101 12v. heavy Duty D.C. Supply, fits all 500w. P.E.P. Transceivers $105

HY-GAIN

- TH6DXX Master 6 el. Tri-band Beam .. $200
- BN-86 Balun $20
- TH3JR Junior 3 el. Tri-band Beam $110
- 14AVQ 10 to 40 Metre 4-Band Vertical $45
- 18AVQ 10 to 80 Metre 5-Band Vertical $75
- Hy-Gain 3-band Quad, 6 el. $150

MOSLEY

- TA33JR Junior 3 el. Tri-band Beam $98
- MP-33 Senior 3 el. Tri-band Beam $125

ROTATORS

- CDR HAM-M Heavy Duty Rotator $180
- AR-22R Junior Rotator $60
- 8-conductor Cable for the Ham-M; yd. 50c

Both Rotators are for 230v. and prices include an indicator-control unit.

NEWTRONICS

- 4-BTV 10 to 40 Metre 4-Band Vertical .. $55
- 4-BTV with 80 Metre Top-loading Coil $70

CRYSTALS

8,000 of them again for the home builder, the elusive FT-241 Crystals with fundamental frequencies between 375 and 515 Kc., Channels 0 to 79, a full box of 80 crystals for only $17.50. Individual choice channels are up to $2 each.

Sideband Electronics Engineering

P.O. BOX 23, SPRINGWOOD, N.S.W., 2777. **Tel. Springwood (STD 047) 511-394**

City Showroom **only**, not for business transactions, Mondays to Fridays 9 a.m. to 5 p.m., by appointment with Clive Hutchison, 145a George Street, Sydney, near Circular Quay. Tel. Sydney 27-5885/6

FEDERAL COMMENT

PLANS FOR 1970 CELEBRATIONS

1970 will be an important year for Australia, two hundred years from when Captain Cook first landed on the eastern coast of Australia. This bi-centenary will be the subject of many celebrations in Australia, and it is not inappropriate that we, as Radio Amateurs, also do something in honour of this occasion.

But next year we have something in addition to celebrate—the **Diamond Jubilee of the Wireless Institute of Australia**. The first steps towards the organisation that exists today were taken in 1909. Our Federal Historian assures me that the Wireless Institute of Australia will, in 1970, be 60 years old. He also assures me that there is no doubt that the W.I.A. can justify its claim to be the oldest radio society in the world. Whether we are or not matters little—what does matter is that we take time to honour those men of the past to whom our great hobby owes so much; and what better year than in 1970 when it is coupled with the very important Cook Bi-Centenary celebrations.

No doubt in sixty years the character of Amateur Radio has changed significantly. The vast technology of a great industry in some way overshadows our hobby today, yet today this industry itself provides so many who are among the ranks of Amateurs. Whilst the character of our hobby may have changed, anyone who has read the contemporary material of the early days of Amateur Radio will be likely to conclude, I think, that the spirit of Amateurs themselves has changed very little. Next year, therefore, we honour not only the Cook Bi-Centenary, but also the Diamond Jubilee of the Wireless Institute of Australia.

SPECIAL PREFIX "AX"

The Federal Council, through the Federal Executive, has made a number of plans, and in this issue of "Amateur Radio" and by simultaneous release throughout the world, I have the honour to announce these plans.

Firstly, from the 1st January, 1970, and until the 31st December, 1970, all Australian Amateur Stations whilst operating on Amateur bands will be able to substitute the special prefix "AX" for the prefix "VK" if the operator so wishes; thus, I can, if I wish, call myself AX3KI. I hope, particularly on international bands, that all Australian Amateurs will make use of this privilege.

QSL CARDS

Secondly, the Australian Tourist Commission is making available 100,000 blank QSL cards. These are printed in four colours and are illustrated with appropriate photographs of typically Australian scenes. They have a text referring both to the Cook Bi-Centenary and the Diamond Jubilee of the Wireless Institute of Australia.

These cards will be distributed through the Divisions. I hope that as many Amateurs as possible, particularly those regularly working on international bands, will have these cards over-printed with their own "AX" call sign.

SPECIAL AWARD

Thirdly, the Wireless Institute will be giving a special Captain Cook Bi-Centenary Award for Amateurs contacting a specified number of stations using the optional prefix "AX" during 1970. The rules of this Award are published on page 7. I hope that this will be a popular Award—I look to Australian Amateurs to do their best to ensure that it is, by using the prefix "AX" and by sending QSLs when requested, and by drawing overseas Amateurs' attention to the existence of the Award when they are talking to them. Details of these plans for 1970 may be found elsewhere in this issue.

EARLY DAYS OF RADIO

Our own journal, "Amateur Radio," will have a series of articles throughout 1970 telling the story of the early years of Amateur Radio in this country.

In making this announcement on behalf of the Federal Council and the Federal Executive, may I record our gratitude to those who have made these plans possible — to the Postmaster-General's Department, to the Controller, Radio Branch (Mr. Carroll), to the Australian Tourist Commission, to the Federal Awards Manager, go our grateful thanks.

Let us make 1970 a great year for Amateur Radio and a great year for the W.I.A. Let us see a record membership in all Divisions; let us see greater activity than ever before on our bands. All of us are Amateurs because we want to be—because we obtain enjoyment from our hobby. Let us honour the past by, in 1970, using our privileges to the full.

Michael J. Owen, VK3KI,
Federal President, W.I.A.

Ayers Rock in Central Australia is the world's largest monolith, 5½ miles around and 1,100 feet high. A sacred place to the Aborigines, whose cave paintings and carvings can still be seen here. Ayers Rock is a major attraction for overseas visitors; it can be reached on air and road tours from Alice Springs, Australia's most colourful outback town.

To Radio..

This QSL confirms our 2 way
SSB/AM/CW/FM/RTTY QSO

On..............mcs. at..............................hrs. GMT

on..

UR sigs. R..................S..................T..................

PWR..............................watts Ant..............................

TNX QSO PSE QSL 73

GREETINGS FROM AUSTRALIA

World famous navigator Captain James Cook discovered eastern Australia in 1770. Two highlights of the bicentenary celebrations will be a London to Sydney air race in December 1969, and in March 1970 Sydney's international exhibition "Panorama of the Pacific". 1970 is also the 60th anniversary of the Wireless Institute of Australia, the world's oldest radio society.

Reverse side of the Special QSL Cards

Wireless Institute of Australia

offers to Overseas Stations and Australian Stations the

COOK BI-CENTENARY AWARD

To mark the occasion of the 200th anniversary of the discovery of the eastern coast of Australia by Captain Cook in the year 1770, the Wireless Institute of Australia is issuing a Special Award to be known as the "Cook Bi-Centenary Award". It will be available free to any licensed Radio Amateur throughout the world who, during 1970, makes two-way radio contact with the required number of Australian Amateur Stations as set out below.

1970 is also the 60th anniversary of the founding of the Wireless Institute of Australia, the Australian Amateur body which has served the interests of Radio Amateurs since 1910 and is the world's oldest Radio Society.

Because of the special significance of the year 1970, a new prefix will be available for use by Australian Amateurs between 1st January and 31st December, 1970. At the option of the station operator during this period, the VK prefix may be replaced by the special AX prefix.

AWARD RULES

Operation.—Only Australian Amateur Stations using the special AX prefix may be worked for the purposes of this award. Contacts may be made on any band or mode available to Australian Amateur stations. Cross-band operation will not be permitted. No contacts made with ship or aircraft stations in Australian Territories will be eligible, but land mobile or portable stations may be contacted provided the location of the station worked, at the time of the contact is clearly indicated. Operators at all times must operate within the terms of their station licence. All contacts must be made during the period 1st January to 31st December, 1970, inclusive. Contestants may work each station once only during this period for the purposes of this award.

Requirements

Overseas Applicants. — Stations outside Australian Territory must contact 50 different Australian Amateur Stations using the AX prefix during the abovementioned period.

AX Applicants.—Stations within Australia must contact 100 different Australian Amateur stations using the AX prefix, working the required number of stations in each Call Area as per the list below, during the specified period:

AX1	(VK1)	3	Stations
AX2	(VK2)	30	"
AX3	(VK3)	30	"
AX4	(VK4)	11	"
AX5	(VK5)	11	"
AX6	(VK6)	6	"
AX7	(VK7)	4	"
AX8	(VK8)	1	"
AX9	(VK9)	3	"
AX0	(VK0)	1	"
Total		100	Stations

Applications.—Stations applying for the Award are **not** to forward QSL cards, but instead should submit a list of the stations worked (in order of Call Signs by Call Areas) plus the following details of each contact: Date, time (G.M.T.), band, mode, report. This list, certified by two other licensed Amateurs plus a statement to the effect that they have sighted the log entries of the applicant, should be sent to:

Awards Manager, W.I.A.,
P.O. Box 67,
East Melbourne,
Victoria,
Australia, 3002.

Applications should be clearly marked "Cook Award" on the back of the envelope containing the check list plus the full postal address to which the award is to be sent. All applications are to be received at the above address no later than 31st December, 1971, as no further entries will be accepted after this date.

Certificates will be forwarded free of charge by surface mail. However, if airmail return is required, eight IRC coupons must be included to cover the extra cost involved.

TOURIST COMMISSION PROVIDES QSL CARDS

The Australian Tourist Commission, following representations by individual Amateurs and subsequently the W.I.A., has provided 100,000 blank QSL cards for the use of Australian Amateurs during 1970.

There are four designs, each a photograph of a typically Australian scene. The scenes depicted are: Sydney Harbour, Ayre's Rock, the Whitsunday Passage in Queensland, and a surf boat. These will be distributed to Divisions, and Divisional Councils will be making arrangements direct with members for their distribution.

The cards were distributed by the Federal Executive proportionately to the number of Amateurs in each State as follows:

N.S.W. Division: 32,000 cards (including the Australian Capital Territory).

Victorian Division: 30,000 cards.

Queensland Division: 11,000 cards.

South Australian Division: 13,000 cards (including Northern Territory).

Western Australia Division: 8,000 cards.

Tasmanian Division: 4,000 cards.

2,000 cards have been retained by the Federal Execlutive for distribution to VK9 and VK0 Amateurs.

☆

SPECIAL CALL SIGN GRANTED BY P.M.G.

From the **1st January, 1970**, until the **31st December, 1970**, all Australian Amateur Stations may use the prefix AX instead of the prefix VK.

The use of the prefix AX is not compulsory, but may be used at the option of the licensee concerned. There are no formalities necessary to enable licensees to use this privilege. Individual licensees will not be notified personally of this privilege.

The Controller, Radio Branch (Mr. C. Carroll) has asked the Wireless Institute of Australia to give the matter the widest possible publicity. An early announcement is necessary to enable publicity to be obtained in overseas journals. However, Mr. Carroll points out that it is **not permissible** to use this special 1970 prefix before the 1st January, 1970.

PROJECT—SOLID STATE TRANSCEIVER

PART NINE

H. L. HEPBURN, VK3AFQ, and K. C. NISBET,† VK3AKK*

This article must be prefaced with an apology to readers for its non-appearance in the July issue. It is to be regretted that the writers were just too occupied with the business of earning a living to have had the manuscript in the hands of the printers in time for publication.

In this article the following aspects will be covered:

(a) Coupling the transmit mixers to the p.a. stage described in the June 1969 "A.R.".

(b) Lining up the transmitter to the output of the transmit mixers.

(c) Tuning the p.a.

(d) A two-tone test oscillator.

(e) A suitable output power meter.

COUPLING TO THE P.A.

Reference to Fig. 25 shows that the 9 Mc. s.s.b. inputs to all transmit mixers, the injection frequency inputs and the signal outputs are all in parallel and that the drive control is in the output of the mixers. This system supersedes that inferred in Fig. 17 (April 1969 "A.R.") which shows the drive control in the 9 Mc. s.s.b. feed to the transmit mixers and in Fig. 15 (March 1969 "A.R.") which shows the r.f. outputs of the transmit mixers being switched. This "loss" of a switch wafer is possible because of the relatively low output impedances of the transmit mixers. The appropriate mixer is selected by h.t. switching and diode gating of the injection inputs only. (See Fig. 17, April 1969 "A.R.")

In order to drive the p.a. stage, it is necessary to have some power gain between it and the transmit mixers.

This is obtained by using a Motorola MM1601 as a resistance coupled, untuned amplifier as shown in Fig. 25.

A 2.5K "C" taper potentiometer is used in the input to the MM1601 as a drive level control.

Correct biasing of the MM1601 is provided by the 2.2K/220 ohm bias chain, while a 10 ohm resistor is used as a collector load. Output from this stage is capacitively coupled to the p.a. stage proper.

The 3.3 ohm w.w. resistor, used in conjunction with the 4.7 uF. and 0.047 uF. capacitors in the h.t. decoupling network, is specified because it has a few microhenries of inductance to improve its decoupling efficiency at r.f.

Note that the MM1601 and its associated components are included in the kit of parts detailed in the June "A.R." and explain the **apparent** discrepancy between the two transistors shown in Fig. 25 and the three mentioned in the kit description.

LINING UP THE TRANSMITTER MODULES

In reading the description that follows, the reader is urged to have before him the copies of "A.R." containing the first seven articles in the series as reference will be made to figure numbers and coil/transformer numbers appropriate to the module under discussion.

These articles appear in the November 1968 to May 1969 issues.

It is assumed that v.f.o. has been put on frequency, the heterodyne oscillators are giving output, the carrier oscillator is functioning and that the filter board is operative. Commissioning of these modules was described in the May 1969 article.

It must now be emphasised that the commissioning procedure that follows is based on the possession of the absolute minimum of test equipment. For that reason it is necessarily "rough". For optimum results, access to a wide band c.r.o. which gives a useful response to 30 Mc., and a first class signal generator having an accurately calibrated attenuator are obligatory.

However, this description assumes that only a v.t.v.m. fitted with an r.f. probe and a general coverage receiver having an S meter are available.

Participants in the project are already aware that—under the conditions detailed in January 1969 "A.R."—the project organisers can, and indeed prefer to, carry out the commissioning procedure in Melbourne where the necessary equipment is available to do the job.

Step 1.—The first three units to be connected together are:

(i) The tx audio module.

(ii) The carrier oscillator module switched to "normal" sideband (8,998 Kc.).

(iii) The balanced modulator module.

The microphone gain potentiometer should be set at zero, the 5K audio trimpot on the balanced modulator board set at zero, the 1.5K balance trimpot set at half way, the 3/30 pF. balance trimmer connected to one side of the balanced modulator and set half open, and the 8,998 Kc. 1.5K level trimpot set to about quarter open before power is applied.

Note that it is necessary to have h.t. applied to the rx product detector if good carrier balancing is to be achieved.

With the v.t.v.m. probe on the d.s.b. output of the balanced modulator, apply 9-10 volts of h.t. Varying the 1.5K balance trimpot either side of centre will give a reading on the v.t.v.m. Adjust the carrier balance control for minimum reading. Also adjust the 3/30 pF. balance trimmer in conjunction with the trimpot to give a null.

Once this has been done on the v.t.v.m., loosely couple the d.s.b. output to a receiver set at 8,998 Kc.

Repeat the adjustments to the trimpot and the trimmer until the lowest possible S meter reading is obtained. It should be possible to get the S meter down to about S3-4 with the r.f. gain control on the receiver full open. Then peak the core of L24 (Fig. 13).

It may be necessary to try the 3/30 pF. trimmer on the other side of the modulator to achieve the maximum carrier suppression.

Note that the carrier will be attenuated by a further 15-20 db. or so by the time the signal has gone through the filter.

Checking audio quality and carrier suppression at this stage by the usual "whistle and listen in the receiver" technique may well be misleading, due to direct pick up of the 9 Mc. carrier by the receiver. At the best, such a test is simply a comforting assurance that **something** is working.

Step 2.—Connect in the filter pre-amplifier, the filter board and the 9 Mc. tx amplifier. Connect the v.t.v.m. across the output of the 9 Mc. tx amplifier and apply power.

Unbalance the balanced mixer to give a small indication on the v.t.v.m. and peak the cores of T3 (Fig. 10), L23 (Fig. 10) and T4 (Fig. 11) to give maximum reading. It may be necessary to partially re-balance the modulator to keep the v.t.v.m. reading on scale. Do not re-balance the modulator at this stage.

Step 3.—Couple in the v.f.o. generator, the heterodyne oscillators, the in-

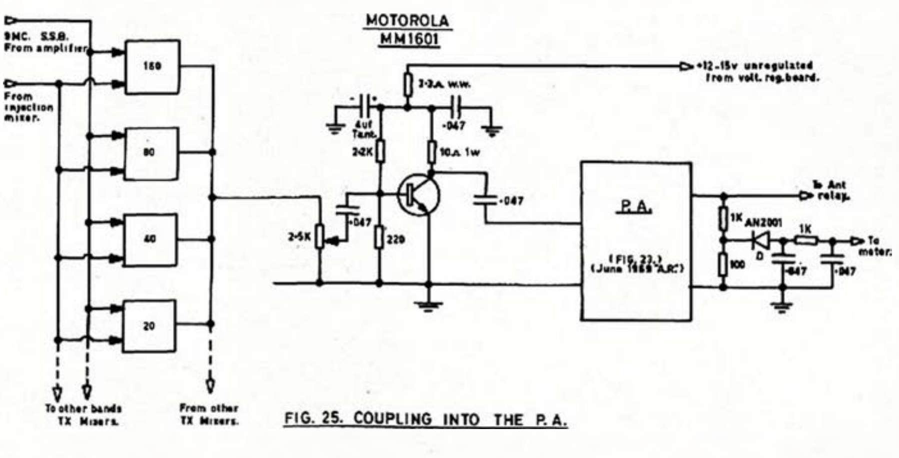


FIG. 25. COUPLING INTO THE P.A.

* 4 Elizabeth Street, East Brighton, Vic., 3187.
† 25 Thames Avenue, Springvale, Vic., 3171.

jection mixer and the tx mixers. Put the v.t.v.m. across the tx mixer outputs.

One band at a time, adjust the coils of each tx mixer to give maximum output. For each frequency range set the v.f.o. to the centre of the Amateur band required, i.e. 1.83, 3.60, 7.07, 14.18 Mc., etc. The corresponding v.f.o. frequencies for the Amateur bands are 10.03, 10.10, 10.07 and 10.18 Mc.

Then wire in place the 2.5K drive level control and check that, for each band, the output of the tx mixers can be varied between zero and maximum.

If it is desired to stagger tune the tx mixer coils, then all the input coils L26 should be peaked in the centre of the required range, all coils L27 peaked at 20% above the lowest end of the range, and all the coils L28 peaked at 20% below the high frequency end of the range.

Step 4.—With the v.t.v.m. across the output of the 9 Mc. tx amplifier, rebalance the modulator for best carrier suppression.

Step 5.—Set the 5K trimpot on the balanced modulator board to about half open.

Connect a 50 ohm variable reluctance microphone to the tx audio module and set the tx audio level control to about quarter open.

With the v.t.v.m. across the output from the transmit mixers, there should be a very positive indication of output when whistling into the microphone. There should be no indication of output when the audio level control is zeroed.

To this stage all that can be said is that output (hopefully, intelligible s.s.b.!) is available. Without a c.r.o. the waveform of the signal cannot be checked but judicuous use of the station receiver should enable some judgment to be made on the quality of the output, its frequency and the presence of unwanted signals or instability.

Participants are again reminded that optimisation, trouble-shooting and correct adjustment can be done for them as a free project service.

TUNING THE P.A.

Several strong recommendations must be made before the p.a. board is coupled in or power is applied.

(i) The output from the tx mixers must be clean. A two-tone test oscillator and a c.r.o. are required to ensure this is so.

(ii) The p.a. **MUST** be run into a 50 ohm resistive power meter as a load. Light bulbs and antennae of unknown impedance are out.

(iii) The power supply should, for the initial tune up, be protected. That is it must cut out if a pre-determined current is drawn by the p.a. Once the tune-up procedure has been carried out, any normal source of 12-15 volts can be used.

(iv) The tune-up should be done on a two-tone test signal, although unbalancing of the modulator can be used as a last resort. (See paragraphs under Power Meter heading.)

Provided these requirements can be met, tune-up can proceed. Refer to Fig. 23 in June 1969 "A.R." for coil and capacitor numbers.

Put a 0-3 amp. meter in the unregulated h.t. lead from the supply to the p.a. Set the drive control at zero. Set all variable padders (C3 and C4) at full capacity. Set the slug of L1 fully in. This applies to each band. Set the tx audio control to quarter open so that a two-tone output is available from the tx mixers. Terminate the p.a. in a 50 watt resistive power meter.

Apply h.t. and note the quiescent current drawn. It should be about 1.3 amps. Three steps follow:

(1) Carefully advance the drive control until the quiescent current JUST starts to increase (i.e. drive is being applied to the MM1602).

(2) Adjust the core of L1 outwards (i.e. in the direction of lower inductance) until the total p.a. current JUST increases again. **Do not attempt to peak the current at this stage.** Peaking will take place only AFTER the MM1603 output circuits are adjusted.

(3) Decrease the capacity of C3 until the OUTPUT of the MM1603 peaks on the power meter.

Increase the drive level by a **small** increment and repeat steps 2 and 3.

Again increase the drive slightly and adjust L1 and C3.

Repeat this procedure using small drive increments until about 10 watts p.e.p. are indicated on the power meter. Then adjust L1 and C3 for a peak in output.

Finally, the drive level is set so that it is just below the "flat topping" point of the p.a. and C4 adjusted for maximum output consistent with the best waveform. A c.r.o. is definitely required for these last two adjustments.

Stress has been laid on the "softly! softly!" approach and on the need to adjust correctly. But it should be borne in mind that once this adjustment procedure has been carried out it does not need to be repeated. Once adjusted, that adjustment will hold for each band and each position in the band. There are no coventional "tune" or "load" front panel controls.

Re-adjustment will be necessary if the antenna load applied to the transmitter varies too much from 50 ohms resistive. Again the warning is sounded against the use of other than properly matched antennae—not so much this time from the point of view of damage to the p.a., but rather to avoid a very considerable drop in output.

The next two sections may assist those who, for this project or not, require some ideas on signal sources or power meters.

TWO-TONE TEST OSCILLATOR

Fig. 26 gives the circuit diagram of the two-tone test oscillator used as an audio signal source for alignment and checking of the project transmitter.

Two RC oscillators provide outputs on either 1.5 Kc. or 900 c/s. The two output levels are independently adjustable by means of the 22K trimpots and an MPF102 source follower is used as a buffer stage.

Two outputs are provided, one at high level for use where a volt or two of tone is required, and a low level output designed to plug straight into the microphone socket of the project transmitter.

Switching is provided so that either audio frequency on its own, or the two together can be selected. It is contained in a die cast box and the output socket can be wired so that the h.t. requirement can be obtained from the project transceiver.

At this point no steps have been taken to produce a kit for this piece of equipment but, since the circuit board layouts, etc., have been done for the writers' own use, kits can be made available should they be asked for. A "guesstimate" price would be around $18 complete with diagrams and instructions.

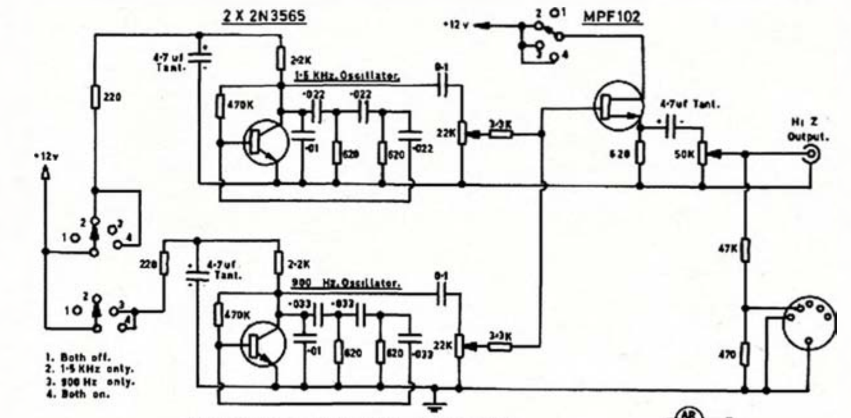


FIG. 26. TWO TONE TEST OSCILLATOR.

POWER METER

As a result of the comments made in the June 1969 issue, regarding power meters, several letters have been received asking for details.

The one used by the writers is a first class low-priced meter made from a kit set marketed by Horwill Electronics, of 45 Edmonds Ave., Burwood, Vic.

It comes complete with all parts, including an internal resistive load, meter and two-position switch to select either a 5-watt or 50-watt f.s.d. On test, it is as accurate at 200 Mc. as at 2 Mc. and at the higher frequency has an s.w.r. of better than 1.5 to 1. The kit price is extremely resonable. Those

(Continued on Page 23)

THE EXPANDED LAZY-H ANTENNA*

JOHN J. SCHULTZ, W2EEY/1

The author presents a simple variation of the Lazy-H Antenna which both improves its gain and makes the feed point impedance a more convenient value. For those interested in a directive, wire-type antenna with good gain, the Expanded Lazy-H Antenna is worth considering.

SOME time ago a wire type antenna which the author had erected came down during a storm. The supports for the antenna, being two tall trees, fortunately didn't come down. It was desired to quickly erect a directive antenna for 10 metres and the author's attention was directed by another Amateur to the old standby lazy-H design (Fig. 1). It is basically a one-band antenna of moderate gain, although with resonant feeders multi-band operation is possible.

A little checking of antenna literature produced some figures on the gain of the antenna as a function of the spacing between the upper and lower set of elements. A three-eighths wavelength spacing produces only 4.4 db. gain, but the gain goes up to 5.9 db. with half wavelength spacing and 6.7 db. with five-eighths wavelength spacing. For only quarter wave length more spacing, a significant increase in gain is produced and it was decided to build the antenna with this spacing.

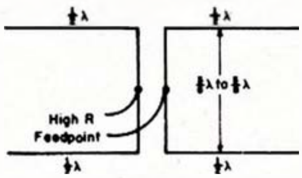


Fig. 1.—Conventional Lazy-H Antenna configuration.

Looking further at the lazy-H, it was seen to consist of two one wavelength colinear elements spaced and fed in phase. A single colinear element by itself does not produce very much gain (about 1.9 db.) and that is why it is rarely used alone. However, it was remembered that a single colinear element is frequently slightly lengthened to 1.3 wavelength, the greatest length that can be used before the broadside antenna pattern splits into lobes, to form a so-called extended double zepp antenna. The gain increases from 1.9 to 3.0 db. for this small increase in antenna length.

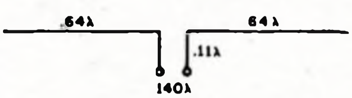


Fig. 2.—Extended Double Zepp Antenna with impedance stub.

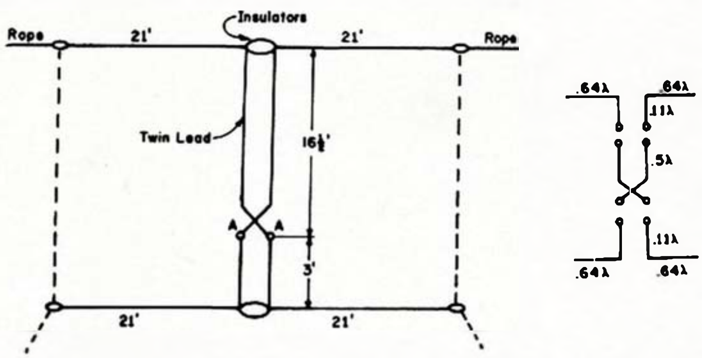
Unfortunately, lengthening of the simple colinear antenna into an extended double-zepp produces an impedance at the antenna terminals having a reactive component. The addition of a small 0.11 wavelength stub, however, as shown in Fig. 2, takes care of the reactive component and presents a 140 ohm resistive termination. Fig. 3 shows how the extended lazy-H is formed using two extended double-zepp elements.

A half wavelength phasing line is used between the antenna elements. The phasing line is twisted once since a phase reversal takes place every half wavelength along the line and the twist is necessary so that the two elements will be fed in phase. The half wavelength line reflects the same impedance that it is connected to without change so point A in Fig. 3 presents basically the impedance at the termination of the two extended double zepp antenna stubs in parallel. The 70 ohm impedance thus produced allows direct connection of point A to a standard 50 or 70 ohm co-axial cable. Of course, on 10 metres there is some advantage to using a coupling device to transform the unbalanced co-axial line to a balanced form for connection to the antenna. A balun or commercial transformer can be used with a 1:1 impedance ratio. The author did not use any matching device only because of the desire to quickly erect the antenna.

The co-ax. feedline is simply connected across the 300 ohm line at the correct point without having to break the line. The insulation on the line is stripped away for about ½" on either side in sequence and the co-ax. leads soldered to the line. The whole connection is covered with electrical tape or heat shrinkable tubing.

The co-ax. is run downwards so moisture from the line above does not enter the connection. Nylon rope is used to connect the ends of the upper element to their supports. Inexpensive plastic clothesline can be used to connect between elements at the ends and hold them in position since only enough stress need be applied to keep the elements reasonably taut.

Fig. 3. Expanded Lazy-H Antenna with dimensions for 10 metre model.



RESULTS

The antenna appeared to work very well in operation. No formal gain measurements were made, but judging from comparison reports, the gain was estimated to be from 7.5 to 8.0 db. It definitely is felt that several db. extra gain was achieved by using wide spacing between elements and having the elements of the extended double-zepp form. Certainly the extra gain was achieved for a minimum investment in wire and other parts.

As was mentioned before, the antenna is basically a one-band type. However, if erected for permanent installation it might be desired to use it as a multi-band antenna by feeding it with a resonant, balanced feedline. The 10 metre model may still produce a small amount of gain on 15 metres if used in this manner and should certainly be at least as effective as a dipole on 20 metres, perhaps a bit better.

CONSTRUCTION

Construction of the antenna is simple and straightforward. Copperweld or phosphor bronze wire is used for the antenna elements. Standard 300 ohm twinlead (or the transmitting type for high power) is used for both the stubs and the half wavelength phasing section. There is, of course, then no distinct point physically where a connection must be made between the stubs and the phasing section. The section of line from the upper element must still be twisted one turn, however. The dimensions which are given in Fig. 3 take into account the velocity factor of the transmission line as must be done if the antenna is constructed for another band.

* Reprinted from "CQ," November 1968.

Transistors on Computer Circuit Boards

RON BROWN, VK7ZRO, and R. LEO GUNTHER,† VK7RG*

Computer circuit boards have been available for several years in this country and have gained wide popularity because they provide a very inexpensive source of components, and even of whole circuits for the experimenter. Although characteristics of some components have been described in various issues of "The Australian E.E.B.," there has been a need for a more detailed examination of the characteristics of the transistors found on the boards. Tests of this type have been performed by a number of people, and this article is an attempt to summarise their work.

LIMITATIONS OF THE DATA

It must be emphasised that the material presented here is not a compilation of precise data of the kind you would find in the commercial Technical Transistor Manuals. The present tests are of simple type and in many instances the information is very sketchy, owing to insufficient numbers of samples being available. We believe, however, that the material is reasonably representative, and that the figures presented may be an approximate guide to what to expect.

In the charts presented here, it must be noted that there is a fairly wide range of variation of ratings from one transistor to another for a given type number. This means that if the rating is not tested for every transistor used, the experimenter must assume the most pessimistic value, i.e. the lowest one stated in these tables.

More performance can be extracted from a transistor if its exact characteristics are known. This means that they ought to be tested. This is not difficult, and suitable procedures have been described in various places in the literature.[1] Testing is desirable for another reason: not only is there a certain chance of finding an occasional bad transistor, but it is possible to damage a transistor if excess heat is applied while desoldering. This is particularly marked for F_T of the Alloy Diffused types: the frequency response can be degraded appreciably by overheating.

ABSOLUTE MAXIMUM RATINGS

Above all, it must be recognised that all breakdown voltages specified here are **Absolute Maximum** values. This means that no built-in safety factors are included, as you would find in manufacturer's specifications. We believe that statement of Absolute Maximum ratings is more useful to the experimenter because they allow him to provide safety factors appropriate to individual conditions. There is a widespread misconception about the flexibility of the ratings of semiconductors, a carry-over from valve technology. When the ratings of a transistor are definitely exceeded, the transistor will die, no fear! "There is no such thing as a flexible transistor voltage rating, though it may appear so because of the necessity for rating them conservatively to satisfy the human desire to get something for nothing!"[2] Much better reliability can, therefore, be obtained by considering the Absolute Maximum ratings, and applying realistic safety factors.

For example, in a circuit running on d.c. only, with no source of transients one might provide a voltage safety factor of, say, 20% above maximum expected peak. When transients are present, as with an inductive source or load, the voltage safety factor may have to be 50-100% or more, depending on how well the transients are suppressed. A transistor operating as an emitter follower in a conventional d.c. regulator could run full current into a resistive load, but 25% less into a capacitative one because of the high peak currents of the latter. Increased collector current also reduces voltage ratings.[3]

VOLTAGE RATINGS

A word about the voltage ratings for transistors is in order. It is not as simple as specifing a p.i.v. rating for a diode, because the various electrodes of a transistor interact. When you measure the voltage breakdown in the reverse direction between collector and base, the highest value is obtained because the emitter is not connected, and the rest of the transistor is not operating. This is the BV_{CBO} (breakdown voltage between collector and base, emitter open), and is often specified as a commercial rating, because it looks good. In the following discussion, it can help considerably if you look at Fig. 94, p. 84 of the R.C.A. "Silicon Power Circuits Manual," a superb book for anyone interested in semiconductors, particularly for r.f. applications.

A more practical rating is the BV_{CES}, taken between collector and emitter, with base shorted to emitter. Although the base is now in the circuit, it is not forward biased, and has negligible effect on the current. For this reason, for all practical purposes, BV_{CES} can

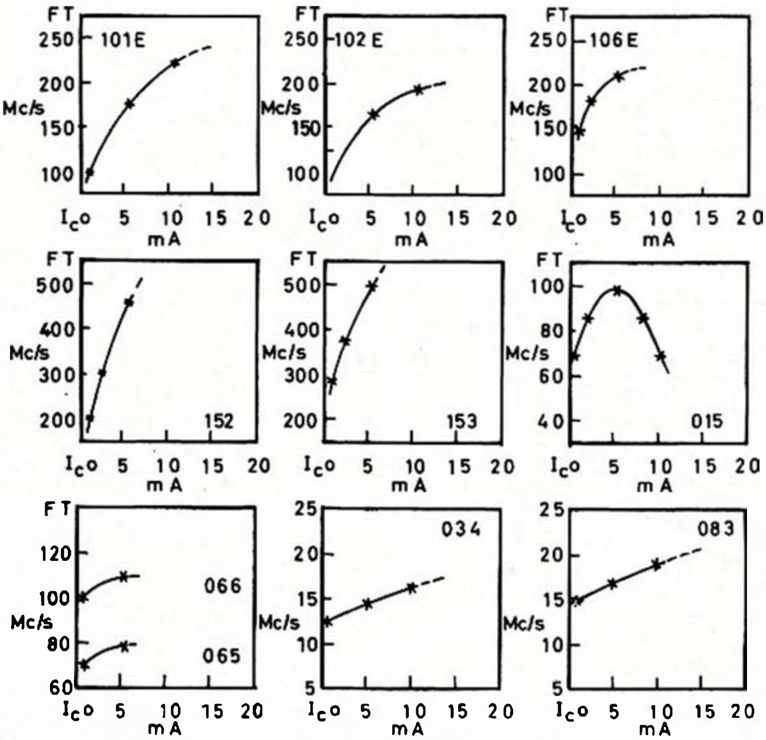


Fig.1. Variation of FT VS Ic at Vce = 5V

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† 32 Waterworks Road, Dynnyrne, Tas., 7005.

1—"E.E.B.": 6, 9, 11/67; particularly 8/68. "A.R.": Dec. 1966, p. 3. "Break-In": July 1966, p. 184. "G.E." and "Motorola Transistor Manuals." Several in "Radio-Electronics" and in "Electronic World" during the past two years, varying degrees of complexity. "The Curve Master," "Ham Radio," March 1968, p. 40, is particularly good, using a c.r.o. If a c.r.o. is not used, probably even better is the Universal Transistor Tester described in "Coryra," Nov. 1968, which is one of the few instruments which tests both gain and voltage. "Coryra" is an Australian journal which often contains good material of interest to experimenters. "E.E.B." also plans a Review of Transistor Testing.

2—"Efficiency Trade-offs in R.F. Power Amplifiers," "E.E.B.," May 1968, p. 46. See also "Why Abuse Semiconductors?" "E.E.B.," September 1968.

3—See "Second Breakdown," p. 84, 91, of R.C.A. "Silicon Power Circuits Manual."

NPN TO-18 MESA GERMANIUM
Types 152 and 153

F_T > 175 Mc. at 1 mA. (see Fig. 1)
(P_C = 50 mW. at 25°C. case)
BV_{CEO} = 50% BV_{CBO}.
BV_{CBO} > 20 V.
I_{CBO} < 2 μA. at 5 V.
(I_C max. = 50 mA.)
BV_{EBO} > 4.0 V.
β min. = 30, β av. = 80 at 1 mA.
Figures in brackets are estimated.

NPN TO-18 SILICON PLANAR
Types 2B8 and 193

(F_T > 150 Mc. at 10 mA.)
(P_C = 200 mW. at 25°C. case)
BV_{CEO} = 30% BV_{CBO}.
BV_{CBO} > 25 V.
(I_C max. = 50 mA.)
BV_{EBO} > 4.0 V.
β min. = 30, β av. = 55 at 1 mA.
Figures in brackets are estimated.

PNP TO-18 MESA GERMANIUM

F_T > 100 Mc. at 1 mA. (see Fig. 1)
(P_C = 50 mW. at 25°C. case)
BV_{CEO} = 50 to 60% BV_{CBO}.
I_{CBO} < 5 μA. at 5 V.
(I_C max. = 50 mA.)
Collector connected to case.

Type	β @ 1 mA. Min.	β @ 1 mA. Av.	BV_{CBO} Min.	BV_{EBO} Min.
045	15	20	15	1.0
101, 101E, 124E	20	35	20	1.5
102, C32/931	25	40	20	2.5
102E Texas	50	60	15	2.0
102E Motorola	40	50	40	3.0
103	10	20	25	3.0
106E		60	50	4.0
141		80	80	6.0
260		30	40	3.0

Figures in brackets are estimated.

TO-5 — GERMANIUM — ALLOY DIFFUSED

F_T > 70 Mc. at 1 mA. (see Fig. 1)
BV_{EBO} > 3 V.
I_{CBO} < 3 μA. at 5 V., 25°C.
Derate P_C at about 5 mW./°C.
N.F.: Audio-high/r.f.-low.
High speed non-saturating switches.

$BV_{CBO} \approx BV_{CES}$.
BV_{CEO} = 30 to 60% BV_{CBO}.
V_{CE} (sat.) ≈ 1.0 V.
T_J max. 75°C.
Base connected to case.

PNP	NPN	P_C Max. at 55°C. Case	I_C Max.* mA.	β Min. at 1 mA.	β Av. at 1 mA.	BV_{CBO} Min.
015, 016, 018	065, 066, 068	35 mW.	20	30	60	70
032	082	35 mW.	20		(70)	(100)
	089	(200 mW.)	600		100	(90)
	091	Finned (500 mW.)		20	30	100
	092	Large H.S. (3 W.)				100
	093			25	60	150

* Current at which β falls off rapidly.
Figures in brackets are estimated.

PNP POWER TRANSISTORS

Type	Case	β Av. @ 1 mA.	BV_{CBO}	BV_{EBO}
028 (2N1038)	Tall TO-5	50	40	20
036	TO-3	80	75	45
042	TO-3	50	100	50

BV_{CES} = 80% BV_{CBO}.
BV_{CEO} = 30 to 60% BV_{CBO}.
Figures in brackets are estimated.

ALLOY JUNCTION — TO-5 — GERMANIUM TRANSISTORS

F_T > 5 Mc. at 1 mA. (see Fig. 1)
$BV_{CES} \approx BV_{CBO}$.
V_{CE} (sat.) < 0.3 V.
T_J max. 75°C.
Derate P_C 5 mW./°C. for low power types.

$BV_{EBO} \approx BV_{CBO}$.
BV_{CEO} = 30 to 50% BV_{CBO}.
I_{CBO} < 5 μA. at 5 V., 25°C.
Base connected to case for most transistors.

PNP	NPN	P_C at 55°C. mW.	I_C Max.* mA.	β Min.	β Av.	BV_{CBO} Min.	Computer Application
013	063	55	50	30	70	30	100 Kc. Switch.
014		55	(50)	50	70	50	45 V. Neon Drive
025	075	55	100	20	30	30	G.P. Switch.
026	076	(55)	(100)	40	50	70	
030	071, 086	(200)	300/400	30	100	30	High Current Switch and Core Driver.
033, N593	083	55	100	20	80	30	G.P. Switch.
034		55	100	40	90	30	G.P. Switch.
035		55	(100)	40	60	30	
044		(55)	(50)	40	60	80	
	099, 167	(55)	(50)	40	70	30	
125		(55)	(50)	(80)	100	60	

* Current at which β falls off rapidly.
Figures in brackets are estimated.

DIODES

Germanium, Glass Case, I_D max. 25 mA.

BV_{DR}	Letter Identification	Colour Identification
10 V.	9D5	
15 V.	GF.	
20 V.	BX, FB.	Br-Br-Bk.
40 V.	DJ, AA, F, DH.	
50 V.	AN, GH, CJ.	O-Bk-Bu, Bu-Bk, R-W-Bk-R, Y-O-G.
70 V.		G-Bu-G-R.

Silicon, Glass Case, I_D max. 150 mA.

BV_{DR}	Letter Identification	Colour Identification
70 V.	GG, FH.	Br-O-O-Gr.
90 V.	AU, CO.	
140 V.	DD, BT237.	
250 V.	AL.	
400 V.	CL444.	Gr-Bu-Gr.

Silicon Power, Epoxy Case

BV_{DR}	Letter Identification
600 V.	AM.

Zener

BV_{DR}	Letter Identification
10 V.	209002.
28 V.	SV3372.

be taken to be nearly equal to (or perhaps slightly less than) BV_{CBO}. The difference is greater as the power rating of the transistor increases, but even for big power types it is usually only about 20%.

When the base is not connected to anything, a small amount of current will leak to it from the collector and this will increase collector current and will decrease the voltage at which a given breakdown current flows. Thus, the BV_{CEO} is appreciably less than the BV_{CES}, but for small transistors lies fairly well in the range, $BV_{CEO} = 0.3BV_{CES}$ to $0.5BV_{CES}$. Evidently, therefore, if you want high transistor voltage rating, there ought to be a low resistance between base and emitter. How low?

If you start with base shorted to emitter, and gradually introduce resistance between them, the collector-emitter breakdown voltage rating gradually decreases from BV_{CES} at 0Ω to BV_{CEO} at infinite resistance; this is shown in Fig. 3 for representative computer board types. You can see that BV_{CES} is approached when R_{BE} is < 10K for TO-18 types, < 3K for most TO-5 types, and still lower for higher power transistors; it can be < 100Ω for 036 and 042. When a given value of R_{BE} controls breakdown voltage, the latter is called BV_{CER}.

BV_{CER} is the really practical value, because it shows the behaviour in a real circuit. In a class C amplifier with link coupling to the base, R_{BE} = O, and the rating is BV_{CES}; in a class A amplifier with appreciable R_{BE}, it can be quite a lot lower. Unfortunately, the BV_{CER} curve varies considerably from one transistor to another, and there is no simple way to predict it. If you do not test it, and if R_{BE} is not obvious from the circuit, you must assume the most pessimistic value, namely the lowest value of BV_{CEO} (or about 30% of BV_{CBO} given in the Tables here). For this reason, and for the others mentioned above, it is always wise to test your transistors and to assign two values to each transistor you test: BV_{CES} and BV_{CEO}. And take note of R_{BE} in the circuit to be used.

BV_{EBO} is the zener breakdown of the reverse-biased base-emitter junction. It is generally of no particular interest for the Alloy Junction types (033, 083, etc.), which have a symmetrical geometry about the base chip, and which have BV_{EBO} about the same as BV_{CES}. For the Alloy Diffused, Mesa, and Planar types, however, the very low base-emitter breakdown voltage poses a hazard, and care must be exercised when driving them in class C operation. This is an important difference between transistors and valves in r.f. power service.

It should be noted that "Breakdown Voltage" as used here does not mean that the transistor will disappear in a cloud of dust when the rating is exceeded. There are two breakdowns, and this first one is reversible. You can measure it simply by applying reverse voltage until a small current flows, as long as that current is not excessive (e.g. < 100 uA. for TO-5 case types, < 5 uA. for TO-18 case). Be sure to limit the current by a large series resistor during the test.

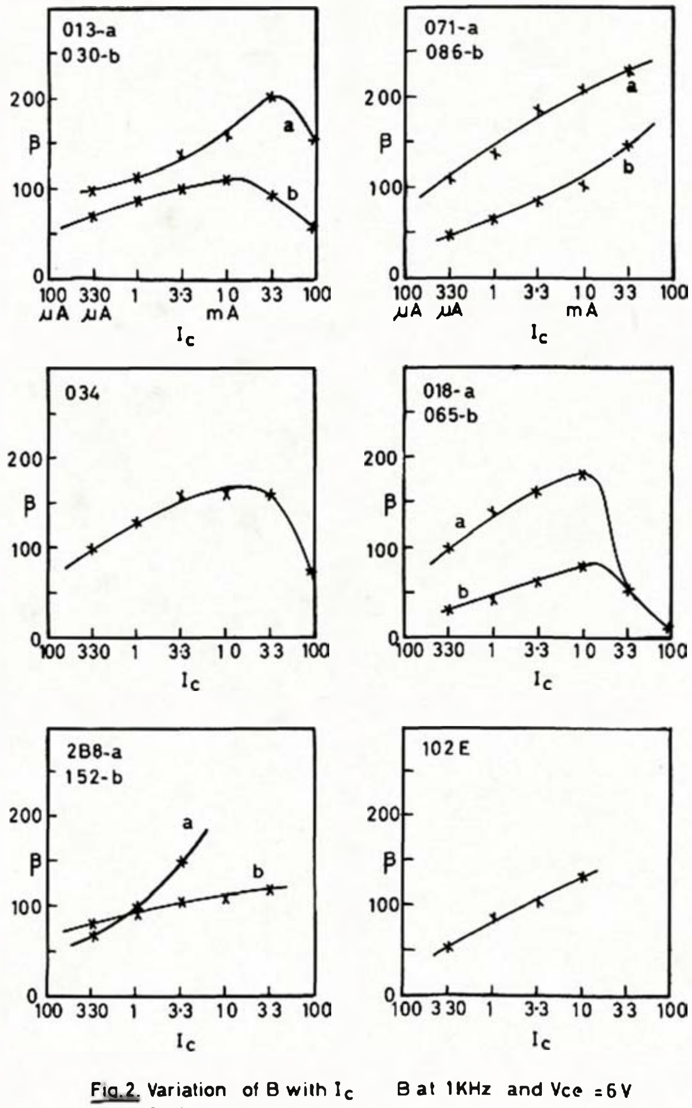


Fig.2. Variation of B with I_c B at 1KHz and Vce =6V
I_c in µA and mA

GRAPHS, ETC.

The graphs presented in Figs. 1 and 2 shows the characteristic of one "average" transistor, each, rather than being the average of a number of transistors. They will be useful only as a guide to characteristics. In Fig. 3, the effect of R_{BE} on collector-emitter voltage breakdown has been investigated, as described above, and each curve represents more-or-less typical behaviour for groups of types as indicated. A similar type of plot appeared in older editions of the "G.E. Transistor Manual." The curves vary widely from one transistor to another, for a given type.

COMMERCIAL EQUIVALENTS

Early in these tests it was realised that in most, if not all cases, there were no commercial equivalent types of transistors. This resulted in a prodigious exercise in testing, and gave us an appreciation of the fact that all characteristics can vary widely indeed between individual units.

Only the characteristics of selected computer board transistors are presented here. Details of other components on the boards are described in the notes supplied with boards ordered from the Tasmanian Division of the W.I.A.

Work is still proceeding at a slow pace to fill in some of the gaps in the tables, but in the meantime the information provided here may be useful to help you find applications for these very nice transistors.

A subsequent article in "A.R." will amplify some of the technical aspects of subjects mentioned here. Another will describe some circuits using computer board transistors. Articles on this subject have also appeared in "The Australian E.E.B." and in "Coryra". "Coryra," in particular, has featured a number of interesting audio and r.f. circuits using computer equipment during the past year.

We wish to express appreciation for help and advice received from R. S.

Maddever, and from an engineer who wishes to remain anonymous because of his work.

SYMBOLS USED

I_{CBO}: Leakage current (uA.), collector to base, with emitter open.

BV_{CBO}: Breakdown voltage, collector to base, with emitter open.

BV_{CEO}: Breakdown voltage, collector to emitter, with base open.

BV_{CES}: Breakdown voltage, collector to emitter, with base shorted to emitter.

BV_{EBO}: Breakdown voltage, emitter to base, with collector open.

BV_{CER}: Breakdown voltage, collector to emitter, with base-emitter resistance as shown.

BV_{DR}: Diode reverse breakdown voltage.

I_D: Forward diode current (Avg.).

R_{BE}: Circuit resistance between base and emitter.

P_C: Power dissipation.

F_T: Transition frequency. F_T = (f) (h_{FE}) when f is above $f_{\alpha E}$. Maximum usable frequency is usually about 30% to 50% of F_T for common-emitter operation, or about F_T for common-base.

Power dissipations (P_C) are for case at temperature indicated; maximum usable power dissipation will depend on the ability of the heat sink (or air) to keep the transistor temperature down to the value indicated. Derating factors may be approximated by consulting manufacturer's Data Sheets for similar types.

Transistor parameters and the various factors influencing them are well discussed in the following references:

"G.E. Transistor Manual," any edition, but the later the better.

"R.C.A. Transistor Manual."

"R.C.A. Silicon Power Circuits Manual."

"Motorola Power Transistor Handbook."

"Grandmas Tests" series in Vol. III. (1967) of "The Australian E.E.B."

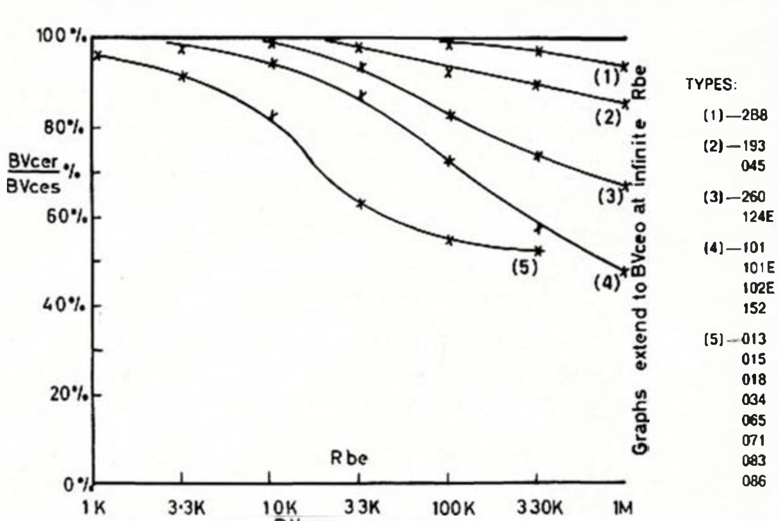


Fig3. Variation of $\frac{BVcer}{BVces}$ % VS Rbe (Kohms)

TVI—IT CAN BE ELIMINATED... WELL, NEARLY ALWAYS

We have seen many answers to the t.v.i. problem, some good, others excellent. This article claims to be neither, just simple, cheap and easy to fit.

Recently becoming the proud owner of a Swan 350C, I was (temporarily) plagued by a problem, which up until now, hadn't raised its ugly head. I had heard people say they had been troubled by t.v.i. and b.c.i., but I had not experienced it for myself.

So far we have maintained good relations with the neighbours (we have to, got the 80 metre dipole anchored to his chimney), and so when said neighbour battered on the shack door mumbling incoherently about no t.v. picture, I was a little taken aback.

We were in the middle of a QSO with a mobile out in the middle of nowhere and an engineer friend, and so we pleaded for any ideas. Back comes the engineer type and suggests a remedy—filters, no Sir, too expensive; just a simple 2-turn coil (18 gauge wire) wound on a pencil, and placed across the antenna terminals on the back of the t.v. set. Turn to Channel 0 or to Channel 2, whichever is your lowest channel, and make sure that the picture quality hasn't been affected. You may require 3 turns for Channel 0 country). Back on the air, stoke up the linear, and instantly, no t.v.i.

I have silenced two neighbours, and all for no cost at all, and it definitely does work.

One warning. When the t.v. technician comes to repair neighbour's t.v. at any time, best warn neighbour that the technician will have a fit when he sees the coil on the antenna terminals and will probably start to give off with all sorts of double talk about expensive repairs to tuners and the like. I can assure you that no such damage can possibly occur.

In very weak signal areas, this method may not work, I haven't tried it other than at home, but if it does work, then our country cousins will also gain.

—David Priestley, VK6ID.

I.T.U. CONFERENCE

7th JUNE, 1971

Federal Executive have been advised that the Administrative Council of the International Telecommunication Union (I.T.U.) decided that a **World Administrative Radio Conference for Space Telecommunications** should open in Geneva on 7th June, 1971, and last for about six weeks.

The agenda will be the following:

To consider, revise and supplement as necessary, existing administrative and technical provisions of the Radio Regulations and adopt, as necessary, new provisions for radio-communcation services, in so far as they use space radio techniques, including those for manned space vehicles, and for the radio-astronomy service, so as to ensure the efficient use of the spectrum.

To consider, revise and supplement as necessary, the Radio Regulations to provide for the use of space radio techniques by the Aeronautical Mobile and Maritime Mobile Services, for communication as well as for radio-determination purposes.

To consider, revise and supplement as necessary, the existing Table of Radio Frequency Allocations in the Radio Regulations for radio-communication services, in so far as they may use space radio techniques and the radio-astronomy service.

To consider, revise and supplement as necessary, the existing provisions pertaining to the technical criteria and the procedures for frequency sharing between space and terrestrial services, and to establish technical criteria and procedures for frequency sharing between space systems.

To consider the feasibility at this time of co-ordinated frequency planning for radio-communication satellites, including those placed on the geo-stationary orbit, and to take such action as is deemed appropriate.

To make only such consequential changes to the Radio Regulations as are essential for the effective implementation of the decisions of the Conference.

To adopt such Resolutions and such Recommendations related to the foregoing, as may be necessary.

The Institute has no further information to offer at this time, but will be evaluating the agenda in relation to the presently held Amateur allocations, and ultimately will participate in local discussions when formal proposals are being drafted.

Your Divisional Council will be calling on you to provide certain information from time to time—please give them your co-operation.

The Institute's I.T.U. representative at this time is Air Commodore A. G. Pither, VK3VX, and a member of Federal Executive.

When information is available he will provide the latest news through "A.R."

P. Williams, VK3IZ,
Federal Secretary, W.I.A.

Measuring Power Input and R.F. Power Output*

DAVID P. SMITH

ONE can still measure the power input to a c.w. transmitter by holding the key down and multiplying the d.c. plate current to the final stage by the d.c. plate voltage. Power output could be determined by I^2R using the direct reading on an r.f. ammeter and having a correctly matched load. A c.w. transmission is the only type of transmission where this type of simple measurement can be made and, even then, it is deceptive because it really defines the power conditions under non-keyed conditions only.

There are at least three types of power measurement which can be used to distinguish the power level in various unmodulated and modulated waveforms: carrier power, average (heating) power, and peak power. Each is important not only to comply with transmission regulations, but also in making the proper choice of the rating for transmitter and transmission line components. The relationship between the various power measurements is often not a simple ratio and wattmeters as well as other instruments may indicate only one power measurement directly.

By realising the characteristics of the waveform that one is concerned with, however, it is possible to derive the relationships between the various types of power terms and to correctly interpret the indication which a meter, used to measure either power input or output, indirectly produces.

To clarify the various power terms, the waveforms produced by common modulating techniques are first discussed. Then, the reaction of various meter indicating devices to the power levels contained within these waveforms is examined as a basis for practical methods of measuring r.f. power input and output levels.

● As modulation waveforms become more complex, perhaps someday including digital forms, one's view of power measurements requires a more generalised approach in order to avoid confusion.

TRANSMISSION WAVEFORMS

Not all Amateurs have the equipment necessary to view actual transmission waveforms and must rely upon meter indications for transmitter adjustments. However, one can easily become too dependent upon meters and not realise the actual content of a transmission waveshape. As one uses meters, therefore, it should be realised that, in general, they indicate only indirectly and partially what is really happening.

Fig. 1 shows the envelope waveforms, spectrum presentation and a tabulation of power measurements for various types of unmodulated, modulated and keyed waveforms. It is assumed that the waveforms are produced across a 50 ohm load and the voltage levels shown are such as could be measured on a calibrated oscilloscope display.

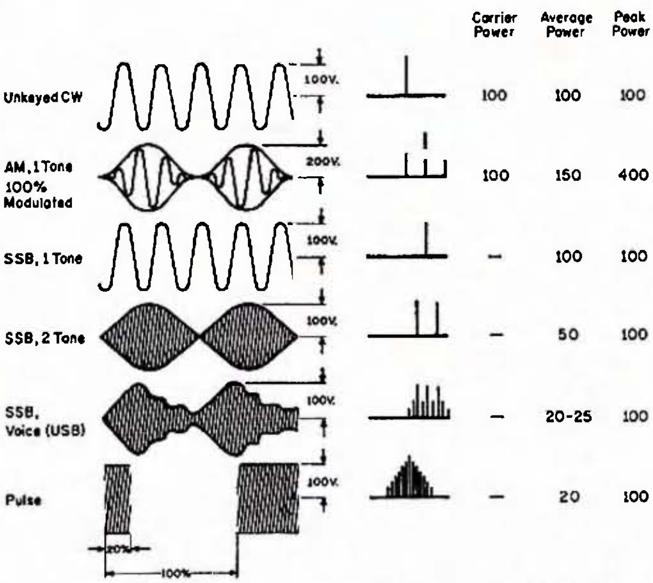


Fig. 1.—Power levels for various unmodulated and modulated waveforms. The power levels are calculated for the waveform amplitudes shown across a 50 ohm load.

The unkeyed c.w. waveform results in carrier, average and peak envelope powers of all the same value. Intuitively, one can see that the average and carrier powers should be the same since the signal is the carrier and it doesn't vary. However, the value of the 100 watts p.e.p. may not seem to correlate immediately with the 100 volt peak voltage shown on the waveform. The reason is that for a power figure, r.m.s. voltage must be used. The r.m.s. value of the peak voltage is 100 × 0.707 and the peak envelope power is:

$$\text{p.e.p.} = \frac{V_{RMS}^2}{Z} = \frac{(100 \times 0.707)^2}{50} = 100 \text{ watts.}$$

Peak envelope power is not simply peak voltage squared divided by the impedance as many Amateurs believe. If one used such a relationship and worked "backwards" to determine, for instance, the peak voltages that various components should withstand for a transmitter of a given p.e.p. output, it would result in using under-rated components. For 100 watts p.e.p., for example, components would be chosen for a 70 volt peak rating whereas a 100 volt peak rating is necessary.

A.M. WAVEFORMS

The single tone modulated a.m. waveform presents peak, carrier and average powers which all differ. Since it is assumed that the waveform represents a 100 watt output transmitter which is modulated 100% by a single tone, the carrier power must remain 100 watts since, by the definition of amplitude modulation, it does not vary. The peak power is calculated the same as in the c.w. case, using the 200 volt peak of the modulated waveform. The average power can be calculated by an analysis of the waveform but, for simplicity, the relationship is shown in the form of the graph of Fig. 2.

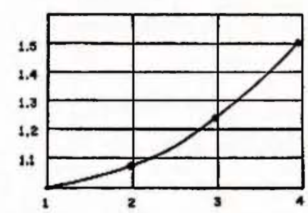


Fig. 2.—Graph used to relate various power levels for an amplitude modulated carrier. It is not applicable to s.s.b. transmission.

From this graph, since the peak power is four times the carrier power, the average power is 150 watts. This average or heating power would be the dissipation a dummy load used with the transmitter would have to handle but transmission line insulation, etc., would have to be calculated on the basis of the peak power.

S.S.B. WAVEFORMS

The single tone modulated s.s.b. waveform is exactly the same as the unkeyed c.w. waveform and all the same power levels apply. One can get involved in semantics as to whether the carrier power should be zero or 100 watts. Compared to the c.w. case, it can be regarded as 100 watts. Compared to the a.m. case, it should be regarded as zero.

The two-tone modulated s.s.b. signal presents a different set of power levels. The peak power is calculated from the

* Reprinted from "CQ," February, 1969.

peak voltage of the waveform. The average power can be calculated by assuming a carrier power that corresponds to the single tone a.m. modulated waveform as a rough approximation, but the single sideband and a.m. waveforms are **not** the same. The approximation would produce an average power of about 40 watts while the actual average power for the two-tone s.s.b. signal is 50 watts. Tests are rarely made on a s.s.b. transmitter with more than two tones (where the 2/1 peak to average power ratio applies), but a graphical relationship could be presented which would show the peak/average power ratio decreasing to 3/1 with three tones and then slowly levelling out (see Fig. 3).

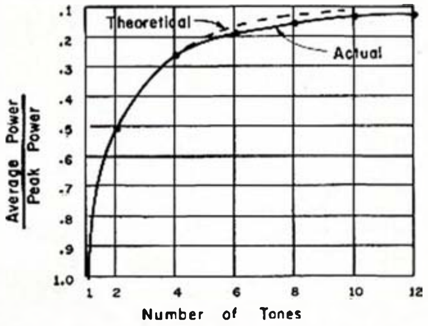


Fig. 3.—Use of two equal amplitude test tones produces s.s.b. average/peak ratio of 1/2, four tones a ratio of 1/4, etc. For a high number of tones the actual ratio is slightly different than expected because statistically for brief instants the tone amplitudes will combine in such a manner that the rated peak power is exceeded.

The relationship of the average to peak power in a voice modulated s.s.b. system depends a great deal upon voice characteristics and equipment characteristics. Usually, the average is taken as 20-25% of the peak value.

PULSE WAVEFORMS

The peak power of the pulse or digital waveform is calculated the same as for the other waveforms. The average power is simply calculated from the percentage of time that the pulse is transmitted. In the example shown, the pulse is present 20% of the time and so the average value is 1/5 of the peak value. Usual keyed c.w. is about 50%.

The usefulness of the various power level measurements depends upon what components are being chosen. Output circuit and antenna components must be rated to withstand the peak voltages encountered with any modulation system for a given peak power level. Tube dissipation, cooling requirements, power transformers, etc., must be chosen on the basis of a sustained average power for their minimum requirements.

METER MEASUREMENTS

The usual D'Arsonval movement used in meters for measuring plate current, plate voltage, relative r.f. output, etc., is essentially an average reading device. This factor is important because it is often used to measure waveforms which are not formed to present equal average and peak value.

The plate meter in an a.m. high-level modulated transmitter does not indicate any change during modulation, except for transient flickers, because it averages out to zero the symmetrical change in the current caused by the modulation process. It continues to read carrier power level although the modulator output has raised both the average and peak power output levels.

Special peak reading meters can be used across the output to indicate the actual peak output but usually an r.f. thermal type ammeter is used in the transmission line to register the increase in average power output.

Knowing the average power and the carrier power (the latter by an unmodulated c.w. test), the peak power can be found from Fig. 2. The peak and average power levels are directly related to the percentage of modulation, of course. The percentage of modulation can be calculated from the formula:

$$\text{Mod. \%} = \frac{\sqrt[2]{P_{PEAK}} - \sqrt[2]{P_{CARRIER}}}{\sqrt[2]{P_{CARRIER}}}$$

In the case of an s.s.b. transmitter which is being modulated by a two-tone test signal, the plate current meter is being driven by a series of half sine waves if the final stage operates Class B so that current flows during 180 degrees of the input r.f. signal to the stage. The average value of such a wave is 0.636 of its peak value. Thus, the peak power input to the final stage is the usual plate voltage times indicated plate current reading but then divided by the 0.636 factor.

If an average reading r.f. power output meter is used on such a transmitter, its reading will also be in error. The meter in such an instrument is also driven by a series of half sine waves but the meter scale is usually calibrated on the basis of symmetrical waveform using the V^2/R relationship in watts. Thus the meter scale will be in error by a factor of 0.636^2 or 0.405. The scale reading on such an average reading wattmeter must be divided by 0.405 to obtain p.e.p. during a two-tone s.s.b. transmitter output test.

A thermal type r.f. ammeter, if it were placed in series with the transmitter output and a suitable correctly matched load, would indicate the true average current and its reading could be taken directly for an I^2R calculation of average power.

Some readers are bound to have noticed by now that the chart of Fig. 1 shows a 50 watt average power for a 100 watt p.e.p. level on s.s.b. during a two-tone test and yet it was just mentioned that the peak power input to the transmitter is found by multiplying plate voltage times plate current and then dividing by 0.636. This apparent inconsistency in the relationship between average and peak power when considering the d.c. power input and r.f. power output has caused a great deal of confusion. The confusion arises because most of us are used to thinking of the efficiency of an amplifier as a constant (60-70%, for instance). The efficiency, however, is not constant and changes during portions of the plate current flow cycle, being greatest when the current is at a maximum. This changing efficiency accounts for the small difference in the average/peak ratio between the input and output.

In the case of a keyed or pulsed transmission with essentially a rectangular waveform, the peak reading is directly related to the average value as a function of the pulse time duration, as shown in Fig. 1. The time characteristics of the waveform must be determined by means of an oscilloscope display having a calibrated time base. Actually, exactly rectangular waveforms are not usually used because of high power transmitter design difficulties with such waveforms and because of the unnecessary interference created when the pulse rate is high. With an odd shaped waveform the only real way to measure the peak or average power input is to calculate an individual correction factor for the meter readings based on an oscilloscope display and an analysis of the waveform. The thermal method remains again, however, a valid means of measuring the average power output.

PRACTICAL MEASUREMENTS

For the modulation methods commonly used today by most Amateurs, measuring the d.c. plate power input to the final stage of a transmitter is still most easily done by means of d.c. plate voltage and plate current meters. One must be sure that the correct modulation is applied to the transmitter, especially in the case of s.s.b., and the meter readings are corrected for peak value. In the s.s.b. case, the audio tones used for the two-tone test must be of exactly equal amplitude and the transmitter should be checked for linear operation.

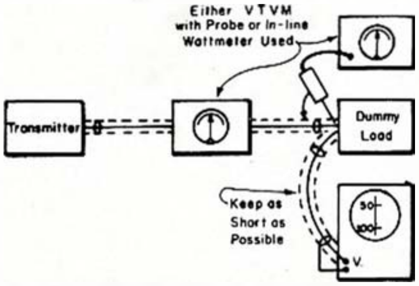


Fig. 4.—Vertical scale on oscilloscope is calibrated in watts using c.w. mode. It will then directly indicate p.e.p. during s.s.b. modulation.

The average power output of any transmitter can be measured by means of a thermal-type r.f. ammeter which is used in series with a matching dummy load for the transmitter.

Measuring peak output power levels can be done in one of several ways. If a calibrated average wattmeter is available, it can be used on s.s.b. using the 0.405 correction factor just discussed. This correction factor is only good for a two-tone test signal, however. Another method would be to operate the transmitter into a dummy load and measure the r.f. voltage across the dummy load. One has to be careful that the voltmeter used is calibrated and that it will operate properly at r.f. frequencies. If a meter is used

(Continued on Page 21)

A Semiconductor, V.H.F. Power Amplifier using a Pi-tank Circuit*

CLIFF SHARPE, G2HIF

G2HIF discusses the design of a V.H.F. P.A. using "overlay" transistors. Observations are made on several causes of unstable operation which can arise in a practical circuit, culminating in design details of a pi-tank circuit offering flexibility in load matching, and good harmonic rejection.

THE target specification of a new solid state, 144 Mc. transmitter for G2HIF/P called for a full 25 watt capability on c.w., and a maximum p.e.p. on s.s.b. consistent with easily available transistors, linearity of operation and depth of pocket.

An examination of manufacturer's literature on v.h.f. power transistors showed that the R.C.A. overlay device, 2N3632 (also by Motorola and Ferranti, or the XB402 by Texas Instruments) was rated at 13½ watts output up to 175 Mc. Two such units would easily provide a 25 watt unmodulated carrier on 2 metres and their specification also suggested that operation in the linear mode would be possible up to 10 watts mean (20 watts p.e.p.).

With the R.S.G.B. Handbook and a slide rule at the ready, a tentative circuit using a pi-tank network was postulated. The first calculations showed very forcibly that this was the wrong approach. The accepted formula yielded component values which could not be realised in practice.

As most published circuits on the data sheets favour one of the several variations of the T-network, this was a configuration which was obviously feasible. Construction of an experimental p.a. was begun. Sufficient data was readily available to enable the p.a. to be built around a single 2N3632 without knowledge of the derivation of the design parameters, and it was hoped that the workings of the finished model would help to supply some of the answers.

This preliminary venture into high power with v.h.f. semiconductors confirmed all the forebodings of other experimenters. Not only was the amplifier very non-linear, but it was also e x c e e d i n g l y temperamental. The thought of what might happen when two 2N3632s were connected in parallel did not bear contemplation, let alone actual construction, until more was understood of the theoretical design procedure.

A closer search was made through published articles and application reports for additional information without finding precise answers to a number of questions. In the majority of reports either the inadequacies of the approach were veiled in the ultimate setting of large variable capacitors, or else so many assumptions were made in a complex mathematical treatise that "the wood could not be seen for the trees".

The first gleam of light came when Motorola published the large signal characteristics of several power devices in graphical form. The parallel input and output impedances were shown to be functions of both power and frequency, and their values did not necessarily bear any relation to the d.c. or small signal characteristics normally quoted on data sheets.

In the accompanying report[1] a design procedure for T-network was explained which yielded realisable component values. The final step in the calculations, however, required some mathematical manipulation before the vital design formulae could be elucidated. Most Amateurs at this point would resort to "guesstimation" to derive the working capacitor values, so it was left to Malcolm Bibby, G3NJY, to thrash out the algebra and to quote working design formulae.[2]

DIFFICULTIES ARISING IN A PRACTICAL DESIGN

Experience on the Mark One was not entirely wasted effort. The idiosyncrasies of this type of p.a. were now more readily appreciated by a knowledge of the theory, and another single 2N3632 was offered for sacrifice.

The instabilities of the original design were attributed to three important factors. These were:

(a) The presentation of an incorrect load to the collector of the transistor by the matching network.

(b) A lack of understanding concerning the vital necessity of ensuring a minimal impedance between emitter and earth/chassis.

(c) A failure to take into account the possible ill effects of coupling in the supply rail through a large, high Q r.f. choke.

Although most careful designers would automatically ensure the condition required by (b) was satisfied, few Amateurs really appreciate the magnitude of the loss in power gain which can be produced by the inductance of only ½" of wire between emitter and chassis.

Inadequate decoupling in the emitter circuit can introduce more serious effects than merely a reduction of output power and in the worst cases can lead to actual instability and parasitic oscillations. The ingenuity of the designer may be severely taxed where it becomes necessary to run the stage from a positive earth supply. Many problems can be avoided—perhaps a transistor saved from self-destruction—by strapping the emitter to chassis with the shortest possible length of 1" wide copper foil (not braid).

The basic methods of obtaining the maximum transference of r.f. power from a semiconductor to a small resistive load are essentially the same as those used in valve circuits. The special problems which the transistor creates arise from the very much lower equivalent parallel input and output impedances of the device.

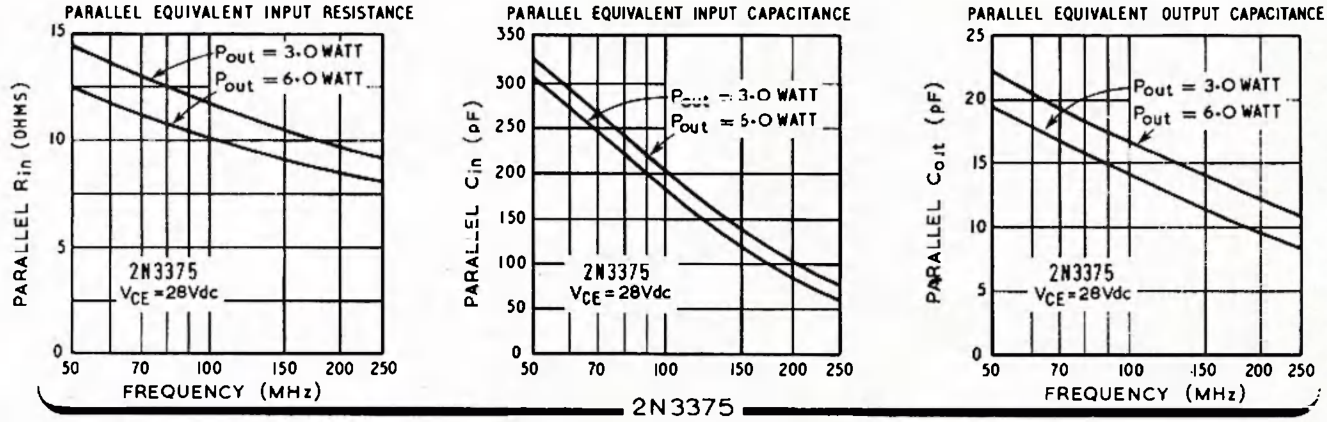
There is still a tendency for many Amateurs who are more at home with valve techniques to think in terms of voltages and not currents when applying themselves to semiconductors. The familiar component values of a valve tank network are a direct function of the high impedances involved. It is hardly surprising, therefore, to find that a similar network, which has been designed for a semiconductor circuit with impedances one hundredth of those found in valve circuits, require vastly different component values.

Unfortunately, these component values are often physically unattainable, especially at very high frequencies, and other networks have to be used which can make the impedance transformation with practical components. Some of the conditions in (a) arise simply through the use of wrong value components in otherwise suitable networks, but even when the designer has analysed the problem, and derived a correct matching network, he is not out of the wood.

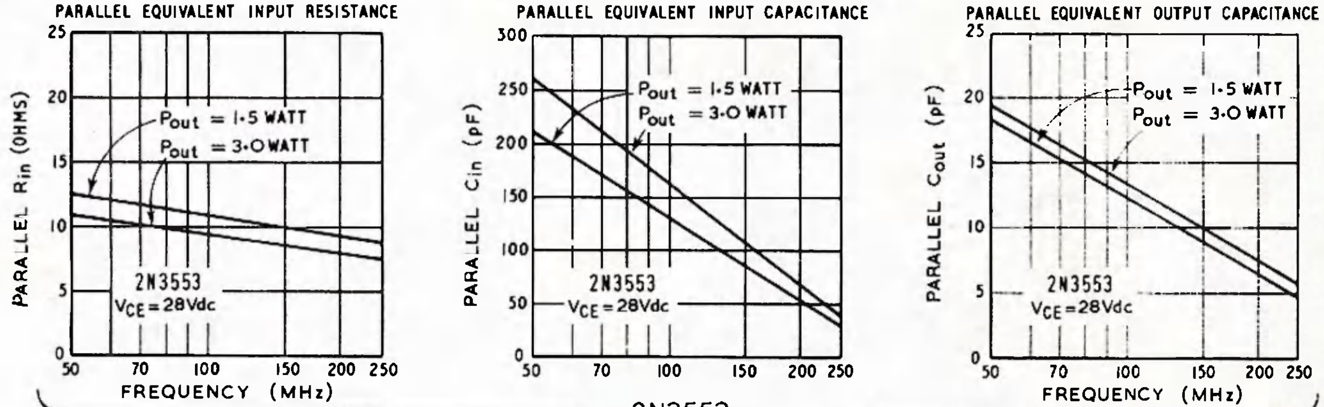
It is inevitable that sometime during its service, the transistor will be subject to off-tune or excess load conditions, and although these may occur only during alignment, the designer cannot afford to ignore them. In high impedance circuits, there are few ill effects resulting from a badly designed tank circuit other than a lowering of the p.a. efficiency, or an increase in the valve anode dissipation. In general, detuning or excess loading will merely cause the load line to steepen, but it will continue to cut the I_A V_A characteristics over their linear region.

This will not be so with the semiconductor p.a. Off-tune and higher load conditions present to the transistor a greater equivalent series impedance than does the correctly tuned and loaded network. The load line will

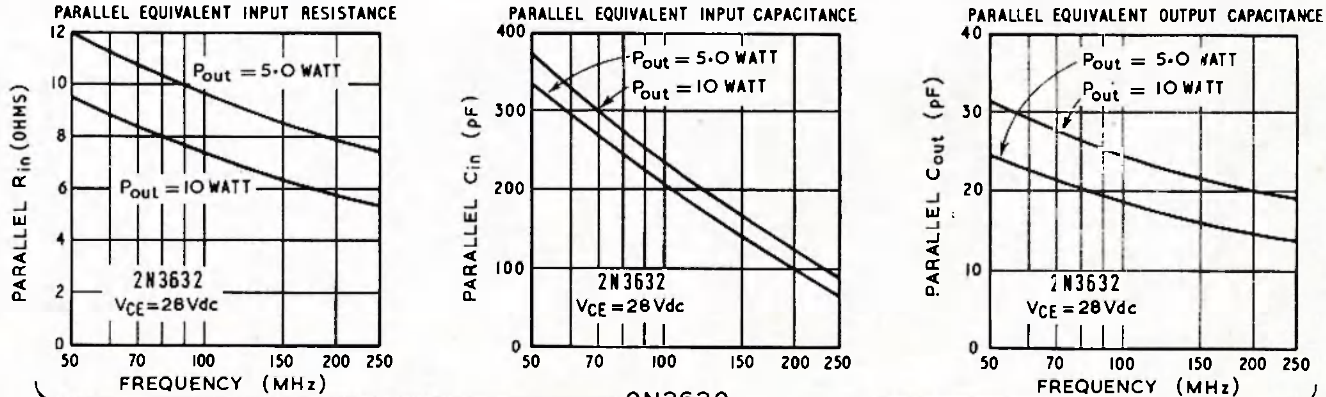
* Reprinted from "Radio Communication," November, 1968.



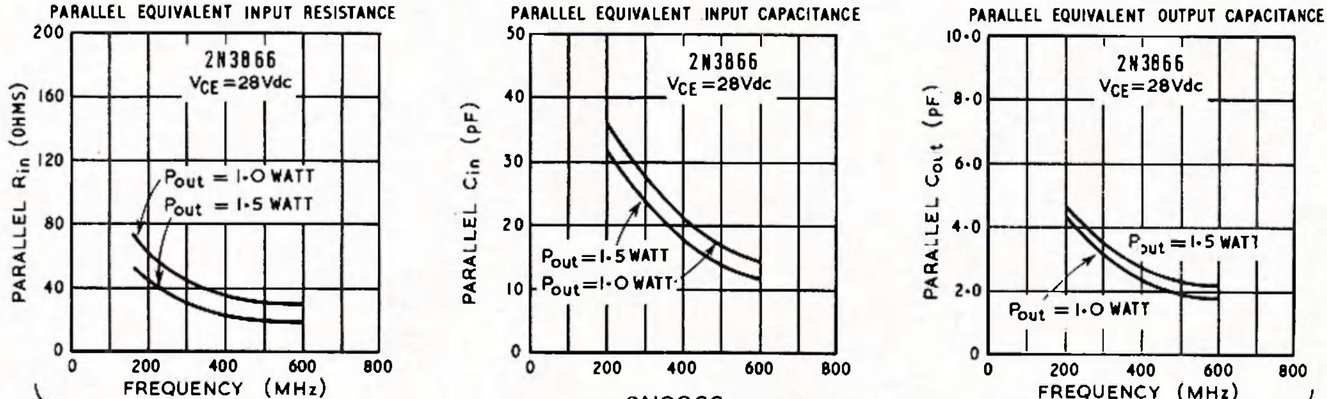
2N3375



2N3553



2N3632



2N3866

therefore cut the I_c V_c curves below the "knee". In this region linear operation is impossible and the conditions favour parasitics and other instabilities. The desirability of choosing a tank network which minimises these adverse effects of misalignment is therefore obvious.

It is not unusual to run into difficulties in valve p.a's when the h.t. supply is shunt fed through an r.f. choke, but semiconductor circuits are even more prone to the ill effects a choke can produce. The need to present a high impedance to r.f. currents circulating in the tank network of a valve p.a. had educated the designer into using high Q chokes as a matter of course. The chances are, therefore, that when the need to use an r.f.c. in a solid state circuit arises he automatically specifies one which is often too good for the job.

Whereas the reactance of the choke appears in shunt with a valve tank circuit, and in consequence, tunes with the inductance of the network without shifting the resonant frequency appreciably, it appears in series with the network inductance in many semiconductor circuits.

The ill effects referred to in (c) are a direct consequence of this. If the tank is neither correctly loaded, nor tuned to resonance, the collector does not see a low impedance in shunt with the choke. The RFC thus becomes tightly coupled to the tank inductance, and will create unwanted resonances with the capacitative reactance of the tank circuit. These resonances can occur at or near the operating frequency during the alignment of the amplifier. The load which they present is usually high with the result that the collector "bottoms" and instabilities become rife.

The impedance required effectively to isolate the collector from the supply rail needs to be no greater than ten times the load presented to it by a correctly matched network. Since this load is unlikely to be more than 50 ohms, a low Q choke, or a self resonant one shunted by a 470 ohm resistance, will be adequate for the application. The unwanted resonances are thus heavily damped and are far less likely to excitation.

TEST RESULTS ON AN INTERMEDIATE DESIGN

The above precautions were scrupulously observed in the Mark Two design. More screening was introduced between the input and output circuits, and the p.a. tested into a resistive dummy load. The parameters of the T-network were aligned to deliver the rated power to the load. It was noted that the settings were in close agreement with the values calculated for the formulae derived by G3NJY. Meter indication of the collector current gave insufficient information regarding the correct tuning, but once the settings had been established, they could be repeated by observation of the load current. Good linearity was maintained to power levels approaching 70 per cent. of those obtained with an unmodulated carrier.

On-the-air tests proved encouraging. A modulated envelope from a QRP valve transmitter provided the modest drive requirements to the 2N3632 and several QSOs were held at a mean power level of 4½ to 5 watts output. Speech quality reports confirmed the amplifier to be linear. More exhaustive tests with Colin Desborough, G3NNG, however, revealed the third harmonic content to be above that which could be tolerated. Strength S3 to S4 over a nine-mile path, and impossible for common site working on v.h.f. N.F.D.

THE FINAL PI-CIRCUIT

The quest for a more efficient tank network which would filter off a greater proportion of the 432 Mc. harmonic brought the considerations of the design back to square one. The pi-tank has not achieved almost universal popularity in valve p.a's without good reason. The question was, could any circuit configuration using a 2N3632 be made to work which would exploit the flexibility and performance capabilities of the network?

The figures were re-examined. Impedance transformation from a few K ohms to a typical cable Z_0 are well within the efficient range of a pi-network, and a few minutes with a slide rule will confirm that these numbers result in realistic component values on 144 Mc. It follows then, that the transformation from 50 ohms to a few K ohms is equally possible. Since two networks may be connected in tandem provided the output impedance of the first equals the input impedance of the second, here was a possible solution to the problem of gaining better harmonic rejection with a more flexible network.

Although the collector of a 10 or 20 watt p.a. is more likely to see a load of considerably less than 50 ohms, the prospect still seemed a good proposition when the possible variations of the network Q were taken into account.

Two pi-networks in tandem; a minimum of three variable capacitors. The tuning procedure for correct alignment was formidable. However, if an L network could be designed to replace the first pi, the design of the new network was home and dry. It remained only to work out the component values in the practical case.

RESULTS

The final p.a. design and pi-tank network proved very simple to get working, and on-the-air tests confirmed that the harmonic radiation on 432 Mc. was reduced to the limits which would be imposed by common site working on v.h.f. N.F.D.

The tuning procedure followed closely that of a normal pi-tank, but the adjustments should always be made for a maximum r.f. current in the load rather than by observation of collector current. A check on this current, however, is valuable in providing an indication of the collector dissipation and input drive requirements.

Two circuits, one using a single 2N3632 running at 13½ watts c.w., and one which connected two similar devices in parallel to give 20 watts p.e.p. were constructed, and neither showed any signs of instability during alignment or operation. The linearity of the latter amplifier was judged to be more than adequate for s.s.b. through its ability to handle a 100 per cent. amplitude modulated carrier without distortion.

The drive requirements of each of the 2N3632s when wired in parallel were well matched in the samples tested, but it is recommended that a method of equalising the drive to each in order to balance the outputs be incorporated in the design. Care should always be exercised to ensure the amplifier is not over-driven, especially when optimum linearity is required.

CONSTRUCTIONAL NOTE

Both models were constructed on a copper earth plain mounted in the lid of a 4½" v 3½" die-cast box. No additional heat sink was necessary.

The two inductances in the tank network were not mutually coupled, and if mounted at right angles interact insufficiently to disturb the correct operation.

Whilst careful layout could obviate the necessity to fit screening between the base and collector circuits, a screen across the collector terminals proved advantageous in maintaining absolute stability during alignment.

Details of the input networks to the transistor bases are not discussed in this report as further experimental work on optimising the design of this section of the amplifier is still being carried out.

REFERENCES

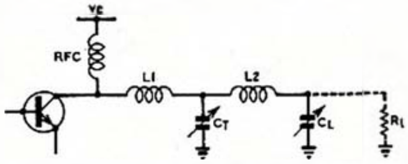
1—"Systemising R.F. Power Amplifier Design." Motorola Application Report No. 282.

2—"The Design of T Networks for Series Tuned, Semiconductor Power Amplifiers," Malcolm Bibby, G3NJY. "QAV" Tech. Supplement, A.E.R.E. Radio Club Newsletter, May-June, 1967. Also "Radio Communication," February 1968, page 96.

3—"Technical Topics," R.S.G.B. "Bulletin," May 1967.

APPENDIX

THE NETWORK



C_T Main tuning capacitor.
C_L Loading capacitor.
L1 L-network inductance.
L2 Pi-network inductance.
R_L Transmitter load resistance.
V_c Supply voltage.

THE DESIGN METHOD

The first part of the design procedure determines the L section of the network in Fig. 1. It follows closely the method set out by Malcolm Bibby, G3NJY, for T networks in series tuned semiconductor power amplifiers.

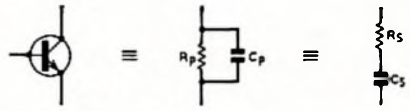


Fig. 1.

The two parameters which must be determined initially are the large signal output capacitance of the transistor, and its equivalent parallel resistance.

The output capacitance, C_P, is obtained from the manufacturer's data sheet of the transistor, and will be quoted in the form of capacitance/frequency graphs at various power levels. The output resistance, R_P, will not be included in the data sheet because it can be computed with sufficient accuracy by assuming a peak-to-peak r.f. voltage swing of twice the supply voltage, V_C.

If P is the mean power output, the equivalent parallel resistance of the transistor,

$$R_P = \frac{V_C^2}{2P}$$

The parallel resistance and capacitance must now be converted mathematically to the equivalent series circuit; Fig. 2. The equivalent series resistance,

$$R_S = \frac{R_P \,.\, X_P}{R_P^2 + X_P^2} \,.\, X_P$$

and the equivalent series capacitive reactance,

$$X_S = \frac{R_P \,.\, X_P}{R_P^2 + X_P^2} \,.\, R_P$$

where $X_P = \frac{1}{\omega C_P}$

and $X_S = \frac{1}{\omega C_S}$

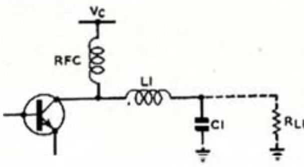


Fig. 2.

The series impedance of the device, Z_S, is therefore equal to $R_S - jX_S$. For the maximum power transfer to a load, the load impedance must be the conjugate of the source impedance, or $R_S + jX_S$; Fig. 3. It is desirable that the network should provide harmonic rejection and ease of tuning, therefore a working Q of between 8 and 20 should be chosen as being satisfactory at v.h.f.

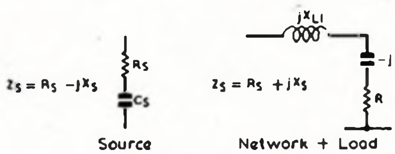


Fig. 3.

Since X_{L1} and X_{C1} (Fig. 3) may have a range of values, the desired loaded Q of the network may be obtained by a choice of the inductance, L1. The formula relating the inductive reactance, X_L, the series resistance, r, and Q is

$$Q = \frac{X_L}{r}$$

so that here $X_{L1} = Q\ R_S$.

The impedance of the source plus the inductive reactance, X_{L1}, is $R_S + j(X_{L1} - X_S)$, thus the impedance of $R - jX_C$ must be the conjugate to establish the match. From this, by equating the real and imaginary parts,

$$R = R_S$$

and $\quad X_C = (X_{L1} - X_S)$

The values of C1 and R_{L1} in the L network (Fig. 1) may now be calculated by making the series to parallel conversion.

Thus $\quad R_{L1} = \dfrac{X_C^2 + R_S^2}{R_S}$

and

$$X_{C1} = \frac{X_C^2 + R_S^2}{X_C}$$

$$C_1 = \frac{1}{\omega X_{C1}}$$

It remains only to apply the Pi-network formula (see R.S.G.B. Handbook) to complete the design of the tank circuit; Fig. 4. This formula states,

$$X_{C2} = \frac{R_1}{Q}\left[1 + \sqrt{\frac{R_2}{R_1}}\right]$$

$$X_{C3} = X_{C2}\sqrt{\frac{R_2}{R_1}}$$

$$X_{L2} = \frac{R_1}{Q}\left[1 + \sqrt{\frac{R_2}{R_1}}\right]^2$$

$$C_2 = \frac{1}{\omega X_{C2}}$$

$$C_3 = \frac{1}{\omega X_{C3}}$$

$$L_2 = \frac{X_2}{\omega}$$

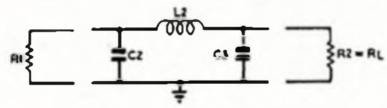


Fig. 4.

Thus the values of the capacitive reactance, X_{C2} and X_{C3}, and the inductive reactance, X_{L2}, may be obtained by making $R_1 = R_{L1}$, and $R_2 =$ the transmitter load, R_L.

The two sections of the tank are connected together by lumping C_1 and C_2 in parallel to form the tuning capacitor, C_T. C_3 is the loading capacitor, C_L.

The Q chosen for the Pi section need not be the same value as that chosen for the L section. Improved harmonic rejection will be obtained with the higher values of Q.

WORKED EXAMPLES

Network design for a single 2N3632 transistor operating at 13½ watts c.w. output into a 72 ohm resistive load. Frequency = 144 Mc. Supply voltage = 28 volts.

From data sheet, parallel equivalent output capacity, C_P, at stated power and frequency.

$C_P = 22$ pF.

Parallel equivalent output resistance, R_P, at stated power,

$$R_P = \frac{V_C^2}{2\,P}$$

$$= \frac{28^2}{2 \times 13\tfrac{1}{2}}$$

$$= 29 \text{ ohms.}$$

Reactance of $C_P = \dfrac{1}{2\pi f C_P}$

$f = 144$ Mc.

$2\pi f = 9.1\ 10^8$

Thus $\quad X_P = \dfrac{10^{12}}{9.1 \times 10^8 \times 22}$

$= 50$ ohms.

By the parallel to series conversion,

$$R_S = \frac{29 \times 50}{29^2 + 50^2} \times 50$$

$= 0.436 \times 50$

$= 22$ ohms

and similarly

$$X_S = \frac{29 \times 50}{29^2 + 50^2} \times 29$$

$= 0.436 \times 29$

$= 12.7$ ohms.

For a Q of 10, reactance of L1

$X_{L1} = Q\ R_S$

$= 10 \times 22$

$= 220$ ohms

and $\quad L1 = 0.24\ \mu$H.

From $\quad X_C = (X_{L1} - X_S)$

$X_C = (220 - 12.7)$

$= 207.3$ ohms.

To obtain the values of C1 and R_{L1} of Fig. 1, the series combination of X_C and R_S must be converted to the parallel equivalent.

Thus from the formulae,

$$X_{C1} = \frac{2.07^2 \times 10^4 + 2.2^2 \times 10^2}{2.07 \times 10^2}$$

$= 208$ ohms.

From which

$$C1 = \frac{10^{12}}{9.1\ 10^8 \times 208}$$

$= 5.3$ pF.

and similarly

$$R_{L1} = \frac{2.07^2 \times 10^4 + 2.2^2 \times 10^2}{2.2 \times 10}$$

$= 1.97$K ohms.

So the L section has been determined. Substituting in the pi-network formula, $R1 = 1.97\ 10^3$ and $R2 = 72$ for a selected Q of 15

$X_{C2} =$

$$\frac{1.97 \times 10^3}{15}\left[1 + \sqrt{\frac{72}{1.97 \times 10^3}}\right]$$

$= 156$ ohms.

Therefore $\quad C2 = \dfrac{10^{12}}{9.1 \times 10^8 \times 156}$

$= 7.1$ pF.

$$X_{C3} = 156\sqrt{\frac{72}{1.97 \times 10^3}}$$

$= 29.7$ ohms.

So $\quad C3 = 37.0$ pF.

SEMICONDUCTOR

$X_{L2} =$

$$\frac{1.97 \times 10^3}{15}\left[1 + \sqrt{\frac{72}{1.97 \times 10^3}}\right]^2$$

$= 186$ ohms

and $\quad L2 = 0.204\ \mu$H.

(Continued on Page 24)

Geelong Radio and Electronics Society's New Club Rooms

Over 200 people were present to see Mr. Reynolds cut the ribbon which formally opened the Society's new club rooms on the Belmont Common.

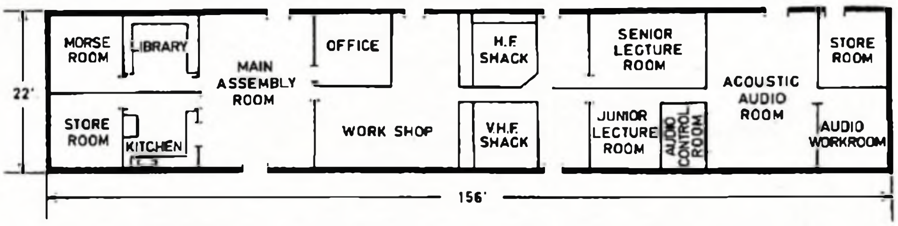
Bill Erwin (VK3WE), President, and Harry Michael (VK3ASI), Secretary, welcomed all visitors. The official guests besides Mr. Reynolds, who was President of South Barwon Shire Council, in whose Shire the Belmont Common lies, were Cr. Wood (Mayor of Geelong), Michael Owen (VK3KI), Federal President W.I.A., and Keith Roget (VK3YQ), Divisional President.

Bill was able to point with pride to the success the Society had had within the six years of its existence. They had been fortunate to have been able to lease on very generous terms, a disused migrant hostel. Its condition had deteriorated to such an extent that all services, water and electricity were condemned. Without outside aid they have removed walls, put in trusses, rewired electric outlets, connected water, repaired plumbing and used twenty-five gallons of paint. In addition, $1,200 has been raised and spent on the project. The diagram shows the layout that they have been able to achieve.

The Club station, VK3ANR, very ably handled the VK3 Divisional call back after the broadcast on Sunday morning. This station will be pleased to have QSOs any time they are on the air. Visitors are welcome to the Society, which also caters for hi-fi and other electronic equipment interests.

The Belmont Common is ¾ mile along the left hand side of the Barwon Heads road after crossing the Barwon River at the Princes Highway.

GEELONG RADIO & ELECTRONICS SOCIETY CLUB ROOMS.



PLEASE QSL OM . . .

Who can deny the pleasure of receiving one's very first QSL card, the one which completes the score for DXCC, or the one from that elusive ZZ call area?

However, courtesy requires that cards be exchanged, and this is where the new Amateur strikes a problem. Funds are probably low when first going on the air, and printing takes time.

This is how I solved the problem, and was able to despatch cards within a few days of receiving my call sign and getting on the air.

First I bought eight sheets of thin white card from the local printer, capable of being cut into six foolscap pieces each. Each piece accommodates four QSL cards—result, 192 cards for about $1.00.

The front of the card has the call sign in large letters, with name above, and QTH below—in free lettering, designed by harmonic No. 1. The back has the usual information, plus room for address to and postal address from. A line drawing of a man separates the information from the addresses. He was designed by harmonic No. 2.

The designs were traced onto two spirit duplicator sheets and the cards run through the machine twice. The foolscap sheets were cut into four, and coloured using felt pencils—two contrasting colours on the front, and a third for the man at the back.

The colouring is rather tedious, and for a start the whole family joined in, to give me a start. I now do a few at a time, often while listening on the band.

If there are no artistic members in the family, perhaps an art student at the local school could help. There is also a firm which designs cards, and advertises in "A.R."

Duplicated cards such as these will assist in trying out designs and wording, and will enable the new Amateur to get started at the earliest possible time, until his cards can be printed. So, you newcomers, reach for a 4H pencil, and get cracking!

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MEASURING POWER INPUT

(Continued from Page 16)

which is so-called peak reading but has a scale calibrated in r.m.s. values, the values read from the scale can be used directly in the V^2/R formula to calculate the peak power.

Another method that avoids some of the instrument problems of the last method is to use a calibrated oscilloscope display (Fig. 4). Use c.w. transmissions first and find the power output either by an average reading wattmeter (which for c.w. requires no scale correction) or by measuring the voltage across a dummy load with a v.t.v.m. and r.f. probe (following the v.t.v.m. instructions to determine the a.c. r.m.s. voltage values) and simply using the V^2/R formula. The oscilloscope scale is marked for various power levels. The transmitter is then switched to s.s.b. transmission and the vertical scale deflection on the oscilloscope will give a direct and instantaneous indication of the p.e.p. output level under tone or voice modulated conditions. The same scheme can be used to check the peak output level using any other modula- method as well.

OBITUARY

GEORGE R. McCULLOCH, VK3GM

George R. McCulloch, Ass.I.R.E., passed away on 6th May, 1969, at the age of 62 years.

George was first licensed in 1926 and held the call sign of A3GM. He was a genuine experimental radio operator and conducted a lot of work on the 200 metre band in the early part. Later, with re-issue of the licence VK3GM, he worked on the higher frequency bands, particularly 10, 5 and the 2 metre bands where he won the Ross A. Hull Memorial V.h.f. Contest in 1955-56. Most of George's equipment was home-built and was still in working order at his death.

George will be missed by his many friends and Radio Amateur operators.

The Institute and all Amateurs extend their deepest sympathy to his wife and family.

Technical Correspondence

FET GATE DIP OSCILLATOR

Editor, Dear Sir,

Gadget builders will be disappointed with the performance of the FET Gate Dip Oscillator described in the journal for June 1969 (p. 14). With the circuit as it stands, there is an intolerable drop-off of oscillator output at the high frequency end of each range.

This defect is cured by increasing the source by-pass capacitor, which is shown as being an improbably low 10 pF. in the circuit diagram. When this is replaced by a 0.047 uF. capacitor the g.d.o. performs well, although some adjustment of the voltage applied to the base of the d.c. amplifier may be necessary for some transistors, e.g. a 10K resistor from base to ground.

—Robert H. Black, VK2QZ.

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CONTEST CALENDAR

16th/17th August: W.I.A. R.D. Contest.
30th/31st August: 10th "AA" DX Contest—J.A.R.L. (c.w. only).
4th/5th October: VK-ZL-Oceania DX Contest, 1969 (phone section).
4th/12th October: Lebanese DX Contest.
11th/12th October: VK-ZL-Oceania DX Contest, 1969 (c.w. section).
11th/12th October: R.S.G.B. 28 Mc. Telephony Contest.
25th/26th October: "CQ" W.W. DX Contest—phone section.
9th November: International OK DX Contest (c.w. only).
6th Dec. to 11th Jan., 1970—Ross A. Hull V.h.f. Memorial Contest.
1st/2nd February, 1970: John Moyle National Field Day.

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ERRATUM

The author of "A Field-Day Transmitter," "A.R." May 1969, has pointed out an error in the circuit diagram. If wired as shown, and the function switch set to the "Tx Ph." condition, the diode OA210 would be reverse biased and the receiver mute relay would not operate.

Readers are asked to correct the diagram by removing the connection from "TSA4-6" (receiver mute relay) to the OA210 and replacing it on the other side of the OA210, i.e. the junction of the OA210 and T/R relay.

VK-ZL-OCEANIA DX CONTEST, 1969

N.Z.A.R.T. and W.I.A., the National Amateur Radio Associations in New Zealand and Australia, invite world-wide participation in this year's VK-ZL-Oceania DX Contest which is one function of New Zealand's Bi-Centennial Celebrations.

Objects: For the world to contact VK-ZL-Oceania Stations and vice versa.

When? Phone: 24 hours from 1000 GMT, Saturday, 4th October, to 1000 GMT, Sunday, 5th October.

C.w.: 24 hours from 1000 GMT, Saturday, 11th October, to 1000 GMT, Sunday, 12th October.

RULES

1. There shall be three main sections to the Contest:—
   (a) Transmitting phone.
   (b) Transmitting c.w.
   (c) Receiving—phone and c.w. combined.

2. The Contest is open to all licensed transmitting stations in any part of the world. No prior entry need be made. Mobile marine and other non-land based stations **are permitted** to enter. Their "country status" will be determined by the country which issued the call sign used in the Contest.

3. All Amateur frequency bands may be used but no crossband operation is permitted. **Note**: VK and ZL stations irrespective of their location do **not** contact each other for contest purposes, **except on 80 metres**, on which band contacts between VK and ZL stations are encouraged.

4. Phone will be used during the first week-end and c.w. during the second week-end. Stations entering both sections must submit separate logs.

5. Only one contact on c.w. and one contact on phone per band is permittetd with any one station for scoring purposes.

6. Only one licensed Amateur is permitted to operate any one station under the owner's call sign. Should two or more operate any particular station, each will be considered a competitor and must submit a separate log under his own call sign. This is not applicable to overseas' competitors operating Club stations.

7. Entrants must operate within the terms of their licence.

8. **Cyphers**: Before points can be claimed for a contact, serial numbers must be exchanged and **acknowledged.** The serial number of five or six figures will be made up of the RS (phone) or RST (c.w.) report plus three figures which may begin with any number between 001 and 100 for the first contact and which will increase in value by one for each successive contact. Example: If the number chosen for the first contact is 021, then the second must be 022 followed by 023, 024, etc. After reaching 999, restart from 001.

9. **Scoring:**

(a) **For Oceania Stations other than VK/ZL**: 2 points for each contact on a specific band with VK-ZL stations; and 1 point for each contact on a specific band with the rest of the world.

(b) **For the Rest of the World other than VK-ZL**: 2 points for each contact on a specific band with VK-ZL stations; and 1 point for each contact on a specific band with Oceania stations other than VK-ZL.

(c) **For VK-ZL Stations**: 5 points for each contact on a specific band and, in addition, for each new country worked on that band **bonus** points on the following scale will be added:

1st contact	50 points
2nd „	40 „
3rd „	30 „
4th „	20 „
5th „	10 „

Note: The A.R.R.L. countries list will be used except that each **call area** of "W/K", "JA", "UA" will count as "countries" for scoring purposes as indicated above.

For 80 metre contacts between VK and ZL stations, each VK and ZL call area will be considered a "scoring area" with contact points and bonus points to be counted as for DX contacts. **Note:** Contacts between VK and ZL on **80 metres only.**

10. **Logs:**

(A) **Overseas Stations—**

(a) Logs to show in this order: date, time in GMT, call sign of station contacted, band, serial number sent, serial number received, points claimed. **Underline** each new VK-ZL call area contacted. Separate log must be submitted for each band used.

(b) **Summary Sheet** to show call sign, name and address in BLOCK LETTERS, details of station, and, for **each band**: QSO points for that band, VK-ZL call areas worked on that band. "All Band" score will be total QSO points multiplied by sum of VK-ZL call areas on all bands, while "single band" scores will be that band QSO points multiplied by VK-ZL call areas worked on that band.

(B) **VK-ZL Stations—**

(a) Logs must show in this order: date, time in GMT, call sign of station worked, band, serial number sent, serial number received, contact points, bonus points. **Use separate log for each band.**

(b) **Summary Sheet** to show: name and address in BLOCK LETTERS, call sign, score for each band by adding contact and bonus points for that band, and "all band" score by adding the band scores together; details of station and power used; declaration that all rules and regulations have been observed.

11. The right is reserved to disqualify any entrant who, during the Contest, has not strictly observed regulations or who has consistently departed from the accepted code of operating ethics.

12. The ruling of the Executive Council of the N.Z.A.R.T. will be final.

13. **Awards:**

World-wide except VK-ZL—

(a) Attractive multi-colour certificates to the top scorers in each country (call area in "W", "JA" "UA"). Separate awards for phone and c.w.

(b) Similar certificates to all participants with a minimum operating time.

(c) **Silver Shield and N.Z.A.R.T. Badge** mounted on polished wooden base awarded in the following categories:
   (1) Top scorer in each continent with separate awards for phone and c.w.
   (2) Top world score on each band: 40, 20, 15, 10. Separate awards for phone and c.w.
   (3) Top "club" entry from North America and from Europe to consist of a phone log and a c.w. log from members of that club—e.g. Ohio Valley DX Club, West Gulf DX Club, Long Island DX Association, etc., etc.
   (4) Multi-operator "club" stations in U.S.S.R. using c.w. only.

Note.—Stations entering for the "club" award must clearly indicate name of club and also entry for this section of the contest.

(d) **S.w.l.**: Attractive multi-colour certificates as for transmitting section in (a) above.

(e) Copper Medallions specially struck for New Zealand's Bi-Centennary awarded to the following:
   (1) Each winner in category (c) above.
   (2) Runner-up in each section of category (c).

VK-ZL Awards—

(a) Attractive multi-colour certificates to the following:
   (1) To the top three scorers in each call area of VK and of ZL.
   (2) To the top three scorers on individual bands (80, 40, 20, 15, 10) in VK and in ZL. Separate awards for phone and for c.w.

(b) Similar certificates to participants with a "minimum" operating time.

(c) Large silver mounted plaque to the top scorer in both VK and in ZL with separate awards for phone and for c.w.

(d) Silver mounted shield to runner-up in section (c) above.

(e) Silver mounted shield to top VK and top ZL scorer using 80 metres **only.** Separate awards for phone and for c.w.

(f) Silver mounted shield to top scoring ZL on 40, 20, 15, 10 with separate awards for phone and for c.w.

(g) Copper Medallions specially struck for New Zealand's Bi-Centenary awarded to the following:
   (1) Each winner in sections c, d, and e above.
   (2) Top scorer in each call area of VK and ZL, both on phone and on c.w.

(3) Top scorer on each individual band for VK and for ZL. Separate medallions for phone and for c.w.

Except that duplicate medallions will not be awarded where one entrant is the top scorer in more than one section.

(h) One year's subscription to N.Z.-A.R.T. publication "Break-In" to top scoring VK station on phone and on c.w.

(i) **S.w.l.**: Multi-colour certificates to the top scoring S.w.l. in each VK-ZL call area with medallion to the top scorer for VK and ZL.

14. **Entries** from—

VK-ZL should be posted direct to—

N.Z.A.R.T. Contest Mgr., ZL2GX,
152 Lytton Rd., Gisborne, N.Z.,

to arrive not later than 31st December, 1969.

Overseas Stations to the above address **or**—

N.Z.A.R.T.,
P.O. Box 489, Wellington, N.Z.,

to arrive not later than 23rd January, 1970.

S.W.L. SECTION

1. The rules are the same as for the transmitting section but it is open to all members of any S.w.l. Society in the world. No transmitting station is permitted to enter the contest.

2. The contest times and logging of stations on each band per week-end are as for the transmitting section except that the same station may be logged twice on any one band—**once on phone** and **once on c.w.**

3. To count for points, the station heard must be in QSO exchanging cyphers in the VK-ZL-Oceania DX Contest and the following details noted: date, time in GMT, call of the station heard, call of the station he is working, RS(T) of the station heard, serial number **sent** by the station heard, band, points claimed.

4. Scoring is on the same basis as for the transmitting section and a **summary sheet** should be similarly set out.

5. Overseas stations may log **only VK-ZL** stations, but VK receiving stations may log overseas stations and ZL stations, while ZL receiving stations may log overseas stations and VK stations.

5. Awards will be made as listed in the section under "Awards".

SPECIAL NOTE

1. There are several changes in the rules for this year's contest. These have been made in an endeavour to increase activity and to cater for the large number of ZLs who operate on 80 metres only. 80 metre QSOs are encouraged between VK and ZL. Activity from mobile marine stations is encouraged.

2. There are a large number of awards available both for VK-ZL stations as well as for overseas stations.

3. This contest is part of New Zealand's Bi-Centennial Celebrations.

4. The success of any function depends on **publicity**. All VK and ZL stations are requested to give this year's contest—specially geared for New Zealand's Bi-Centennial—all the publicity possible.

5. Advance publicity has already gone out to major Societies and DX clubs.

6. A condensed version of these rules is being sent to all winners in the 1968 contest; to Amateur Radio Societies around the world, to DX clubs, to Amateur Radio magazines, and to DXers in general!

7. Do you know any member of an overseas DX club very well? Draw his attention to the trophy for competition among DX clubs. A challenge might help!

—Jock White, ZL2GX,
Contest and Awards Manager, N.Z.A.R.T.

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NEW CALL SIGNS

APRIL 1969

VK1BX—M. C. Hooper, Flat 36, Block C, Kanangra Crt., Reid, 2601.
VK2FZ—A. Pollock, 15 Matthew Pde., Blaxland, 2774.
VK2ASF—S. C. Fletcher, Maling St., Eden, 2551.
VK2BWT—W. M. Thompson, 3 Kalbada Ave., Gymea Bay, 2227.
VK3MU—R. G. O. Wilson, 45 Pleasant Rd., East Hawthorn, 3123.
VK3AQM—P. R. Seddon, 3 Cobden St., Ballarat, 3350.
VK3AUJ—J. H. Hutchinson, 37 Bruce St., Mitcham, 3132.
VK3AXV—S. R. Goodwin, Station: Kaniva; Postal: P.O. Box 81, Kaniva, 3419.
VK3AZZ—R. J. Gray, Flat 2, 11 George St., Reservoir, 3073.
VK4EV—R. A. Everingham, 30 Hunter St., Everton Park, 4053.
VK4IQ—C. J. Case, 6 Granville St., Pimlico, Townsville, 4810.
VK4IT—P.M.G. Technicians' School Radio Club, 28 Banfield St., Chermside, 4032.
VK4QL—M. S. Pedder, 24 McNamara St., Toowoomba, 4350.
VK4ZIR—I. R. Milne, Listening Ridge, Pechey, Crows Nest, 4355.
VK4ZTK—R. C. Tulloch, 40 Sussex St., Hyde Park, Hermit Park, 4812.
VK5AV—J. B. Masters, 4 Calum Gr., Seacombe Heights, 5047.
VK5HJ—H. J. Town, C/o. Superintendent, Radio Branch, 31 Franklin St., Adelaide, 5000.
VK5IR—G. R. Thompson, 15 Fleetwood Cres., Henley Beach, 5022.
VK5PB—R. G. Stone, 120 Coombe Rd., Allenby Gardens, 5009.
VK5ZWI—Wireless Institute of Australia (S.A. Division) V.h.f. Group, Station: Mobile; Postal: C/o. J. A. Hackworth, 34 Oaklands Rd., Somerton Park, 5044.
VK5ZWS—J. B. Sparrow, 62 Portland Rd., Queenstown, 5014.
VK6BV—B. E. C. Varley, 79 Stubbs Tce., Daglish, 6008.
VK6ED—E. F. Davies, 104 Kent St., Busselton, 6280.
VK6IA—I. G. Dawson (Rev. Fr.), Franciscan Friary, 53 Grt. Northern H'way, Midlands, 6056.
VK6JY—J. M. Young, 61 Peoples Ave., Gooseberry Hill, 6076.
VK6MR—M. P. Ryan, 12 Warrick Rd., Sorrento, 6020.
VK6VN—V. Mathews, Lot 169, Mereworth Rd., Thornlie, 6108.
VK6WD—W. G. Dowie, 19 Sadlier St., Subiaco, 6008.
VK6ZDB—G. S. Byass, 10 Florence Rd., Nedlands, 6009.
VK6ZFQ—K. C. Thompson, 52 Minninup Rd., Bunbury, 6230.
VK6ZLM—L. K. McPherson, Station: Carnarvon; Postal: C/o. P.O. Carnarvon, 6701.
VK7CD—C. A. Danforth, Lockett St., Wynyard, 7325.
VK7NB—N. Bolland, 4 St. Georges Tce., Battery Point, 7000.
VK7ZDW—D. R. Wilson, Junee Rd., Maydena, 7457.
VK7ZMS—M. G. Sailer, 6 Osborne St., Sandy Bay, 7005.
VK7ZJR—B. Robinson, 5 Nevin St., South Hobart, 7000.
VK8ZGY/T—G. L. Tillett, Flat 1, 6 Hong St., Alice Springs, 5750.
VK9GD—A. G. Dunn, Station: Kapuna, P.; Postal: United Church, Kapuna, P.M.B., Boroko, P.
VK9LB—J. R. Liebgold, Station: Norfolk Island; Postal: C/o. Barry Research, Box 287, Norfolk Island.

CANCELLATIONS

VK2FE—E. F. Davies. Now VK6ED.
VK2ANI—A. H. Nicholls. Transferred to Qld.
VK2BJD/T—B. J. Dwyer. Not renewed.
VK2ZCS—A. Pollock. Now VK2FZ.
VK3AOK—A. D. Swinton. Now VK2BBJ.
VK3AXO—R. G. O. Wilson. Now VK3MU.
VK3AYP—W. H. Preston. Not renewed.
VK3ZUN—B. S. W. Churchill. Transferred to A.C.T.
VK3ZWA—G. S. Byass. Now VK6ZDB.
VK3ZYG—S. R. Goodwin. Now VK3AXV.
VK3ZZS—P. R. Seddon. Now VK3AQM.
VK4DK—J. A. Kelly (Dr.). Deceased.
VK4LH—L. Grimshaw. Now VK2BLG.
VK4ZRE—R. A. Everingham. Now VK4EV.
VK5DR—R. C. G. Jackson. Transferred to Vic.
VK5KW—C. J. Kosina. Not renewed.
VK5OL—R. E. Maricle. Transferred to Vic.
VK5SB—I. S. Brown. Not renewed.
VK5WB—F. W. Blake. Not renewed.
VK5ZGY/T—G. L. Tillett. Now VK8ZGY/T.
VK5ZKV—W. Blackburn. Not renewed.
VK5ZXL—K. D. Roper. Not renewed.
VK6GG—H. E. Rhodes. Deceased.
VK6RY—R. Chamberlain. Now VK7RV.
VK6VG—J. V. Griffin (Bro.). Transferred to Vic.
VK6ZBV—B. E. C. Varley. Now VK6BV.
VK6ZBY—J. M. Young. Now VK6JY.
VK6ZCW—M. P. Ryan. Now VK6MR.
VK6ZDD—W. G. Dowie. Now VK6WD.
VK6ZEU—V. Mathews. Now VK6VN.
VK7ZCD—C. A. Danforth. Now VK7CD.
VK8AV—J. B. Masters. Now VK5AV.
VK9LM—L. Meek. Not renewed.
VK9LR—R. H. Leskie. Not renewed.
VK9ZJK—J. Kendall. Not renewed.

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SOLID STATE TRANSCEIVER

(Continued from Page 9)

interested should write direct to the makers at the address given.

FOOTNOTE

It may be worth mentioning a few component value changes and additions that have been found necessary.

(i) The values of C5 and C6 for the 20 metre front ends have been increased from 100 pF. to 220 pF.
(ii) The value of C1 on the 160 metre tx mixer has been reduced from 33 pF. to 22 pF.
(iii) The value of C1 on the 40 metre tx mixer has been reduced from 22 pF. to 15 pF.
(iv) An 0.01/25 volt ceramic disc condenser has been added across the 1.5K noise limiter trimpot on the i.f. board.
(v) An 0.01/25v. ceramic disc between the drain of the 3N140 and earth on the tx audio board.
(vi) An 0.1/25v. ceramic disc between pin 9 of the uA719C integrated circuit and earth on the i.f. board.

It is hoped that next month a suitable power supply will be described.

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VOLUNTEERS WANTED

The Publications Committee is in need of assistance. Our immediate needs are for extra draftsmen. Whilst it is preferable that our draftsmen be located in Melbourne, this is not strictly necessary. If you can help, please contact the Assistant Editor, Ed Manifold, VK3EM, 267 Jasper Road, McKinnon, Vic., 3204 (phone 58-7745), or the Administrative Secretary of the Victorian Division.

New Equipment

100 mW. TRANSCEIVER

Available from Melbourne's wholesale house, Radio Parts Pty. Ltd., is the Pony brand model CB-16, 100 mW. Transceiver. Completely transistorised, the unit operates on 27.24 Mc., and is crystal controlled. Superheterodyne, crystal controlled receiver; selectivity 10 Kc. at 18 db. down. The unit uses 10 transistors, 1 diode, 1 thermistor, and two crystals; aerial extends to 4 ft., overall weight 1.02 lb.

Trade price per pair: $62.50 plus 15% sales tax. A technical leaflet is available from Radio Parts Pty. Ltd., 562 Spencer St., Melbourne, or their city depot and East Malvern branch.

ELNA CAPACITORS

A range of electrolytic capacitors branded ELNA is now available throughout Australia. There are types for a variety of applications including miniature, pigtail, printed circuit, twist-lug can, and standard can.

All types are hermetically sealed with a high quality production finish; other features offered by the manufacturer are low leakage, welded connections, high ripple ratings, and extended shelf life combined with robust and compact construction.

A technical brochure is available on application to the Australian agents: Soanar Electronics Pty. Ltd., 45 Lexton Road, Box Hill, Vic., 3128.

EDDYSTONE EA12 RECEIVER

The Eddystone EA12 Communications Receiver is designed specifically for Amateur use, catering for a.m., c.w. and s.s.b. signals.

Frequency coverage.—Range 1: 29.4-30 Mc.; Range 2: 28.9-29.5 Mc.; Range 3: 28.4-29.0 Mc.; Range 4: 27.9-28.5 Mc.; Range 5: 20.9-21.5 Mc.; Range 6: 13.9-14.5 Mc.; Range 7: 6.9-7.5 Mc.; Range 8: 3.4-4.0 Mc.; Range 9: 1.8-2.4 Mc.

The double conversion circuit uses a total of thirteen valves and five silicon diodes, two of the latter being power rectifiers. The overall bandwidth at 6 db. down is continuously variable within the limits 1.3 Kc. to 6 kc. and is narrowed to 50 c/s. when using the 100 kc. crystal filter.

Further information from: R. H. Cunningham Pty. Ltd., 608 Collins Street, Melbourne, Vic., 3000.

LIGHT-WEIGHT HEADPHONES

Designed specifically to eliminate the heavy "closed-in" feeling when wearing conventional headphones, a completely new approach to high-fidelity listening is now available with the Sennheiser "Open-aire", HD-414 headphone set.

Feather-light, foam ear cushions do away with air-tight pressure upon the ears to give absolute comfort for the user. Fidelity reproduction is possible from 20 to 20,000 c/s., and high or low impedance output connections can be made. The headset is of simple, rugged modular design and construction, all major parts including the high-impact plastic headband, earpieces, dynamic elements and cords are easily replaceable as separate units, without the need for any special tools. A 10 ft. cord and stereo plug is provided; weight 5 oz. (without cord).

Price: $14 plus sales tax where applicable.

Further information from R. H. Cunningham Pty. Ltd., 608 Collins Street, Melbourne, Vic., 3000.

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New Circulation Policy

The Victorian Division, Wireless Institute of Australia, as publishers of "Amateur Radio," has given considerable consideration to the policy to be adopted regarding the circulation of the magazine.

For a number of reasons, both financial and constitutional, it has been decided that as from September, "Amateur Radio" will not be available from booksellers, nor by direct subscription to residents of Australia or its Territories.

Direct subscriptions will be accepted only from Federal or State Government Departments, Educational institutions, and Public Libraries—both government and municipal.

In all other cases, it will be necessary for readers to join the Wireless Institute of Australia in the appropriate grade of membership to ensure receiving continuity of the magazine. All existing subscriptions will be fulfilled.

In the case of overseas subscribers, whether direct or through an affiliated society of the I.A.R.U., a special class of membership, "Overseas Associate", has been established, and overseas subscribers will automatically become W.I.A. members in this category.

The foregoing policy brings the W.I.A. into line with the practice adopted by A.R.R.L., R.S.G.B. and similar Societies.

VICTORIAN DIVISION, W.I.A.

160 METRE FIELD DAY

3rd August, 1969

Portable and mobile stations will, in addition to QSOs between themselves, welcome QSOs with home stations. Certificates awarded for longest distances contacts. Interstate stations are invited to participate and are eligible for certificates. Logs are to be sent to the Victorian Division, W.I.A., P.O. Box 36, East Melbourne, Vic., 3002.

ANNUAL DINNER

The Annual Dinner of the Victorian Division, W.I.A., will be held at the Sciences Club, Clunies Ross House, 191 Royal Parade, Parkville, on 24th September, 1969. Early application is advisable as accommodation is limited. Tickets, $5 per person including drinks. Application, with remittance, should be made to the Secretary, Vic. Div., W.I.A., P.O. Box 36, East Melbourne, Vic., 3002.

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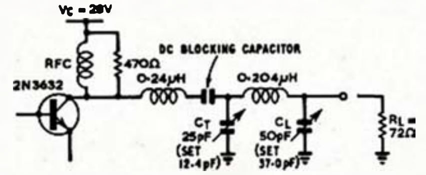
A SEMICONDUCTOR V.H.F. POWER AMPLIFIER

(Continued from Page 20)

Finally combining C1 and C2

$$C_T = C1 + C2$$
$$= 5.3 + 7.1$$
$$= 12.4 \text{ pF.}$$

Thus the completed tank circuit becomes



Similarly for two 2N3632s in parallel, operating 20 watts on 144 Mc., the following values may be calculated:

C_P (for pair) = 44 pF. R_P = 19.6 ohms.

X_S = 9.5 ohms and R_S = 12.1 ohms.

X_{L1} = 182 ohms and L1 = 0.2 µH. for Q of 15.

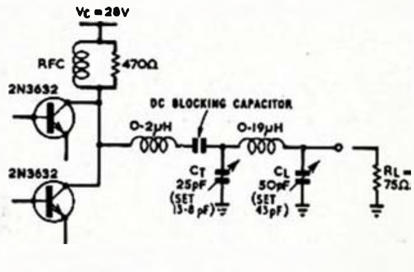
X_C = 172.5 ohms.

X_{C1} = 174 ohms and C1 = 6.35 pF.; R_{L1} = 2.51K ohms.

For a Q = 20 in the pi section:

C2 = 7.5 pF.; C3 = 43 pF.; and L2 = 0.19 µH.

Thus the completed Tank Network becomes



DX

Sub-Editor: DON GRANTLEY
P.O. Box 222, Penrith, N.S.W., 2750
(All times in GMT)

June saw a slight falling off in conditions on the higher frequencies, and, despite the presence of an expedition or two, the entire month was nothing to get excited about. As is the case in these falling-off periods, occasionally a band produces something out of the box, and this time it was on the ten metre band one afternoon at 0600z when ZS5FF, 9J2, 5R8 and some JAs were heard in Melbourne. If, however, the higher bands were not so good, this was made up by increased activity and better conditions on the lower spectrum. One excursion down to 40 at about 1900z yielded some 20 Europeans battling it out on the c.w. mode, whilst Mac Hilliard assures me that the s.s.b. Europeans have been plentiful a couple of hours later. No reports have been received on 80 or top-band activity.

We are indebted to George ZL2AFZ for the sunspot information ,to the effect that the July and August forecasts are 91 and 90, with the February confirmation being 121 as against a forecast of 98. All in all, it has been a reasonably good month, and with Gus still flitting around, the next few weeks will be worth watching.

Gus has varied his itinerary somewhat, and it would seem that the best thing to do is watch and wait, the word gets around pretty quickly when he is on. Bruce ZL3ABJ/C on Chatham is shortly due to go QRT.

DX nets are all the fashion these days, and there can be no doubt that they assist in the hooking of a wanted DX station, particularly in the case of a s.w.l. It is not for me to pass any comment, only to compile information, so here are a couple to go on with. The British Commonwealth net meet daily on 21354 at 0600z, and 14285 at 1430z. The Independent country net is on 14336 at 1600z. The N.Z. Chapter 67 meet on 2nd and 4th Tuesdays each month at 0830z on 3775. There is a Saturday and Sunday DX net on 14170 at 1200z with YV4UA in control.

The new prefix UZ3 is being issued to stations in the Moscow area, the other prefixes having been exhausted. Two known to be in use are UZ3TA and UZ3TB.

SK5AS is a club station in Sweden, the prefix system being used in that country being SK for club stations, SL for military stations, and SM for private calls.

Brunei is not an easy country to locate, and the following may assist. VS5TJ operates week days on 14320 s.s.b. at 1200z, then QSY to 14240/250 until QRT at 1330z. Also active is VP5SH who has been logged on 21270.

QSLs for CR6BX, CA, DA, DB, DX, FY, HL and IK can go to CR6GO at C.P. 10408, Luando, Angola, Portuguese West Africa.

There is still spasmodic activity from Mongolia to assist with the elusive Zone 23—JT1AG, JT1AK, JT1KAA and JT2AB are the regulars and are all on c.w., and in some cases the tx tone is a little on the rough side.

The bedlam which passes under the title of citizen band in the U.S. is occasionally logged here, and on one occasion I heard a tape made in the States, of the goings on in the 27 Mc. band. Much more interesting is the operating in the Novice segments, particularly on 40 metres. Though not DX in the strict meaning of the expression, many of these young lads are really fine operators and will provide the basis for much of the future U.S. Amateur activity. I had a look over their segment of 40 metres a few days ago when WH6GOZ and WN6EBY were having a very fine QSO. The bedlam of the aforementioned citizens band doesn't reign in the Novice segment, and for any Y.R.S. or young S.W.L. who is studying code, have a look for these lads in their band which is between the American phone band and the VK phone segment on 40 metres.

ITEMS OF INTEREST

The Camel Drivers net meets on 14325 s.s.b. from 1800z, and all QSLs for YA stations and net members can go to YA5RG, Wolfgang Renner, Box 279, Kabul, Afghanistan.

9X5AA advises that his QSL manager is W1YRC, not the one shown in some other publications.

FO8BW, active June 5 to Aug. 10, skeds W6JR 14260 s.s.b. at 0400z, after sked is QRZ for DX. All QSLs to home QTH W6JFM, and these will be processed after Sept. 1.

XW8 operation is often spasmodic. However XW8AX QSL W6KTE, XW8BP QSL DL9SX, XW8CR QSL W2CTN, and XW8CS QSL VE6AO are regularly in operation at the time of writing.

Frank DL7FT is now QSL manager for the following, for which a s.a.s.e. should be sent: EA6AR, EA6AS, EA6BG, EA6BH, F9UC/FC, HB0LL, OY2A, KL7BEK, KR6JT, KZ5EK, TU-2AY, TU2AZ, W4UAF/KH6, 3A2CN, 3A2EE, 3A0CU and 3V8BZ.

K9RHN and party will try and make 10,000 QSOs from PJ8MM on Sint Maarten over a period of 48 hours during the October "CQ" Contest with 10-160 metre operation. For his earlier operation from PJ8MM in early April, send QSLs to K9HRN, C/o. Collins Mail Stn., 407-022 Dallas Texas 75207. PJ8NN QSLs via K9GCE.

The proposed trip by WB6KBK and party to Roncador Cay and Bajo Neuvo has been cancelled for political reasons.

The Navassa Is. operation by K4IA/KC4 from June 22 went off on schedule with many QSOs on all bands. In a recent survey by Geoff Watts News-sheet, Navassa Is. was named by 79 of the world's top DX men as the most wanted country. Second was Clipperton Is., third Albania and fourth was Heard Is.

HC8RS operates s.s.b. on Saturdays to 0500z when power supply is shut off. Frequency is 14175, however his QSL manager SM5EAC claims that mails from Galapagos are very erratic and logs are often lost or delayed.

7Z3AB has changed QSL managers, the new one is W5NOP, his frequencies are 14212 and 21290. 9Q5WS is on 21040 c.w. from 2200-2230z daily, he is Syd., ex-TL8SW, and will be there until June 1970. QSLs via W1BPM.

WA4PUC/HS was only station thus far to have a permit to work U.S. stations, and he went QRT on April 2.

Further information on LI2B, the reed-boat "RA" in the Sth. Atlantic. They will work stations on 14234 u.s.b. after handling traffic on 14217. Amateurs are asked not to interrupt any transmission on this frequency, and are reminded that the station is operative only between 1000 and 1130z. He apparently works to a list prepared by LA5KG.

FW8RH went QRT on June 8 and is now FK8AH. FW8RC who went QRT some time ago is now home in France and signing F0GL. SV0WN, normally operates from Crete, but over the Easter period, together with SV0WMM and SV0WOO, were at Rhodes.

QSL MANAGERS

CR3KD—W2CTN	SV0SV—VE3GCO
CR5SP—W2GHK	SV0WCC—WA0HPU
CR6GA—WA3HUP	TA1MGK—WA6TFZ
CR6KT—W3HNK	TA1IB—W4GHV
CR6LF—W3HNK	TA1MG—K1UHY
EP2FD—WA5ERS	TF2WLM—K4SAK
EL8J—LA6OJ	TG9RN—DL3RK
F9UC/FC—DL9PF	TG8GL—VE3DCY
FG7XT—K5AWR	TU2AY—DL7FT
GI5AHS—WA2DHF	TU2AZ—DL7FT
GM5AHS—WA2DHF	ZS3LU—W2CTN
HB0LL—DL7FT	4X4VB—WA4WTG
HS3AL—W3KT	5A1TL—WB6WAA
MP4MBJ—G3POA	5A1TN—DL8OA
MP4TAF—DL6AA	5W1AS—WB6KBK
OD5LX—K4TSJ	5R8AO—GI3PLL
PA9HS—G3MZK	5Z4KO—WA1GIA
PJ5VL—PJ7VL	5Z4LQ—K2RAR
PX1FD—ON5FD	8P6CC—W4OPM
PY2PA—W2GHK	8QAYL—4S7YL
PY2PE—W2GHK	9E3USA—VE3IG
PY0EP—PY1MB	9F3USA—VE3IG
SK5BB—SM5DXV	9K2BV—W5GM
SK9WL—SM7CRW	9Y4RP—WA5MYR
SV0WMM—K8JAJ	9V4VT—W3DJZ

A2CAU—Box 200, Francistown, Botswana, Africa.

CT2AK—C.P. 143, Ponta Delgada, S. Maguel, Azores Is.

EA8GL—Box 860, Tenerife, Canary Is.

FY7YR—B.P. 93, Laurent-du-Marconi, French Guiana.

HK1BQR—Apto 785, Barrahquilla, Colombia.

HR4RB—Casilla 4, Amapala, Honduras Rep.

HK0TU—Via KH3RQ, Apto Aereo 4468, Bogota, Colombia.

IT1ITA—A.R.I., Box 20, Messina, Italy.

KC6CS—Milton Bennett, C/o. Peace Corps, Truk, Caroline Is. 96042, Pacific Ocean.

KS6CX—Via K4ADU, 5330 Buena Vista Rd., Colunbua, Ga. 31907.

OX5BA—R.C.A., Box 484, A.P.O. New York, 09023.

PJ2CK—C/o. 82 Acton Ave., Downsview, Ontrio, Canada.

PZ1BX—Box 2003, Paramaribo, Surinan.

VP2KC—Box 86, St. Kitts.

VP2AB—Box 229, Antigua, B.W.I.

3V8AC—Box 323, Tunis, Tunisia.

4S7YL—102/11 Templar Rd., Mt. Lavinia, Ceylon.

5W1AD—Box 63, Apia, Western Samoa, Pacific Ocean.

6W8DY—B.P. 10021, Dakar-Liberte, Senegal Republic, West Africa.

6W8XX—Box 3013, Dakar, Senegal.

7P8AB—Box 389, Maseru, Lesotho.

7Q7WW—P.O. Box 453, Blantyre, Malawi Africa.

7X0AP—Box 414, Alger, Algeria.

7X0BF—B.P. 2, Alger, Algeria.

9J2BR—Box 122, Lusaka, Rhodesia.

9Q5LC—B.P. 377, Mbujimayi, Kasai, Dem. Republic of Congo.

That winds it up for this month. My thanks to Geoff Watts, George ZL2AFZ, Long Is. DX Assn., Maurie Cox, Mac Hilliard, Maurie Batt, Eric Trebilcock, Newark News Radio Club, "Monitor," Bernard Hughes and Steve Ruediger. I would appreciate any up-to-date information from any of the VK chaps. 73, Don WIA-L2022.

10th ALL ASIAN DX CONTEST, '69

PRECIS RULES

1. Period: 1000z hours, 30th August to 1600z hours, 31st August.
2. Bands: 1.8 through 28 Mc.
3. Modes: C.w. only.
4. Calls: Asians will call "CQ Test". All others call "CQ AA".
5. Entry: (a) Single-band operator; (b) multi-band single operator.
6. Cyphers: Five figures made up of RST plus age. For YLs, RST plus 00 (zero zero).
7. Scoring: One QSO point per Asian contact. Multiplier of one for each Asian country worked. Single-band score is total contact points x total countries worked. Multi-band score is total contact points on all bands x sum total of countries worked on all bands.
8. Logs: To J.A.R.L. Contest Committee, P.O. Box 377, Tokyo Central, Japan, to arrive not later than 30th Nov., 1969.

W.I.A. D.X.C.C.

Listed below are the highest twelve members in each section. Position in the list is determined by the first number shown. The first number represents the participant's total countries less any credits given for deleted countries. The second number shown represents the total D.X.C.C. credits given, including deleted countries. Where totals are the same, listings will be alphabetical by call sign.

Credits for new members and those whose totals have been amended are also shown.

PHONE

VK5MS	317/340	VK5AB	298/314
VK3AHO	312/326	VK4FJ	285/304
VK6RU	312/337	VK4KS	284/299
VK4HR	309/327	VK4TY	276/279
VK2JZ	306/323	VK2APK	275/280
VK6MK	304/323	VK3TL	271/277

New Member:
Cert. No. 98 VK4CZ 118/118

Amendments:

VK3ZE	227/230	VK2AHH	145/155
VK3AMK	170/170	VK4RF	143/143
VK5BB	170/173	VK2AGH	111/122

C.W.

VK2QL	301/323	VK3YL	270/287
VK3AHQ	301/315	VK3ARX	269/278
VK4FJ	290/314	VK2APK	267/275
VK3CX	289/312	VK6RU	266/289
VK2AGH	282/296	VK3NC	264/277
VK4HR	281/304	VK3XB	264/277

Amendments:

VK2AHH	130/138	VK4RF	126/138

OPEN

VK4HR	313/337	VK4TY	302/316
VK6RU	313/338	VK4FJ	298/322
VK2AGH	312/332	VK3ARX	292/301
VK2VN	306/323	VK2APK	292/302
VK6MK	305/324	VK3TL	287/293
VK2EO	302/325	VK3XB	286/274

New Member:
Cert. No. 118 VK3OG 103/103

Amendments:

VK4KS	285/304	VK2AHH	174/188
VK4RF	188/200	VK3AMK	170/170

Correspondence

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers.

ROYAL SIGNALS AMATEUR RADIO SOCIETY

Editor "A.R.," Dear Sir,

As General Secretary of the R.S.A.R.S. and Editor of "Mercury", the journal of the Society, I wonder if you could assist the Society by publishing (at your convenience) details of the Royal Signals Amateur Radio Society. We are particularly interested in letting interested and eligible people in Australia know that membership is open as follows:

Associated Membership: "Any serving or retired member of a Commonwealth Signal Corps".

Affiliated Membership: "Any Amateur Radio Club of a Commonwealth Signal Corps".

Fees are ten shillings per annum for Annual Membership, and £5 for Life Membership, with affiliated fees the same for Club Stations.

"Mercury", the Society's journal, is published four times a year and sent free to all members. Other Society facilities include a members-only QSL Bureau, an Awards Scheme and various members' supplies, including QSL cards (plain and overprinted), Notepaper, Lapel Badges, Ties, etc.

At present we have members in the U.K., Germany, Holland, Malta, Gibraltar, Cyprus, Trucial Oman, Singapore, Malaya, Hong Kong, U.S.A., Canada, Brazil, etc.

Thanking you on behalf of the Society,

—WO1 (F. of S.) J. Cooper, G3DPS, General Secretary, R.S.A.R.S.

[Readers interested in becoming a member of this Signals Society may write to the Secretary at 15 Valley Road, Blandford Camp, Blandford Forum, Dorset, U.K., for an application form to become a member.—Ed.]

U.S.A. REGISTRATION PLATE

804 Woodland Way, Richardson, Texas, 75080.

Editor "A.R.," Dear Sir,

I thought perhaps you would be interested in the enclosed photograph (shown above) of the back of my car.

—J. S. (Dick) Sisson, W5ONL/VK8AF.

S.W.L's LOGS

Editor "A.R.," Dear Sir,

After reading Mr. Cullinan's letter in May '69 "A.R.," I thought that I should second his idea of including S.w.l's logs in their zones scores in all contests. This would increase the S.w.l. participation and also add to the totals of the smaller zones. I am sure that in the smaller, and not so small, zones there are unlicensed members who could simply turn on their radio for a few hours and send in their logs, however small they may be.

—Andrew Dixon, WIA-L7051.

1969 JOHN MOYLE MEMORIAL N.F.D.

Editor "A.R.," Dear Sir,

June "A.R." to hand yesterday, and would like to say how pleased I was in getting top score in the receiving for all States, namely 1015 points.

It is noted, however, that I am getting more credit than I should as it is put in the six-hour list, not the twenty-four, as it should be.

This score took about 18 hours to compile and would be impossible in six hours.

I was surprised at the small number of people interested in all sections, also the numbers that are not listed as putting in returns.

—"Tom" C. H. Hannaford.

IMPROVING OUR AMATEUR IMAGE

Editor "A.R.," Dear Sir,

The attention of your readers is drawn to the Presidential Editorial on the first page of May 1969 N.S.W. Divisional "Bulletin", in which the VK2 President, Mr. Gordon Clarke, warned that greater use must be made of Amateur bands if we are to justify retention of our allocations in the face of strong pressures from commercial interests which could make better use of our frequencies. He points out that the licensing authorities are continually monitoring our channels to assess the degree of gainful occupancy and, we must admit, the low degree of usage and, in many cases, the unmeaningful chatter that contributes nothing to our image offers little cause for optimism regarding the future of the Amateur Service. Already we have lost quite significant segments of various bands; non-Amateur services have moved into our allocations; certain formerly exclusive Amateur sectors are available to us only on a shared basis.

The only valid arguments that we can present for the continuance of an Amateur Service are (1) that we provide a pool of semi-trained operators in the event of war; (2) that some of our members have performed creditably and in the public interest during civil emergencies; (3) that in the early days of Radio a small proportion of licensed Amateurs made major contributions to the communications art, probably because of their professional training and experience rather than by participating in Amateur Radio. The field of electronics development is now the prerogative of the "professionals" with vast resources available to them. The Amateur has been phased out of this sector and, in most cases, is engaged in talking to himself about himself in somewhat confused and meaningless circles, making little real contribution to the non-Amateur world. Of the increasing numbers of personnel engaged in the Electronics and Communications services and industries, only a very few are interested in Amateur Radio. In fact, a large proportion of these regard the licensed Amateurs as the "lunatic fringe" of the Electronics area. Judging by a great deal of nonsense one hears on the Amateur bands, even intelligent Amateurs might be persuaded accordingly.

All these points demonstrate that the Amateur Service is NOT essential to the national welfare and one day the authorities are going to wake up to this fact and hand over our channels to non-Amateur occupants. This happened during the War and can happen again. To those of us who happen to regard Amateur Radio as a "good thing" only a gloomy picture is presented. One can conceive of some future time when Amateur Radio does not appear anywhere on the frequency spectrum. There are countries where Amateur Radio just does not exist and no catastrophes have resulted. It is quite easy to visualise a "Brave New Australia" where even the most diligent tuning will reveal no trace of Amateur verbosity. One can imagine beautiful Swans and Galaxies and similar exotic black boxes being cannibalised for the Stony Creek High School Radio Club! Sacrilege! Heresy! Treason! Is this fellow Black some sort of a nut (don't answer that) or a stirrer or merely clairvoyant? Have I shocked someone? Good and fine! Am I the only individual to think along these lines? No, indeed! Others with whom I have discussed these matters go along with these sentiments and regretfully admit that the Amateurs as a whole must take a long, cold and calculating look at themselves and their activities in the light of present situations and cease looking over their shoulders at the notable achievements of the earlier generations of Amateur operators. Those days are finished and new pressures exist of which we must be fully aware.

I support Mr. Clarke fully in his campaign for greater band occupancy. To achieve this, we must have more Amateurs than we have at present. On a population basis, and using U.S.A. as a reference point, we should have about 13,000 VK Amateur operators. Instead, we have fewer than 6,000. The rate of increase gives us no basis for optimism. The efforts of the W.I.A. Correspondence Course, the evening courses conducted by several State Divisions, the instruction provided by all-too-few district Radio Clubs, the work of the Y.R.C.S. and all the other educational agencies of the Institute produce only a slow increase in Amateur lists. Against the gains we must offset the quite substantial losses recorded monthly in "A.R.," the net gain being relatively small. It is obvious, therefore, that existing Institute agencies are just not producing sufficient numbers of new licensees to ensure adequate band usage and to demonstrate to the authorities that replacement of Amateur stations by commercial stations would be unjustified.

Having demonstrated these unpalatable facts, I must offer some constructive suggestions. In the face of expressed opposition from certain gentlemen in the W.I.A., and in the face of undoubted apathy from a large segment of the Amateur movement, I submit that the introduction of a Novice licensing system would go a long way towards achieving a dramatic increase in Institute membership and in populating the wide-open spaces in the Amateur frequency allocations. There are some very strong arguments in favour of such a scheme and only prejudice and woolly thinking on the other side of the debate. First, the American Amateur listing has doubled since the introduction of Novice licensing in 1951. Second, the leading nations in the field of Electronics—U.S.A., the Soviet Union, Japan—have had well-established Novice licensing systems operating for a long time and it is about time that Australia adopted similar methods to avoid continuance of its retarded situation. Third, the very conservative British G.P.O. has actually OFFERED to the R.S.G.B. a Beginner-type licence in order to encourage hobbyists to pursue Amateur Radio. Fourth, other nations of less importance in Electronics have been operating low-level licence systems with no undue ill-effects; such nations include Korea, Israel, India, the Faroes Islands, Finland, the Dominican Republic and Czechoslovakia. Fifth, Novice licensing is a well-developed facet of Amateur Radio elsewhere and there is no valid reason why it should not be introduced into this country.

One recalls wryly the hideous screams which arose from certain elements in the Amateur Radio field when the Limited A.O.C.P. was introduced. Contrary to the opinions of the "conservatives", the A.O.L.C.P. gave the Amateur movement here a real "shot in the arm" and the Institute benefited greatly from the influx of "No Code" members. I suggest that the introduction of a Novice system would provide a boost to Australian Amateur Radio, probably of greater significance than the introduction of the Limited ticket. Various specious and invalid arguments have been offered in other columns against the suggestion that Australia needs Novices, but the fact remains that the opponents have very little room to manoeuvre in the light of overseas developments at this level.

I suggest, however, that we might avoid the use of the term "Novice" as an undesirable Americanism and substitute some locally acceptable designation. My concept of a suitable low-level licensing system to meet our local conditions implies that such licensees are engaged in some form of formal training with the A.O.C.P. as the ultimate objective and that the "Novice" licence is not an end in itself. Accordingly, a suitable term to meet Australian situations might be something like Conditional, Provisional, Student, Training, Preliminary, Restricted or whatever. Contrary to vile insinuations made elsewhere, I do NOT, repeat NOT, advocate such a licence for members of the Y.R.S. alone, but suggest that mature candidates might well be included. Perhaps there might be room for two types of low-level licensing, one for bona-fide students and one for others who pursue their studies privately. That, however, is a matter of detail and the principal task is to persuade the Institute members first and ultimately the licensing authorities that low-level licensing is essential to meet present and future circumstances.

I submit, also, that one of our primary objectives should be to gain the support of the State and Federal Education authorities by demonstrating the valuable support which a low-level licensing system could offer to the current campaign by the Federal Government to foster Science Education. The introduction of "Novice" licences would involve the Government in negligible expense, whereas the Science Education programme costs the taxpayer vast sums.

In conclusion, I submit that the Institute in particular and the Amateur Service in general has nothing to lose and a great deal to gain by the introduction of a lower-level form of transmitting licence, which, I suggest, could involve adequate safeguards to protect the interests of the more highly qualified Amateurs by specifying crystal control, low power, limited operating hours, restricted frequency allotments, and such other limitations as may be introduced to meet the situation.

—R. C. Black, VK2YA.

(Correspondence continued on next page)

NOVICE LICENSING

Editor "A.R.," Dear Sir,

Enclosed you will find a copy of a letter which has been sent to the P.M.G. Radio Branch regarding Novice Licensing.

We have sent you the copy so as to put our view to the members of the W.I.A. and obtain their opinions on the subject, especially from those not in favour of this type of licence.

As stated in our letter, the question of Novice type licences has come about in what we would term **the lack of facilities available within Ham Radio for young students.**

We will inform you of any results.

—S. Greening and S. Voron (WIA-L2230)

[The following is the letter referred to above. Ed.]

C/o. The Radio Club,
Randwick Boys' High School,
Cr. Rainbow and Avoca Sts.,
Randwick, N.S.W., 2031.

Dear Sir,

We represent the members of the Randwick Boys' High School Radio Club. We are concerned with the lack of facilities and opportunities for young people, especially students, to increase their knowledge of radio, especially aimed at obtaining an Amateur Operator's Licence.

We would like to illustrate the circumstances by which radio enthusiasts lacking the facilities to increase their knowledge and interest in the hobby commenced the illegal use of radio for this purpose. This was brought about by the points listed below.

Say a person 15 years of age develops an interest in radio. If he knows very little about radio what facilities are open to him? Let us compare three countries. Firstly, in the U.S.A. he would either (a) obtain an Amateur Novice Licence or (b) operate a low power on Citizens Band (Walkie-Talkie). In New Zealand, there is no Novice Licence system, however Citizens Band fills the demand. What do we have in Australia? **No Citizens Band, No Novice system!** So what happens to this 15-year-old Australian boy and the many others like him? Does this mean his interest must be swept aside. Yes until some time when a system is introduced his interest will have to be swept aside. The problems facing a young student are numerous, the main ones being: Pressure of studies. He would not have the time necessary to achieve the standard necessary for an Amateur licence, as he is continually pressed by his studies and examinations. Also in his years of secondary and tertiary education he cannot afford to devote extra time to advanced study of radio.

In our earlier years we thought the problem of no importance when we left school, but for the fact that we now know what the problem is as we are High School students with the school certificate examinations approaching.

As a conclusion we have found that a Novice Licence would maintain and develop a students interest in radio during his studies.

During our meetings the question of Novice licensing was brought to our attention and after discussing it we found that a Novice Licence should facilitate points similar to the following:

1. The licence will only be issued once for a two-year period (two years will only apply to persons doing secondary and tertiary education, and one year for other people.) This was decided after consulting various technicians and Amateurs who agreed that two years is the maximum time necessary to achieve the standard necessary to attain a full Amateur licence.
2. The P.M.G. should print a booklet for sale to the general public containing the basic rules of radio theory and regulations necessary for receiving a Novice licence. This booklet should contain the foundations for further studies towards a full Amateur licence.
3. Morse code should have a speed of around 5 words per minute. This may seem slow but we must remember that this section of the Novice licence only applies to students who have just entered the radio field.
4. Modulation to be used. Modulation will consist only of a.m. and c.w. signals and power input should have a maximum satisfactory to the P.M.G. for this type of licence.
5. Frequencies. Sectors of the 160, 80, 11 and possibly 10 metre bands should be allocated to Novice licensees, to increase use of these bands not often used by the full Amateur himself.

We would greatly appreciate your opinion on this matter as we have given it much thought during the spare time we manage to get between our studies and examinations. Copies of this letter are being forwarded to Electronics Australia, Amateur Radio and the Wireless Institute of Australia.

Yours sincerely,

Samson Veron and Seth Greening,
President and Vice-President,
Randwick Boys' High School
Radio Club.

P.S.—During our discussions with local Amateurs two ideas were suggested:

1. Equipment to be used by Novice licensees should meet strict P.M.G. requirements, such equipment could be commercially produced by an Australian company, e.g. A.W.A., or Pye.
2. It was suggested that Amateur exams. should put more emphasis on measuring equipment to minimise and detect interference rather than the construction of transmitters for certain bands.

NEW FREQUENCY CONTROL ORGANISATION

The recent announcement of the formation of Hy-Q Electronics Pty. Ltd., a fully Australian-owned, advanced technological manufacturing company, will further strengthen the Australian telecommunications and electronics industry.

With laboratories and production facilities located in Frankston, Vic., Hy-Q Electronics will specialise in the manufacture of quartz crystals, quartz crystal devices and other related products.

The new company is a fully independent organisation, free of internal requirements and influence, and therefore will be able to fulfil the special needs of the Australian telecommunications industry.

Managing Director of Hy-Q Electronics is Mr. R. C. Richards, S.M.I.E.E.E., S.M.I.R.E.E. (Aust.).

Technical Director is Mr. D. H. Rankin, M.I.E. (Aust.), A.M.I.R.E.E. (Aust.).

Production Director is Mr. R. W. Taphouse and Marketing Director is Mr. T. A. Dineen, all very well known in the Australian frequency control and telecommunication field.

SIDEBAND ELECTRONICS AND YAESU MUSEN EQUIPMENT

Sideband Electronics, of Springwood, New South Wales, now have available a full range of Yaesu Musen equipment, all of which is tested and checked before despatch to buyers. The equipment is covered by the manufacturer's warranty which reads:

"We warrant this equipment against defects in material or workmanship, except for tubes, transistors and diodes, for a period of one year from date of original purchase. This warranty is valid only if the enclosed card is properly filled in and mailed to the factory within ten days of date of purchase. Do not ship to the factory without prior authorisation. This warranty is limited to repairing or replacing only the defective parts, and is not valid if the equipment has been tampered with, misused or damaged."

Sideband Electronics carry a range of spare parts to cover any likely needs of Yaesu Musen equipment users, and can also undertake service work if so requested.

VHF

Sub-Editor: CYRIL MAUDE, VK3ZCK
2 Clarendon St., Avondale Heights, Vic., 3034

This month I would like to thank the two correspondents from the Hobart area, and would appreciate more news from them and from members of other Divisions and V.h.f. Groups.

Next month we hope to have a report from Birchip where Ray VK3ATN, Les VK3ZBJ and Ken VK3AKK are attempting to receive signals from the Apollo 11 space craft during its return trip to the moon.

73 Cyril, VK3ZCK.

VK3 V.H.F. GROUP ANNUAL CONVENTION

This annual event of the VK3 V.h.f. Group will be held over the week-end of 11th and 12th October, 1969, in Gippsland. For further information write to the V.h.f. Convention, W.I.A. Victorian Division, P.O. Box 36, East Melbourne, Vic., 3002.

VICTORIA

The local v.h.f. activity, at least on the air, is rather low at present but a few new stations boasting the new limited call prefix VK3Y — — are naturally quite enthusiastic and are braving the cold shacks.

The number of bands on which we can go mobile and set a precedent was reduced even more in VK3 when Les VK3ZBJ "went mobile" on 1296 Mc. recently. Les has produced a "rig" which is entirely solid state for this band and also on 144 and 432 Mc. at a flick of a switch. This fine piece of equipment is ideal for portable/mobile operation. In addition, VK3s have used 432 Mc. and 576 Mc. as well as the popular 6 and 2 metres.

Some of the 432 Mc. rigs being built in VK3 should really provide steam on this band. Eric VK3ZSB is using a parallel pair of varactors driven by his 2 metre transmitter and proposes to use a 4CX250B complete with cavity. Bob VK3AOT is also underway with his rig which uses a mixer amplifier unit to drive a QQE03/20 and a pair of 4X250Bs as a linear amplifier. One 432 bird-perch which is becoming popular in VK3 is a 32-element extended phased array (5/8 wavelength driven element), ex W6AJF. This antenna is being used by a few, and they have found that it gives excellent results. 73, Peter VK3ZYO.

SOUTH AUSTRALIA

About 150 Amateurs from VK3 and VK5 attended the South-East Radio Group's annual convention at Mt. Gambier over the Queen's Birthday week-end. Everyone present had a very good time even though the temperature dropped below freezing point at one stage.

The winners of the competitions were—Scrambles: VK3AOT, VK3ZSB, VK5QZ. YL/XYL Scramble: Betty (VK3ZCK). Fox Hunts: VK5ZAI, VK3AXV, VK3ZHU. Hidden Tx Hunt: VK3ZGS. Mobile worked furthest from Mt. Gambier: VK3AIJ. Amateur travelling furthest: VK3FE. Best built mobile: VK5LP. 73 Colin VK5ZKR.

TASMANIA (Hobart Area)

The DX activity from here over the past few months has been almost nil. In fact it has been the worst for years, even openings to the mainland were rare and even 6 metres was not what could be called good. The only DX that could be recorded were the many contacts had with Winston VK7WH on Mt. Nelson.

The main net frequencies in use here are 53.032 and 144.1 Mc. a.m., and 146 Mc. channel B f.m.

It is proposed to instal a repeater on channel 3 to prevent interference from the Launceston one on channel 4. Incorporated in the unit will be a HI keyer which will operate every 20 or 30 seconds while the unit is on to remind operators that they are operating through the repeater. 73. Ron VK7ZRO and Brian VK7RR.

CHANGE OF ADDRESS

W.I.A. members are requested to promptly notify any change of address to their Divisional Secretary —not direct to "Amateur Radio."

Overseas Magazine Review

"BREAK-IN"

May 1969—

An All Transistor Two Metre Transceiver, Part 2, ZL4KU. This small unit runs about one watt to the final transistor and appears to be a unit which would find a place in the shack of the average v.h.f-er.

Safe Transformerless Mains Connections, by ZL2BEV. The writer uses a pair of low current relays to ensure that the power supply is correctly connected and the chassis never becomes live.

Modernising the Eddystone 750, ZL4IO. Mr. Shuttleworth is a prolific writer of receiver articles and in this offering he describes modifications to the 750 to fit it for s.s.b.

Chatham Island DX-pedition. ZL1DS tells the story of how he and ZL2AFZ became ZL1DS/C and ZL2AFZ/C during January, 1969.

"The Amateur Radio Service—Producer of Experts", ZL2AZ. Who else but an Amateur would design, engineer, purchase, construct, test, operate, maintain, etc., a communications system alone?

Around the World by Light Aircraft. ZL-1BCY tells the story of how ZL1AKI proposes to blaze a trail around the world in a Victa Airtourer now made in Hamilton by Hamilton Aero Engineering Co.

"CQ"

April 1969—

Ham and Roses, Amateur Radio aids the Rose Parade. W6NAA describes how a group of Amateurs used v.h.f. radio to provide control of the Pasadena, California, Rose Parade. Perhaps it would be possible for W.I.C.E.N. groups in the various States to co-operate with State and Federal authorities in a similar way with such parades as Moomba in Victoria and Anzac Day and other such parades in other States.

A Transistorised Transceiver I.F. Strip for Mobile S.S.B. Use, VE7BRK. Transistorised unit operating at 5.25 Mc. using FT243 crystals in two cascaded four-crystal filters.

Instrument Landing Service. W1RIL describes how this device, which adds to the operating safety of the world's airlines, operates to ensure safe landing of aircraft in minimum visibility conditions.

A Simple Regulated 12V. Power Supply, K1BQT. A simple bench type supply using a minimum of components to supply 12v. at 600 mA.

Vertical Antennas, Part XI, W3JM. This instalment of the series describes the effects of earth on the efficiency of radiation and the vertical patterns to be expected from a vertical antenna.

Automatic Repeater Requirements. W7DQS discusses the requirements to be met by repeaters under the F.C.C. regulations.

Breadboard Dummy Load, Jim Ashe. A small, low power load for use in various projects from audio to v.h.f.

The Swan 500C Transceiver. W2AEF reviews this latest offering from Swan.

The Corkscrew, W2EEY/1. An antenna, adapted from a commercial design, having both vertical and horizontal polarisation simultaneously. Stated to be useful on any band but particularly the v.h.f. and h.f. DX bands.

"QST"

April 1969—

An Examination of the Gamma Match, by W3PG. A working analysis of the gamma match problem that gives useful practical results. New light on the question of when it will and when it will not give a perfect match to the co-axial transmission line.

A Compact Multi-Purpose Test Instrument, W0JF. Small enough to fit neatly into the palm of one's hand and using a 200 microamp. movement, it performs a number of functions often required by Amateurs.

The Evolution of an Amplifier, W2OL. An amplifier to run the U.S. full legal limit. It is a little large for Australia and the unusual tube is not likely to be available here.

An Electronic Paddle. W7BZ describes a simple gadget that can be used to operate a conventional electronic key by "touch" without any movement of the paddle. The resistance of the body is used to complete a circuit through a transistor d.c. amplifier to operate a pair of low voltage relays.

Some Notes on Solid State Product Detectors. W1CER describes a number of the latest solid state circuits and discusses their advantages and disadvantages.

The Delta-Loop Beam on 144 Mc., W1ICP. Lew goes up in frequency and describes a three-element design of this new type antenna for v.h.f.

Amplified A.G.C. for the Heath Mohawk Receiver, K4HEB/W4ZOJ.

Converting a Popular Six Metre Rig to V.F.O. Operation, K1QDR.

Application of Broadband Balun Transformers, W2IMU. Some very useful information, with applications far beyond the centre of a dipole.

A Simple Filter for the 1215 Mc. band, W0RUG. One for the u.h.f-ers.

A Hidden Mobile Antenna. W4TZB describes how to isolate and load up the framework of a "soft top" on a car. Come on you ingenious Holden owners, let us see you apply this technique to a Monaro!!!

Recent Equipment. Drake MN-2000 Matching Network.

Plus all of the usual features which Wayne Green of "73" says fills most of his competitors' magazines. "73" maintains they have more technical information in their issues than "those other 200-page magazines". "QST" for April has 172 pages and "CQ" 116.

"QST"

May 1969—

The D.C. 80-10 Receiver, W1CER. Doug De Maw describes a direct conversion c.w./s.s.b. receiver for 80 with plug-in converters for the other h.f. bands. It is easy to build, uses semiconductors throughout and provides Amateur-band only reception from 3.5 to 29.5 Mc. Stability and sensitivity are excellent. Operates into headphones and only requires 40 mA. at 12v.

Legalise Your Phone Patch, W4PME. Now that special legislation has been passed to make certain types of devices attachable to telephones, the "Phone Patch" as used by many DX Amateurs is taking on a look of respectability. The voice coupler—a simple device consisting of a capacitor, varistor, isolating transformer and telephone jack—is supplied by the telephone company.

A 500 Watt F.M. and C.W. Transmitter for 220 Mc. W1QWJ. Four tubes and a handful of semiconductors are used in conjunction with a final tuned cavity to produce an output of about 300 watts on 220 Mc.

The Mainline TT/L-2 F.S.K. Demodulator. W6SDZ. Stated to be an advanced design offering high-performance f.m. (limiter) and a.m. (limiterless) reception of radioteleprinter signals.

All Driven Three Element Mini-Beam. VE-4AS describes a beam which is claimed to give performance very similar to that of a full size beam but is lighter in weight and less expensive to build as well as being capable of driving from an AR-22 rotator.

Long Delayed Echoes—Radio's Flying Saucer Effect. W6QYT, W5LFM and WA6NIL. The authors state that on rare occasions the echoes of radio transmissions persist for periods much longer than the time of propagation around the earth. First reported in Holland during the 20s, a number of scientists are keen to obtain more information and are enlisting the aid of Radio Amateurs as observers.

Some Common Problems and Their Answers, W1ICP. A continuation of the Beginner and Novice series Lew has been doing.

A 160 Metre Converter for Amateur Band Only Receivers, W4LQC/W8BKK. If your receiver or transceiver is one of the post-war breed that only covered Amateur bands from 3.5 to 30 Mc., then this article will show you how to put it on "Top Band". Yes, the A.R.R.L. seems to have adopted the British expression for this band too.

Mobile Whips and Corona, K0WQN. Increased operating power levels on 160 metres and the availability of kilowatt level mobile equipment for the other bands bring up the old problem of corona around the mobile whip. Some practical examples and solutions are discussed. (The reviewer feels that if Australian Amateurs use kilowatts mobile they may need to remain mobile!)

Galaxy R-530 Receiver. W1CER reviews this relatively new piece of general coverage equipment. His review succeeds that of "CQ" and so you are referred to one or other of the journals if more information is needed.

"RADIO COMMUNICATION"

April 1969—

Direction Finding and D.F. Receivers, G3JLE. Tubes or transistors, you may take your choice and then you will find something here to interest you if you are keen to make up something for that next hidden transmitter hunt.

Remote Control for V.h.f. Applications, by G5AFL. This article presents experimental concepts being considered by the author in connection with taking advantage of a remote and lofty aerial site for vastly improved v.h.f. performance, while maintaining control of the remote equipment from the comfort of the home station.

Technical Topics. G3VA discourses at some length on recent developments in the way of Homodyne/Synchrodyne/Direct Conversion Receivers/Transceivers for the various Amateur bands. He also describes a new communications receiver called the GT100 by Messrs. GT Electronics. Multiple conversion with most of its selectivity at 455 Kc., this receiver covers 3-30 Mc. and could probably be sold in Australia for about $2,000.

"73"

April 1969—

Dual Channel Oscilloscope Pre-Amplifier, W3ZZY. An inexpensive method of upgrading your present oscilloscope. The second channel is very handy even on a three-inch instrument. Built to give dual trace facilities for a Tektronix 360 d.c. 10 Mc. oscilloscope. Very good if you have a 360!

Simplest R.F. Pre-Amp. W1EZT describes a transistor unit which uses two 9v. batteries, two capacitors, two resistors and providing the transistor will amplify at the operating frequency, he says it adds gain. One for Aussies.

Education and Ecstacy, George Leonard, Associate Editor of "Look" magazine in a short article (all "73" articles are short) describes his first shortwave receiver and the thrill of hearing those first signals from distant stations on a product of his own hands and brain.

Push to Talk (The two-er way). VE3ETJ describes modifications to Heath's HW-30.

Variable D.C. Load. W2AJW describes a unit consisting of two 211s (VT4Cs) with a built-in variable power supply for bias so that the current drawn from a power supply can be adjusted in microscopic increments from 0 to maximum and beyond. Will probably handle up to about 2kV. For lower voltages, other tubes can be used and with some lamps and a few resistors a very useful device can be constructed. Not new. The Army Apprentice School had one in 1954 using 6L6s to handle 350 volts at 150 mA.

Single Side S.W.R. Bridge. WA5SWD. An s.w.r. bridge which has been made from a piece of single sided P.C. board suitably etched. Stated to operate up to a kW. and 144 Mc.

100 Kc. Marker Generator, W7CJB. Using a 2N409 and 2N384 or similar types, it is stated to provide markers throughout the Amateur bands.

One Technique to avoid that routine QSO.— W6EUV suggests ways and means of making contacts more interesting.

Minimum Cost Semiconductor Silicon Survey, Conrad C. Zaranski. How to get the best value for your money. A long "73" article, about eight pages.

Heath SB-610 Monitor Scope Modifications, by K6SDE.

V.H.F. F.M. Station Control, WA7EVX/0.

A Simple Portable Rig for Six, WB6BIH. Two transistors an IC and some battery and you have a six metre rig—almost.

Using FETs in Burst Generators, K3VKG. Pulses of r.f. are used for testing many items of equipment and they are becoming especially useful with semiconductor devices. This article describes some simple equipment for tests.

Two Metre Converter for the Swan 250 or anything else. K3VLQ describes a useful solid state device to put the receiver of your h.f. transceiver on two.

V.S.W.R. an Outmoded Parameter, VE2AXQ. This author agrees with VK2JR that s.w.r. meters sometimes give misleading information or that many of us do not know how to interpret the readings we do get. I've no doubt we can learn from both of them.

Drake V.H.F. Converters. W1EMV reviews a series of interesting commercial items which I have not yet seen advertised in Australia. They can be purchased individually or fitted into an attractive console.

About "Load"-ing. Which loads what or what does it mean? By "73" staff.

Zero Cycle Audio Filter for C.W., LX5SM/W4. Come on you c.w. addicts.

Kayla W1EMV has now departed "73" to get married to K4MWS and live in Florida. Wayne Green says he will miss her. He also says that it is possible to earn $50,000 p.a. on "Amateur" DX-peditions. Ah Wehll!

CLUB STATION VK2BXK LOOTED

The active Kyeemagh Sea Scouts Radio Club was equipped with a licensed Amateur transmitting and receiving station, VK2BXK. It also provided training for the various Y.R.C. certificates and such aids as to permit students to proceed at a pace suited to the individual ability.

This station was built into a special steel cabinet in such a manner to allow ease of operation, provide neat storage facilities, serve as a model installation, and provide instructional demonstration as required. On the inside of the twin doors to this cabinet were mounted framed items such as W.I.A. registration certificate, photostat copy of the station licence, resistance color code chart, electric shock resuscitation chart.

Vandals have struck and the complete station looted. The Club has lost a Heathkit DX400 20-40-80 metre transmitter, variable frequency oscillator, Morse code oscillator, two Morse keys, a small auxiliary power supply, a National H.R.O. Type 1155 communications receiver and power supply, a Millen aerial coupling impedance matching unit, co-axial fittings and cabling, desk type microphone (xtal), aerial send/receive electric relay and a complete G5RV antenna with insulators, and "ladder" type impedance matching twin feeder which was down for overhaul and stored in the cabinet. Entry was gained by using a heavy instrument such as a crowbar to tear open the heavy duty cabinet housing the equipment. The various framed items torn from the doors were found scattered around the floor.

The financial loss to this small but active Club is severe, and they make an appeal for assistance (in the form of equipment or cash donations) to enable them to resume classes at an early date from another location.

—Noel Ericsson, VK2MF.

— . . . —

THE AWARD HUNTERS' CLUB

INTERNATIONAL (A.H.C.)

REVISED RULES, EFFECTIVE FROM 1st JULY, 1969

The Award Hunters' Club (A.H.C.) International, incorporated as a judicial person under the Finnish law as "The Award Hunters' Club R.Y.", is divided into six Continental Sections. The Continental Sections are independent but all of them follow the general principles in the membership rules upon agreements co-ordinated by the A.H.C. International Headquarters. The Award Hunters' Club has been established since the end of 1957.

The Headquarters has the following main tasks:

(1) To co-ordinate the activities of the Continental A.H.C. Sections.

(2) To keep a register of world awards and certificates (published as "A.H.C. Bulletin").

(3) To maintain the "XL" Club as a goodwill recognition to highly skilled Amateur Radio operators all over the world.

REQUIREMENTS FOR MEMBERSHIP

1. The basic membership requires a minimum of twenty-five (25) different certificates and must comprise the following:—

(a) At least 10 "official" certificates (i.e. those certificates sponsored by the I.A.R.U. Member Societies—I.A.R.U. Region 1 recommendations 1966).

(b) Not more than 10 certificates may be from one's own continent.

(c) At least 4 continents must be represented in the list of certificates submitted.

(d) Certificates issued on contacts on "national" or "international" basis will only count (i.e. no local certificates).

(e) Regardless of class or endorsement, the same certificate may be counted only once.

2. Endorsement stickers will be available for 50-100-150-200 and 250 certificates. At least one-third of the certificates submitted for endorsements must be "official". (Note: Local certificates may be used for endorsement purposes.)

3. Application: Send your Continental A.H.C. Secretary (A. Shawsmith, VK4SS, 35 Whynot St., West End, Brisbane, Qld.) a list of your certificates, giving the abbreviations of the award names in alphabetical order, full names of the awards, number and/or date of issuance of awards, possible endorsements. Certify the correctness of the list with your own signature. No other certifications are required, but any falsification in the application will lead to the disqualification of the applicant.

4. The fees: Registration fee, giving you a life-long membership, is based on $1 U.S. Equal amount of any currency or IRCs may be used upon agreement with your Continental A.H.C. Secretary.

A.H.C. SERVICES
(care of A.H.C. Headquarters)

Summary list of "official" awards. 2 IRCs.

"A.H.C. Bulletin", duplicated 16-sheet (loose-leaf) publication giving information on award rules. Subscription fee $3.00 U.S. or the equivalent per 12 issues (2 IRCs per issue).

The "XL" Club. Rules available for return postage. "XL" Club was introduced on 1/1/68.

—From VK4SS.

SILENT KEY

It is with deep regret that we record the passing of—

VK3GM—George R. McCulloch

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YAESU

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ANY Buyers for Galaxy 12 volt Mobile Power Supply, $70. Also set of VK4DA Mobile Helical Whips for 80, 40, 20 metres, $35. All guaranteed in good order. Contact VK3AO, 383 Warrigal Road, Burwood, Vic. Phone 288-2326.

FOR SALE: Bendix RA-1B Communications Receiver with a.c. supply and speaker, $50. Pye Mk. 3 two-channel 12v. Carphone on 6 metres, $30. Home-brew 6 and 2 metre a.m. Tx's complete with a.c. supply and mike, $30. Home-brew CRO with three inch CRT as is, $12. Or offers. VK3ZNC, P.O. Box 175, Maffra, Vic., 3860.

FOR SALE: Collins S-Line, consisting of 32S1, 75S3 and 30L1 linear. $1,500 o.n.o. K. Moore, VK6KM, 191 Ninth Ave., Inglewood, W.A., 6052.

FOR SALE: Compact, custom built, 160 metre, 20 watt, a.m./c.w. transceiver. Tunes 1500 to 2000 Kc., 12 tubes, xtal locked b.f.o., product detector, squelch, S meter/plate meter, high level plate and screen mod., p.t.t. or mox. Complete with a.c. p.s.u./spkr., net frequencies xtals. $85 o.n.o. 48 Orchard St., Glen Waverley, Vic., or phone 232-9492 (Melb.).

FOR SALE: Creed Model 75 Page Printer with reperferator without keyboard, $50. Creed Model 6S/5 Tape Distributor, $50. M. Faulkner, P.O. Box 602, Katanning, W.A., 6317.

FOR SALE: Heathkit Marauder S.S.B. HX10 Tx, 80-10, 160w. p.e.p., vox, p.t.t., $325. Heathkit S.S.B. HR20, 80-10, sep. supply, $100. HCR62 Rx, 550-10, $100. Type 3 Mk. 2, $40. ATR2C 80-40 Tx-Rx, a.c. power supply, $30. VK3AGE, G. Esam, 18 Crawley St., Warrnambool, Vic., 3280.

FOR SALE: Swan 350 as new, with all mods., 12v. mobile P/S, A.C. P/S, mike; CDR Ham M Rotator without control unit. $600 the lot, F.O.R. All had very little use. VK1IL, 27 Kavel St., Torrens, A.C.T. Phone 86-1095.

FOR SALE: Swan 350 Transceiver with 230 a.c. power supply, vox, cal., u.s.b./l.s.b., and s.w.r. bridge, $500. FLDX2000 Linear, only 1 month old, $250. 500 watt Acitron Mobile Power Supply, only 1 month old, $90. Webster Bandspanner Mobile Whip, $45. M. Faulkner, P.O. Box 602, Katanning, W.A., 6317.

RECEIVER Star 600, triple conversion, all bands, crystal calibrator, notch filter, pre-selector, condition as new, leaving 240 volt area. Price $225 or near offer. F. Willis, rear Athenaeum Hall, Doncaster, Vic., Phone 848-1386 (Melb.).

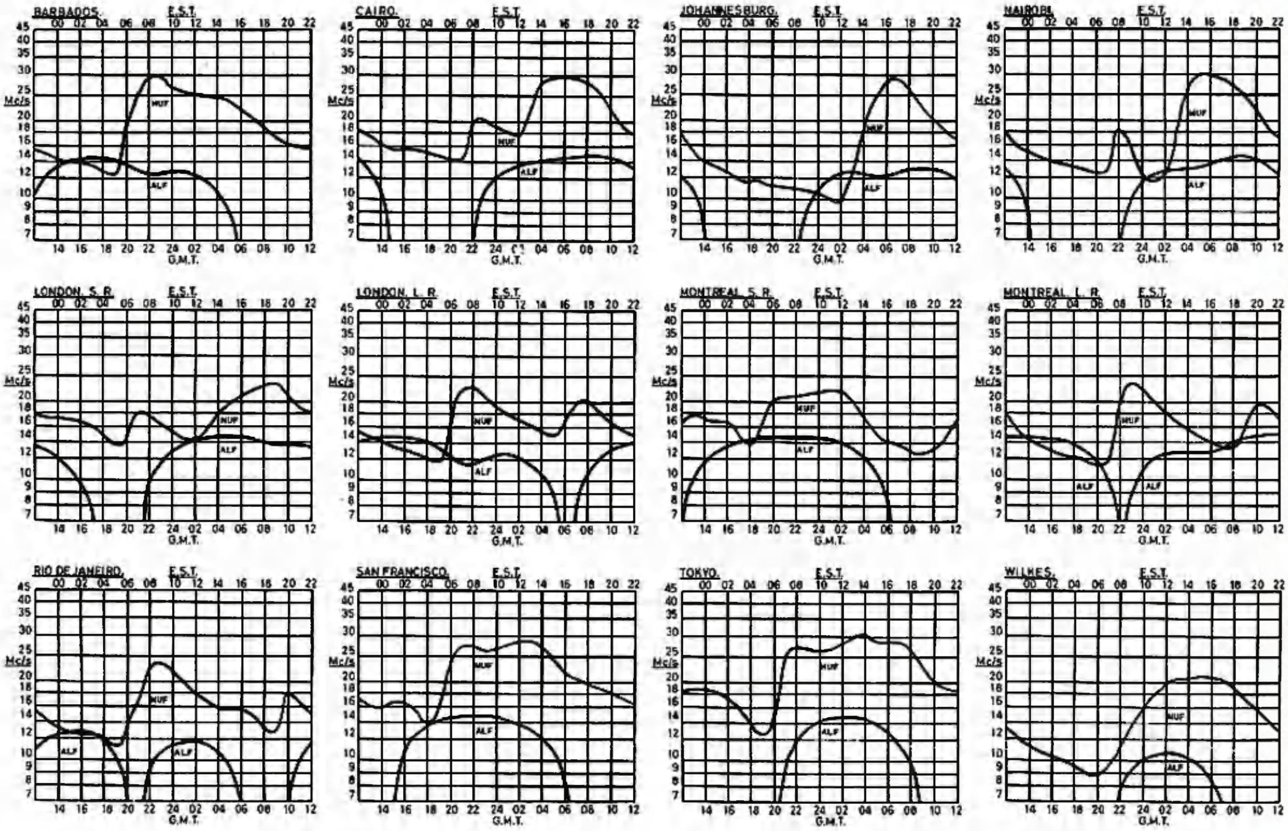
SELL: Heath DX35 compact bandswitched Transmitter, 80 through 10 metres, 75 watts c.w., 60 watts a.m. controlled carrier phone. 12BY7 xtal oscillator or buffer, 12BY7 driver, 6146 p.a., 12AX7 speech amp., 12AU7 modulator, internal solid state 240 volt power supply, with stable matching VF1 VFO, manuals, $70. Could be converted to s.s.b. Basil Dale, VK2AW, 19 Gorrell Cres., Mangerton, Wollongong, N.S.W., 2500.

SELL: New 2 metre American "Tunaverter", tunable 140-150 Mc. into 1500 Kc. i.f. Ideal for use with car radio. This is extremely sensitive, latest model and can also be used crystal locked. Sell at landed price of $35 as 2 metre receiver recently purchased. Roth Jones, 1 Albert Road, Melbourne, Vic., 3004. Phone 26-6911.

TRANSCEIVERS No. 19 Mark II., plus power supplies. Comprising of a 2-8 Mc. set and a 240 Mc. v.h.f. set. $10 each. Phone 89-4997 (Melb.).

PREDICTION CHARTS FOR AUGUST 1969

(Prediction Charts by courtesy of Ionospheric Prediction Service)



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EDDYSTONE
Model "EA12"
Amateur Band Communications Receiver

The EDDYSTONE "EA12" is a model specially designed for use by Amateur Radio operators and covering the six major Amateur bands from 1.8 Mc. to 28 Mc. It possesses an exceedingly good electrical performance and will produce first-class results with all modes of signals. Mechanically the "EA12" is built to the high engineering standards common to all Eddystone products and will give years of trouble-free service, irrespective of climate.

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FEATURES—

- **Adequate bandspread, correct degree of selectivity for the various modes of signal, ease of tuning S.S.B. signals, and frequency stability.**
- **Cascode type R.F. amplifier stage.**
- **Separate R.F., I.F. and A.F. gain controls.**
- **Continuously variable selectivity in the 100 Kc. second I.F. stages. Crystal filter can be switched in to give an extremely narrow band for c.w.**
- **Mode switch selects either upper or lower sideband.**
- **Large S meter, calibrated from 1 to 9, each division 6 db. change of level.**
- **Two noise limiters, one a series diode type for a.m., other a double diode which is operative with c.w. and s.s.b.**
- **Image rejection better than 50 db. at highest frequency and proportionally greater at lower frequencies.**

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34 WOLYA WAY, BALGA, PERTH, W.A., 6061. Phone 49-4919
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1.6 Mc. to 10 Mc.,
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10 Mc. to 18 Mc.,
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TRIO

SSB transceiver

200 watts PEP–7 Bands–A M & C W and Power Supply and Speaker Unit

SPECIFICATIONS:

Frequency:	80m Band	3.5-4.0 MHz
	40m Band	7.0-7.5 MHz
	20m Band	14.0-14.6 MHz
	15m Band	21.0-21.6 MHz
	10m A Band	28.0-28.6 MHz
	10m B Band	28.5-29.1 MHz
	10m C Band	29.1-29.7 MHz

Communication Method: SSB (A3j) AM (A 3H) CW (A1)

Maximum Input Power: (Xmitter final stage) 200W (PEP)

Standard Input Power: (Xmitter final stage) 180W (PEP) 120W on 28 MHz band only

Antenna Input Impedance: 50-75 ohm

Carrier Suppression Ratio: More than 40 dB

Single Side Band Ratio: More than 40 dB

Mic. Input Impedance: High impedance (dynamic or crystal mic. recommended)

Xmitter Audio Frequency Characteristics: 300-3,000 Hz (-6 dB)

Receiver Sensitivity: 1μV S/N 10 dB (14 MHz)

Receiver Selectivity: 2.7 kHz (-6 dB) 5.0 kHz (-55 dB)

Spurious Rejection Ratio: More than 45 dB

Image Ratio: More than 60 dB

Undistorted Power Output: More than 1W

Receiver Output Impedance: SP 500 ohm PHONE 8 ohm

Power Consumption (using PS-500AC): 450W (At maximum power output) 250W (Receiving Mode)

Tubes and Transistors used: 17 TUBES, 3 TRANSISTORS, 15 DIODES

Dimensions: W: 13⅛"; H: 8$\frac{11}{16}$"; D: 11$\frac{11}{16}$"

Weight: 17.6 lb

FOR/FOA SYDNEY: TS 500, $491.00; PS 500 AC, $98.00

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Please forward free illustrated literature and specifications on Trio equipment.

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T'grams: "Metals" Adel.

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Readers are requested to submit articles for publication in "A.R.," in particular constructional articles, photographs of stations and gear, together with articles suitable for beginners, are required.

BETTER RADIO RECEPTION

FOR ONLY 20 Cents

Published by Eddystone, a complete guide how to get the best results from your receiver, contains 24 pages, with illustrations; covers propagation, aerials, interference, and other useful data.

Write now with **20 cents** postal note to:

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608 Collins Street, Melbourne Victoria, 3000

TRIO TR2E
2 METRE TRANSCEIVER

- Triple conversion receiver with crystal locked 2nd and 3rd oscillators for maximum selectivity and sensitivity.
- Separate VFO tuning for both receiver and transmitter.
- Nuvistor RF amplifier.
- Provision for crystal locking of the transmitter.
- 12 volts DC (internal transistor power supply) and 230/240 volts AC operation.
- Noise limiter and squelch.
- 17 tubes, 4 transistors and 7 diodes.
- 1 microvolt sensitivity for 10 db. S/N ratio at 146 Mc.
- :"S" meter, RF output meter, and "netting" control.

Price: $282.00

MILLER 8903B PRE-WIRED I.F. STRIPS

455 Kc. centre frequency, 55 db. gain, uses two PNP transistors and diode detector. Bandwidth 5 Kc. at 6 db. DC requirements: 6 volts at 2 mA.

Price: $9.70
Plus pack and post 25 cents

VALVE SPECIALS

ATS25 ceramic base 807, **70c** or **three for $2.**
815, **70c.**
6AC7, **20c** or **12 for $2.**
6J6, **30c** or **7 for $2.**
6CQ6, **20c** or **6 for $1.**
VR150/30, **75c** or **3 for $2.**
QB2/250 (813), new and boxed, **$7 ea.**
6H6 metal, **20c** each.
DM71 indicator tube, **40c ea.** or **6 for $2.**
6F33, **30c** ea.

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Mixed Values
$2 per 100
plus postage 20 cents

CAPACITORS

Mixed Values
80 for $2
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STAR ST-700 TRANSMITTER

SSB — AM — CW
80 Metres to 10 Metres

- Ultra-precision three-stage double gear tuning mechanism, completely free of backlash, spreads each 600 Kc. over 1.68 metres with 1 Kc. dial calibrations.
- Stability better than 100 cycles. "Vackar" type VFO. Voltage regulated power supply.
- Uses mechanical filter at 455 Kc. specially designed for SSB. Selectable upper or lower sideband. Carrier and sideband suppression 50 db. or more.
- May be connected with STAR SR-700A receiver for transceive operation.
- Fully adjustable VOX and ANTITRIP circuits for automatic transmission/reception.
- Press-to-talk relay, break-in keying and sidetone oscillator for CW monitoring.
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- Built-in antenna relay.
- Final stage uses two 6146s in parallel with conservatively rated input of 250 watts PEP on SSB and CW, 100 watts on AM.
- Built-in heavy duty power supply with adequate reserve margin assures trouble-free operation.
- Power supply 220 to 240 volts AC 50 cycles.

Price: $519.50

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3000 TYPE RELAYS
large range
Only 50 cents ea.

VACUUM SEALED RELAYS
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TRANSISTORISED COMPUTER BOARDS
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FULL RANGE OF MULTIMETERS

STAR SR-700A RECEIVER

SSB — AM — CW

- Ultra-precision three-stage double gear tuning mechanism, completely free of backlash, spreads each 600 Kc. over 1.68 metres with 1 Kc. dial calibration.
- Stability better than 100 cycles. "Vackar" type VFO. Voltage regulated power supply.
- Triple conversion. IF's 1650 Kc. and 55 Kc. First and third oscillators crystal controlled.
- Imagine ratio better than 60 db. on all bands. Beat interference below noise level.
- Variable selectivity band pass filter at 55 Kc. provides steep cut offs and a good shape factor. Four positions: 0.5, 1.2, 2.5 and 4 Kc. (at 6 db. down).
- T-notch filter provides better than 50 db. attenuation.
- Variable decay AGC. Variable BFO tuning.
- Output terminal on VFO for transceive operation.
- Product detector for SSB/CW. Diode detector for AM.
- Noise limiter with adjustable clipping level operates on AM, SSB and CW.
- Built-in 100 Kc. crystal calibrator (crystal included). Zero adjustment on VFO.
- Sensitivity better than 0.5 uV. for 10 db. S + N ratio on SSB and CW, better than 1 uV. on AM.
- Power output, 1 watt. Impedance, 4 ohms.
- 13 tubes, 6 diodes.

Price: $461.50

MARCONI TF885A VIDEO OSCILLATOR
Price: $120

SANSEI SE405 S.W.R. BRIDGE
1 Mc. to 150 Mc., also doubles as a Field Strength Meter
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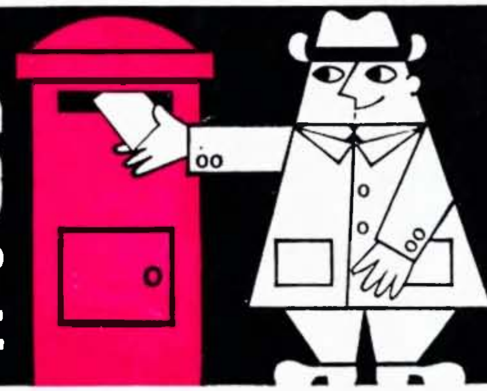
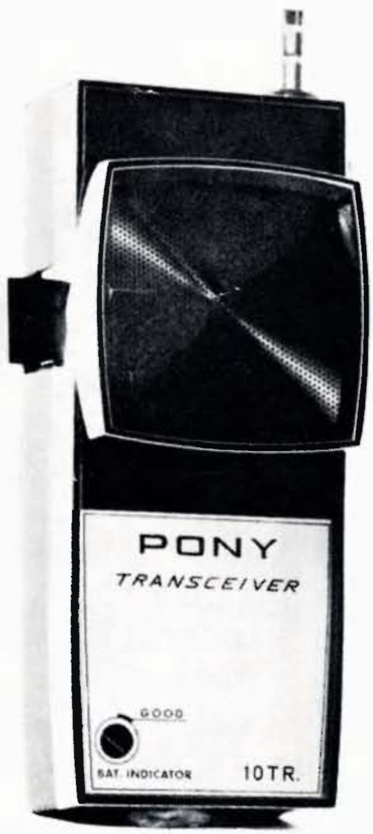


CUSTOMER SERVICE

100 mW. PONY TRANSCEIVER MODEL CB-16

COMPLETE TWO-WAY COMMUNICATION FOR BUSINESS, HOME, FARMS, BOATING, ETC. . . .



PONY TRANSCEIVER CB-16 is a completely transistorised portable transceiver which can transmit and receive voice communication on the 27.24 Mc. band.

PONY TRANSCEIVER CB-16 is so tiny in form and so simple in manipulation that you can always carry it in your hand wherever you may go.

Final input of the CB-16 is 100 mW., and will make conversation possible for a distance of about 1 mile (1.6 Km.) in cities and about 15 miles (24 Km.) on the open water.

The CB-16 Transceiver is equipped with harmonic suppression and will not interfere with television and radio equipment using V.H.F.

SPECIFICATIONS

- **TRANSMITTER SECTION**
  Circuit: Crystal controlled oscillator and amplitude modulation.
  Frequency: 27.24 Mc.
  Modulation: Final collector, amplitude modulated.
  Transmitter frequency tolerance: Within ±0.005% at 0°C./40°C.
  Final input: Not to exceed 100 mW.

- **RECEIVER SECTION**
  Receiver type: Superheterodyne with crystal control.
  Sensitivity: 17 db. or better for 5 mW. output, 10 db. signal-to-noise ratio.
  Selectivity: 10 Kc. at 18 db. down.

- **GENERAL**
  Component: 10 transistors, 1 diode, 1 thermistor and 2 crystals.
  Antenna: 10-section telescopic antenna 4 feet (1.216 m.).
  Speaker: 2¼", voice coil 8 ohms.
  Power consumption: 0.085 watt receive, 0.15 watt transmit.
  Dry battery: 9v., 216 x one-piece.
  Size: 5-13/16" high, 2-3/8" wide, 1-13/16" deep.
  Weight: 1.02 lb. (464 gm.).

Trade Price per pair (2): $62.50 + 15% Sales Tax

Pony Model CB-36, high power Transceiver, also available

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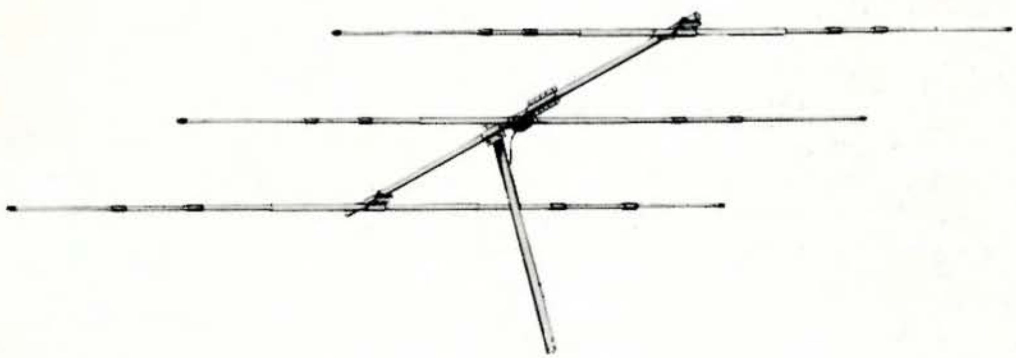
amateur radio

Vol. 37, No. 9

SEPTEMBER, 1969

Registered at G.P.O., Melbourne, for transmission by post as a periodical

PRICE 30 CENTS



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To suit Japanese Walkie-Talkies and Transceivers. P.M.G. approved. Freq. 27.240 Mc. (Tx), 26.785 Mc. (Rx).

HC6/U Subminiature, ½ in. pin spacing, 27.240 or 26.785 Mc. $3.50 each or $6.50 a pair.

HC18/U Miniature ¼ in. pin spacing, 27.240 or 26.785 Mc. $3.50 each or $6.50 a pair.

(HC18/U also available with flying leads)

Other Crystals available include 27.145 and 27.195 Mc.

Postage 10c.

CRYSTAL MICROPHONES

Price only **$5.50**

Stand to suit $2.50 extra.

Packing and Postage 25c.

Model BM3 (illustrated): Response 100-8,000 cycles, fitted with 6 ft. cable and phone plug with on-off switch. Can be used on stand or for hand use. **BM3 Insert, $1.00 each**

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Specifications.—Standing Wave Ratio: 1:1 to 1:10. Accuracies: Plus or minus 3 per cent. scale length. Impedance: 52 ohms and 75 ohms. Meter: 0-100 DC microamperes. **Price $19** inc. tax.

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N-P-N TRANSISTORS

Type 325—replaces BF115, SE1010

Type 327—replaces BC108, 2N3565, SE4002

Type 328—replaces BC109, SE4010

All 75c each, or three for $2.00

Type 2N441 Transistor, $2.40

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Suit all Garrard Turntables. Finished in polished teak, **$8.50.**

Also SRP22 Bases. Finished in polished teak, **$8.50.**

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15 uH, 22 uH, 27 uH, 33 uH, 39 uH, 47 uH, 56 uH, 68 uH, 82 uH, 100 uH, 120 uH, 150 uH, 180 uH, 220 uH, 270 uH, 330 uH, 390 uH, 470 uH, 560 uH. **Price 40c.** Postage 10c.

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Ratio 8 to 1 Reduction. Scaled 0-10.

Type	T 501	1½ inch diameter	$1.75
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LOW PASS FILTERS

A "Cabena" Low Pass Filter will fix T.V.I. Cut-off frequency, 30 Mc.; attenuation at 60 Mc. better than 30 db.; insertion loss, negligible. Impedance 50-72 ohms. **Price $11.50.** Postage 10c.

TRIO COMM. RECEIVER MODEL 9R-59DE

Four-band receiver covering 550 Kc. to 30 Mc. continuous, and electrical bandspread on 10, 15, 20, 40 and 80 metres. 8 valves plus 7 diode circuit. 4/8 ohm output and phone jack. SSB-CW. ANL, variable BFO. S meter, sep. bandspread dial, I.F. 455 kc., audio output 1.5w., variable RF and AF gain controls. 115/250v. AC mains. Beautifully designed. Size: 7 x 15 x 10 in. With instruction manual and service data.

PRICE $175 inc. sales tax

Speaker to suit, type SP5D, $15 inc. tax.

MULTIMETER MODEL 200H

20,000 ohms per volt d.c., 10,000 ohms per volt a.c. **Specifications**.—DC Volts: 0-5, 25, 50, 250, 500, 2,500. AC Volts: 0-10, 50, 100, 500, 1,000. DC Current: 0-50 uA.; 25, 250 mA. Resistance: 0-60K ohms, 0-6 meg. Capacity: 0.01-0.3 uF. (at AC 5v.); 0.0001-0.01 uF (at AC 250v.). Decibel: Minus 20 db plus 22 db. Output range: 0-10, 50, 100, 500, 1,000. Battery used: UM3 1.5v., 1-piece. Dimensions: 3¼ x 4½ x 1⅛ in. **Price $11.00** Post Free. Complete with internal battery, testing leads, prods.

KEW VACUUM TUBE VOLTMETER

MODEL K142

Specifications:

AC Voltage—
- Measurement Range, Sine Wave (in 7 ranges): 0-1.5v., 0-5v., 0-15v., 0-50v., 0-150v., 0-500v., 0-1500v.
- Peak-to-peak (in 7 ranges): 0-4v., 0-14v., 0-40v., 0-140v., 0-400v., 0-1400v., 0-4000v.
- Output (dBm): Minus 2 dB to plus 65 dB (in 7 ranges) (0 dB equals 1 mW. in 600 ohm line): minus 20 to plus 5/16/25/36/45/56/65 dB.
- Input Impedance: 1.4 megohms.
- Input Capacitance: 30 pF. or below (1.5/5/15/50 150v. range). 15 pF. or below (500/1500 range).
- Accuracy: Within plus or minus 5% full scale.
- Freq. Response: 30 c/s.-500 Kc. within plus or minus 3%; 20 c/s.-10 Mc. within plus or minus 10%.

DC Voltage—
- Measurement Range (in 7 ranges): 0-1.5v., 0-5v., 0-15v., 0-50v., 0-150v., 0-500v., 0-1500v.
- Input Impedance: 11 megohms, 2 pF. or below (using "D.C." Probe).
- Accuracy: Within plus or minus 2% full scale.

Resistance—
- Measurement Range: 0.2 ohm-1000M ohms (in 7 ranges): 0-1K, 10K, 100K, 1000K, 10M, 100M, 1000M ohms.
- Accuracy: Within plus or minus 3% of the scale length.

Including D.C. Probe & Leads. **Price $58.50** inc. tax. R.F. and H.V. Probes extra.

30c Postage.

MINI-TESTER, MODEL C1000

Ranges.—AC voltage (1000 ohms/volt): 10, 50, 250, 1000. DC voltage (1000 ohms/volt): 10, 50, 250, 1000. DC current: 1, 100 mA. Resistance: 0-150K ohms. Dimensions: 2¼ x 3-9/16 x 1-1/16. Weight 0.37 lb. Price $6.35, plus postage 20c.

STEP-DOWN TRANSFORMERS

Primary: 240 volts. Secondary (switched): 24, 28 or 32 volts a.c., 50 cycle, 1.88 amp., with on/off switch and two outlet sockets. **$7.00.** post $1.00.

ALARM BELLS

(Parachute type), 6 volt. Suitable for Burglar Alarms, etc., complete with trip rope, etc. **Price** $1.25, post 50c.

F.M. TAXI RADIOS

T.C.A. (Philips). Low Band, F.M. Mobile Units, 6 volt. Crystal locked, 120 Kc. bandwidth. Operating frequency, approx. 80 Mc. Complete with all valves, vibrator and microphone. Suit Amateur conversion. **Good condition.**

OUR PRICE, LESS CRYSTALS, $25.
Freight and Packing extra. Rail or IPEC.

V.H.F. TRANSCEIVERS

V.h.f. Transceiver, supersedes SCR522. Freq. range 115-145 Mc. Crystal locked. 21 valves comprising 6C05, 6AM6, EB91, 6AM5, TT15, QV04/7. Suitable for conversion to 144 Mc. band. (Still current for aircraft bands). Brand new condition, less crystals.

Price $30. Rail or IPEC.

"MURATA" CERAMIC FILTERS

Ideal for solid state i.f. applications.

BC455A—bandwidth 5 Kc. at 455 Kc. **45c**
BC455D—bandwidth 2.4 Kc. variable or 455 Kc. **90c**
Insertion loss 1.0 db., input impedance 3.3K ohms.

WESTINGHOUSE

INTEGRATED CIRCUITS

Type WC334AT—audio power amplifier. Input 0.5v. r.m.s., output 1 watt into 15 ohms. Distortion 2.4% at 1w. on 13.5v. rail. Physical size approx. size top-hat transistor. **Price** $7.50 **ea.** Post. 10c.

SIGNAL GENERATORS

LEADER LSG11

120 Kc. to 390 Mc.

Frequency range (6 bands): 120 Kc. to 130 Mc. on fundamentals: 130 Mc. to 390 Mc. on harmonics. Mod. frequency 400 and 1,000 cyc. Uses 12BH7, 6AR5 plus selenium rectifier. Provision for crystal oscillator by use of external xtal (xtal not supplied), 1 to 15 Mc.

Dimensions: 7½ x 10¾ x 4½ inches. Professionally finished, grey crackle enamel. **Price $36.75.**

T.V. TUNERS

M.S.P., incremental, brand new, complete with valves 6ES8 and 6U8. **Price** $5.50.

CARBON RESISTORS

100 assorted Resistors, ¼ and 1 watt. Good selection. All popular types. **Price $1.75** packet.

MICA WASHERS and GROMMETS

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COVER STORY

Our cover picture this month shows the "Triple-3" Three-Band Beam for 28, 21 and 14 Mc., produced by J-Beam Engineering Ltd., and available from Sideband Electronics Engineering, Springwood, N.S.W.

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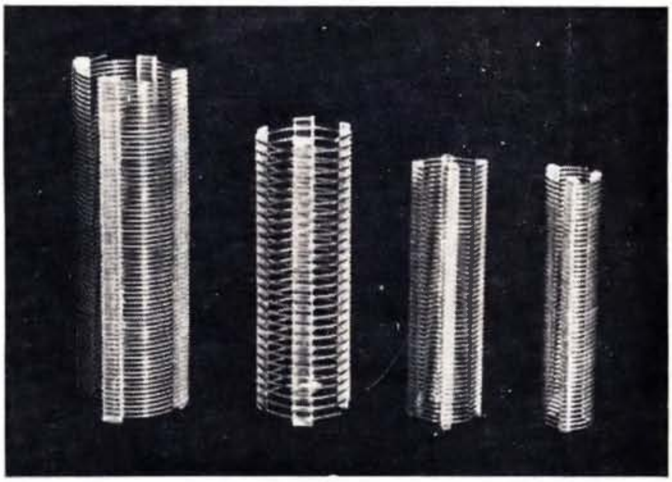

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A question only serious hams should answer...

by Laurie Wade, VK2AQW

How come you are still asking for our obsolete book? The one called "The Care and Feeding of Power Tetrodes". Look, we've already mailed out over 5,000 copies of the thing. It's just got to be in the hands of every amateur who ever went on the air. Don't get me wrong, I'm happy you find it useful. But now you should be asking for our NEW book, "The Care and Feeding of Power Grid Tubes".

It so happens that right now on my desk is a pile of these new books. They're really pretty interesting. You see, one of the fellows on our Eimac staff — Bob Sutherland W6UOV — took it upon himself to incorporate the answers to over 400 questions asked of us over the years. In fact, he has spent just about every spare moment away from his shack, preparing this new book. I couldn't believe that it has almost 200 pages. Bob said he just got carried away. He has expanded the original book, which we published back in '46, so that in its new form it covers all types of power grid tubes in RF and AF service. Even has graphs and things like that.

Now you're probably wondering, where can I get it? Thought you'd never ask. Right this minute there is another pile of these books at our Crows Nest office. Figuring all the time we've spent in getting them ready for you, they're really a bargain at $3.95 each. If it's inconvenient to call at our office, write me, and I'll be happy to post your copy.

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Laurie Wade
Senior Marketing Engineer.

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Everything is sold under standard factory warranty, prices include S.T. and are net, cash Springwood. N.S.W. transportation, postage and insurance are extra. —Arie Bles.

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FEDERAL COMMENT:

"PROJECT AUSTRALIS" NOW "W.I.A. PROJECT AUSTRALIS"

It all started in 1965 when the Melbourne University Astronautical Society, one of the many student clubs in the University, decided to design and construct an initial "test bed" satellite package. Thus Project Australis was born.

Project Oscar, the American organisation, agreed to negotiate for space on a rocket for an Australian Amateur built satellite as it had done for the American satellite, Oscars I.-IV.

At the Federal Convention in Brisbane at Easter 1966, the University Club sought the support of the W.I.A. This was enthusiastically given, as was $400. The initial difficulties, technical and financial, were overcome and the completed satellite was delivered to Project Oscar officials in California in June 1967. Then the big wait began.

The official projects with which Oscar hoped to "hitch a ride" were themselves postponed and delayed. The chances of Australis becoming an operational reality steadily faded. Then, early this year, a new organisation was formed in the United States, based on the east coast this time, named the Radio Amateur Satellite Corporation or A.M.S.A.T. The office-bearers of A.M.S.A.T., headed by President, Dr. Perry Klein, K3JTE, are professionally associated with the Space Communications industry in the U.S.A.

In brief, the aims of the organisation as expressed in its articles of incorporation are: the provision of satellites for Amateur Radio communication and experiments, encouragement of development of skills and knowledge of Amateur communications and space science, fostering of international co-operation and goodwill by joint participation, facilitation of emergency communication by Amateur satellites, encouragement of extended use of higher frequency Amateur frequency allocations.

A.M.S.A.T. has been able to offer fresh hope that the Australis Oscar A will now be launched and become Australis-Oscar 5. Thus with the support and approval of Project Oscar, the package has been shipped from California to the Washington D.C. area where it is currently undergoing a round of tests by vibration under vacuum at high and low temperatures and tests to ensure that no out-of-band spurious radiations exist that might interfere with official experiments.

A.M.S.A.T. is negotiating with the National Aeronautics and Space Administration (N.A.S.A.) for a "piggy back" launch in the near future. Apart from saying that it is hoped that a launch will occur before the end of this year, it is not at this time to be more precise. One interesting technical point is that the launches likely to be available to A.M.S.A.T. are of a higher altitude than originally planned by Oscar and therefore signals will be weaker by about 6 db. However, the Project Australis group advise that the satellite should be clearly readable by reasonably well-equipped stations. However, they suggest that a low noise converter or pre-amplifier would be a good investment for stations interested in receiving the satellite. So much for the history and the technical side.

Whilst all this has been going on, earlier this year the Project Australis group approached the Federal Executive of the Wireless Institute of Australia. Whilst originally the group was University based, it has now, with the passage of time, become Amateur based and for all practical purposes, the Project Australis group has become a group in its own right, no longer directly associated wth the University clubs from which it originally came.

As a result of these discussions, and after reference to the Federal Council, Project Australis is to become a Federal activity of the W.I.A. to be known as "W.I.A. Project Australis". The co-ordinator will be appointed by the Federal Council. In other words, in the past, Project Australis has been a group quite independent from the Institute, though encouraged and supported by the Institute. Now it becomes part of the Institute organisation and its policy becomes the ultimate responsibility of the Federal Council. I think this is a very significant and exciting move.

It seems to me to be eminently appropriate for our National Radio Society to directly foster such an important activity as Project Australis.

In the August issue of "Amateur Radio", the agenda for the forthcoming Space Frequency Conference was published. The pressures on v.h.f. and u.h.f. bands caused by the requirements of space communications is rapidly increasing. That the Amateur Service is fully and properly utilising the frequency allocations made to it is one of the more convincing arguments in the Amateurs' claim for the retention of these bands. But what of the future?

A.M.S.A.T. is encouraging the Australian group to go ahead and produce a "follow on" satellite. This, it is proposed, would be a sophisticated communications satellite. This has already been partially planned on the basis that such a satellite will be designed to take a 144 Mc. signal in and re-transmit that signal at 432 Mc. This project is an exciting one. To succeed, it will be necessary for a satellite to be designed and fabricated with a minimum delay. Let us not under-estimate the magnitude of such a project. It is a big project and will require money far beyond any amount that our organisation can itself afford.

I believe that the Institute can play an important part in ensuring the success of this important activity, particularly by providing a firm base upon which the project may continue to grow, and by the provision of an administrative facility that is now much needed. I believe also that the Institute will itself benefit much from this closer association with a very worthwhile object.

MICHAEL J. OWEN, VK3KI,
Federal President, W.I.A.

PROJECT—SOLID STATE TRANSCEIVER

PART TEN *H. L. HEPBURN,* VK3AFQ, and K. C. NISBET,† VK3AKK*

The Power Supply to be described, although designed to suit the needs of the Project Transceiver, will also run any equipment requiring 12/14 volts d.c. at up to 5 amps. Many of the low- and high-band f.m. and a.m. "Carphones" fall into this category. It can also be used as a very useful general purpose low power supply.

With respect to the power supply's use in the transceiver, the supply needs to have some specific characteristics. It must deliver a minimum of 12 volts and preferably nearer 15 volts. In view of the wide current range encountered—especially on transmit—the supply output voltage should remain reasonably constant, that is, it must have good dynamic regulation. In addition, it should afford some protection to overload. For example, if the p.a. final transistor tries for any reason to draw a destructive current then the supply should "refuse" to deliver such current or, at least, limit the current drawn to a safe value.

The design now described complies with all these requirements. With the output open circuit, the voltage is 15. With a 3 amp. load (roughly the peak value drawn by the transmitter) the output has dropped by only half a volt. The circuit is so designed that the maximum current it will supply is less than that needed to exceed the dissipation of the p.a. transistors. On short circuit this is about 7 amps.

While the supply will not withstand a short circuited output for long periods of time, it is capable of limiting the output current to a safe value for long enough to allow the fuse in the centre tap of the transformer to blow.

Fig. 27 gives the circuit diagram for the complete unit.

A 36 volt centre tapped transformer supplies a full-wave bridge using two BYX38/300 silicon diodes. These diodes are rated at 300 volts p.i.v. and 6 amps. average current drain. Any other diodes of 100 volts p.i.v. or more at about the same current capability can be used. Two 2,000 uF. 35 volt working capacitors form the primary smoothing. At the output of the two capacitors the no-load voltage is 26 and is the input to the regulator/limiter section.

The base of the first regulator transistor, an R.C.A. 2N3053, is held at a constant 16 volts by means of a zener diode. The technique of using an MPF102 as a constant current dropping resistor is the same as that used on the sub-regulator/distribution board described earlier in the project. The emitter of the 2N3053 is directly coupled to the base of the main 2N3055 regulator transistor. Further filtering is provided by the 1,000 uF./25 volt capacitor across the output.

To outline (somewhat sketchily) the limiting action of the supply, assume its output to be short circuited. Such a short circuit could be looked upon as a load trying to draw an infinite current.

At the start of the "short" the 2N3055 will attempt to draw an infinite current, but will be prevented from so doing by the 1 ohm resistor in its collector lead and by the inability of the transformer to supply an infinite current. The drop across the 1 ohm resistor and the concurrent tendency of the supply rail voltage to fall, limits the current that the 2N3055 will pass.

However, the base of the 2N3055 will, unless prevented, try and draw a destructive current, since its emitter is earthed by the applied short. Since the bias supply to the 2N3055 base is, in effect, through the 22 ohm resistor in the 2N3053 collector, the drop across this resistor as the 2N3055 base current attempts to rise, effectively reduces the bias on it to a safe value and protects the regulator device.

POSTSCRIPT

This is the last of the articles describing the main modules of the transceiver. It is proposed, in about two months time, to have a final article which describes alternative uses and/or additions that have come to mind during the past eight or nine months. For the time being, it is hoped that the series of articles has been of interest to readers and that it may have enabled some of them to adopt the ideas contained in the various modules to their own required ends.

AVAILABILITY

The power supply kit, complete with all parts, circuit board and full instructions will be available from early September. It will cost $28.60 plus 20c postage and can be obtained by writing to 4 Elizabeth Street, East Brighton, Vic., 3187.

Now that all the modules have been described any of them are obtainable on request. As indicated in the January 1969 "A.R.," they will continue to be available for at least two years, this availability being subject only to the ability of the suppliers to obtain the specified components. In the event that specific items cease to be manufactured the project organisers will obtain alternate components and detail any changes in circuit constants that may be necessary.

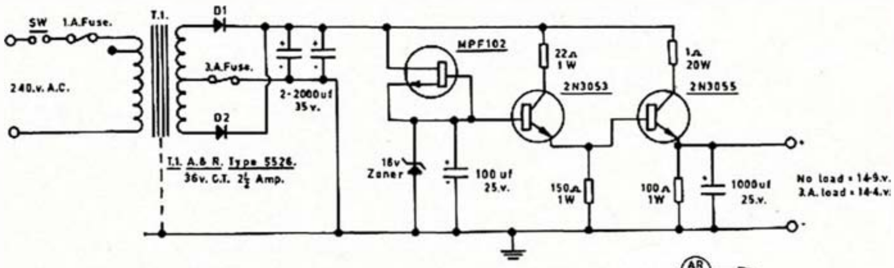

FIG. 27. CURRENT LIMITED POWER SUPPLY.

The emitter resistor of the 2N3053 shows 150 ohms. This should be increased to 1000 to 1500 ohms.

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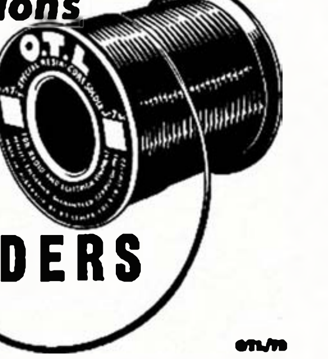

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"Said the Spider in the Sky"*

HOWARD W. KELLEY, K4DSN

"Ideals are like stars, you will not succeed in touching them with your hands, but like the seafaring man on the desert of waters, you choose them as your guides, and, following them, you reach your destiny."—Carl Schurz.

A SPINDLY, ugly, clumsy-looking, insect-like contraption that only the world could love has made its debut. In an age of super-smooth and sleek flying machines, U.S. astronauts will soon be flying an aerodynamic misfit to the moon and back.

The final payoff of the Apollo moon mission is to be carried out aboard the spidery Lunar Module (LM) whose homeliness is offset by its beauty of sophistication and practicality. Though its ability to space-fly is something of amazement about which pages could be written, this discussion is limited to the LM's communication ability.

IN-FLIGHT COMMUNICATIONS

The communications subsystem aboard the Lunar Module is capable of three two-way combinations of in-flight or lunar surface radio links: LM to the orbiting Command Module (CM), LM direct to earth, and LM to the astronauts who are roaming about the moon's terrain.

As in the Apollo, the LM places its communications responsibilities in Unified S-band and v.h.f. equipment.

In flight, when the LM is on the earth side of the moon and separated from the Command Module, communication with earth is handled on S-band, but between the LM and CM information is passed back and forth on v.h.f.

As in the Apollo S-band system a multitude of information sources on the LM can be transmitted and received at the same time, on the same antenna and often on the same frequency. LM-to-earth S-band links contain voice, TV, digital uplink, ranging code signals, biomedical, and systems telemetry data (see Table 3).

S-band voice is the primary means of communication between Mission Control and the two men aboard "Spider" (the voice identifier for the Lunar Module). Backup voice from earth is possible using the digital uplink channel, but this is usually tied up keeping the LM's guidance computer up-to-date.

In response to ranging code signals sent to the LM, the S-band equipment supplies earth stations with a return ranging code signal that enables Mission Control to track and determine range of "Spider".

Biomedical data pertinent to astronaut heartbeat is transmitted by the LM (so earth-bound doctors can monitor and record the physical condition of the spacemen), as is telemetry, voice (using redundant S-band equipment) and, in case voice capability is lost, an emergency key is provided for c.w. communication to the Manned Space Flight Network.

S-band Transmit	2282.5 Mc.
S-band Receive	2101.8 Mc.
V.h.f. Channel A	296.8 Mc.
V.h.f. Channel B	259.7 Mc.

Table 1.—**LM Frequencies.**

Most of the same information can be exchanged between "Spider" and "Gumdrop" (voice identifier for the Command Module) that can be sent directly to earth from the LM. However, these communications are carried out on v.h.f. Normal voice chatter goes out on 296.8 Mc. simplex. Backup is accomplished on 259.7 Mc. simplex. V.h.f. ranging, which is initiated by "Gumdrop" uses both v.h.f. channels as a duplex operation.

When the two orbiting spacecraft are behind the moon, contact with Mission Control is not possible. Simplex voice is maintained over the 296.8 Mc. circuit between "Spider" and "Gumdrop" at this time while telemetry data is fed over channel B into tape recorders aboard the command ship to be stored and re-transmitted to earth at 32-times the original recording speed when radio conditions between earth and space improve.

LUNAR SURFACE COMMUNICATIONS

When the 16-ton Grumman Aircraft Spider has planted its legs into the moon's crust, the orbiting CM will use its S-band system to talk to earth and v.h.f. to maintain communications with the astronauts who are on the lunar surface. The Lunar Module then becomes the world's most expensive f.m./a.m. repeater. The LM takes the v.h.f. voice, converts it to S-band and retransmits it to the space network of earth receiving stations.

Should v.h.f. between the moonbound astronauts and the command ship not be satisfactory, earth stations may act as repeaters by re-transmitting S-band from the moon back into space to the CM.

TELEVISION

LM-to-earth capabilities from the moon are the same as in-flight except that, in addition, TV may be directly transmitted to earth from the lunar surface. In fact, one of the first assignments of the LM crew, after checking for landing damage, is to erect a 10-foot 2200 Mc. parabolic antenna.

The television system has a much more utilitarian use than just to show earthlings the spectacle of man's first step on a foreign planet. It will provide the closest, most exacting view thus far of the moon's topography for instant evaluation by scientists in Houston. These same scientists can advise the spacemen which rocks to pick up and bring back, which features are important, and which way to point the camera. There are also plans to set the camera on a tripod a distance away from the LM so that we on earth can see the actual blast off from the moon when the job is done and Spider returns to space for a rendezvous with the mother-ship. The television transmitter is located in the base section (descent stage) of the LM—the part that stays behind.

The small-hand-held TV camera designed for the Apollo programme weighs only 4½ pounds. It has a bandwidth of 10 cycles to 500 Kc. and scans 10 frames per second (f.p.s.) at 320 lines and 5/8 f.p.s., 1280 lines. The 1-inch vidicon consumes about 7½ watts of power.

PLSS—PRONOUNCED PLISS

The well-dressed astronaut who strolls along Lunar Lane wears upon his back an all important unit known as the PLSS—Portable Life Support System. The PLSS is a self-contained, self-powered rechargeable environment self-powered rechargeable environmental control system. For four hours the back-pack supplies pressurised oxygen, cleans and cools the expired gas, circulates cooling liquids, and contains a transmitter for biomedical information and a dual v.h.f. transceiver for communication.

The PLSS has a contoured fibreglass shell to fit the astronaut's back, and a thermal micrometeoroid protective cover. It has three control valves, and, on a separate remote control unit, two control switches, a volume control, and a five-position switch for the dual v.h.f. transceiver. The remote control unit rests on the chest.

The astronaut has available to him primary and secondary duplex voice communication, and physiological and environmental telemetry all of which must go through the LM to the CM on v.h.f., then from the CM to earth on S-band. The v.h.f. antenna for the PLSS is permanently mounted on the oxygen purge system. Two side-tone generators over-ride incoming audio in the headphones to notify of low pressures or low fuel reserve.

* Reprinted from "CQ," June 1969.

Freq. (Mc.)	Vehicle	Mode	Information
2287.500 secondary	CM	PM	Voice, tracking/ranging, data
2282.500 transmit	LM	PM/FM	Voice, TV, tracking/ranging, data
2272.500	CM	FM	TV, data
2106.400 primary	CM	PM	Voice, tracking/ranging, data
2101.800 receive	LM	PM	Voice, tracking/ranging, data
296.800 Ch. A	CM/LM	AM	Voice, CM to LM, EVA, data
259.700 Ch. B	CM/LM	AM	Voice, CM to LM, data
243.000	CM	AM	Recovery beacon
10.006	CM	SSB	Backup h.f. recovery link

CM—Command Module of Apollo.
LM—Lunar Module.
EVA—Extra Vehicular Activity.

Table 2.—**Frequency Chart of Apollo/Lunar Module.**

R.F. EQUIPMENT

In several respects, r.f. equipment on the LM is much like that on its big brother Apollo. (Note: Unlike military ships, astronauts don't refer to their spacecrafts as "she", but rather "he".) The S-band assembly consists of two identical phased-locked receivers, two phase modulated (p.m.) transmitters (0.75 watt output) with driver and multiplier chains, and a frequency modulator (f.m.). The receivers and phase modulators provide the ranging, voice, emergency c.w., and telemetry transmit-receive functions. F.m. is primarily used for video transmission, but accommodates pulse-code-modulation telemetry, biomedical, and voice transmission. F.m. also provides limited backup for both p.m. units.

When more r.f. is required amplifiers can be brought into play. This assembly consists of two amplitrons (primary, 18.6 watts output; secondary, 14.8 watts output), an input and output isolator (ferrite circulators), and two power supplies all mounted on a common chassis. The r.f. circuit is a series interconnection of the isolators and amplifiers. The amplifiers themselves (which are saturated, rather than linear) are broadband and exhibit high efficiency, high peak and average output power, but relatively low gain. The isolators protect both amplifiers and both S-band transmitter driver and multiplier chains. The isolators exhibit minimum isolation of 20 db. and a maximum insertion loss of 0.6 db. Only one amplifier can be activated at a time and when neither amp. is selected, a feedthrough path through the power amplifier exists with a maximum insertion loss of 3.2 db.

V.H.F. EQUIPMENT

Although the Apollo relies heavily on its S-band capabilities, the Lunar Module is oriented toward v.h.f. This equipment consists of two solid-state superhet. receivers and two 5-watt a.m. transmitters. One transmitter-receiver combination operates on 296.8 Mc. (Channel A), the other on 259.7 Mc. (Channel B), for simplex or duplex voice communications. Channel B may also be used to transmit pulse-code-modulation (p.c.m.) data from the LM to the CM at a low bit rate and to receive biomedical and space suit data from the astronauts who are outside the ship on the moon.

SIGNAL PROCESSOR

The signal processor unit is the common acquisition and distribution point for most received and transmitted information, except that low bit rate split-phase data are directly coupled to v.h.f. Channel B and TV signals go directly to S-band f.m. The signal process or assembly processes voice and medical information and provides the interface to the proper r.f. generator, tape recorder, modulator, or computer.

This signal processor includes an audio centre for each astronaut and a premodulation processor where information is switched, mixed and modulated. It also has a repeater function so that v.h.f. received signals can be re-transmitted on S-band.

The two identical audio centres provide individual selection, isolation and amplification of audio received or transmitted from the LM. Each centre includes a mike pre-amp., headset amplifier, VOX circuit, diode switches, audio gain controls, and an intercom system.

DIGITAL UPLINK

The digital uplink assembly decodes 2101.8 Mc. commands from earth and routes the information to the LM guidance computer. It also provides a verification signal to the pilots that the equipment has in fact received all the needed information from earth and got it in fine shape. However, if for some reason the computer doesn't get all the information it wants or it suspects some of it of being wrong, it will signal through the S-band transmitter "no-go" and ask for a repeat. The uplink commands addressed to the LM parallel those inputs available to the LM guidance computer via the display and keyboard accessible to the spacemen. The digital uplink assembly also provides another means of voice-backup if the received S-band audio circuits in the premodulation processor fail.

RANGING TONE TRANSFER

The ranging tone transfer unit operates with v.h.f. receiver B and v.h.f. transmitter A to provide a transponder function between the command and the moon vehicle. The v.h.f. ranging tone input is made up of two acquisition tone signals and one track tone signal. Accurate ranging is accomplished when the track tone signal from the CM is received and re-transmitted from the LM.

ANTENNAS

The S-band steerable antenna is a 26-inch diameter parabolic reflector with a point source feed that consists of a pair of cross-sleeved dipoles over a ground plane. Primarily this antenna provides deep-space voice and telemetry communications and deep-space tracking and ranging. This radiator functions over 174 degrees azimuth and 330 degrees elevation coverage and can be operated manually or automatically. Initial positioning is done manually to

(Continued on Page 17)

Information	Freq. or Rate	RF Carr'r Modulat'n	Subcarr'r Modulat'n	Subcarr'r Freq.
Receive: 2101.8 Mc.				
Voice	300 to 3000 cy.	PM	FM	30 Kc.
Voice Backup	300 to 3000 cy.	PM	FM	70 Kc.
Ranging Code	990.6 kilobits/sec.	PM		70 Kc.
Uplink Data	1.0 kilobits/sec.	PM		70 Kc.
Transmit: 2282.5 Mc.				
Voice	300 to 3000 cy.	PM or FM	FM	1.25 Mc.
TV	10 to 500 cy.	FM baseband		
Biomedical	14.5 kc. subcarrier	PM or FM	FM	1.25 Mc.
Lunar Surface Unit	3.9, 5.4, 7.35, 10.5 kc. subcarriers	PM or FM	FM	1.25 Mc.
Voice	300 to 3000 cy.	PM baseband		
Biomedical	14.5 kc. subcarrier	PM baseband		
Lunar Surface Unit	3.9, 5.4, 7.35, 10.5 kc. subcarrier	PM baseband		
Voice Backup	300 to 3000 cy.	PM baseband		
Ranging Code	990.6 kilobits/sec.	PM		
Emergency Code	Morse Code	PM	AM	512 Kc.
Pulse-code-mod. non-return zero	High bit rate: 51.2 Low bit rate: 1.6	PM or FM	Phase Shift	1.024 Mc.

Table 3.—**Lunar Module S-band Capabilities.**

Useful Circuits Using Computer Board Transistors

RON BROWN, VK7ZRO*

In the August issue of "A.R." was presented a set of characteristics of transistors from I.B.M. computer circuit boards, showing typical values, with some indication of the spread of values to be expected. Although there may be some similarity between the transistors and certain commercial types (e.g. 2N1300 series for 033, 083, etc.), it is definitely undesirable to make any definite use of such similarities, because the evidence shows too wide a variation of some of the characteristics of the computer transistors compared to the commercial ones.

The data hinted, but did not state, an interesting fact: the computer transistors are high quality items, likely superior to the "general purpose" germanium types generally available commercially. They are usually characterised by low leakage, low noise, and adequate gain—depending on type, of course. The power transistors (in the TO-3 case) have remarkable voltage and gain ratings, with good linearity, and a healthy frequency rating.

The circuits presented here use some of the transistors from computer boards. Even though satisfactory performance has been obtained, it may be necessary to experiment further to obtain optimum results, depending on individual components. It will, in most cases, be possible to use transistors from the boards, other than those specified, but the previously presented data should be consulted first. Special attention, for example, should be given to the difference between the alloy junction (e.g. 033, 083) types with modest frequency response, the alloy diffused (e.g. 015, 065) types with high frequency response but low BV_{EBO}, and the mesa types (e.g. 102, 152 with TO-18 case) having very good frequency response but quite low collector voltage ratings.

* 215 Carella Street, Howrah, Tas., 7018.

A TUNING FORK OSCILLATOR

This little oscillator was devised to enable the YF to tune her violin.[1] See Fig. 1.

The fork used is a British Standard "A" (440 c.p.s.) which costs about $1. Reference should be made to previous articles in "Electronics Australia"[2] and "Amateur Radio"[3] for details of mounting. Remember, however, that the fork must be mounted rigidly with respect to the earpieces. The circuit of Fig. 1 is self-explanatory.

1—Reasons: No piano and I got tired of having QSOs interrupted by the YF wanting to listen to WWV.
2—Jeffcoat, K., "A Tuning Fork Frequency Standard," "Radio, Television and Hobbies," Oct. 1961, p. 28.
3—VK3PB, "RTTY the Easy Way," "A.R.," Nov. 1967, p. 8.

T1 and the speaker could well be replaced by a two-inch speaker and appropriate transformer (1 to 2K primary impedance). R1 should be adjusted so that oscillation is maintained at just below clipping level.

The unit has now been operating quite successfully for several months. Output is quite loud enough for violin tuning, and frequency shift (checked against WWV) is undetectable.

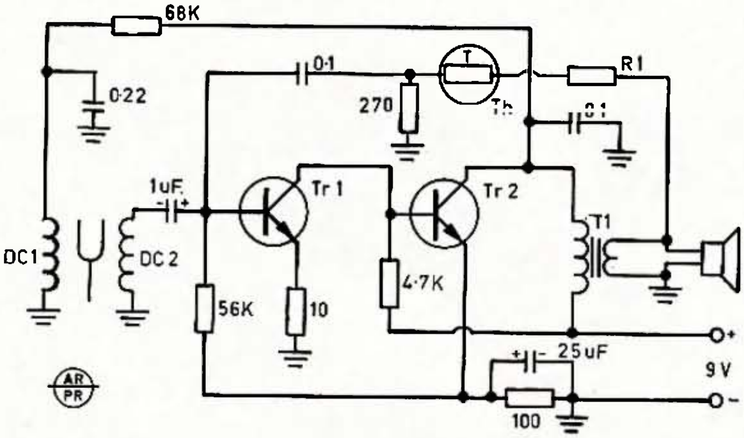

FIG.1. TUNING FORK OSCILLATOR

TR1, TR2—083, or 034 (or 033) if supply polarity reversed, as well as polarity of C2 and C3.
Speaker: Earpiece from BC611, or similar.
T1—Output transformer from BC611, or similar. Rewound with half the number of primary turns.
TH1—S.T.C. Thermistor, type R23.
R1—Between 1K and 2K, see text.
DC1 and DC2—Drive coils for fork. These consist of two high impedance headphones (complete), mounted 1/16 inch from each fork tine.
C1—To resonate with DC1 at operating frequency.

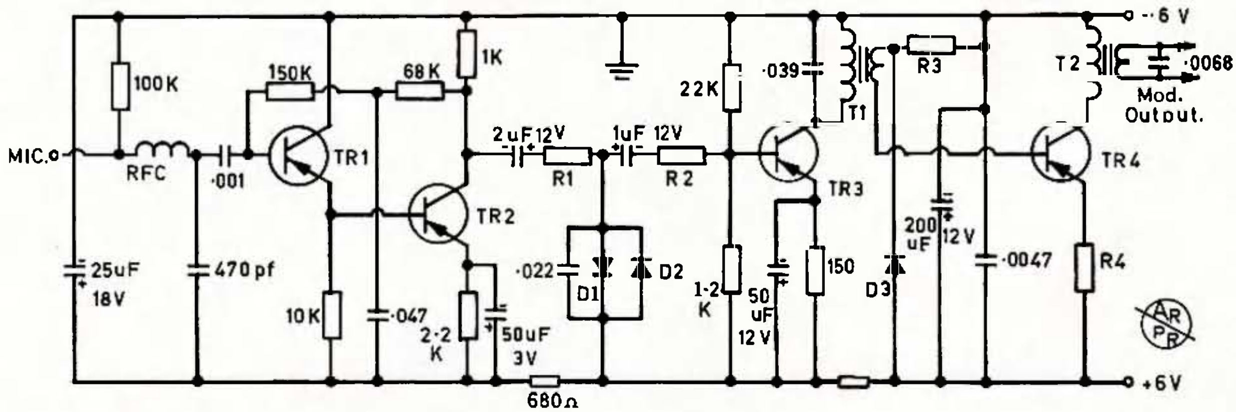

FIG. 2. A 3·5 WATT MODULATOR

Capacitances in uF. If not indicated specifically.
D1, D2, D3—Silicon diodes from boards; see text.
R1, R2, R3—See text.
R4—¼ ohm wire; see text.
T1—Driver transformer; see text.
T2—Modulation transformer; see text.
RFC—56 uH. from circuit boards.
All other values uncritical.
TR1, TR2, TR3—033 or 034.
TR4—AT1138, 036, or 042.

3½ WATT MODULATOR

Fig. 2 shows a transistor modulator which has now been in use for 18 months in a 6 metre mobile; the final valve is a 6DL5.

The unit operates from a 50K ohms dynamic microphone. R1 adjusts the drive level to the clipper diodes, D1 and D2, which are silicon diodes from the computer boards,[4] and matched for equal forward voltage at 5 mA. forward current.

Due to the low output voltage of the microphone used by the author, R1 was not required. R2 adjusts the modulation level.

T1 was wound for the job, but it should be possible to find a commercial unit, such as the ones used in car radios. T2 is an ordinary 3.5 ohm to 5K ohm speaker transformer with the 3.5 ohm winding re-wound with the heaviest wire practical, and arranged to match 3 ohms. It is most important to connect the two windings of T2 so that the two d.c. magnetising components tend to cancel. Under these conditions the paper air gap spacer in the transformer may be removed.

The collector current of the AT1138 is adjusted by varying R3 until I_c = 1.8 amps. If this requires reducing R3 below about 35 ohms, try a different diode for D3. R4 is obtained by using an appropriate length of copper or resistance wire, calculated from the wire tables, or by finding the ohms per foot from a long piece which gives a reasonable reading on an ohmmeter.

R3 and D3 form a voltage divider of the usual sort to bias the base of the AT1138, but D3 also provides a measure of temperature compensation; ideally D3 ought to be germanium to balance the characterstics of the output transistor, but that would require a bit of experimenting about the values of R3 and R4 for optimum results. R4 gives some negative d.c. feedback to reduce tendency to thermal runaway, and some negative a.c. feedback to improve quality.

If you have an 036 or 042 from the computer board, you can use it in place of the AT1138. Or inexpensive transistor types OC26, etc., can be obtained.

If a very low-Z microphone is used, a common base pre-amplifier of conventional design would be appropriate.

4—These are the miniature glass-capsule type common on the boards, but some of them are silicon, and some are germanium. An easy way to tell the difference between them is to measure the forward resistance with an ohmmeter and compare it with that of a diode known to be silicon. Also works for transistors.

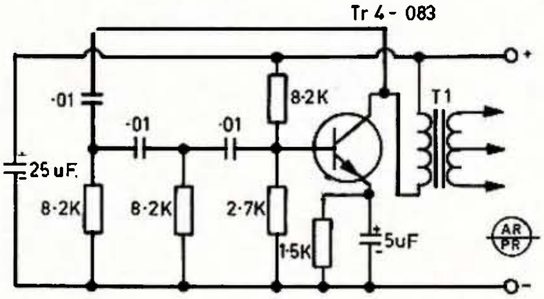

FIG. 4. PHASE SHIFT AUDIO OSCILLATOR FOR FOX HUNTS.

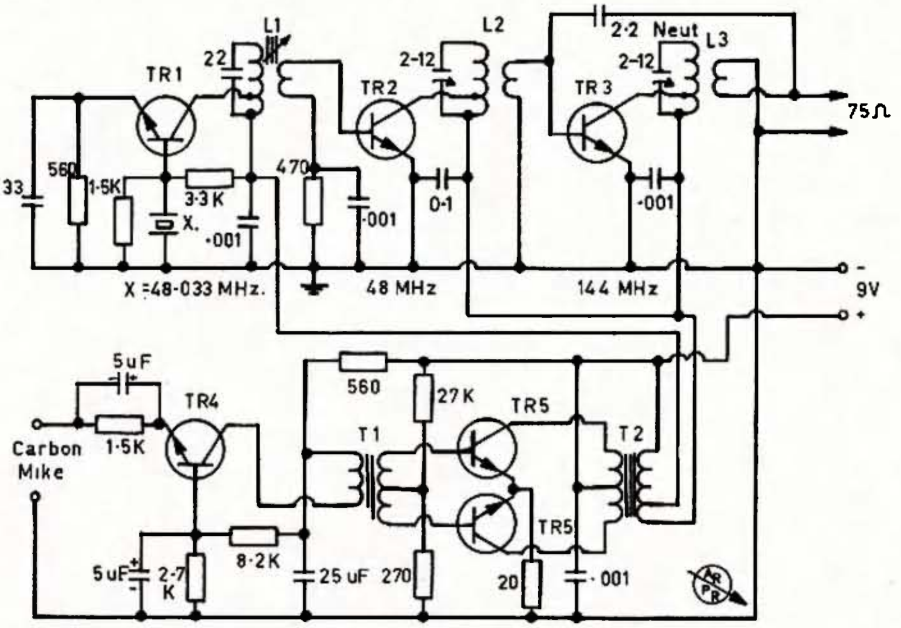

FIG 3 TWO METER TRANSMITTER P.in. 250 mW

TR1, TR2—2B8 or 2N3646.
TR3—2N3646.
TR4—083.
TR5—071, 086.
T1, T2—See text.

Coils: All wound with 18 s.w.g. tinned wire.
L1—9 turns ¼ inch slug, ½ inch long, tap at 4½ turns, link 1 turn in centre.
L2—3½ turns 3/8 inch diam., 3/8 inch long, tap at 2¼ turns, link 1 turn.
L3—Same as L2 but tap at 1½ turns.

TWO METRE TRANSMITTER

Although it is very simple, this little transmitter gives very good results, considering that the input power is only 250 mW. It has been built in two versions:

(a) As shown in Fig. 3, and (b) with the audio driver as a phase shift oscillator (Fig. 4) for a fox-hunt transmitter.

T1 is an OC71 to 2 x OC72 driver transformer, while T2 is an OC72 output transformer with the secondary replaced by a centre tapped winding of about the same number of turns as the primary. The heaviest wire possible should be used, consistent with space available on the former. When replacing the laminations, place all of the E's together so that a small air gap will be formed.

If it is desired to avoid the use of a tapped transformer, an ingenious alternative system is possible with two diodes, as described on p. 96 of "Transsistor Transmitters for the Amateur," by Don Stoner. It is also described on p. 170 of "E.E.B." for Dec. 1967, with improvements.

Some trouble was experienced with transistor break-down in the 2B8 driver when modulation was applied; to avoid this, it was necessary to select a transistor with a high BV_{CES}.[5] A small heat sink used on the driver may increase the reliability of the TO-18 types, because voltage rating decreases with temperature. If you don't have any luck, replace it with a 2N3646 or equivalent. The Fairchild types do not appear to have impressive voltage ratings, but the fact is that the actual ratings may be as much as 100% higher than published.

The 2B8 and 193 types are TO-18 planar transistors, characterised by high f_T. The 150 series has low BV, so would be hopeless for this application, though excellent in receivers and other LT locations. The 065 and 066 are excellent TO-5 transistors having high BV and good gain at h.f., but with f_T of the order of 75 Mc.; 48 Mc. would be asking rather a lot from them in common emitter configuration. They could well be worth trying as common base, in driver and/or final.

A shield must be placed across the final transistor (between base and collector), and the input and output cir-

5—The 193 series is also worth trying. Note that the resistance in the base of the driver is low, so that for all practical purposes, BV_{CER} equals BV_{CES}.

cuitry well isolated from each other. Good bypassing and short leads are imperative; thus, although the 0.1 uF. and 0.001 uF. by-pass condensers of driver and final are shown separated on the diagram (Fig. 3), the compact geometry used on a printed circuit board (not shown) resulted in the two being very close together.

The neutralising of the final (if it proves necessary) is simple but effective, and is adjusted by varying the value of the 2.2 pF. condenser for best stability. The output link must be phased correctly. Neutralisation of the final will probably be required if a transistor with low f_T is used.

With compact geometry and the components shown in Fig. 3, the transmitter was stable and performed well. The current literature[6] is, however, full of warnings about dire effects of transients or parasitics, and might be worth consulting if trouble is encountered. Various cures are offered.

The unit was built on a circuit board about 2½" x 3". It was combined with an audio output stage (as shown in Fig. 5) and a super-regenerative receiver to make a small hand-held transceiver.

LOW POWER CLASS B COMPLEMENTARY SYMMETRY AUDIO OUTPUT STAGES

The idea of using circuit board transistors and disposals high impedance speakers had, for some time, appealed to me as an economical way of making low power audio output stages. In fact it proved possible to build one, complete with speaker, for less than $4.

Fig. 5 shows the details. For best results, TO-5 high current (300-400 mA. rating) transistors from the boards should be used. These are:

PNP: 030 and 026.
NPN: 086 and 071.

Mine were matched on a Kyoritsu tester for h_{FE} and β within 20%. Even though the 086 should be a better match for the 030 than the 071, it was hard to find 086 mates for the 030s, so 071s were used.

The pre-amplifier transistor can be any of the PNP TO-5 types (034, etc.), but note that I used transistors with β greater than 130; I suggest you do the same.

I commenced the design with a mathematical approach (Ref.: T. Davis, "Miniwatt Digest," Vol. 2, No. 4, p. 54-59), but I tired quickly, and adopted a more practical approach. I decided that the 030 was sufficiently similar to the AC132 to try direct substitution in already published designs (Ref.: "Miniwatt Digest," Vol. 3, No. 3, p. 38-44) and to make any modifications required, by trial and error. The final design with layout, is shown in Figs. 5, 6 and 7.

After wiring, check, and switch on. Measure the voltage, V_A and the collector current of the 030. V_A should be as given in Table 1, and the collector current should be between 1 and 3 mA. If not, adjust R4, or if a c.r.o. is available, adjust for equal positive and negative clipping at maximum output. For best results, R3 will also need slight adjustment.

With the low voltage versions, power dissipations should be acceptable at normal ambient temperatures, but with the 18v. version small heat sinks should be fitted. These can be made easily by cutting 1" lengths of aluminium tubing from an old t.v. aerial and pushing them over the transistors (for tight fit).

6—Recent issues of "QST," "Ham Radio" and Australian "E.E.B."

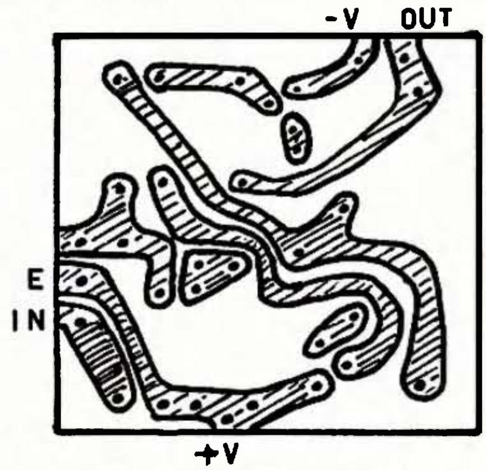

FIG. 6—BOTTOM VIEW (Actual Size).

As it stands, the circuit has a large amount of a.c. feedback from V_A to the base of the 034 via R3. If this is undesirable for your application, it can be removed by dividing R3 in two, and by-passing the centre. The low frequency cut-off point of 250 c.p.s. is limited by the 25 uF. condenser; if you want lower frequency response, increase its value.

All units performed satisfactorily, except that there was a small amount of crossover distortion with the 6-volt version.

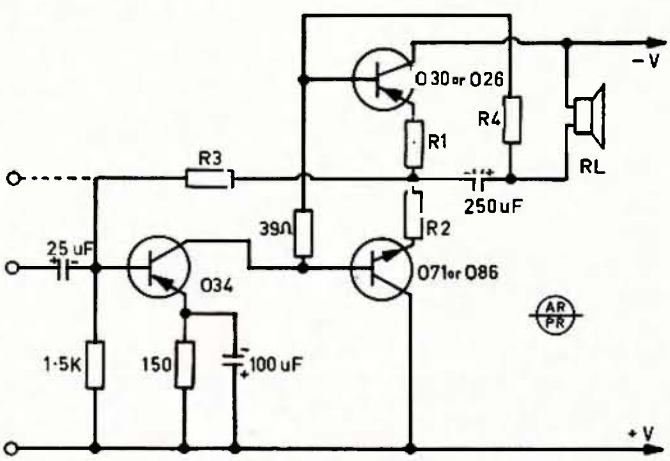

FIG.5. LOW POWER AUDIO AMPLIFIER.

Voltage, E Volts	R_L Ohms	P_o* mW.	V_A Volts	R1, R2 Ohms	R3 Ohms	R4 Ohms
6	8	130	3.6	3.9	4.7K	470
9	15	300	4.9	3.3	6.8K	820
12	27	450	6.8	2.7	5.6K	560
18	33	700	10.0	1.5	9.1K	1000

Input Impedance: Approximately 30 ohms at 1 Kc.
Frequency Response: 3 db. down at 250 c.p.s. and 150 Kc.
* Power output at the onset of clipping (at 1 Kc.)

Table 1.

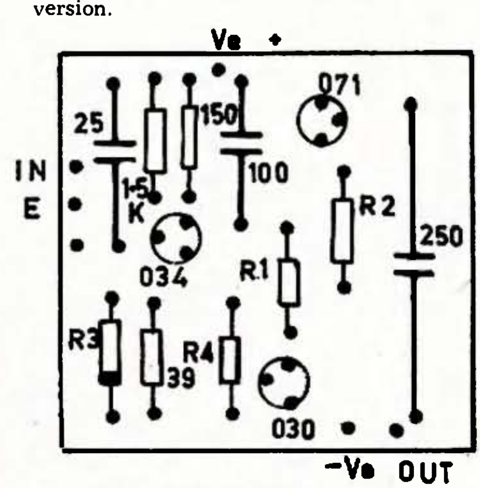

FIG. 7—TOP VIEW (Actual Size).

DIODE SWITCHING A REMOTE CONTROLLED 3-CHANNEL 6 METRE MOBILE

Due to the fact that my 6 metre mobile is remote-controlled, the addition of two extra channels presented quite a problem. Relays and step switches were considered, but in the end it was decided to try diode switching, mainly due to cost.

My first attempt used 100K resistors from the h.t. line but not all crystals could be made to oscillate reliably, because the r.f. rectified by the diodes probably tended to turn the crystal off. Increasing the "on" current to the diodes to about 40 mA. each solved the problem, but the h.t. power supply was unable to provide the extra 80 mA. needed. This was solved by supplying the diodes from the l.t. line (6v.). This turned the crystals on reproducably, but resulted in interaction between the two sets of crystals by coupling through the low resistances used. The final method isolated the two sets of crystals with r.f. chokes, as shown in Fig. 8.

Due to the fact that there is a large amount of circuitry at grid potential, it is necessary to be careful with the layout and shielding. For the same reason it is inadvisable to use more than three sets of crystals. The 56 μH. chokes might be larger, but they were readily available from the computer boards (green body, colour coded; or brown body, lettered); occasionally larger chokes may be found on the boards.

For 12v. supply, increase the values of the 82 ohm resistors to 180 ohms or 220 ohms; incidentally, the 82 ohm resistors also came from the boards. 50 mA. might seem on the high side for the germanium diodes, but as this unit has been working for nearly 12 months, this current level can be regarded as satisfactory. As Leo VK7RG points out, if this was too much current the diodes would not take it for long. It is worth noting that if a germanium diode does not get more than moderately warm, it will take a given current indefinitely at a given room temperature. For the same reliability a silicon diode can get hot enough to hurt the touch. Be sure you know which is which **before** you start (see reference 4).

I wish to thank R. L. Gunther, VK-7RG, for his assistance in preparing this manuscript.

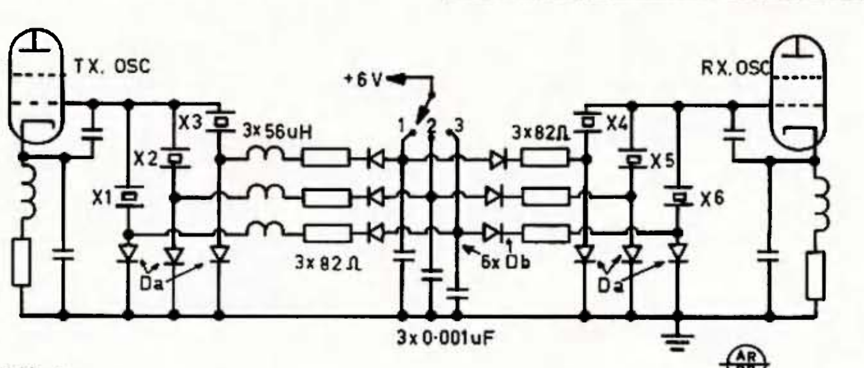

FIG. 8.

Switch Position 1—52.830 Mc.
2—53.032 Mc.
3—53.100 Mc.
Da—Germanium diodes from circuit boards.
Db—Silicon diodes from circuit boards.
X1—5900 Kc., FT243.
X2—5892.5 Kc. FT243.
X3—5870 Kc., FT243.
X4—5443 Kc., FT243 (for 1600 Kc. i.f.)
X5—5463.2 Kc., FT243 (for 1600 Kc. i.f.)
X6—5470 Kc., FT243 (for 1600 Kc. i.f.)

Unmarked components are original transceiver components.

Silver Plating of V.H.F. Inductances

A. S. LUNDY, VK2ASI*

Reference is often made to the use of silver plated inductances above about 50 Mc., but unfortunately the average Amateur has the problem of getting small "one off" jobs done.

VK2ASI has been plating his v.h.f. inductances for several years now since building a 2 metre a.m. portable rig for a field day. This rig used a final that required 3 mA. of grid current across a 15K grid resistor. Upon firing up the rig, the usual 2 metre problem arose—not enough grid drive. In fact, only 2 mA.! 1 mA. short. What to do? The inductances were wound with bare copper wire, so three coils were removed, one at 48 Mc., and two at 144 Mc. from the driver stages. These were silver plated and then installed back into the rig and, without any alterations to the circuit, except for a slight retune, 3 mA. of grid current was obtained. Success!—and now how to get it.

An essential requirement in silver plating is that the electrolyte used must contain a very low concentration of silver ion. A solution of silver nitrate for instance would be unsuitable, as all the silver would be present as silver ion. This would cause the silver plating to be non-coherent and it would flake off.

The electrolyte of choice is Potassium Argentocyanide solution. In this solution the argentocyanide ion is in equilibrium with only a very small amount of silver ion, hence the concentration of the silver ion $Ag+$ is low, nearly all the silver being present as argentocyanide ion $[Ag(cn)_2]$—.

To prepare the Potassium Argentocyanide solution dissolve 17 grams of silver nitrate in about 200 Mls. of distilled water or rain water, and 6 grams of sodium chloride in 100 Mls. of water. Upon mixing these two solutions, a white curdly precipitate of silver chloride will form and settle to the bottom as a coherent mass. Decant the excess water off and wash the precipitate twice by adding 200 to 300 Mls. of water and decanting.

The silver chloride is quite heavy and no trouble should be experienced in keeping it at the bottom while decanting. Add about 300 Mls. of water to the precipitate and leave where it will not be in direct sunlight or it will decompose.

Now dissolve 14 grams of Potassium Cyanide in 200 Mls. of water and add about three quarters of it to the silver chloride, most of which will dissolve. Add small amounts of the cyanide solution to the silver chloride with stirring until all the silver chloride has just dissolved. Dilute to about 1 pint which should be sufficient for most jobs. **The solution is extremely poisonous. All possible care must be taken with it.**

The work to be plated is made the cathode of the electroplating cell (negative voltage applied to it) and the anode is a piece of silver of at least 95% purity and about one inch square. A voltage of 6 to 12 volts at a current of 1 to 2 amps. is required, depending on the size of the object being plated. Too high a current will cause an effervescence at the work and the silver plating will be porous and will rub off. If this occurs, the current must be reduced either by lowering the voltage or if this is fixed (I use a battery charger) by increasing the distance between the work and the anode.

Silver ions are discharged at the object being plated, while cyanide ions are discharged at the silver anode. These combine with the silver to form silver cyanide which then dissolves back to potassium argentocyanide. This means that the electrolyte never "wears out", silver is simply transferred from the anode to the work.

—···—

* 36 Otho Street, Inverell, N.S.W., 2360.

LEBANESE DX CONTEST

The Lebanese Amateur Radio Association (R.A.L.), in co-operation with the Lebanese Ministry of Tourism, Middle East Airlines Air-Liban, and the Cadmos Hotel, announces a special DX Contest commemorating its 20th Anniversary.

Contest Period: 0001 GMT, 4th October, 1969, through 2359 GMT, 12th October, 1969.

Procedure: An OD station may be worked only once per band for credit (c.w. or phone), but may be worked on additional bands for additional point credit.

Points: Contacts from Europe, Africa, and Asia count one point on 10, 15 and 20 metres; two points on 40 metres; and three points on 80 metres.

Contacts from North and South America, Oceania, and Antarctica count two points on 10, 15, and 20 metres; four points on 40 metres; and six points on 80 metres.

Scoring: Final score is the total of points on all bands.

Logs: Submit list of contacts with date and time in GMT, band, and points claimed to: R.A.L., P.O.B. 1217, Beirut, Lebanon. Mailing deadline is 1st November, 1969.

Prizes: Grand prize of air tickets for two to Beirut from any point on the M.E.A. route plus a free double room at the Cadmos Hotel in Beirut for one week. Both good any time during the period 1st March through 31st August, 1970.

The high scorer on each continent will be awarded a silver cup, and the high scorer in each country and U.S. call district will be awarded a special certificate.

Design of a Three-Band Beam for 28, 21 and 14 Mc.

B. SYKES, G2HCG*

EXPERIMENTING with antennae can be lots of fun, but when the final design must be suitable for mass-production and eventual use in all parts of the world, in all climatic conditions, the fun element tends to disappear. Nevertheless, the story of the problems involved and the methods used to achieve final success can still provide entertainment especially as, regardless of the amount of laboratory work involved, the final tests must be "on the air".

REACTANCE COMPENSATION

The basic objective was to produce a three-band beam with a performance on each band as good as a single-band beam. As always with antennae designs, the objective appeared to be quite impossible. A correctly designed single-band beam can be expected to operate satisfactorily throughout the whole of any one band with a possible exception of 10 metres. The match will normally fall off at the edges of the band, but even this can be compensated for on a single-band beam by suitable reactance compensation.

Briefly, reactance merely means the effect of mis-tuning, and normally if, for example, a dipole is operating h.f. of resonance it will have an inductive reactance, namely it will look like an inductance. Similarly, if the dipole is l.f. of resonance, it will have a capacitive reactance. Now all that is necesesary to bring the dipole back on tune is to apply the opposite amount of reactance and, if this reactance can be made to vary with frequency inversely to that of the dipole, then it is possible to provide compensation and the antenna remains on tune over a much larger bandwidth than normal.

These principles of reactance compensation may be applied quite simply to single-band beams by the use of stubs, etc., but the possibilities of reactance compensation on a multi-band beam seem almost impossible and, in fact, most designs of multi-band beams have a considerably narrower bandwidth on any one band than an equivalent single-band beam.

TRAP DESIGN

Trap design is the fundamental in all multi-band beams and trap performance may be divided into two parts. Firstly, the characteristics at resonance where a high degree of isolation is required, and, secondly, but possibly a more important characteristic and one which is so often ignored, namely, that of trap performance on the bands other than the resonant frequency.

With the thought in mind that it might prove possible to provide a measure of reactance compensation by means of the off-resonance characteristics of traps, various trap configurations were considered. The normal type of trap using a resonant coil and capacitor has reasonable characteristics at resonance, although the bandwidth tends to be inadequate. The performance on other than the resonant band, however, left very much to be desired and, far from providing reactance compensation, this type of trap was making the situation worse, resulting in very limited bandwidth characteristics of the antenna as a whole. Consideration was then given to the use of a quarter-wave stub, but although the resonance characteristics appeared to be improved and a better bandwidth could be expected, the off-resonance characteristic was still the opposite to that required for successful reactance compensation.

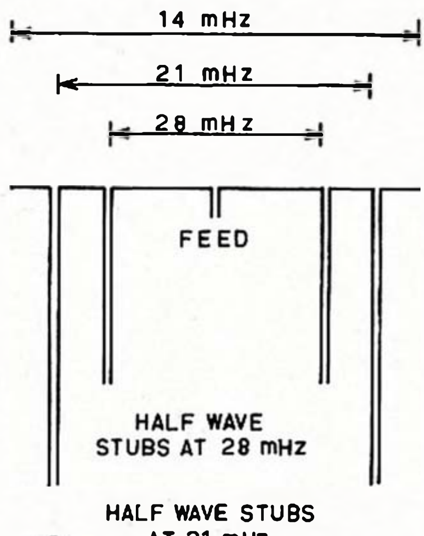

FIG. 1

The project of a no-compromise beam nearly foundered at this point and designs were actually in hand for a standard type of three-band beam using well known principles of trap design. Little enthusiasm existed for this antenna as not only did it not meet the specification, but it offered no more than existing commercial designs.

USE OF HALF-WAVE STUB

The usual British winter weather took a hand here and kept the laboratory antenna testing staff indoors with little to do but think, and suddenly the thought arose: why not try a half-wave open stub as a trap? Consideration of the theoretical aspects of this idea showed considerable promise, not only that bandwidth would be adequate at resonance but reactance swing appeared to be in the correct direction at last to provide compensation against the reactance swings of the antenna alone.

Theory indicated therefore that reactance compensation was possible, but to achieve an exact balance in practice was quite another thing. Calculation of the reactance characteristics of the half-wave stub was no problem whatever, but calculation of the feed characteristics of even a three-element yagi borders on the use of computer techniques and some practical work seemed to offer a far quicker solution.

Tests on full size antennae at 14 Mc. are expensive and time-consuming and the results, bearing in mind the proximity of the ground and nearby objects, are unlikely to be reliable and repeatable. Tests were therefore carried out at 10 times the operating frequency, namely at 140, 210 and 280 Mc. On these frequencies, using a sweep generator, it proved possible to display on a cathode-ray tube screen the complete matching characteristics of the antenna on all three bands simultaneously and thus, not only would it be possible to see the effect of adjustments of the traps at their resonant frequency, but also the effect on the other two bands.

It proved possible to produce a highly efficient three-element yagi operating on 140, 210 and 280 Mc. and measurement of the bandwidth in practice showed that reactance compensation had indeed been achieved on the two lower frequency bands, but not at the highest frequency. The reason for this is of course that, at the highest frequency, namely 280 Mc., the 280 Mc. trap is behaving correctly as an open circuit and to all intents and purposes, the rest of the antenna does not exist. On 140 Mc., however, both the 210 and 280 Mc. traps are in series with the antenna elements although they are not resonant at 140 Mc. The off-frequency trap compensating properties therefore operate and the match obtainable on the final antenna at 14 Mc. was almost too good to be true: in fact better than 1.1/1 from 14.0 to 14.4 Mc. At 21 Mc., there is still compensation from the 28 Mc. trap which is in circuit but of course off-frequency, and although the match is not as phenomenally good as on 14 Mc., there is still coverage of the entire band at better than 1.5/1. On 28 Mc., there is no reactance compensation since, as previously stated, the traps have shut off the rest of the antenna, but nevertheless it has proved possible to obtain a match better than 1.6/1 from 28.1 to 28.7 Mc. Fig. 1 shows the schematic of how the three-band dipole finally looked using the half-wave traps.

MECHANICAL DESIGN

The next problem was one of mechanics on how to accommodate this type of trap to a practical waterproof design. The necessary properties are strength, lightness, resistance to weather and good electrical power factor. No one material is capable of providing all these properties and it proved necessary to use fibre-glass for strength and lightness together with polythene for insulation and good power factor.

The half-wave stub was composed initially of 72 ohm flat-twin trans-

* J Beam Engineering Limited, Northhampton, England.

mission line and attempts to place this loosely inside the radiator tube were doomed to failure due to uncontrollable capacitive effects. It was, however, found that the half-wave stub could be wound into the form of a coil without adversely affecting the electrical properties. Unlike a coil, however, there was no large external field, in fact the winding could be on metal with little effect, or it could be inside a metal tube without the adverse effects which occur when a normal coil is placed inside a close-fitting screening can.

The fact that the stub could be placed inside a tube led to the obvious conclusion that the best place for it was inside the antenna elements and the final configuration is illustrated in Fig. 2, where there is complete protection against the weather for the stub and the strength of the join is provided by the fibre-glass joint piece.

wavelength at 20 metres, giving a boom length of some 16 feet and a spacing on 15 metres of 0.185 wavelength, and on 10 metres of 0.25 wavelengths.

The increase on spacing on the two higher bands is particularly advantageous in this design since, on 20 metres where spacing is closest, there are two traps in use to provide reactance compensation, and on 15 metres, where the effective spacing is larger requiring less compensation, there is only one trap in use, and on 10 metres, where no reactance compensation is possible, the spacing is effectively quarter-wave and a three-element quarter-wave spaced beam has a dipole feed impedance of virtually 50 ohms with no problems.

The question of a balun was then considered, and although it proves very difficult in practice to measure the difference between antenna with a balun and one without, the no-compromise thoughts definitely dictated the use of a balun, if only to reduce t.v.i. problems due to radiation from the feeder. The only possible type of balun which would not upset the careful impedance balance which had been achieved was a non-resonant device and design was finalised on the modern ferrite-ring balun which could easily be incorporated in a waterproof connector box.

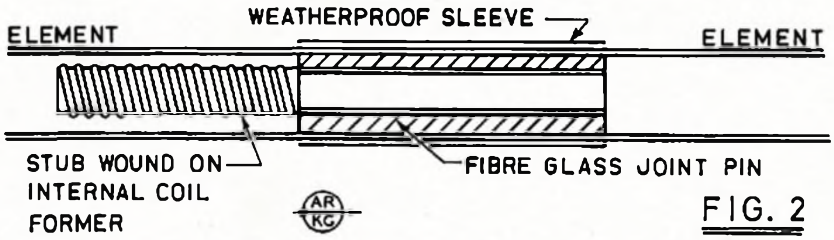

FIG. 2

The mechanical considerations of the final design now had to be considered. A half-wave element on 20 metres is quite simply and logically 10 metres long and the no-compromise design of the traps meant the dipole would in fact be half a wave long, namely 33 feet. This length of element has to be supported in the centre and, assuming it to be made from 1" diameter tubing, the total area is just under 3 square feet. The wind pressure at 100 m.p.h., allowing for the circularity of the elements, is 25 lbs. per square foot, and thus a 1" element at 20 metres will have to be designed to withstand 75 lbs. of wind pressure.

The total wind pressure on a three-element array including the cross-boom will be approaching 300 lbs. The obvious method of reducing these stresses is to taper the element, thus reducing wind pressure on the tips where leverage is greatest. Cost considerations dictate that the taper must be in the form of steps and it is convenient on a three-band beam to step the element size down at the point of insertion of a trap. Total wind pressure by this means is reduced to approximately 200 lbs. at 100 m.p.h., but even so, to provide an adequate margin of fatigue resistance, a 2" boom is essential.

SPACING AND FEEDING

On 20 metres, a spacing of one-eighth wavelength results in a reasonable sized antenna, but due to the close spacing, the Q is high and the provision of adequate bandwidth and match is very difficult. With reactance compensation, however, the high Q of the close-spaced beam proved to be an advantage as is shown by the almost perfect match obtainable throughout the 14 Mc. band. It was therefore decided to standardise on a spacing of one-eighth

A word of warning is perhaps appropriate here in that one particular type of ferrite strongly recommended in magazines proved to have utterly unacceptable losses which appeared in the form of heat and a rising mis-match when power was applied to the antenna. Investigations had to be undertaken into the properties of ferrites and the correct type for this particular application was finally found and both the traps and the balun will withstand continuously 1 kw. of c.w.

GAIN ACHIEVED

Tests of short distance free-space gain showed that the theoretical maximum of 5.8 db. over a single dipole was achieved and it is interesting to wonder how some quoted gain figures for three-element beams of 8 and 10 db. can possibly be justifed. The answer of course is in the DX gain of an antenna system which depends mainly upon angle of radiation, thus considerable advantages must accrue from the use of the beam which cannot waste power upwards, as with a long wire or dipole.

It is difficult, however, to justify any numerical statement of this DX gain, but there can be no doubt that it exists —in fact tests were carried out using a dipole as a standard of comparison. Locally, tests of gain between the beam and the dipole showed the theoretical beam gain of 5.8 db., but a daily sked with VK2NN, using instantaneous switching between the beam and the dipole, showed a consistent 3 S points improvement with the beam and this was repeated on similar skeds with WA8BBN. Three S points is 12 to 18 db., which is quite impossible to achieve from a three-element beam, but this amount of DX gain quite definitely does exist.

Since this initial design was a three element to cover three bands, it was decided to name it the Triple Three, with the possibility of a family of Triples reaching to Triple Fours and Triple Sixes in the future. Doubts exist on whether it will be possible to achieve the same amount of reactance compensation with a 4 and 6 element beam and in any case, lots of headaches are in store from the mechanical standpoint in that a six element must have a wider spacing than one-eighth wavelength with consequent problems in boom design which will undoubtedly need to be larger than the present 2", bringing in all the attendant problems in the design of new fittings.

Sincere thanks are due to VK2NN, WA8BBN and G3OUJ for their patience in providing the other end of the final test range, where business became pleasure.

— . . . —

PROVISIONAL SUNSPOT NUMBERS

MAY 1969

Dependent on observation at Zurich Observatory and its stations in Locarno and Arosa.

Day	R	Day	R
1	90	16	121
2	77	17	124
3	70	18	117
4	73	19	120
5	88	20	123
6	71	21	163
7	57	22	178
8	87	23	198
9	81	24	205
10	100	25	182
11	125	26	177
12	149	27	145
13	155	28	136
14	169	29	88
15	146	30	54
		31	50

Mean equals 120.0.

Smoothed Mean for November 1968: 110.0.

—Swiss Federal Observatory, Zurich.

TRANSISTORS

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MT. WAVERLEY,
VIC., 3149.

Modifications to the No. 10 Crystal Calibrator to use 3 Volt Filament Supply

P. DAW, VK2AGJ*

The diagrams show the power supply I used and the modifications made to the No. 10 Crystal Calibrator to operate it from 3 volts d.c. filament supply.

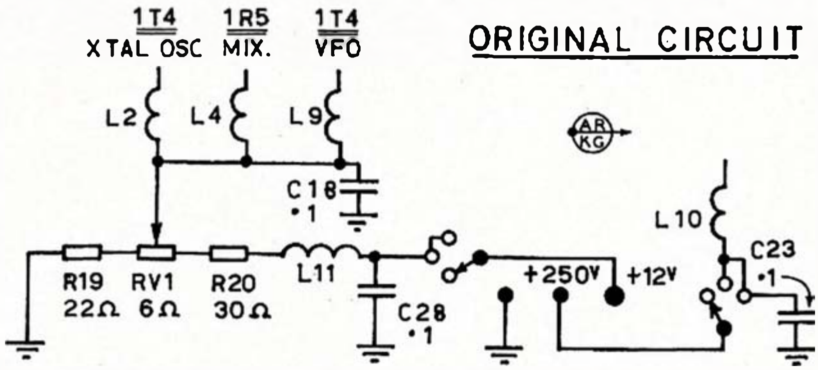
The most difficult part of the job is disconnecting R19 from the earth lug. I used needle nosed pliers and carefully bent the wire back and forth where it was soldered to the lug until it broke. Then I lengthened the resistor pigtail by soldering a wire to it with a small iron and insulated the lead with spaghetti tubing. I removed the screw holding the solder lug and mounted a piece of bakelite under it which extended to the large hole alongside.

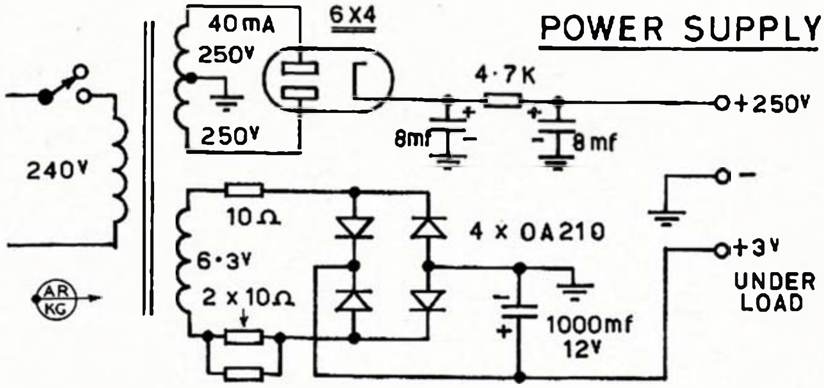
An eyelet was placed in the bakelite and centered in the hole so that it would not short to the chassis and the pigtail of R19 soldered to this. An insulated link connected to points 1 and 2 (L11 and L2) completed the modification.

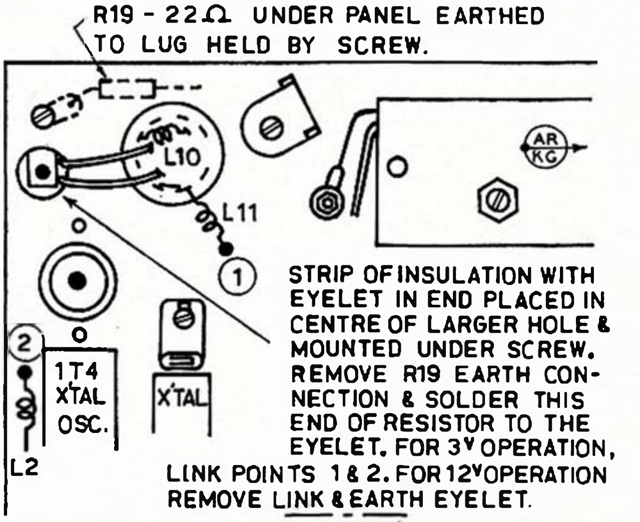
Three volts positive is applied to the large pin on the front panel instead of 12 volts.

The power supply showed slight hum when using the calibrator, but was not excessive. A larger capacitor in the l.t. filter would probably improve matters.

* "Woodlands," Wombat, N.S.W., 2595.







PART REAR VIEW OF No 10 XTAL CALIBRATOR

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1969-70

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I.A.R.U. REGION III. NEWS

The W.I.A. Director, John B. Battrick, VK3OR, has written to all Region III. Amateur Societies inviting them to join the Association. A complete outline of suggested activities with a copy of the interim constitution, provides a complete picture to the Region III. Association.

I.T.U. CONFERENCE

The agenda for this conference was listed in the August issue of "A.R." and the I.A.R.U. Hdqrs. have stressed that it is important for I.A.R.U. Societies to contact their telecommunication officials to allow a mutual exchange of information.

The Region I. I.A.R.U. conference, as reported below, wish to achieve a mutual aim of expansion of Amateur space privileges generally for frequencies above 28 Mc. The reason for wanting this clarification is that I.T.U. regulations state that Amateur space activities shall be permitted between 144 and 146 Mc. This has been interpreted by some administrations as prohibiting activity on other frequencies.

I.A.R.U. and Region I. feel that Amateur space communication (satellites and moonbounce) should be permitted in all bands above 28 Mc. It should be the aim of all Societies to take up their question with their administrations, whether the result is a series of permissive footnotes to each Amateur band involved, or a change in the definition of the Amateur Service as contemplated by U.S.A.

At the proper time Headquarters will apply to I.T.U. for admission of the International Amateur Radio Union to the Conference in observer status. Observers from U.K., France, U.S.S.R. and U.S.A. are likely to be present as members of their respective delegations.

REGION I. CONFERENCE

During the week of May 4-10, Region I. Societies met in Brussels and discussed matters of reciprocal licensing, Amateur Radio in developing countries, intruder watch and representation at the forthcoming space conference.

1970 will be the first year of a new system whereby one of the European contests (e.g. W.A.E.) will be the nucleus of a larger DX contest sponsored in the name of Region I. The **Radio Sports Federation** of the U.S.S.R. offered to provide the major trophy.

A world-wide set-up of 10 and 15 metre beacons was endorsed by the Conference. G2BVN is co-ordinator.

Promotions programmes will be undertaken to create a widespread interest of Amateur Radio among citizens of developing countries.

NEW MEMBER FOR REGION III.

The Western Samoa Amateur Radio Club has been approved by Member Societies of the I.A.R.U. The Secretary is Ron F. Seager, P.O. Box 498, Apia, Western Samoa.

Call Signs in the Territories

Federal Secretary,
Wireless Institute of Australia,
Box 2611W, G.P.O.,
Melbourne, Vic., 3001.

Dear Sir,

As you know, amateur radio stations licensed for operation in the Territory of Papua-New Guinea and other external territories other than Antarctica have hitherto been assigned call signs prefixed by the letters "VK" followed by the numeral "9" and two or three other letters of the alphabet.

As a result of a review which was made recently of the call sign position in the areas concerned, it has been decided to re-arrange the "VK9" series to provide distinctive call sign groups for each of the territories in question.

Accordingly, as from 1st July, 1969, full privilege amateur stations authorised for operation in the territories concerned will be allocated call signs from within the particular group set aside for the area in question as indicated hereunder:

(a) Papua-New Guinea—
VK9AA — VK9MZ
(b) Norfolk Island—
VK9NA — VK9NZ
(c) Christmas Island—
VK9XA — VK9XZ
(d) Cocos Island—
VK9YA — VK9YZ
(e) Other territories under Australian jurisdiction—
VK9ZA — VK9ZZ

Call signs for limited amateur stations will be allocated on the same basis except, of course, that the suffix letters will be preceded by the letter "Z".

Notwithstanding the abovementioned alterations in call sign arrangements, however, in view of the significance which many amateur station licensees attach to call signs, particularly in cases where they have been employed for a long period, no licensee will be required, at this stage, to forego an existing call sign which does not conform with the new allocation plan unless he makes a specific request for such a change.

It would be appreciated if you would be good enough to arrange for information concerning the abovementioned matters to be included in your monthly journal, please.

Yours faithfully,
C. Carroll,
for Director-General.

— . . . —

JAMBOREE-ON-THE-AIR

Most Amateurs are aware that this event is to take place world-wide over the week-end of 18th and 19th October.

Have you thought of setting up a link station in a Scout Hall? VK3ASC expects to operate, over the whole 48 hours if more volunteers come forward, from a Scout Hall in the Heidelberg district. Any Amateur from the Heidelberg district who can offer assistance will be welcome and should contact Syd VK3ASC on 45-3002 (after 6 p.m. most evenings) or 69-0300 ext. 200.

"Said the Spider in the Sky"

(Continued from Page 9)

orient the steerable antenna within ±12.5 degrees (capture angle) of the line-of-sight signal received from the earth. Once the antenna is positioned within the capture angle, it can operate in the automatic mode within the limits of its gimbal mount.

In flight, two omni-directional S-band antennas can be used; one forward, one aft on the LM. The radiators are right-hand polarised helicals that collectively cover 90 per cent. of the sphere at —3 db. or better. As mentioned earlier, there is also an erectable 10-foot parabolic surface reflector that is unstowed from a side compartment of the descent stage after landing.

The two v.h.f. inflight antennas are also omni-directional right-hand circularly polarised radiators. An 8-inch conical monopole with 12-inch radials is used between the LM and the spacemen equipped with the PLSS. The monopole is mounted on the top of the LM and is erected by an astronaut after landing the LM.

Summing up the communications system aboard the Lunar Module, it might be said that flexibility is the by-word, for in nearly every respect, redundancy of function has been "engineered-in".

Without waxing too poetic, it might be said that despite the superficial ugliness of America's "Spider in the Sky", its real beauty "lies in the harmony of man and his industry" that it represents.

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AMATEURS LOCATE MISSING AIRCRAFT

On Thursday, 17th July, 1969, a light aircraft with five people on board was reported overdue. It had last reported its position as being near Ararat at about 2100 hours. The following morning a search aicraft spotted what appeared to be wreckage approximately three-quarters of a mile south west of the television transmitting tower at Lookout Hill in the Mount Cole Range. The staff at the National television station were informed that it was possible the plane had crashed not far from the transmitting site.

Three local Amateurs figured prominently in the ensuing search, these were: The Officer in Charge of the National Station, Harvey Lelliott, VK3ZG; staff members, David Giles, VK3ADS, and Neville Maddern, VK3AAQ.

After a discussion at the station, the O.I.C. decided that, as it was unlikely that there would be any search parties operating in the area for some time, a search could be instituted using station staff. Using VK3ADS' car equipped with 2 metre f.m. equipment, VK3ZG and VK3ADS set off for the probable crash site.

Before leaving, they had carefully studied a map of the area and worked out, with astonishing accuracy, the probable position of the wreckage. VK3AAQ, in Ararat, was contacted by phone and requested to make radio contact with VK3ADS. Within five minutes of receiving this request, contact was made between the two mobiles and once it was ascertained that the contact could be maintained in the search area, the Ararat Police were advised that VK3AAQ was in radio contact with a search party. At this stage, the Police had cars moving towards the area but advised that the spotter plane was not certain that what he had seen, was, in fact, the missing plane.

Approximately half an hour after the initial contact, VK3ADS reported that they had located the wreckage and that two bodies had been found. VK3ZG remained with the wreckage and continued the search for the missing people while VK3ADS drove back to the main mountain road to direct Police and rescuers to the scene as well as marking the route to be followed for any late arrivals. VK3AAQ, meanwhile, notified the Police by phone the details thus far, which they were then able to pass on to their cars which had still not arrived at the area. Contact was maintained between the two Amateur Stations until the Police arrived and established that they could maintain radio contact with the Ararat Police Station from the scene of the accident. The Amateurs' job was then completed and both stations closed down.

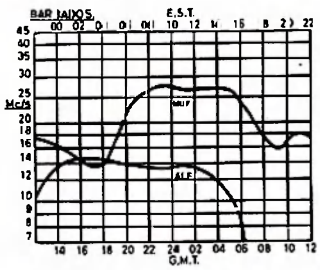
At this stage it should be pointed out that, although the traffic was carried by two Amateur stations, there were two other stations standing by ready to play their part if required. These two were Stan VK3SE at Ballarat and Ted VK3ZQA in Ararat.

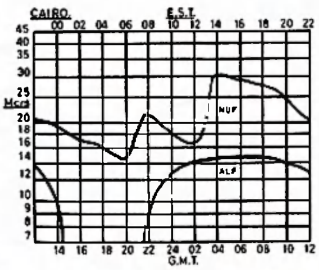
The operation went off very smoothly and should be worthy of recording that once again Amateurs were ready and able to provide communication when the need arises.

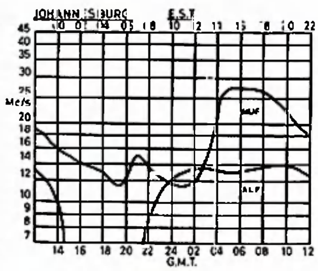
Perhaps it should also be mentioned that the Amateurs' participation was entirely on their own initiative, they were not requested to render help by any authority. Just how much time they saved the authorities is difficult to gauge, but as there was no communication between spotter plane and ground parties, it is quite possible that several hours could have been saved. Had anyone survived the crash, this time could have meant the difference between life and death. By the time Police and rescuers arrived at the scene, VK3ZG had located two more bodies and VK3ADS then located the fifth and final victim. The part played by VK3ADS and VK3ZG must surely be worthy of recognition, but anyone who followed the press and radio coverage, would not have known the part these two, and Amateur Radio, played in the drama.

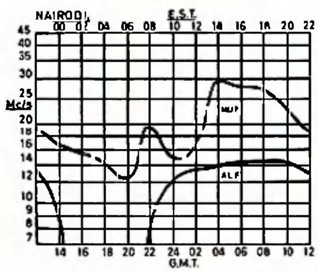
PREDICTION CHARTS FOR SEPTEMBER 1969

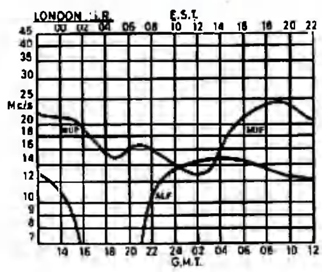
(Prediction Charts by courtesy of Ionospheric Prediction Service)

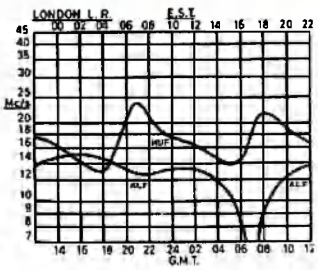


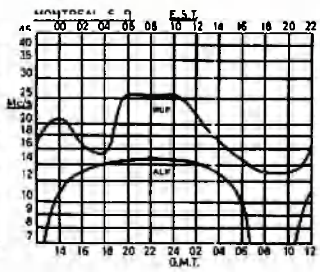


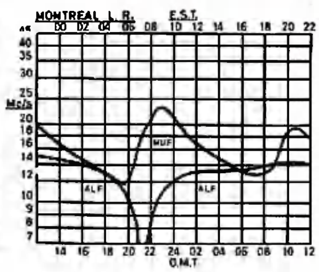


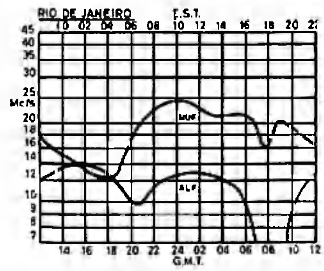


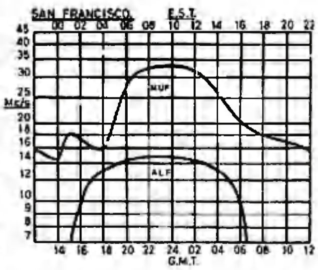


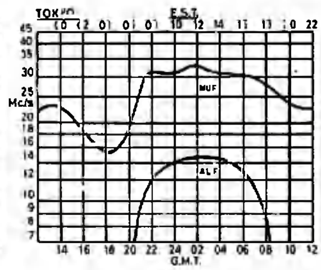


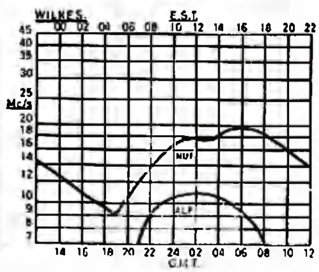












New Equipment

PIC RF SWITCH

Switching of r.f. power can now be done quickly and safely, with minimum losses, by using the latest system of r.f. power transfer, the Pic Polyswitch, now available from Bail Electronic Services. Designed for higher load-carrying, they are capable of handling 1 kw. a.m. or 2 kw. p.e.p. Of ceramic construction with silver plated contacts, these switches are sealed against dust and are easily mounted; will take standard PL259 co-ax. connectors. Two models are available, the PS750, single pole, 5-position switch, and the PS752, single pole, 2-positions.

Further information may be obtained from Bail Electronic Services, 60 Shannon St., Box Hill North, Vic., 3129.

EDDYSTONE EC10 RECEIVER

R. H. Cunningham Pty. Ltd. have released the latest product from Eddystone, the EC10, transistorised communications receiver. Designed for commercial and Amateur use, the EC10 is fully transistorised, of compact dimensions and is light in weight. Five frequency ranges provide continuous coverage from 550 Kc. to 30 Mc., including the broadcast band, marine band from 1500 Kc. to 3000 Kc., and six Amateur bands from 160 metres to 10 metres.

Features include built-in speaker, b.f.o. and a flywheel-loaded tuning knob controls a gear drive with a reduction ratio of 110 to 1. Power is derived from six U2 type batteries housed in a separate detachable compartment. An alternative a.c. power supply is available if required. Housed in a metal cabinet, the EC10 is of robust construction and finished in an attractive two-tone grey. A fully illustrated technical brochure is available on request. List price, $179.40 plus sales tax where applicable. A.c. power supply extra.

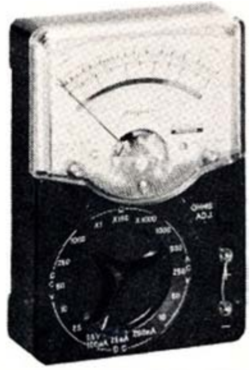
Further information from R. H. Cunningham Pty. Ltd., 608 Collins Street, Melbourne, Vic., 3000.

A & R CATALOGUE

The new 1969-70 A & R-Soanar Group catalogue of power supplies, transformers and chokes is now available. Comprising 26 pages of technical data and specifications, the catalogue features a wide range of transformers and chokes, with a detailed stock price list.

A section is devoted to power supplies which include precision and regulated types to meet applications for laboratory, commercial and Amateur use. The catalogue is available free and enquiries should be directed to A & R Electronic Equipment Pty. Ltd., 42 Lexton Road, Box Hill, Vic., 3128.

RAPAR MULTIMETERS



Available from Radio Parts Pty. Ltd. is a new range of multimeters to suit many applications for commercial and Amateur use. Branded Rapar, there are six models priced from $9.00 for the YT68A model, to $45.00 for the SK100, a full size meter fitted with a carrying handle. Specifications and other details are featured in Radio Part's advertisement elsewhere in this issue.

☆

CORNISH AWARD

This award is issued by the Cornish Radio Amateur Club for working stations in Cornwall, England in three classes.

European: Class I. 30 points; Class II., 20 points; Class III., 10 points.

Non-European: Class I., 15 points; Class II., 10 points; Class III., 5 points.

Each different Cornish station counts one point but same station worked on a different band also counts.

QSL cards need not be sent but log data must be confirmed by two licensed Radio Amateurs or by an officer of a National Radio Society.

C.H.C. all directory rules apply AOMB/M free disabled and B/P. Available to S.w.l's. Apply with G.C.R. and 5/-, $1 or eight IRCs to: Awards Manager, Ted Bowden, G2AYQ, "Albany House," Goonown, St. Agnes, Cornwall, England.

ADDITIONS TO BOARD OF DIRECTORS

Hy-Q Electronics, of Frankston, Vic., an independent quartz crystal manufacturer, has announced the following additions to their Board of Directors.

Mr. D. H. Rankin, M.I.E. (Aust.), A.M.I.R.E.E. (Aust.), has been appointed Technical Director.

Mr. Rankin, a fully qualified Chartered Engineer, has had a long association with a prominent crystal manufacturer as Chief Crystal Engineer.

He has travelled extensively and has attended many important Crystal/Frequency Symposiums in the U.S.

Mr. R. W. Taphouse has been appointed Manufacturing Director.

Mr. Taphouse was formerly Manager of the Crystal Division of a prominent manufacturer and has many years of experience overseas in the crystal manufacturing industry in a senior production capacity.

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CHASSIS HOLE PUNCH

A sheet metal punch that will cut holes in steel and aluminium up to 16 gauge is now available in a range of sizes for hole diameters from 3/8" to 1-1/4". Branded Q-Max, these metal punches cut cleanly and leave no jagged edges and will be found ideal for the hobbyist and Radio Amateur not equipped with a machine shop. Punches to cut square (11/16" and 1") and rectangular (21/32" and 15/16") are available also ex stock.

Further information from R. H. Cunningham Pty. Ltd., 608 Collins Street, Melbourne, Vic., 3000.

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W.A.V.K.C.A. AWARD

The following Amateurs have received this Award during the period 1/7/68 to 30/6/69:

Cert. No.	Call	Cert. No.	Call
337	ZL2NV	354	UB5KDS
338	JA7MA	355	ZL3RK
339	KR6TAB	356	JA2CZS
340	ZL3JU	357	JA2LA
341	UA0RV	358	JA1NDO
342	JA1FI	359	ZL1AMN
343	SM0ATN	360	GW4NZ
344	ZL1ON	361	WB6IUH
345	G4JZ	362	JA1OCA
346	OK1MP	363	JA1MIN
347	ZL2QK	364	VP7NH
348	JA2JKV	365	W4UAF/KH6
349	KR6KQ	366	UA3UJ
350	VP7NA	367	UB5MZ
351	JA1AKH	368	GM3CFS
352	VE5FO	369	K4AUL
353	DL1MD	370	JA6BEE

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VK S.W.L. D.X.C.C. AWARD

1.	WIA-L3042	Eric Trebilcock	1965
2.	WIA-L2022	Don Grantley	1965
3.	WIA-L3211	Warwick Smith	1966
4.	WIA-L4018	Chas. Thorpe	1966
5.	WIA-L5080	Ernie Luff	1967
6.	WIA-L3229	Bob Halligan	1967
7.	WIA-L6021	Peter Drew	1968
8.	WIA-L2283	Bob MacIntosh	1969
9.	WIA-L5088	Steve Reudiger	1969
10.	WIA-L3185	Brian Hannan	1969

(All enquiries to Eric Trebilcock (WIA-L3042), S.w.l. Awards Manager for VK, 340 Gillies Street, Thornbury, Vic., 3071.)

Overseas Magazine Review

Compiled by Syd Clark, VK3ASC

"BREAK-IN"

June 1969

The 663 H.F. Beam, ZL2ASJ. This beam operates as a six-element on 10 and 15, and as three-element on 20. It is a full-sized beam and the longest element is about 34 feet long. The boom is made from two sixteen foot lengths of 2 x 1½ inch oregon. Tuning for operation on the two higher frequency bands is accomplished by LC circuits inserted at the element centres and the switching is done by relays.

Simple Beam Rotator, ZL1AYT. A "handraulic" system rotated by leaning out the window to swing the beam around. The beam in this case being a 2 metre six over six skeleton slot type.

V.H.F. Antennas, ZL1TFE. Describes the usual types of v.h.f. beams and methods of matching.

All All-Band Transmatch, ZL1FS. The author means all h.f. bands.

The 21 db. Two Metre Sly Beam, ZL4TAH. This is a different type of long yagi and the name comes from "Suspended Long Yagi" because the beam is made up ladder fashion from aluminium tubing and artificial fibre cordage. It folds into a neat bundle for transport.

Home-Brew Hellwhip, ZL3QR. The interesting thing about this eight ft. helical whip is that it has a matching section at the bottom consisting of several 7-inch sections with the pitch of the winding diminishing from 2 to 1/8 inch before going into the close-wound section. The author claims this technique increases the impedance from about 20 to around 50 ohms.

Coupling the Co-ax. to the Antenna. Some interesting ideas for coupling the co-ax. and a dipole at the centre.

Tips on Tuning a Beam, W6BLZ.

The issue is completed by all of the usual features.

"CQ"

May 1969—

The front cover describes this as a "Special Surplus Issue". Do not give it away at this stage for what they mean is that it is especially devoted to the modification of Disposals equipment.

The ARC-5 Receiver Transmitter. W2DYR describes a phasing type s.s.b. rig for use on 7 Mc. He suggests others can be used for operation on 1.8 or 3.5 Mc.

A Q5er for the BC454. W3EAG describes how to use a BC453 as a second i.f. at 85 Kc. to give the faithful 3-6 Mc. BC454, with its 1415 Kc. i.f., greater selectivity.

Converting the No. 19 Sets, by W6JTT. This is an article I never expected to see in an American magazine. Apparently some British disposals has percolated onto the American market and in some quarters is highly prized.

Surplus British Electronics. W6JTT gives a good run-down on what is available from British sources and suggests how the best use can be made of it.

Putting the Raytheon 21TR11A F.M. Transmitter/Receiver on Two Metres, WA2DND. Lots of miniature tubes and an 832A.

Putting the URC-11 on 220 Mc., W3TFA. A small hand-held walkie-talkie type equipment for operation on our shortest v.h.f. wavelength.

Putting the Motorola R394/U F.M. Receiver on Two Metres. W6JTT must have a whole station made up from "surplus".

Re-inking R.T.T.Y. Ribbons, W2IDX. To think I always thought they used standard typewriter ribbons. That shows how much I know about r.t.t.y.!

Two Metre F.M. with the ARC-5, W2IAZ. The unit described here was never seen in quantity on the Australian market.

A Power Supply for the URC-4 and URC-11. Modern solid state circuitry to replace those accumulators.

The Galaxy GT-550 Transceiver, W2AEF. Wilf reviews a piece of equipment which is not yet surplus.

June 1969

A Two-Channel Converter for Apollo Reception, W6AJF. Perhaps there are a number of VK Amateurs who wish this had appeared a month before Apollo 11. Come on fellows, don't despair, there is still time to build one for No. 12.

The Pop Bottle Vertical, WA0EMS. The Amateur is noted for his skill in improvisation and WA0EMS makes a "Coca Cola" bottle into a re-useable.

Simultaneous Transmitter and Receiver Operation, W2EEY/1. A subject which should be dear to the hearts of all N.F.D. "multiple operator" teams. Or, so that's how to work three bands simultaneously.

A Current Sensitive Pilot Lamp, W1USM. A very sure way of indicating current flow. The transformer need not be so large of course!

An Improved 7360 Converter for 14 and 21 Mc. VU2JN. It uses two innovations in addition to the 7360. Ferrite toroidal coils and a front end "Q" multiplier.

Build Your Own Tilt Over Tower, WA7EMM. The author is a professional engineer and the article probably contains sufficient information to satisfy the local council. One of the best articles I have seen in recent times.

What's a Fortune Cookie, GM3BST. The story of his visit to the U.S.A. with the General Electric Company playing fairy godmother to John and Margaret Tuke reads as though he has been brain washed. Will someone please offer to brainwash me and my XYL in smilar fashion?

The Inverted Vee Contest Antenna, W3FQJ. Describes three "droopy dipoles" using one pole, one feed line and co-axial feed for operation on bands from 6 to 80 metres.

Said the Spider in the Sky, K4DSN. This is it men, it gives details of the communications systems used on trips such as that just completed by Apollo 11. It helped me answer questions from fellow workers and the kids at home.

"CQ" Review: The Heathkit SB-200 Linear Amplifier, W2AEF. Since these units are being sold in Australia this will probably interest quite a few.

"QST"

June 1969

The QRP 80-40 C.W. Transmitter. W1CER describes a small solid state rig for these two popular bands. Uses only three transistors, a zener diode and is crystal controlled. Another interesting point is that all the inductors are on toroids.

Aluminium Tubing—What Sizes are Available. W1CP lists the sizes of round (circular) aluminium tubing available on the American market in grade 6061-T6 (61S-T6) which is considered to be the best all round grade for use by Radio Amateurs and others for building antennas.

Cathode Ray Tube Display Unit for Satellite Weather Pictures, W7UGV. The picture reproducing system described here permits use of an ordinary camera for recording the slow-scan t.v. weather pictures transmitted by the Nimbus and Essa satellites. Relatively simple circuits are used, with horizontal synchronising controlled by pulses included in the picture transmission.

The Mainline TT/L-2 F.S.K. Demodulator. W8SDZ continues the article commenced in May issue of "QST". This demodulator will handle both 850 and 170 c/s. shifts.

1275/2125 C/s. Filters for the TT/L-2 F.S.K. Demodulator, K1PLP. In some of the pictures they look like the buns or "chignons" that the ladies prize so highly. He must have had a great deal of fun with his toroids.

Clean Up Your Harmonics, W1CP. Lew tells American readers how to stay out of trouble with the F.C.C. Since the American regulations are based on International agreement of standards, just as ours are, I suppose this will apply in Australia.

Three Innovations for Field Day, K6YNB. Take one lawn mower motor, one motor car alternator and a spare battery and your field day insurance is complete. Will supply in excess of 500 watts is the claim. No. 2 is a plywood construction to fit into the front seat of the car so that the equipment can be placed thereon and the log, etc., will be tilted at a convenient angle. No. 3 is a tilt-over tower for, in the writer's case, a two-element quad. Three very interesting articles although it appears to me that the generating system is unnecessarily clumsy with its vee belt drive. The tower idea also looks very practical and will appeal to anyone handy with tools. My personal problem is centred around three lengths of 2-inch conduit and whether or not I can get a flange to fit?

Recent Equipment—Galaxy GT550 Transceiver. An updated version of the Galaxy V, which was so popular amongst Australian Amateurs a few years ago. This new model gets away from the necessity to squint to read the dial and uses a pair of 6LB6 tubes in the final running 550 watts d.c. input on sideband peaks. The c.w. rating is lower at 360 watts. It would appear that the sections of this transceiver which are really new are the ones which are solid state because the receiver a.f. stages and the "pre-mixer" chains have gone solid state.

Easily Constructed Antennas for 1296 Mc., WA2VTR.

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In this issue is an article "Three Innovations for Field Day" and on page 53 a letter from W4JRU on the use of motor car alternators for field day use. At the risk of buying an argument with some better technically qualified person, I am going to suggest a somewhat different approach.

The average car alternator is a three-phase, high frequency device. W4JRU suggests about 180 c/s. at 2000 r.p.m. (The actual frequency can be worked out easily by counting the number of pairs of poles and multiplying by revolutions per second.) The battery is necessary to provide field excitation and it is probably indispensible. Were I to use one of these alternators for the supply of a.c. power to a transceiver taking about 500 watts, I would need to split the load into three so that each phase would be loaded about equally. The average transceiver power supply does not lend itself to an easy splitting of the load on a constant basis, but I feel sure that no harm will come to the alternator if it is connected so that filament power comes off one phase, receiver h.t. off the second, and transmitter e.h.t. off the third (on an intermittent basis).

One of our Australian television manufacturers builds his transformers of about 150 v.a. rating at 50 c/s., onto bobbins which are very easily rewound if you can find some in the "disposals" market. If you cannot find any of these, then I feel certain that the bobbins, core and clamp assemblies can be obtained from Anodeon Sales in your own State.

The use of these three separate transformers will permit you to make a power supply, especially for your field day activities, which is designed to take the voltages from a car alternator and transform them to the levels required by the various circuits in your transceiver. There does not appear to be any valid reason why the existing rectifiers in some cases and the filters in all cases cannot be used with this system.—VK3ASC.

"RADIO COMMUNICATION"

May 1969

A Simple Transistor Portable D/F and General Purpose 160 Metre Receiver, G3EDM. Direction finding has gained popularity in Essex through the regular D/F contests held in recent years by Chelmsford and Colchester Amateur Radio groups.

Technical Topics, G3VA, regular feature. Fast squelch with FET gate, adjustable voltage stabiliser, dual gate MOSFET pre-amp; t.v.i. round-up; simple crystal filter; recent equipment. It is perhaps worthwhile to pause awhile and note that details are now beginning to filter through on the Signal/One CX7—"Don't call it a Transceiver". Pat gives some brief details. Aerial tuning unit; the Delta Loop beam, and the round-up concludes with r.f. diode probe.

As Steady as a Rock. G3JGO continues his discussion of crystal oscillators.

A Digital Clock. G3PHG describes a digital clock made from relatively inexpensive components.

A Simple P.S.U. for the BC221, by G3MQT.

Transistors for Amateurs, by G3XIW.

A Roof Rack Fitting Top Band Mobile Whip, G3JBU. Titles are self explanatory on the three latter articles.

"SHORTWAVE MAGAZINE"

May 1969—

In this issue G2HCG, of J-Beam Engineering Ltd., describes the development of a high gain system for 10, 15 and 20 metres, in an article titled "**New Approach to Multiband Beam Design**".

This is followed by Part 2, Circuit details, general layout and construction, alignment and testing of "**Design for a C.W. Transceiver**".

The Eddystone 740 and 750 Receivers, by G3OGR follows. In this article the author gives helpful hints for those wishing to update these tube type receivers which are still capable of giving quite good performance in the hands of someone with a reasonable amount of experience and common sense.

The last article in the issue is **Linear Amplifier for Two Metres, by G3DAH.** Part 1 of the description of a linear using a pair of 4CX250s in p.p. This unit is designed to follow the author's transverter described in the July and August 1968 issues and to run the British legal limit of 600 watts p.e.p.

(continued next page)

"73"

May 1969

This issue is sub-titled "Antenna Spectacular."

Who's Who in Amateur Radio, W8GI. Celebrities in our ranks.

Stacked Gamma Matched Turnstile, WA9LPC. About 10 db. on two metres—omni-directional.

V.H.F. Vacation Special, W2ZRX. Two metre slot antenna from aluminium foil.

S-Unit Attenuator, WA5SWD. For calibrating "S" meters and measuring antenna gain.

In the Beginning, K1YSD. Not for serious Amateurs or heart patients.

Don't Kill Your Generator, W1EZT. Just wound it a little maybe!

Working DX Without Six Elements, K5PAC. Persistence and sneakiness substitute for power.

The Short Vee Antenna, W3FOJ. 10, 15 and 20 metre 56 ft. on a leg and it works. (Is this the G5RV?)

The Little Wonder, W5ZBC. 80-10 metre antenna—looks a lot like the Joystick.

Easy Tuning of the Quad, W4AZK. Multi-element quads can be difficult.

The Antennascope—An Effective Tool, by VE3CEA. It's okay if you know how to use it!

Two on Top, W6AJZ. 80 metre vertical which tunes both ends of the band.

Measuring Antenna Gain, W2EEY. You don't just look around for signal reports.

QRP a New World to Conquer, W6TYP. Where 1,000 watts is a full gallon.

Report on the Galaxy 550, W6AJZ. Great new transceiver, read all about it.

Feeding and Tuning Three-Band Quad, WA4VWY. Boomless Quad, novel approach, etc.

To Patch or Not to Patch, W5LHG. Here's the latest news on patching.

Direct Reading S.W.R. Indicator, K3WRW. Tired of switching back and forth?

Asymmetrically Feeding Long Wires, W2EEY. Strange things happen when you move the feed around.

Compressed Vertical for 160, W6FPO. If you have room for a 120 ft. tower, pass this by.

Class A Transistor Amplifier Design, WA5SWD. Seven steps to total and complete success. Probably.

$4.98 Novice Special, WA7CSK. Why spend more for a nice 15 metre antenna?

How to Fly Your Kite, EI4R. Simple 160 metre antenna for field day or expedition.

In Search of a Better Angle, K9YDE. Angle of radiation is of critical importance.

F.S.K. Exciter, W4LLR. Another bone for the r.t.t.y. fiends.

Telephone Beeper, W6BLZ. Handy gadget for the new phone patch laws.

KW. Dummy Load . . . Cheap, WB2PTU. Start using this instead of your antenna.

Mini-Bomb, W0SYK. Another of his little 10 kw. amplifiers, almost.

DX from DL Land, DL4BR. What it is like over on that end.

Phonetics for the Pile-ups, KH6IJ. How to get your call letters through the mess.

Extra Class Licence Course, by the Staff. Part 4 of the series.

Economy Chronometer, W0EDO. Some Amateurs are pretty cheap.

4X150 Sockets, WA3AQS. Another short-cut for the cheapskate.

All Band Curtain Array, VK4SS. 160-10 metre and only 112 feet long. (VK call signs do not often figure in the credits.)

How to Tune a Circuit, K5LLI. Figuring capacitance and parallel capacitance.

Mobile Antenna for Vacation Use, WB2WYO. Not much trouble and it works.

Plus all the usual features. There are plenty of articles but the quality appears to be slipping a little. Perhaps this is due to "73's" change of Editors.

June 1969

Last month we had an Antenna Special and this month it is a "V.H.F. Special". Some readers may be wondering where all the cryptic comments to "73" articles come from. I wouldn't know, but they are in the index.

New Ways of Generating Microwave Power, K3PBY. New solid state devices you should probably know about.

Modification of V.H.F. Transmitters for C.W. Operation, K1OYB. Moonbounce? Auroral DX? You may need to use c.w.

Mondo Hamme, K1YSD. Read slowly, this may be injurious to your health (mental).

Straightforward S.S.B. for Six Metres, by VE4RE. Build this little beauty next week.

The 432'er Solid State, K1CLL. Bill Hoisington gets you on 432 the fast, easy way.

Six Metre FET CONVERTER, W6RET. If you are still using tubes in your converter, reform.

Compleat A.V.C., W8RHR. Showing how much can really be done to improve a.v.c.

Leaky Lines, K2AGZ. Random thoughts by a random thinker.

Field Day Fever, VK4SS. Your field day should only work out as well.

A Field Day to Remember, W8BVU. Field day can be loads of fun, give it a try this year. This must have been his first.

Sunspots? Who Needs 'Em for Six Metre DX? K7ALE. Okay, so you can work 'em without sunspots, too.

Whipping Two Mobile, K6ZFV. Make your own whip for two metre mobile. Some handy tips on whips longer than lambda over four.

Design of U.H.F. Tuners using Silicon Transistors. Some good ideas for you u.h.f'ers.

How to Convert Your Receiver for Six Metres, W8RHR. Nice little converter for the 75A2 . . . or any other receiver.

Forty, Twenty and Two, WA8IYL. Nice simple vertical antenna using dielectric pipe unions.

A.T.V. Video Modulator, W6ORG. One transistor is all that it takes.

V.H.F., FET, More Of, K6KTP. Pre-amps. for 144, 432, etc.

Simple Scope for R.T.T.Y. Monitoring, W6JTT. Good news for all you r.a.t.t.s.

Curtain Rods Coat-hangers and Control Links, K9STH. V.h.f. and u.h.f. antennas from the closet.

Facsimile and the Radio Amateur, Part 2, K6GKX. Answers to questions about F.A.X.

Soft Solder Construction of Cavities and Lines, WA9VFG. Makes those v.h.f. machining jobs a cinch, almost.

Police Converter, K0VQY. Enjoy the thrills of listening to police calls . . . if it isn't illegal.

The Neglected Mini-Vee Beam, W0LBV. Small and it works like crazy on 10, 15 and 20. You read it here.

Modifying a Tube Converter for FET, W6OSA. Makes a great improvement and doesn't cost much.

A Variable Resistance V.F.O. for Six and Two, K9ALD. Transistors, p.c. board, and tuned from afar. Also very stable.

V.H.F. Bandscanner, WA8OIK. Watch the v.h.f. bands with the ALA-10.

Simple Converter for Slow Scan T.V. and Facsimile, W2LNP. Ridiculously simple, if you want to know. Let's get going.

Confessions of an Appliance Operator, W3ETQ. How to ad-lib in spite of the state of the art.

AMATEUR GETS JAIL SENTENCE

"QST" reports an event that should be a warning to any ill-inclined Radio Amateurs.

In November, in Bowling Green, Kentucky, K4KHE was convicted on seven separate counts of transmitting obscene, indecent and profane language on Amateur frequencies. The case had been investigated by the F.C.C. and the F.B.I. K4KHE was fined $100 on each of the seven charges, totalling $700. He was also sentenced to six months in jail on each count, each period to run concurrently.

Two other Kentucky Amateurs, WB4AOE and W4EBG, were convicted for similar reasons. They received three months suspended sentence each, and they are on probation for two years. They were also fined $100 each.

"QST" also reports that ex-WN6PNZ, of Hollywood, California, has been denied an Amateur licence due to consistent past violations of F.C.C. rules.

VICTORIAN DIVISION, W.I.A.

V.H.F. CONVENTION

will be held on

SATURDAY and SUNDAY, 11th and 12th OCTOBER, 1969

at

MOONDARRA RESERVOIR

near MOE, Gippsland

Meals, Accommodation and Registration, approx. $5 each.

Trade Displays, Fox Hunts, Scrambles, Lectures, Bus Tours—the lot as usual.

Further Information Convention, P.O. Box 36, East Melbourne, Vic., 3002

VHF

Sub-Editor: CYRIL MAUDE, VK3ZCK

2 Clarendon St., Avondale Heights, Vic., 3034

Not much news at this time of the year. The most interesting to date is special prefix that has been allocated to us for next year, although primarily for operators on the lower frequencies they can be used by Limited licensees if they so desire. As yet no form of award has been decided upon for v.h.f. operators, it is still possible that one could be made.

Heard on the grapevine that VK3 may have a two metre beacon later on this year and it is completely solid state. 73, Cyril VK3ZCK.

VICTORIA

In a recent two metre scramble on a cold Sunday night, 26 stations were heard exchanging numbers; for this time of the year it is a large gathering. Unfortunately on cold nights contacts can be hard to obtain.

A variation in scoring is being made in the form of a handicap for those who have won a scramble in the past couple of months. It is hoped that this new system will give more incentive to those who have the attitude "I won't bother taking part as I have not got a hope". Full details will be announced on the Sunday broadcast on the Sunday of the scramble.

The VK3 V.h.f. Group holds its monthly meetings on the third Thursday of each month at 2000 hours E.A.S.T. and visitors are always welcome. Fox Hunts are held on the Friday of the week following the Group meeting. Scrambles are on the second Sunday of each month.

During the summer months Field Days are held at frequent intervals. The dates of the forthcoming Field Days are: Sunday, Oct. 26; Sunday, Nov. 16; Sunday, Dec. 14; Thursday, Jan. 1; Sunday, Jan. 25; Sunday, Feb. 15; and Monday, Mar. 30.

The V.h.f. Group will hold its 1969 Convention over the week-end 11th and 12th October at the Moondarra Reservoir, near Moe in Gippsland. Further details appear elsewhere in this month's "A.R."

AROUND AND ABOUT

The VK7 two metre beacon VK7VF, which is located at Devonport, Tasmania, is again operating on 144.9 Mc. after having repairs and maintenance completed. The beacon transmits its call sign in m.c.w. and has a power input of 15 watts to a QQE03/12, which is loaded by a pair of big wheels.

John VK3TN, ex VK5HP, is contemplating building a 10-foot diameter dish to use on 1296 Mc. John is planning to join the many others who have already operated on this band and those planning equipment.

The Christchurch, New Zealand, beacon is on 145.0 Mc. and runs 20 watts input to a QQE03/20 and, like all ZL beacons, uses the suffix VHF. Christchurch has a two metre translator, input frequency of 144.65 and an output frequency of 145.775 Mc. and is designed for amplitude modulation.

Proposed ZL f.m. net frequencies are 145.8, 146.0 and 146.2 Mc., with a maximum deviation of plus or minus 6 kc., polarisation vertical.

An interesting article in the W.A. V.h.f. Group Newsletter is about a system of cathodeless valves using Thorium 234 as the electron source.

The above information was gleaned from various magazines and newsletters.

W.I.A. 52 Mc. W.A.S. AWARD

Cert. No.	Call	Additional Countries
	New Member:	
85	VK4VX	-
	Amendments:	
26	VK4ZAZ	8
50	VK2ASZ	3

RE LOG BOOKS

A query raised at Canberra as to the length of time it is obligatory to keep a log book has been answered by the Department as paraphrased.

The log book showing the record of transmissions should be available for inspection 12 months from the date of the last entry.

NEW CALL SIGNS

MAY 1969

VK1AR—A. S. Radford, 50 Gouger St., Torrens, 2607.
VK1ZEB—E. J. Barnes, 26 Dennis St., Garran, 2605.
VK1ZVT—D. S. Thomas, 5/17 Devonport St., Lyons, 2606.
VK2AU—J. B. Thomas, 81 Hanbury St., Wentworthville South, 2145.
VK2CA—R. M. Harnett, 40 Hermitage Rd., West Ryde, 2114.
VK2DG—A. J. Gillham, 34 Neerim Rd., Castle Cove, 2069.
VK2EV—J. R. McArthur, 136 Brighton Ave., Toronto, 2283.
VK2OA—N. S. Hill, 14/749 Pittwater Rd., Dee Why, 2099.
VK2SB—R. W. Chaplin, 40 Charlton St., Nambucca Heads, 2448.
VK2BAR—B. A. Ritchie, 97 Deutcher St., Temora, 2666.
VK2BBJ—A. D. Swinton, 547 Pennant Hills Rd., West Pennant Hills, 2120.
VK2BGR—G. J. G. Smith, 18 Macassar St., Cowra, 2794.
VK2BIN—I. T. Nance, 34 Spruce St., Blacktown, 2148.
VK2BLG—L. Grimshaw, 28 Cliff Rd., Collaroy, 2097.
VK2BLM—L. Morrison, 3 Evans St., Peakhurst, 2210.
VK2BMD—M. A. Du Feu, 34 Ivey St., Lindfield, 2070.
VK2BNL—L. J. Yates, 26 Bulwarra Rd., Eleanora Heights, 2101.
VK2BPV—P. J. Vernon, 10/7 Gilbert St., Dover Heights, 2030.
VK2BPW—P. G. Wickenden, 115 Victoria St., Lewisham, 2049.
VK2BSI—S. G. Riley, 36 Teviott St., Richmond, 2753.
VK2BSN—N. A. Spratt, 1 Ventura Ave., Miranda, 2228.
VK2CAS—A. G. Svenson (Sqn. Ldr.), 53 Cox St., Windsor, 2756.
VK2ZHG—H. J. Ferrall, 338 Moore Park Rd., Paddington, 2021.
VK2ZKC—K. M. Cunningham, 55 Marshall St., New Lambton Heights, 2305.
VK2ZLU—L. A. McKenzie, 106 Ashmont Ave., Wagga Wagga, 2650.
VK2ZNN—N. N. Watson, 30 Rossford Ave., Jannali, 2226.
VK2ZNR—B. J. Byrne, 2 Lavai Pl., Beacon Hill, 2100.
VK2ZPY—R. A. Girdo, Station: 111 Cooper Rd., Birrong, 2143; Postal: P.O. Box 324, Bankstown, 2200.
VK2ZPZ—W. Frost, 98 Young St., Cremorne, 2090.
VK2ZRW—R. R. Winston, 20 Cooper St., Cessnock, 2325.
VK2ZSX—R. A. Wells, 11 Astley Ave., Padstow, 2211.
VK2ZTP—J. P. Tomkins, 78 Aberdeen St., Muswellbrook, 2333.
VK2ZVO—R. P. Tester, 78 Lachlan St., Cowra, 2794.
VK2ZZV—B. Z. Vlcek, 100 Murray St., Tumbarumba, 2653.
VK3WJ—F. S. Kantor (Dr.), 22 Castella St., East Ivanhoe, 3079.
VK3AFS—R. G. Rowlands, 35 Cratloe Rd., Mt. Waverley, 3149.
VK3BAB—S. W. Platt, 2 Robinson St., Moe, 3825.
VK3BAK—V. H. Niedeck, 19 Talofa Ave., Ringwood East, 3125.
VK3ZWY—E. W. Ferrier, 178 Alma Rd., Balaclava, 3183.
VK4FZ—E. B. Hall, 10 Kenilworth St., Sherwood, 4075.
VK4KJ/T—L. Cordell, 12 Nesbit St., Southport, 4215.
VK4MJ—K. M. Kelly (Dr.), 285 Monaco St., Surfers Paradise, 4217.
VK4NV—E. Robinson, Station: Menso's Rd., Maidavale, via Ayr, 4807; Postal: P.O. Box 491, Ayr, 4807.
VK4OA—J. P. Baker, 18 Valiant St., Chermside West, 4032.
VK4PI—P. R. Tompson, 13 Comus St., Hamilton, 4007.
VK4QU—R. D. Ross, Station: 43 Wentworth Tce., Rockhampton, 4700; Postal: C/o. Commonwealth Bank, Rockhampton, 4700.
VK4VE—Teachers' College Radio Club, Victoria Park Rd., Kelvin Grove, 4059.
VK4WZ—W. E. Purser, 2/26 Guildford St., Kelvin Grove, 4059.
VK5GO—F. D. Voight, 67 Crittenden Rd., Smithfield Plains, 5114.
VK5SB—I. S. Brown, 5 Indarra St., Taperoo, 5017.
VK5XJ—C. A. Pryzibilla, 42 Burbridge Rd., Brooklyn Park, 5032.
VK5ZBA—B. T. Polnton, 5 Caroline Ave., Belair, 5052.
VK5ZFH—G. L. Stephens, 3 Bickford St., Richmond, 5033.
VK5ZJO—J. C. Willoughby, 30 Geraldine St., Valley View, 5093.
VK5ZKO—B. T. Parker, 10 Regent St., Pennington, 5013.
VK5ZLY—G. D. Trowbridge, 19 Raleigh Ave., Flinders Park, 5025.
VK5ZMO—D. M. Clegg, 6 Reynell St., West Croydon, 5008.
VK5ZRG—R. W. Greeney, 60 Illawarra Ave., Hove, 5048.
VK6DY—F. H. Smith, 93 Empire Ave., Wembley Downs, 6019.
VK6GN—G. E. Nixon-Smith, 385 Grand Promenade, Dianella, 6062.
VK6LZ—B. Telford, Station: Portable; Postal: Ruru Ave., Otatara R.D. 9; Invercargill, New Zealand.
VK6MC—W. R. Attwood, 45 Coventry Rd., Shoalwater Bay, 6169.
VK6PZ—P. Zeld, 34 Williams Rd., North Dianella, 6062.
VK6RL—R. F. Henwood, 43 Taylor Rd., Claremont, 6010.
VK6ZGF—J. A. Hassell, Flat 16, 367 Stirling H'way, Claremont, 6010.
VK7KW—C. S. Perger, 37 Galvin St., Launceston, 7250.
VK7RJ—R. H. Waldon, 11 Mayne St., Invermay, 7250.
VK7RV—R. Chamberlain, 23 Lincoln St., Lindisfarne, 7015.
VK7TF—T. W. Firth, 11 Rosewood Rd., Risdon Vale, 7016.
VK7ZNR—A. N. Richardson, 53 Cameron St., Launceston, 7250.

CANCELLATIONS

VK2LW—L. W. F. Waugh. Deceased.
VK2MY—J. F. McGregor. Not renewed.
VK2TV—W. G. Weiss. Not renewed.
VK2VI—V. J. Gay. Not renewed.
VK2YO—G. H. Younger. Deceased.
VK2ADZ—G. Harriman. Deceased.
VK2AFB/T—F. C. Barron. Deceased.
VK2AGN—G. E. Nixon-Smith. Now VK6GN.
VK2ALH—F. M. Scanlon. Not renewed.
VK2AZB—J. K. W. Bork. Not renewed.
VK2BAQ—A. G. Svensen (Sqn. Ldr.). Now VK2CAS.
VK2BMT—M. R. Travena. Not renewed.
VK2BUA—U. H. Aalbers. Transferred to Vic.
VK2BZZ—G. A. Bentz. Not renewed.
VK2ZFR—D. K. King. Not renewed.
VK2ZHU—A. J. Hughes. Not renewed.
VK2ZIJ—I. R. Johnston. Not renewed.
VK2ZJB—S. J. Brown. Not renewed.
VK2ZKI—J. B. Thomas. Now VK2AU.
VK2ZLD—L. W. Doolan. Not renewed.
VK2ZLQ—L. E. Peasley. Not renewed.
VK2ZPC—P. J. Carter. Not renewed.
VK3ABC—F. D. Voight. Now VK5GO.
VK3ZKQ—D. W. F. King (Cpl.). Transferred to A.C.T.
VK3ZKZ—D. V. Hambleton. Transferred to Western Aus.
VK3ZPL—S. W. Platt. Now VK3BAB.
VK3ZYZ—A. B. Hamilton. Not renewed.
VK3ZZN—N. J. Spalding. Transferred to New Guinea.
VK4JD—J. L. Thomason. Transferred to N.S.W.
VK4NH—N. S. Hill. Now VK2OA.
VK4PN—P. Lyons (Rev.). Ceased operation.
VK4WA—W. R. Attwood. Now VK6MC.
VK4ZHH—E. B. Hall. Now VK4FZ.
VK4ZLB—B. J. Byrne. Now VK2ZNR.
VK4ZQT—Teachers' College Radio Club. Now VK4VE.
VK4ZRL—R. D. Ross. Now VK4QU.
VK5HP—J. H. Lehmann. Transferred to Vic.
VK5PO—A. M. Perriman. Not renewed.
VK7DE—D. E. Burkinshaw. Not renewed.
VK7KT—C. Lindsay. Not renewed.
VK7LL—K. M. Kelly (Dr.). Now VK4MJ.
VK7SS—P. R. Tompson. Now VK4PI.
VK7ZCP—C. S. Perger. Now VK7KW.
VK7ZHF—H. J. Ferrall. Now VK2ZHG.
VK7ZRJ—R. H. Waldon. Now VK7RJ.

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ERRATA

In the July issue of "A.R." some drafting errors appeared in "300 W. P.E.P. 2 Metre Transmitter." The inductance in the cathode of V7a (overtone oscillator) should be 2.5 μH., not mH. The emitters in the two transistor stages are not marked. They each have a 470 Ω resistor to earth, which will identify them. The second transistor stage is not an emitter follower as marked, but is an untuned amplifier.

Wagga District Radio Club

The Club was inaugurated at a general meeting in June 1968 and is a member of the Wireless Institute of Australia. Part of the Club activity is to provide the local Civil Defence Organisation with a communication branch and operations are conducted in the Civil Defence Headquarters. Operations began in the temporary premises of the Civil Defence and are now conducted in the permanent quarters of the Civil Defence. A high proportion of Club members are also active members of Civil Defence.

The electronic equipment provided by the Club consists of a 50w. 146 Mc. f.m. base station, eight 10w. 146 Mc. mobile stations, and a 7 Mc. base station. Base stations are operated by members on a roster basis. The future developments are expected to include the provision of a second 50-foot aerial tower and single sideband transceivers by the Civil Defence Organisation and a 146 Mc. f.m. repeater station operated by the Club to give a very good coverage of the locality. This latter project is already well in hand and should be operational by December of this year.

Another important aspect of the Club activity is fostering of Y.R.S. activity by Brother Jeffrey, VK2HI, at the Christian Brothers' College and progress has been such that other Y.R.S. stations will be in operation during the coming year.

An active programme has been followed in the year centering around A.O.C.P. instruction so that five new licences have been gained by members. Further activities for members are planned including participation in all major VK contests, Jamboree-on-the-Air, v.h.f. hidden transmitter hunts, field days, inter-club visits and contests, club sponsored construction projects, while continuing to offer A.O.C.P. training in theory, Morse code and regulations.

Club members feel that the activity is furthering the interests of Amateur Radio in the Wagga Wagga area and providing a valuable public service through the links with Civil Defence Organisation. Enquiries with regard to the Club should be made to the Hon. Secretary, Wagga District Radio Club, 106 Ashmont Avenue, Wagga Wagga, 2650.

OBITUARY

JOSEPH GRIFFITHS REED, VK2JR

It is with deep regret that we record the sudden passing of one of the real "Old Timers," Joe Reed, VK2JR. Joe died suddenly on 29th July.

He had a long career in the world of radio, in fact dating back to at least 1910 when he was just a schoolboy. Space does not permit a full listing of all Joe's contributions to radio whilst employed by the Navy, P.M.G's Department, A.W.A., etc.

He was a regular contributor to "Amateur Radio" and was responsible for many tapes in the VK2 Division library. He was never too busy to help anybody with a problem and a question to him resulted in several typewritten pages and diagrams in the next day's mail.

To his family, we convey our condolences and assure them we feel their loss as much as they themselves.

VICTORIAN DIVISION, W.I.A.

WESTERN ZONE

CONVENTION

HALLS GAP

25th and 26th OCTOBER, 1969

Accommodation available. Dep. $2.

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Bookings to: "Convention," P.O. Box 25, Ararat, Vic., 3377.

DX

Sub-Editor: DON GRANTLEY
P.O. Box 222, Penrith, N.S.W., 2750
(All times in GMT)

This month has produced some relatively good openings here and there with ten metres opening at all sorts of odd and interesting hours. However, the higher frequencies have shown the steady decline predicted, but in contrast there have been some good openings to many parts of the world on 80 metres which has become less noisy due to the winter period. No information whatsoever has reached me from VK sources other than what has been heard from Divisional broadcasts, so most of the following information has been taken from the usual overseas bulletins.

At the time of writing, Gus W4BPD had cut short his jaunt in the VQ9 area due to transport difficulties, and last heard, he was heading for Kenya.

YB1ZZ has been logged here in Australia, and has a very fast QSL return if sent to M. H. T. Patah, Let. Kol. Police Force, Box 8, Bandung, Indonesia.

From the Long Is. DX Ass., here is an account of the recent operation by K4IA/KC4 from Navassa Is. QSLs for which should go to WA4WIP, G. Tesar, 2666 Browning St., Sarasota, Fla. The arrival of operators K4CAH, W4DQS, W4PJG, W4KET, K4IA, W4WXZ and W4CKB was delayed several hours, however no difficulties were planned and the first QSO was made at 2040z on 7.205 Mc. with 6Y5LA who had been monitoring the frequency for almost nine hours. Three stations were put on the air, the first night, on all bands except 75 s.s.b. and 160. The following morning antennae for these two bands were raised, along with two other triband beams, giving a total of three triband beams, one vertical, two inverted Vs, and one long wire across Lulu Bay. Two Drake TR4/RV4s and two Drake T4XB/R4B combinations were powered by a single 1750 watt generator which packed up on the second morning. A spare 1250 watt generator was put into operation until the other was repaired later that day.

On the afternoon of 25th, dismantling commenced, with the last QSO being sent at 1940z after 71 hours operation. Due to the slower boat, they had to leave Navassa 12 hours earlier, nevertheless 11,162 QSOs were made with good coverage to all continents.

You will note in the QTH section of July "A.R." I listed Jack C2IJW as C2. Jack has to QRT at about 1140z daily, but as he will be on Nauru for three years there will be plenty of time.

ZK2KR has been heard in the mornings working Europe on 20 metre c.w., giving his QTH as Niue and QSL manager W2CTY.

Aland Is. operation recently reports on 7 and 14 c.w. and s.s.b., says QSL to home address Box 40015, Helsinki, Finland. The station has been reported at good strength from VK3.

The prefixes PQ, PR, PS, PT and PU, which were active during the W.P.X. Contest back in April, were all Brazilian and 100 stations from that country were issued with them.

Currently active from Jan Mayen Is.: JX-1OM, JX2BH, JX3DH, JX3NM, JX3P, JX3XK and JX5CI. Average time of activity as listed in a report seems to be from 1400z to 2000z. JX3DH is the only one shown as active on 7 Mc., actually 7055 s.s.b.

The special call sign PE2EVO, active on 14 s.s.b. at around 1500z, is situated in the Phillips Co., Netherlands.

I didn't note just who said it, but I gleaned from the Pacific net on 4th July that a weather station is being built on Bouvet Is. and will have Amateur activity.

KF7BSA, who was in great demand during the Pacific Net on 18th July, was operating from a Scout Jamboree in Idaho.

The operation of LI2B on the ill-fated trip across the Atlantic by Thor Heyerdahl in "Ra" has had sufficient coverage in the daily press, however many Amateur contacts were made and Thor says that QSLs will be ready by the end of August, and should go via LA5KC, Box 150, Slependen, Norway, with five IRCs for the handicapped children's fund.

KH6EDY, still working from Kure Is., is always a pleasure to hear. The way this guy handles the "screaming heap" is really something. Frequency is 14020 and QSL to Box 36, F.P.O., San Francisco, 96614, U.S.A.

Sad to report the deaths of two well known DXers. Charles HB9ADO passed away on 11th April and Arne SM5PW on 29th March. Arne was well known for his /MM operation and his YU7LAE jaunts, whilst Charles was better known for his activity as 4W1ADO.

Martin G3VOF, together with other Amateurs, G3VQY, WAB and XQC, are active most days from Billericay in Essex on 14 s.s.b., and are anxious to know how their signals are getting out. They will appreciate QSOs from this part of the world, also will answer any reports. QSLs can go via I.S.W.L. Bureau.

The station signing HU1P was quite in order. This prefix is used in El Salvador for special activities such as contests.

Regular operation from Taiwan can be found on 14027 c.w., where BV2A is crystal controlled. His operating time is 1130z to 1430z, and QSLs via WB2KUP for American stations only.

Monitor, the official magazine of the I.S.W.L., reports that a station signing 2B3DC claiming to be in Biafra has been worked, however at this stage it will not count due to the political situation, and lack of licensing authority.

Operation from West Pakistan by Ahmed AP2AD continues. He is operating transceive on 14205 s.s.b. and handling the dog piles really well. He has been worked in VK at about 2100z, whilst other reports show him active at many other times. QTH: Box 94, Lyallpur, West Pakistan.

An unexpected operation occurred on 14233 recently when OH2BH/OHO/SR came on from Skarp Reef in the Baltic from 0150z to 0400z in the one day. It is not a new country at this stage, but in keeping with the common trend, it could well be. Says QSL to OM2AM/Skarp Reef.

If you have been waiting for a card from EA9AA, don't despair, he has had new cards printed and they are in the process of being issued, to try and offset the backlog.

From LA7RF comes the news that JW1CI will be on Bear Is. for a year and will be joined by JX3XX signing JW3XX in September at the QTH of Walrus Bay. DXCC credit for Svaalbard. QSL to LA3T.

Recent activity from GD3LNS and GD3KDB went off very well, with good contacts on 7 Mc. QSLs go to G3LNS and G3KDB, or to QSL manager WB2YQH, Robt. Nadolny, 72 S. Pierce St., Buffalo, N.Y., 14216.

The proposed trip by WB6KBK and HK operators to Serrana Bank and Roncador Cay has been cancelled as permission was not forthcoming.

TF3IRA is the DX-pedition by Haddi and Berger working transceive on 14189. Not an easy country to find, but they have been active at around 0300z, with QSLs to Box 1058, Reykjavik, Iceland.

Operation from Kuwait is plentiful at present with 9K2BF operating transceive on 14220 (Box 1083, Kuwait); 9K2AA, on 14201, and 9K2BI listening on 14275 transmitting 14196 at 0220z. QSL to Box 8419, Kuwait.

FOUS/FC will be W1PRI and XYL, together with HB9TL. Bob planned to operate /AM on the way over, and their operating frequencies were listed as 14240 and 21310. Other Corsican operation by F2FD/FC on 14027. QSL to home QTH or F bureau.

Recent operation by VS5MC from Brunei successfully completed and the operator, Maurice VS6AA, back at home QTH. The QSL manager for this operation is K8UDJ, Charles Hutchinson, 2072 Rolfe Rd., Mason, Michigan, 48854. VS6AA has skeds with K8UDJ on Saturdays at 1500z on 21080.

The following is a summary of recent VP2 activity. VP2AZ (op. K5AAD). QSL to WA-5LES; VP2s KK, LZ and VI to W3EVW; whilst VP2VT goes to the operator's home QTH VE-2AFC, and VP2VK is at Box 1737, St. Thomas, Virgin Is., 00801.

KC6AT is active from the East Carolines. He has been active on 14230 from 1000-1200z and QSLs go to Box 94, Ponape, East Caroline Is., 96941.

Further operation reported from Alland Is., this time by DL7NS/OH0, who expects to be active during August and September on 3510, 7010, 14050, 21050 and 28050 c.w., Sundays from 1200z for one hour on each band. QSLs to DL7MQ.

Gilbert TL8GL is now QRT and will not be returning. Logs of the operation are available and QSLs should go to VE2DCY, Bernard Leblanc, 8900 Lacordaire, Montreal, 458, P.Q.

Operation from Tristan Da Cunha by Roy G3KDY continues, he is listed to stay there for 2½ years. He is listed on all bands, but a challenge would be his operation from 3798 s.s.b., where he is every Saturday and Monday from 2100. Little hope from here at that time. QSL to GB2SM.

QSL MANAGERS

3A2EE—DL7FT.
3V8AD—DL1IA.
5A1TY—HB9ADP.
5A2TR—DL9OH.
5A3TX—WA3HUP.
5H3LV—VE3ODX.
5L2BJ—WA3HUP.
5L2D—W5EJ.
5L2VAT—EI2E.
5R8AN—K4IE.
7G1CG—WA3HUP.
8R1S—VE3DLC.
8R1X, U, Z—VE3DLC.
9H1L—G3VPS.
9M1MM—W3KVQ.
9M2AE—W7EPA.
9Q5DZ—W2LGV.
9Y4RU—K8LSG.
ZB2AY—K3RLY.
ZB2BS—G3PSM.
ZD8Z—W6CUF.
ZE1DC—WA9UES.
ZF1AA—K2OLS.
ZF1AR—W8ROF.
ZF1DT—K4AYO.
ZF1RD—K8LSG.

SOME QTHs

5A3TK—Box 3184, Tripoli, Lybia.
5L2BA—Box 987, Monrovia, Liberia.
6W8BJ—B.P. 62, Thies, Senegal Republic.
7P8AR—Ulli Dehning, Box 194, Maseru, Lesotho.
8R1J—P. Taylor, Box 557, Georgetown, Guyana.
8RIT—Sonia Blue, Box 25, Georgetown, Guyana.
9G1DY—Norman Price, Box 44, Tarkwa, Ghana.
9M6HM—C/o. Police Hdqrs., Kota Kinabalu, Sabah.
9X5SP—Deutsche Welle, B.P. 420, Kigali, Rwanda, Africa.
TY6TAE—Box 107, Natitingou, Dahomey Rep., Africa.
WN7JKQ—Les Bowman, 1650 Hawthorne St., Forest Gve., Ore., 97116.
YB0AR—J. Hartadi Kertayasa, Gunung Sahari 51, Djakarta.
YK1AA—Rasheed Jalal, Box 35, Damascus, Syria.

AWARDS

The Lincoln Century Award is issued by the Lincoln Short Wave Club to Amateurs and S.w.l's alike, with no date limit for contacts; endorsements for band and mode; cost is 7/6 or one dollar U.S. or 10 IRCs. Issued in five classes, class E with 100 points through to class A with 500 points. Points are issued thus:

Stations in the Lincoln Postal District, England	20 pts.
Stations in the county of Lincolnshire, England	10 pts.
Stations in the Lincoln Country of U.S.A.	10 pts.
Lincoln Short Wave Club Station G3IXH	30 pts.
Stations in any other world town of Lincoln	20 pts.

Contacts on v.h.f. and with C.H.C. or F.H.C. members are double. Send certified lists of QSLs with exact QTHs of all Lincoln stations to Stew Foster, 68 Goldsmith Walk, Lincoln, England. There are no Lincolns in VK, however we might get away with VK2's Lincolnville. How about it Stew?

With that lot, I shall climb back up the ladder and prepare some sort of an antenna for the forthcoming VK/ZL Contest.

My thanks to Eric Trebilcock, Maurie Batt, Benrard Hughes, Geoff Watts DX News-sheet, I.S.W.L. "Monitor," Steve Ruediger, VK2 Broadcast, Long Is. DX Assn., and Mac Hilliard, for information supplied. See you next month. 73 de Don WIA-L2022.

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CONTEST CALENDAR

4th/5th October: VK/ZL/Oceania DX Contest (Phone).
4th/12th October: Lebanese DX Contest.
11th/12th October: VK/ZL/Oceania DX Contest (CW).
11th/12th October: R.S.G.B. 28 Mc. Telephony Contest.
18th/19th October: W.A.D.M. DX Contest (CW only).
25th/26th October: "CQ" W.W. DX Contest (Phone).
25th/26th October: R.S.G.B. 7 Mc. Contest (CW).
9th November: International OK DX Contest (CW only).
8th/9th November: R.S.G.B. 7 Mc. Contest (Phone).
15th/16th November: R.S.G.B. 1.8 Mc. Contest.
29th/30th November: "CQ" W.W. DX Contest (CW).
6th Dec. 1969 to 11th Jan. 1970—Ross A. Hull V.h.f. Memorial Contest.
6th/7th December: C.H.C. International DX Contest (CW).
13th/14th December: C.H.C. International DX Contest (SSB).
1st/2nd February: John M. Moyle National Field Day.

Correspondence

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers.

PARTICIPATION BY LIMITED LICENSEES

Editor "A.R.," Dear Sir,

I was very pleased to read in the August edition of "A.R." the plans for Amateurs to celebrate the Cook Bi-Centenary/W.I.A. Diamond Jubilee and especially the Bi-Centenary Award.

My only disappointment is the exclusion of Limited Licensees from this award. I don't need to point out that the rules would exclude us but they state, "Available free to any licensed Amateur throughout the world".

Although, due to our band allocations we are unable to convey our feeling of pride to overseas stations, surely we can do this on a more local basis in the country whose Bi-Centenary we are celebrating. Granted it would be difficult setting up rules for such an addition and make it fair for country and city Amateurs alike, but at the cost of complete exclusion I am confident something could be arranged.

How about an Amateur with less than 25 ACTIVE Hams in a radius of 100 miles contact 20 of them to qualify for this award? And those in more densely populated areas a proportionly greater number.

—Peter Collins, VK3ZYO.

COPIED C.W. VISUALLY

Editor "A.R.," Dear Sir,

The resourcefulness by which a person who has no hearing has let himself into the field of Ham Radio prompts me to write to this column.

Some time ago I had a card from Jan Verstelle, a Dutch S.w.l. reporting on my contact with a DJ. Jan pointed out that he could not give me a tone report because he was deaf. He had no means of copying speech, but displayed c.w. on a cathode ray tube and copied it visually. Presumably he wrote as well as he could without taking his eyes off the tube.

I sent Jan a QSL and told him that I had put his card among the few I pinned up in the shack for affectionate or honourable reasons and today I had a letter from him, and I give it here verbatim:

> "Dear Tony. I beg your pardon that I write bad English and thank you for your card. It is nice that my card attracts you and you put it on the wall. I have now three cards from your country, all three 100 per cent. by post.
>
> "Now I am very busy making a Morse computer because it is difficult to read c.w. on the tube and at the same time to write it down.
>
> "I hope you demonstrated my card to deaf people in your surroundings because many deaf people in Holland think that they cannot be a Radio Amateur and do not dare to take hold of it.
>
> "I think probably I am the only one in the world and I enjoy my shack very much. When I have finished my computer I shall study to be a Ham. Regards to your family from my wife who is also deaf.
>
> —Jan Verstelle, NL915."

Not only did Jan's effort impress me very much in its own right, it brought home to me that this is another instance of c.w. being able to reach where nothing else can. Though I have top class modern s.s.b. gear, I can rarely be lured into using phone and am particularly glad that I was working c.w. when Jan was "having a look round the band".

—Tony Brinkley, VK1SG.

NOVICE LICENCE

Editor "A.R.," Dear Sir,

Prompted by two letters in August "Amateur Radio" I would like to register my support for a Novice Licence. I do not intend to introduce any new arguments in favour of such a licence as there has been sufficient said on the matter by others. I also believe that a Novice Licence is essential to the future development of Amateur Radio in this country. I feel that many of the objections raised by the opponents of a Novice Licence scheme are frivolous and display prejudice.

The fact that I or anyone else found it easy to obtain an A.O.C.P. is no argument against having a Novice Licence. Also I cannot understand the Victorian Division in having the age limit lowered to 15 for a full licence as an alternative to a Novice Licence. The lower Morse speed limit also has doubtful advantages. Surely a lower class licence would be a better apprenticeship for a young licensee.

On a slightly different note, I do not go along with this gloomy and inferioristic view of the hobby as presented by R.C.B. I do not believe it is necessary or right to justify ones own existence. Modern society is oriented to the benefit of the individual. The community provides large areas of land for people who like to play golf, air space is provided for those who wish to fly aeroplanes for relaxation, and parts of the seashore are provided for yatching clubs. No one would think of taking these away just on the grounds that they were unjustified in keeping them. So do we have frequency bands provided for those who enjoy communications as a hobby. This is just part of the privileges of a modern free society.

To remove Amateur Radio would be a threat to all minority groups who enjoy special privileges. Most people belong to some privileged minority, either in business or pleasure. Continually asking the Radio Amateur to justify his own existence could have an opposite effect to the desired result. The authorities may become convinced that we ourselves do not think we are justified in keeping our hobby, with disasterous results.

There is, however, a certain amount of undesirable operating creeping into activity on the bands. Conversations and operating which are not quite in accordance with regulations and standard Amateur practice are a bad thing for our image. This is apparently becoming a problem overseas, judging from articles in overseas magazines (reference Editorial, "QST" Feb. 1969). Standards seem to be changing and who can tell what will be right or wrong in the future.

—J. A. Adcock, VK3ACA.

Book Review

POPULAR TUBE AND TRANSISTOR SUBSTITUTION GUIDE

Contents: Popular receiving tubes (1733 substitutes for 770 original types); industrial and commercial tubes (264 substitutes for 142 original types); American substitutes for foreign tubes (985 substitutes for 793 types); tube circuit and base diagrams; popular transistors (2248 substitutes for 454 original types); American substitutes for foreign transistors (1486 substitutes for 301 original types); general purpose transistor substitutes (606 substitutes for 150 original types); transistor base diagrams and manufacturer abbreviations.

TAB Book No. 491, 160 pps., 8 sections. Price: $US4.95 leatherette bound, $US2.95 paper.

THE OSCILLOSCOPE

New Third Edition

By George Zwick

A completely re-written, up-dated edition of the classic work on understanding and using oscilloscopes. Completely expanded and updated to include triggered sweeps, dual-trace scopes, electronic switches for multi-waveform displays, d.c.-to-d.c. supplies, d.c.-to-a.c. inverters, and d.c.-to-d.c. converters, this brand new book is right up to date on the current state of oscillography. All the useful data of the previous edition has been up-dated to include the latest information in keeping with technology. It is a virtual handbook on the subject, explaining scope operation from the simplest to the most intricate uses.

Beginning where the scope manual stops, the author covers basic waveforms (d.c., sine, sawtooth, trapezoid and pulse) clearly detailing their generic characteristics and how they are interpreted in oscillography. Scope operation, from the c.r.t. screen to the power supply, is thoroughly explained in chapters devoted to the cathode-ray tube and sweep systems (including triggered sweep). To give practical meaning to scope design, the author literally "takes apart" four current models, thus enabling the reader to better understand what they'll do for him.

Chapter 5 shows how valuable the scope is in radio and t.v. alignment, as the author explains various techniques, applicable to everyday as well as unique situations. Further tests and measurements are divulged in later chapters—audio measurements, power output calculations, video, hum, current—plus special oscilloscope techniques, probes, etc.

Of special value are the numerous experiments in the final chapter. Included are 17 step-by-step procedures specifically planned for familiarisation with the methods for performing tests and measurements with an oscilloscope. Here the reader will find the information needed to make comparisons of direct and amplified signals, detect audio signal distortion, observe transmitter modulation percentage, employ square-wave response tests, perform capacitor leakage measurements, set up dual-trace displays, analyse and interpret various waveforms, understand and use various probes, and many other important aspects of practical oscilloscope application.

An extremely valuable reference and guide for those now using scopes and those who would like to begin.

TAB Book No. 498, 256 pages, over 170 illustrations, eight big chapters. Price: $US7.95 hardbound, $US4.05 paper.

AUDIO SYSTEMS HANDBOOK

By Norman H. Crowhurst

This brand new, authoritative book is just what the title suggests—a reference and guide to audio system design, as useful for engineers and technicians as well as for audiophiles. It encompasses home entertainment, commercial sound and studio installations. Based on his extensive experience in the field, the author approaches each subject in a practical way. Where theory is essential to an adequate presentation of the facts, it is boiled down to its simplest terms.

Chapter 1, covering amplifiers and amplication, explains db. and impedances, level limitations, insertion gain, plus a host of other basics necessary for practical system design. The author goes to great lengths to impart an understanding of these vital ingredients as they apply to overall operation. The same may be said of his treatment in succeeding chapters on equalisers, mixers and filters, distribution systems, programme sources, commercial systems (public address, background music, intercom, paging, etc.), studios and loudspeaker systems.

"Audio Systems Handbook" imparts a firm knowledge of microphone characteristics, loudspeaker utilisation, and other factors required to make up a really good system. It provides an understanding of such terms as loudness compensation, constant-voltage lines, low-level distribution, electronically-generated audio, frequency-shift speaker feeds, noise suppression, reverberation, pre-emphasis, power margin, electrical and electronic crossovers, and much, much more. The reader will learn how to put a system together, the requirements of commercial sound installations, the standards of studio (recording and broadcast) audio facilities, and the rudiments of loudspeaker systems—both mono and stereo, outdoor and indoor. This is a design handbook which tells you how to evaluate and select systems and components, how to install them for flawless performance, and how they may be operated for greatest overall efficiency. It also contains much information which will aid in locating troubles.

TAB Book No. 494, 192 pages, 125 illustrations, 10 chapters. Price: $US7.95 hardbound, $US4.95 paper.

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SILENT KEYS

It is with deep regret that we record the passing of the following Amateurs:

VK2JR—J. G. Reed.
VK4CK—Len Schnitzerling.
VK4CL—Joe Waterworth.
VK4DK—John Kelly.

FEDERAL CONSTITUTION CHANGE OF W.I.A.

Notice of Motion following has been given to Federal Executive by the Victorian Division of the W.I.A.:

"That Clause 62 of the Federal Constitution be amended by deleting the word 'March' and inserting in lieu thereof the word "January", and that further, in the interpretative clauses of the Federal Constitution the definition of the term 'Fiscal Year' be deleted and in lieu thereof be inserted 'Fiscal year means the year commencing the first day of January in each year'."

The effect of this is to change the financial year's commencing and finishing dates to allow more time for the preparation of audited statements to be submitted to the Federal Convention.

Article 70 of the Federal Constitution requires the publishing of this notice in two consecutive issues of the Institute's official journal.

—Peter D. Williams, VK3IZ,
Federal Secretary, W.I.A.

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RESEARCH LABORATORIES' "OPEN DAY"

The Post Office Research Laboratories in Melbourne plans to hold an "Open Day" programme over a few days in September and it is thought it may interest readers of "A.R."

The Research Laboratories are at present carrying out more than 200 projects of varying magnitudes and a comprehensive exhibition of the work being done is planned for visitors.

The main concern of the Laboratories is to solve technical and research problems facing the Post Office.

Its work includes basic research and development in telecommunications theory and practice under Australian conditions, the design and development of telecommunications or mail-handling plant most suitable for Australia and an appraisal of world developments in telecommunications.

The Research Laboratories are housed in several buildings at the eastern end of the city and transport between buildings will be arranged by the Post Office. Inspection tours for visitors will begin at 59 Little Collins Street, Melbourne.

The timetable for the "Open Day" is:

Monday, September 15—
2 p.m. — 4.30 p.m.

Tuesday, September 16—
10 a.m. — 4.30 p.m.
7 p.m. — 9.30 p.m.

Wednesday, September 17—
10 a.m. — 4.30 p.m.

Thursday, September 18—
10 a.m. — 4.30 p.m.
(reserved for students)

For further information contact the Information Officer at the Research Laboratories—Melbourne 630-7932.

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CHANGING QTH. Must sell. Antenna Tower, 60 ft. self supporting. Also Prop. Pitch Motor with cradle and control unit. TA-33 Junior Beam. All items in very good condx. Bob Glasser, VK3OA, 306 Wattletree Rd., East Malvern, Vic. Ph. 50-1409.

FOR SALE: Bendix Frequency Meter, BC221AK, complete with modulation, calibration book, earphones, and a.c./d.c. power supply, $55. Phone 560-0670 (Melbourne).

FOR SALE: FLDX-2000 Linear Amp. less than 20 hours' use, $220. Heathkit HW32A, 20M, 200w. p.e.p. s.s.b. Transceiver, includes plug-in 100 kc. xtal calibrator, $125. Heavy duty a.c. Power Supply for transceiver, $30. Heathkit SB610 Signal Monitor, $80. Heathkit HP10 12v. d.c. Mobile Power Supply, $20. 40 ft. crank-up galv. Antenna Tower, $30. CDR T.V. Antenna Rotator, $30. D. D. Kinnersley, VK4XI, 27 Oxley St., Edge Hill, Cairns, Qld., 4870. Phone 53-2068.

FOR SALE: G209 Geloso Receiver, excellent condition, unmarked, very little use, $90, or near offer. Original packing case on hand. VK4XS, L. J. Salter, P.O. Box 219, Kingaroy, Qld., 4610. Phone 973.

FOR SALE: Hallicrafters 5-band, s.s.b., c.w. Transceiver, Model SR150, complete with a.c. power supply, vox, p.t.t., 125 watts p.e.p. input, instructional manual, $350 o.n.o. VK1AN, 37 Ingamells St., Garran, A.C.T., 2605, or phone (062) 81-5905.

FOR SALE: Hammarlund SP600, JX21, 20 valves, six bands 50 Mc. to 0.55 Mc., rack, clean and in excellent condition. Test any time. $360. Will trade 1 Park St., Coledale, N.S.W., 2513 (near Wollongong). Phone Thirroul 541.

FOR SALE: Heathkit Apache Tx, five-band, with SB10 s.s.b. adaptor. Excellent condition. G. Whitby, VK3ADY, Ph. 848-3205 (home), 62-6025 (bus.) (Melbourne).

FOR SALE: Large variety Ham Radio components at bargain prices. Power and audio transformers, chokes, meters, capacitors, relays, vernier dials, Selsyns, etc. Standard 7 ft. 6 in. P.O. rack, vented speaker enclosure, bound volumes "QST" and "Radio Hobbies." Inspect. 30 Rossall Road, Somerton, South Aust. Further details, J. Lamprey, VK5JL, Phone 96-7694.

FOR SALE: One Teletype Model 14 Tape Reador-Distributor, $30. One A.W.A. r.t.t.y. Terminal Unit (limiter-detector), Type IG72740 with meter and control unit in 2 ft. x 19 in. rack, $30. One Teletype Model 12 Tape Perforator, $15 (will consider swapping above for suitable Pen Recorder or general coverage H.F. Receiver). Two A.W.A. IG52740 r.t.t.y. Terminal Units, $15 each. One 465 Mc. Telemetry Transmitter, 5 watts, $10. One SCR522 Transmitter, modified for 2 mx a.m., metered, $15. One Marconi U.h.f. Wavemeter, 20-300 Mc., as new, $10. One A.W.A. AMR101 H.F. Receiver (like HRO and AR7), 3.5-15 Mc., with power supply and speaker, $65. One 44 in. Parabolic Reflector, aluminium, suit microwave, $15. One S.T.C. Polar Relay Testset, $4. R.t.t.y. gear: Teletype Model 15 Page Printer typing unit (only), Model 14 Typing Reperforator incomplete, several keyboards, etc. Many springs and other small bits; tubes, chassis, junk, all cheap. Geoff Thomson, 115 Hawdon St., Heidelberg, Vic., 3084. Phone 45-6734.

FOR SALE: Star SR550 Ham-Band Receiver, 160 to 6 metres, s.s.b.-c.w.-a.m., as new, $150. S.s.b. Transmitter, vox, p.t.t., c.w., 9 Mc. xtal filter, wants some work done on it, $75. Palec Tube Tester and Multimeter, $15. W. R. Jardine, P.O. Box 95, Leongatha, Vic., 3953. Phone 2711 evenings.

FOR SALE: Type "S" Power Supply, Modulator 807s p.p., 6 mx Tx, 2 mx Tx, both with xtals and 6/40 final; Tx's are interchangeable; $80. 2 mx Tx, fully metered, 6/40 final, $20. Pye 53.032 Mc. a.m., converted, with xtals, $20. D. Godfrey, P.O. Box 248, Moe, Vic., 3825.

GALAXY V., remote v.f.o., vox, calibrator, spare valves, mic., s.w.r. bridge, 813 linear, solid state p/s., $600. Owner going overseas. VK3IA, C/o. Dave Clancy, Phone (Melb.) 232-3434.

SELL: Complete s.s.b./a.m./c.w. Station comprising National Radio Company NCX-3 Transceiver, NCX-A Power Supply, Johnson Viking Matchbox, Kyoritzu S.w.r. Meter, Shure Microphones (2), plus spare relays and final tubes. All equipment in first class condition. $495 o.n.o. For inspection, Phone Melbourne 86-5321 ext. 388.

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SELL: S.s.b. Communications Receiver NC155, six bands 80-6 mx, power supply, flip-foot model, phones, inst. book, $100. "Ian McMillan" Tx/150 Transmitter, c.w., a.m., 80-10 mx, Type S power supply, mike, key, etc., inst. book, $60. Make good station for beginner. VK3GA, 35 Valley Pde., Glen Iris, Vic. Phone 29-7256.

WANTED: Heath SB10 Sideband Adaptor to suit Apache Tx. Reply to B. Baker, 7 Kara St., East Doncaster, Vic., 3109. Phone A.H. 842-1938, Wk. 41-1246.

WANTED: R.C.A. AR88 Receiver in A1 condition, complete with instruction manual. Price and particulars to W. A. Halley, VK4TI, 1/24 Tarcoola Cres., Chevron Island, Qld., 4217.

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FTV-650 Six Metre Transverter: Converts your 28 Mc. SSB to VHF, includes receiving converter. $135.

FT-200 Transceiver: New model, 80/10 mx, 300w. speech peak input. Operates from separate power supply, FP-200. $345.

FP-200 imported Yaesu **AC Power Supply** for FT-200, in matching cabinet with in-built spkr. $90.

FF-30DX three section **Low-Pass Filter** for TVI reduction. $18.50.

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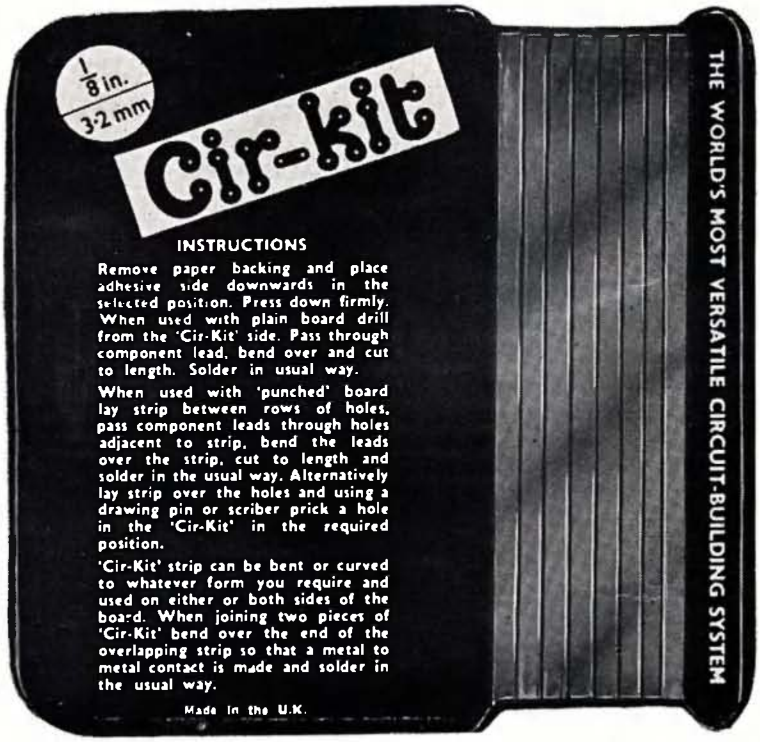

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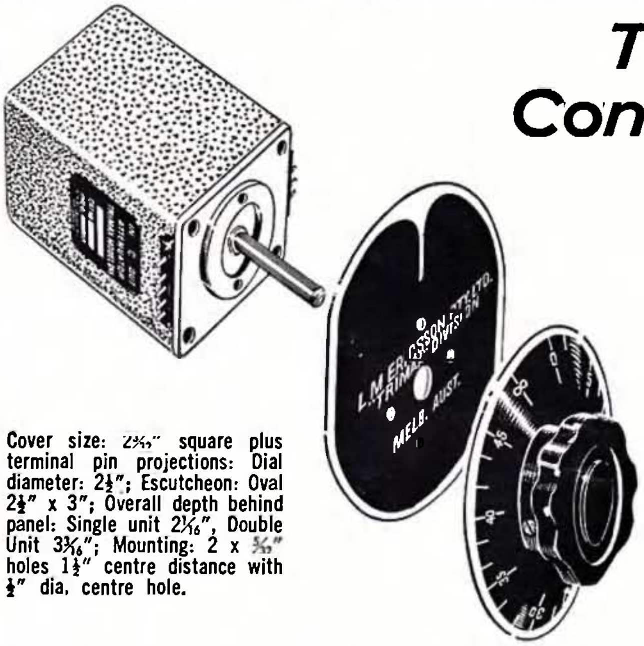

ATTENUATORS AND FADERS by TRIMAX

Cover size: 2[illegible]" square plus terminal pin projections: Dial diameter: 2½"; Escutcheon: Oval 2½" x 3"; Overall depth behind panel: Single unit 2¹⁄₁₆", Double Unit 3³⁄₁₆"; Mounting: 2 x ⁵⁄₃₂" holes 1½" centre distance with ½" dia. centre hole.

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1 mA.	**$4.50**	S Metre	**$5.25**

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2SC73: 65 mW., 25 Mc., NPN.
2T76: 65 mW., 8 Mc., NPN.

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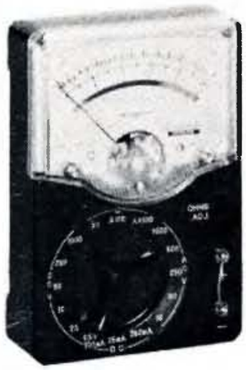

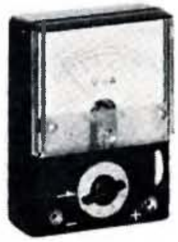

MODEL:	SK100 — 100K O.P.V.	SK33 — 10K O.P.V.	YT68A — 1K O.P.V.
D.C. V.:	0.6, 3, 12, 60, 300, 600, 1200.	0.5, 2.5, 10, 50, 250, 1000.	10, 50, 250, 1000.
A.C. V.:	6, 30, 120, 300, 1200.	10, 50, 250, 500, 1000.	10, 250, 500.
D.C. mA.:	0.012, 0.3, 6, 60, 600, 12A.	0.1, 25, 250.	250.
OHMS:	1Ω to 20 Meg. in four ranges.	1Ω to 3 Meg. in three ranges.	100Ω to 100K, one range.
SIZE:	7" x 5¼" x 2½".	5" x 3½" x 1½".	2½" x 3⅜" x 1¼."
PRICE:	$45.00.	$15.00.	$9.00.

All Prices include Sales Tax and Freight.

MODEL:	SK120 — 20K O.P.V.	SK7 — 4K O.P.V.	M303 — 30K O.P.V.
D.C. V.:	0.6, 3, 12, 60, 300, 1200.	10, 50, 250, 1000.	0.6, 3, 12, 60, 300, 1200.
A.C. V.:	6, 30, 120, 300, 1200.	10, 50, 250, 500, 1000.	6, 30, 120, 300, 1200.
D.C. mA.:	0.06, 6, 60, 600.	0.25, 10, 250.	0.06, 6, 60, 600.
OHMS:	2Ω to 8 Meg. in four ranges.	10Ω to 2 Meg. in two ranges.	2Ω to 8 Meg. in four ranges.
SIZE:	5¾" x 3¾" x 2".	4⅞" x 3½" x 1½".	5¾" x 3¾" x 2".
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SK100, M303, SK120 and SK33 have diode protected movements.

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amateur radio

Vol. 37, No. 10

OCTOBER, 1969

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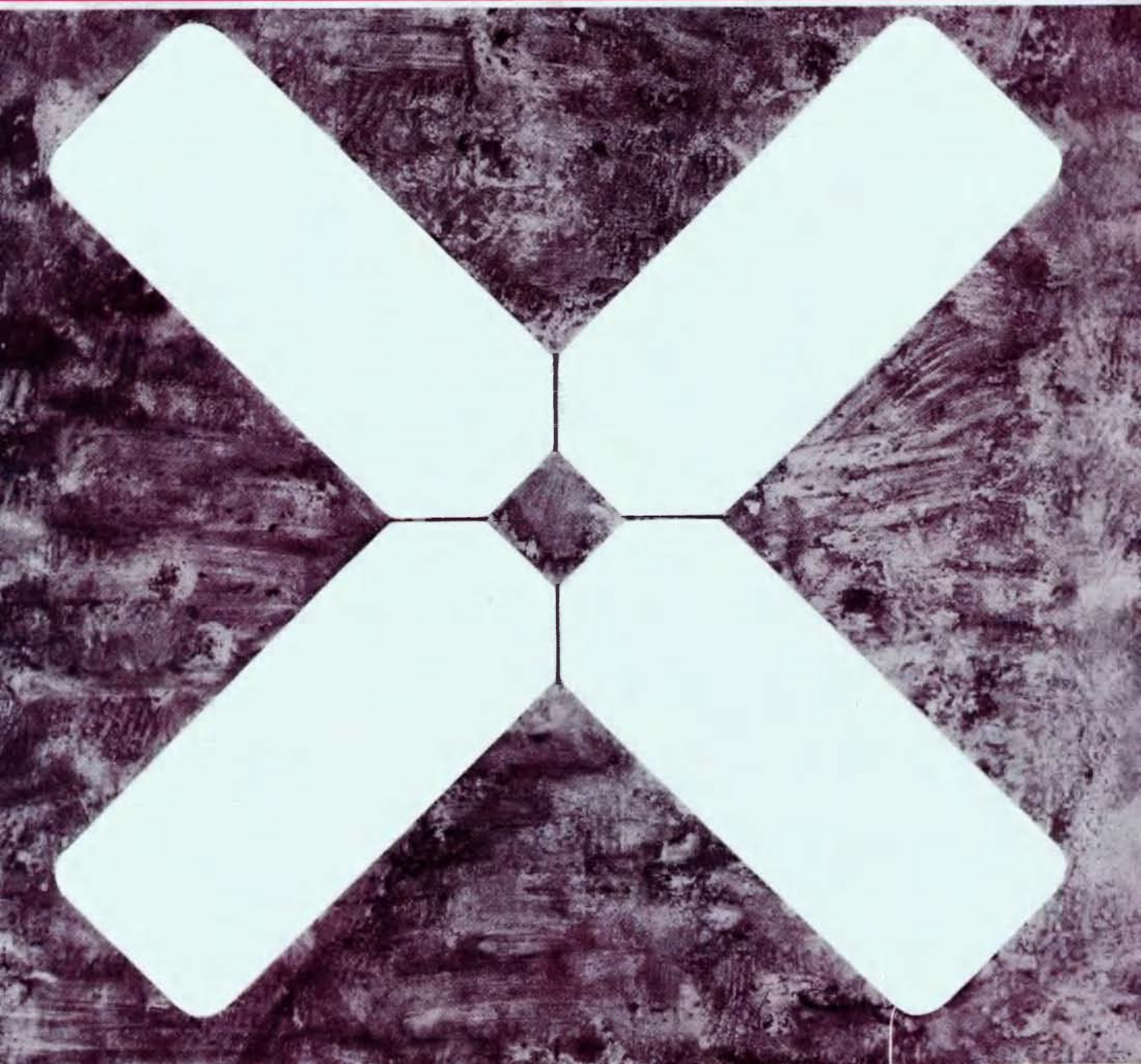

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Ratio 8 to 1 Reduction, Scaled 0-10.

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Four-band receiver covering 550 Kc. to 30 Mc. continuous, and electrical bandspread on 10, 15, 20, 40 and 80 metres. 8 valves plus 7 diode circuit. 4/8 ohm output and phone jack. SSB-CW, ANL, variable BFO, S meter, sep. bandspread dial, i.f. 455 kc., audio output 1.5w., variable RF and AF gain controls, 115/250v. AC mains. Beautifully designed. Size: 7 x 15 x 10 in. With instruction manual and service data.
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20,000 ohms per volt d.c., 10,000 ohms per volt a.c. **Specifications**.—DC Volts: 0-5, 25, 50, 250, 500, 2,500. AC Volts: 0-10, 50, 100, 500, 1,000. DC Current: 0-50 uA., 25, 250 mA. Resistance: 0-60K ohms, 0-6 meg. Capacity: 0.01-0.3 uF. (at AC 5v.); 0.0001-0.01 uF. (at AC 250v.). Decibel: Minus 20 db plus 22 db. Output range: 0-10, 50, 100, 500, 1,000. Battery used: UM3 1.5v., 1-piece. Dimensions: 3¼ x 4½ x 1⅛ in. **Price $11.00 Post Free.** Complete with internal battery, testing leads, prods.

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MODEL K142

Specifications:

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Measurement Range, Sine Wave (in 7 ranges): 0-1.5v., 0-5v., 0-15v., 0-50v., 0-150v., 0-500v., 0-1500v.
Peak-to-peak (in 7 ranges): 0-4v., 0-14v., 0-40v., 0-140v., 0-400v., 0-1400v., 0-4000v.
Output (dBm): Minus 2 dB to plus 65 dB (in 7 ranges) (0 dB equals 1 mW. in 600 ohm line): minus 20 to plus 5/16/25/36/45/56/65 dB.
Input Impedance: 1.4 megohms.
Input Capacitance: 30 pF. or below (1.5/5/15/50 150v. range). 15 pF. or below (500/1500 range).
Accuracy: Within plus or minus 5% full scale.
Freq. Response: 30 c/s.-500 Kc. within plus or minus 3%; 20 c/s.-10 Mc. within plus or minus 10%.

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Measurement Range (in 7 ranges): 0-1.5v., 0-5v., 0-15v., 0-50v., 0-150v., 0-500v., 0-1500v.
Input Impedance: 11 megohms, 2 pF. or below (using "D.C." Probe).
Accuracy: Within plus or minus 2% full scale.

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Measurement Range: 0.2 ohm-1000M ohms (in 7 ranges): 0-1K, 10K, 100K, 1000K, 10M, 100M, 1000M ohms.
Accuracy: Within plus or minus 3% of the scale length.

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30c Postage.

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Ranges.—AC voltage (1000 ohms/volt): 10, 50, 250, 1000. DC voltage (1000 ohms/volt): 10, 50, 250, 1000. DC current: 1, 100 mA. Resistance: 0-150K ohms. Dimensions: 2¼ x 3-9/16 x 1-1/16. Weight 0.37 lb. Price $6.35, plus postage 20c.

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amateur radio

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CONTENTS

COVER STORY

Our cover this month portrays a graphic representation of the Elco Varicon system of connecting. Elco Varicon contacts, feature a unique patented fork-like design which incorporates four large mating surfaces, coined to achieve exceptional hardness and smoothness. Fairchild Australia Pty. Ltd., are sole Australasian agents for Elco Varicon.

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- Cascode type R.F. amplifier stage.
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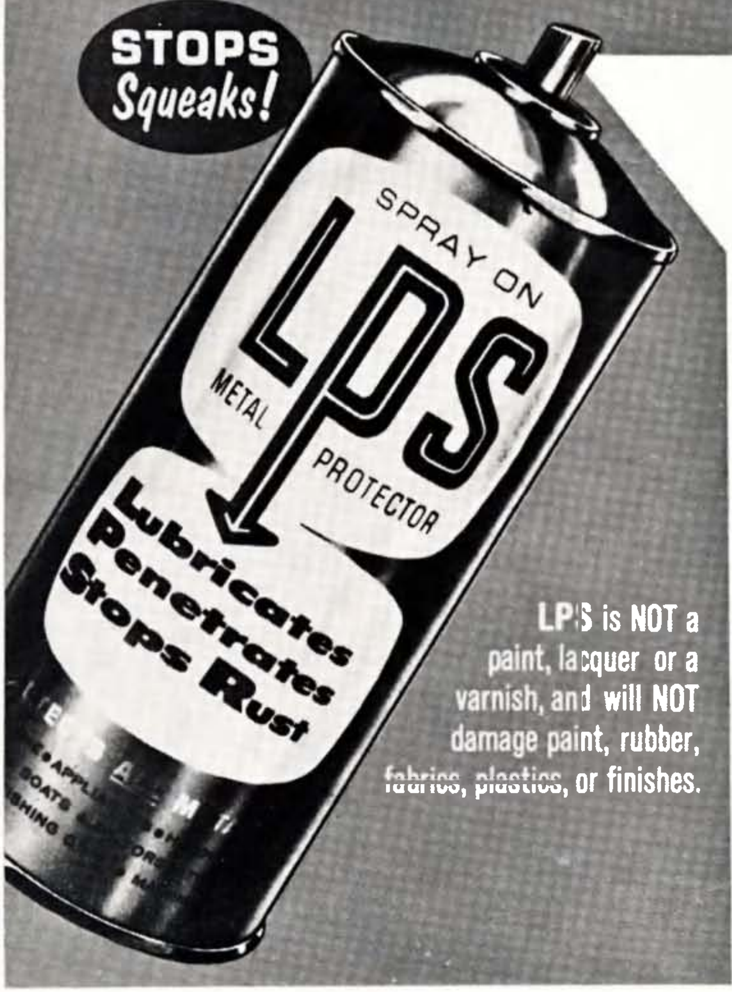

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Dielectric Constant per ASTM-877:
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Dielectric Strength volts/inch, 320,000 volts.

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SIDEBAND ELECTRONICS ENGINEERING ANTENNA SUPPLIES

Last month's (Sept. 1969) issue of "Amateur Radio" carried a picture on the front cover of the latest Tri-band Amateur Beam development. It was not the best of a picture, done in a hurry on very short notice. Anyway, after an aborted attempt some ten years ago in the U.S.A. by GONSET, this is the second and very successful case of a full size 3-element 10-15-20 Metre Tri-band Yagi Beam. All other types of tri-band beams feature element lengths shorter than the standard half wavelengths on 15 and 20 Metres, but not the new TRIPLE-THREE. For instance, the reflector length is the full 35 ft., boom length 18 ft., weight approximately 50 lbs., 2" boom diameter and mast clamp for 2" diam. mast, with built-in 52 ohm Balun. Elements are 1¼" at the centre, tapering to ½" at the ends.

The manufacturer of the TRIPLE-THREE is J-Beam Engineering Ltd., of Northampton, England, a well known firm in the U.K., making VHF, TV and HF Antennas for the U.K. Government, Army and Navy. The price of the TRIPLE-THREE is £60 (approx. $131) in the U.K. I expect to have them in stock in November 1969 at a target price, S.T. and all other charges included, of $180. I shall then be carrying stocks of five different types of tri-band beams and four types of multiband verticals. If the choice becomes difficult, here are my recommendations:

Choice No. 1—HY-GAIN TH6DXX, 6-element master beam, 24 ft. boom length.
Choice No. 2—TRIPLE-THREE J-Beam.
Choice No. 3—MOSLEY MP-33 Tiger-array.
Choice No. 4—HY-GAIN TH3JR or MOSLEY TA33JR.

The TH6DXX, TRIPLE-THREE and MP-33 will safely handle more than our legal power limits, the TA33JR and TH3JR are junior beams and not recommended for the maximum power limit; also, they can be rotated with the CDR AR-22R heavy duty TV rotator, the choices 1 to 3 require a HAM-M heavy duty rotator.

Trapped multi-band vertical antennas like the HY-GAIN 14AVQ and 18AVQ, and the NEWTRONICS 4-BTV are handy for restricted space locations but must have an effective counterpoise to perform properly. Unless one has a metal roof or similar structure or a good conductive soil structure, this counterpoise must be made up with a minimum of two quarter wavelength long radial wires per operating band. Otherwise these verticals will not be very satisfactory. They are also excellent for portable work, easily assembled and broken down in maximum 5 ft. long parts and mounted on an iron stake into the ground, on a bracket on a caravan, etc.

Attempts to obtain another supply of multiband dipoles, W3DZZ types or otherwise, are being made again.

—Arie Bles.

YAESU-MUSEN—

- FT-DX-400 De Luxe Transceiver $525
- FT-DX-100 AC/DC Transceiver $515
- FV-400 Second VFO $80
- FT-200 Transceiver with AC Supply-Spkr. Unit $410
- FL-DX-2000 Linear Amplifier $240
- FR-DX-400-SDX De Luxe Receiver with FC-2TR and FC-6TR 2 and 6 Metre Converters, CW and FM filters, FM discriminator, over $150 of extras! $475
- FL-DX-400 Transmitter $375
- FC-6TR and FC-2TR Converters .... each $25

SWAN—

- SW-350-C Transceiver $550
- SW-500-C Transceiver $675
- 14-230 AC/DC SWAN Power Supply $150
- AC Power Supply-Speaker $80

GALAXY—

- GT-550 Transceiver $625
- External VFO $100
- AC Power Supply-Speaker $80
- VOX Unit $30

HY-GAIN—

- TH6DXX 6-Element Tri-band Beam $180
- BN-86 Balun $20
- TH3JR Junior 3-Element Tri-band Beam $110
- 14AVQ 10 to 40 Metre 4-Band Vertical $45
- 18AVQ 10 to 80 Metre 4-Band Vertical $75

J-BEAM LTD.—

- TRIPLE-THREE 3-Element Tri-band Yagi $180

MOSLEY—

- TA33JR Junior 3-Element Tri-band Beam $95
- MP-33 3-Element Tiger Array $120

ROTATORS—

- CDR HAM-M Heavy Duty Rotator $165
- AR-22R Junior Rotator $60

A.C.I.—

- ACITRON 101 12-Volt Heavy Duty DC Supply .. $105

NEWTRONICS—

- Hustler 4-BTV 10 to 40 Metre 4-Band Vertical $55
- 4-BTV Vertical with 80 Metre Top-Loading Coil $70

CRYSTALS—

- FT241 Crystals, full box of 80 Crystals, Channels 0 to 70, 375 to 515 Kc. $17.50
- Postage and Registration $1
- Sets of six matched Filter Crystals, incl. USB/LSB Carrier Crystals, between 440 and 450 Kc. and between 460 and 470 Kc. .... per Set $10

USED EQUIPMENT—

- TRIO TS-500 with PS-500 AC SSB Transceiver and Power Supply, like-new condition $375
- SBE 34 AC/DC Transceiver, 18 lbs. package, good condition $300
- GALAXY III. Transceiver, with VOX Unit and AC Power Supply-Speaker Unit, perfect $275

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FEDERAL COMMENT:

INTRUDER WATCH AND THE W.I.A.

The Wireless Institute of Australia, like the R.S.G.B. and A.R.R.L., has initiated an Intruder Watch programme. The programme was initiated by a decision of the Federal Council in 1967 who saw the need for such a programme as an important aspect of the Institute's task of protecting Amateur frequency allocations.

A recent issue of "QST" pointed to the reason why Amateurs need an Intruder Watch. It quoted the Radio Regulations Geneva, 1959, the currently effective international document as follows:

> "Article 3, Section 3: Administrations of the Members and Associate Members of the Union shall not assign to a station, any frequency in derogation of either the Table of Frequency Allocations given in this Chapter or the other provisions of these Regulations, except on the express condition that harmful interference shall not be caused to services carried on by stations operating in accordance with the provisions of this Convention and of these Regulations."

The significance of this provision is that it does not prohibit the allocation of a frequency contrary to the Frequency Table—but makes the allocation contravene the Regulations only when interference is caused. Of course, a broadcasting station in, say, the 40 metre Amateur band, will cause interference to the Amateur Service, but the onus is on the Amateur to demonstrate the interference.

Of course all interference is not the result of deliberate acts. The Intruder Watch also serves to draw attention to inadvertent interference, spurious transmissions caused by faulty equipment or by faulty tune-up procedures, which together with harmonics can also result in interference to Amateurs. Complaints about such transmissions usually result in their rectification. The important function of Intruder Watch is to report the interference. Until the interference is reported, the intruder on Amateur bands may be legitimately there. Basically, any Intruder Watch must depend on the listener or observer.

The significance of reports spread over a vast area such as our continent, is obvious. To be successful, Intruder Watch cannot depend on only a few observers. The initiative for the organisation of the observers rests with the Divisions. Each Division appoints an Intruder Watch Co-ordinator. How he undertakes his task depends largely on his Division and himself. The reports are collated by the Federal Intruder Watch Co-ordinator who passes the information on to the appropriate authority, the Postmaster General's Department. The Federal Co-ordinator also co-ordinates the general activities of the Divisional Co-ordinators, sending out information in regular bulletins and providing them with standard stationery and specifying standard procedures. At least this is how it should work.

Reports have come to the Federal Co-ordinator from two Divisions only since the formal appointment of Divisional Co-ordinators. This, of course, may be due to a number of reasons. It should be noted that the appointment of the last Divisional Co-ordinator occurred only a little over a year ago. Probably, though, the most important reason for this paucity of reports lies in the fact that there are insufficient Amateurs willing to undertake the task of acting as observers. Perhaps some of the fault may lie with the W.I.A. Have we really published enough information so that every member knows how important this activity is to the Amateur Service? Make no mistake about it—Federal Executive is a little disappointed in the response to date. We want a Federal Intruder Watch Co-ordinator to be complaining of overwork—not underwork.

If you want to know how you can help in your Division, contact your Divisional Intruder Watch Co-ordinator. His name was published on page 14 of the June issue of "Amateur Radio". It may be that some may question whether the Institute's programme is perhaps a little over-elaborate. We don't think so. There are two points about the Institute's programme that are important and these, we think, justify a formal structure rather than a system that depends on Amateurs being urged "to write letters to the Post Office" when intruders are observed. The Institute can only pass the reports on to the appropriate authority.

If the complaint is in respect of an overseas country, certainly no individual could make direct representation to that country. Such complaints may involve official diplomatic representations direct to the country concerned or through the headquarters of the International Telecommunications Union in Geneva. These representations can only be initiated through the Postmaster General's Department. The Postmaster General's Department is also directly responsible for acting on complaints originating within the Commonwealth of Australia. The Department requires complaints to be submitted to it in a proper form.

The Federal Executive has discussed the problems involved with interference reports with officials of the Department and a procedure has been developed so that reports can be easily and effectively processed by the Department.

The other point about Intruder Watch is this. Reports of interference must be reliable. One of the most important tasks of the Divisional Co-ordinators is to guarantee the standard of reports submitted. Misleading or inaccurate reports are not merely worthless, they are positively harmful to the cause of the Amateur Service.

One of the difficulties facing the Institute in carrying out its prime responsibility of protecting Amateur frequency allocations is that it involves activities in which our membership generally can only participate remotely. Intruder Watch represents one area where not only can all members participate, but without their participation the job just cannot be done.

MICHAEL J. OWEN, VK3KI,
Federal President, W.I.A.

Australis-Oscar 5 Satellite ready for Launch

DON GRAHAM, VK3BAC, and RICHARD TONKIN†*

It now seems likely that the AUSTRALIS OSCAR 5 Amateur Radio Satellite will be launched into orbit shortly after 15th October.

Official confirmation of the planned launch date is expected as this issue of "Amateur Radio" goes to press. The latest information on the launch date may be obtained from the Project Oscar State Co-ordinators, whose names and addresses are listed below, or by listening to the W.I.A. Divisional broadcasts on Sunday mornings.

While AUSTRALIS OSCAR 5 may ride piggy-back into space with one of several different satellite series, the Radio Amateur Satellite Corporation (AMSAT) (which is co-ordinating the launch in the U.S.) suggests that the TOS (TIROS Operational Weather Satellite) orbit is a practical one to consider as an example for the Radio Amateur Satellite. Many Radio Amateurs are already tracking TOS satellites to obtain local cloud cover pictures (APT). A typical TOS orbit has the following parameters:

- Height: 910 statute miles.
- Inclination to equator: 101.5 degrees (polar orbit).
- Period: 114 minutes.
- Launch Site: Western Test Range, California.
- Launch Direction: East to West.
- Launch Time: Around 9 p.m., A.E.S.T.
- Times of nearest overhead passes: Around 3 p.m. local time (ascending node, south to north), around 3 a.m. local time (descending node, north to south).

A detailed description of the AUSTRALIS OSCAR 5 Satellite has already been published in "Amateur Radio". Readers are particularly referred to the following articles:

- Australis Oscar A—Users' Guide, "Amateur Radio," Feb. 1968, p. 3.
- Australis Oscar A—Users' Guide, Part Two, "Amateur Radio," March, 1968, p. 10.
- Using a Phase Comparator, "Amateur Radio," April, 1968, p. 12.

It should be noted that the telemetry calibration curves published in "Amateur Radio" in March 1968 have since been redrawn, owing to re-calibration of the satellite by AMSAT. The correct calibration curves appear elsewhere in this article. Also, the Project Oscar State Co-ordinators' list has been updated and is now as follows:

New South Wales:
V.h.f. and T.v. Group,
14 Atchison Street,
Crows Nest, 2065.

Victoria:
Don Graham, VK3BAC,
38 Murray Drive,
Burwood, 3125.

Queensland:
Laurie Blagborough, VK4ZGL,
54 Bishop Street,
St. Lucia, 4067.

South Australia:
Brian Tideman, VK5TN,
33 Ningana Avenue,
Kings Park, 5034.

Western Australia:
Kevin Bicknell, VK6ZBC,
48 Sanderson Road,
Lesmurdie, 6076.

Tasmania:
Peter Frith, VK7PF,
181 Punchbowl Road,
Launceston, 7250.

These Co-ordinators can be contacted regarding any aspect of the launch, orbit, operation, tracking, etc., of the satellite. They will be kept fully advised of all developments concerning the satellite.

What is AUSTRALIS OSCAR 5 and what will it do?

The satellite carries two amplitude modulated transmitters; one of 50 mW. on 144.050 Mc. which will operate continuously, and one of 150 mW. on 29.450 Mc. The 29.450 Mc. transmitter will be switched on and off by nominated ground stations in order to conserve the life of the satellite's chemical batteries. It is planned that this transmitter will be operated over each weekend so that it can be monitored by the maximum number of Radio Amateurs. If all goes well with the launching, the h.f. transmitter will be commanded on at around 0700 GMT each Friday and off at about 0700 GMT each Monday.

How long will the Satellite Transmit?

It is expected that the satellite's batteries will enable it to operate for approximately two to three months.

What Information will be Transmitted?

Both transmitters will carry the same telemetry data, by means of a group of seven sequential bursts of audio tone (channels), followed by an identifier of HI in Morse code by audio frequency shift keying. The HI contains no telemetry data. The frequency of each of the seven telemetry tones is a measure of one of the following:

Channel 1: Battery current drain.
„ 2: X axis horizon sensor.
„ 3: Battery voltage.
„ 4: Y axis horizon sensor.
„ 5: Internal (electronics package) temperature.
„ 6: Z axis horizon sensor.
„ 7: Skin (inside casing) temperature.

Each "channel" is of approximately 6.5 seconds duration. Frequency variations noted on Channels 2, 4 and 6 compared over several weeks will indicate how well the simple magnetic stabilisation experiment is controlling the satellite's orientation in space. The success of the technique used could assist in improved performance of future Amateur translator satellites by reducing fading caused by spacecraft spin.

How can the Telemetry be Measured?

Useful information on the spin rate may be possible by direct observation of the appropriate Channels 2, 4 and 6. For example, after launch there may be three "bleeps" or changes in frequency on Channel 2, two on Channel 4 and no frequency change on Channel 6. After a week or two in orbit, the data on these three channels will probably have changed, indicating that the magnetic stabilisation system is slowing the satellite's spin rate. For example, there may be one change of frequency on Channels 2 and 4 and two such changes on Channel 6. These figures are purely hypothetical, since it cannot be accurately determined, until the satellite is in orbit, just what it's orientation in space will be.

The frequency of the telemetry tones for Channels 1, 3, 5 and 7 may be measured by:

1. Audio oscillator and phase comparator.
2. CRO, audio oscillator and Lissajous figures.
3. Direct reading audio oscillator.

As there will be times when the received signal/noise ratio will be poor (e.g., when the satellite is near the local horizon), method 1, followed by method

* Victorian Co-ordinator, Project Oscar, 38 Murray Drive, Burwood, Vic., 3125.
† Chairman, Project Australis, 5/39 Tooronga Road, East Malvern, Vic., 3145.

2 is recommended. Method 3 should only be attempted when the signal/noise ratio is extremely good.

What Reception Reports are Required?

All reception reports are welcomed. Special telemetry reporting forms are available from the State Co-ordinators. In the case of the 29.450 Mc. transmitter, a report that the signal is **not** audible when it should be, i.e. when the satellite is in radio range and the transmitter is switched on, is very useful. Likewise, any h.f. signals heard when the satellite is below the horizon should be noted on the telemetry reporting form. Completed forms should be returned to the appropriate State Co-ordinator.

How well will the Signals from the Satellite be Received?

As the "piggy back" launches likely to be available to AMSAT are of a higher altitude than originally planned by OSCAR, received signals will be weaker by about 6 db. However, the satellite should be clearly readible by reasonably well-equipped stations. For example, typical cases at a range of 2,500 nautical miles are:

1. Frequency 144.050 Mc.
   Antenna gain +13 db.
   Receiver noise figure 3 db.
   Receiver bandwidth 5 Kc.
   Then signal/noise at rx . . . 11 db.
2. Frequency 29.450 Mc.
   Antenna gain 0 db.
   Receiver noise figure 3 db.
   Receiver bandwidth 5 Kc.
   Then signal/noise at rx . . . 17 db.

As it will not be uncommon for signal levels to fall below 1 μV. in 50 ohms at the receiver input, a low noise converter or pre-amplifier will be a good investment.

When will the Satellite be Audible?

It is possible that the 29.450 Mc. transmitter will be audible at times when the satellite is below the radio horizon. This will depend on the state of the ionosphere between the ground receiver and the satellite. Over-horizon reports of the 29 Mc. signal will therefore be of particular interest.

Orbital predictions to assist in reception of the satellite are available from State Co-ordinators.

How are the Orbital Predictions Produced?

For a satellite in a given orbit, that orbit is defined by the time and position that the satellite crosses the equator, travelling northwards. This is called the "**Ascending Node**".

On the basis of various ascending node positions, a set of "Standard Orbits" have been prepared for all States. These "Standard Orbits" give the azimuth and elevation of the satellite at two-minute time intervals, from the station. A typical example is shown below:

Standard Orbits for Melbourne
for ascending node 45°West

Minutes after Ascend. Node	Azimuth	Elevation
84	171	3
86	165	9
88	159	15
90	144	19
92	131	15
94	123	10
96	119	5

Table 1.

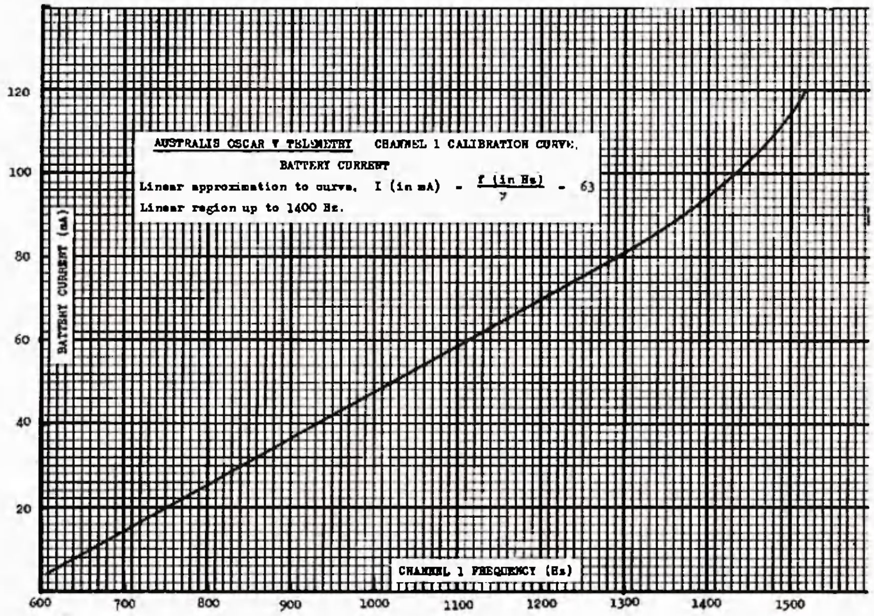
"Standard Orbits" are now available from State Co-ordinators, as are the projected "Ascending Nodes" predictions for the first few days after launch. An example of the "Ascending Node" data is shown below:

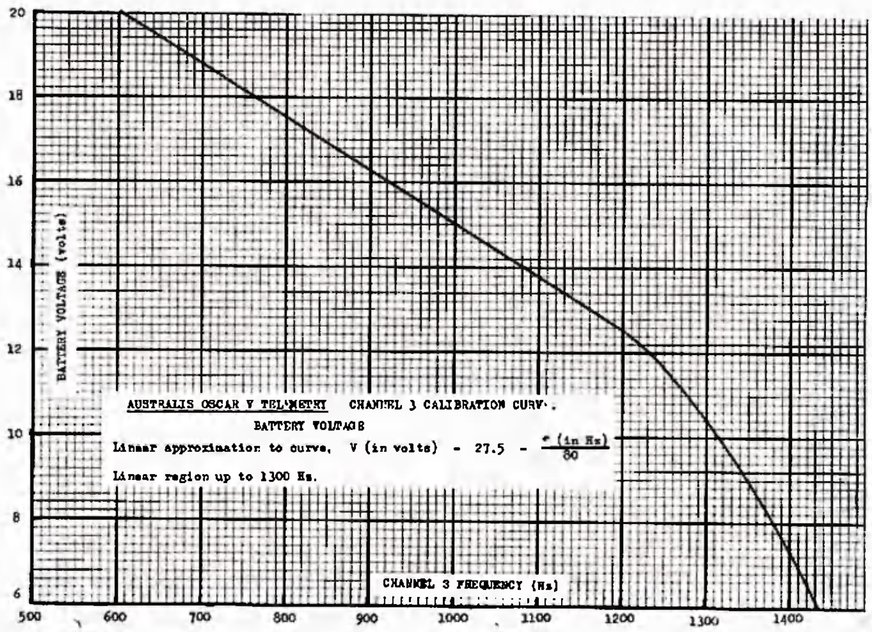
Ascending Nodes for Australis Oscar 5

Date	Orbit	Time (GMT)	Ascend. Node
31 Oct. '69	0693	0326	356
31 Oct. '69	0694	0507	020
31 Oct. '69	0695	0648	044
31 Oct. '69	0696	0829	070
31 Oct. '69	0697	1010	096

Table 2.

If, for example, a station wished to track orbit number 0695 on 31st October, 1969, the appropriate "Standard Orbit" (Table 1), i.e. the "Standard Orbit" having an ascending node closest to the selected orbit, would be chosen. The antenna pointing figures are thus calculated:





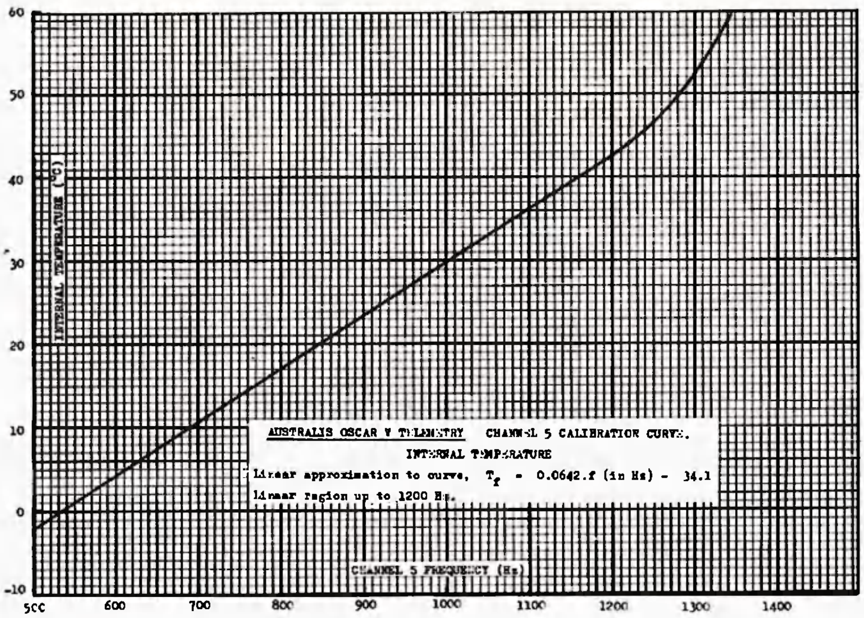
Orbit Number 0695, 31st Oct., 1969

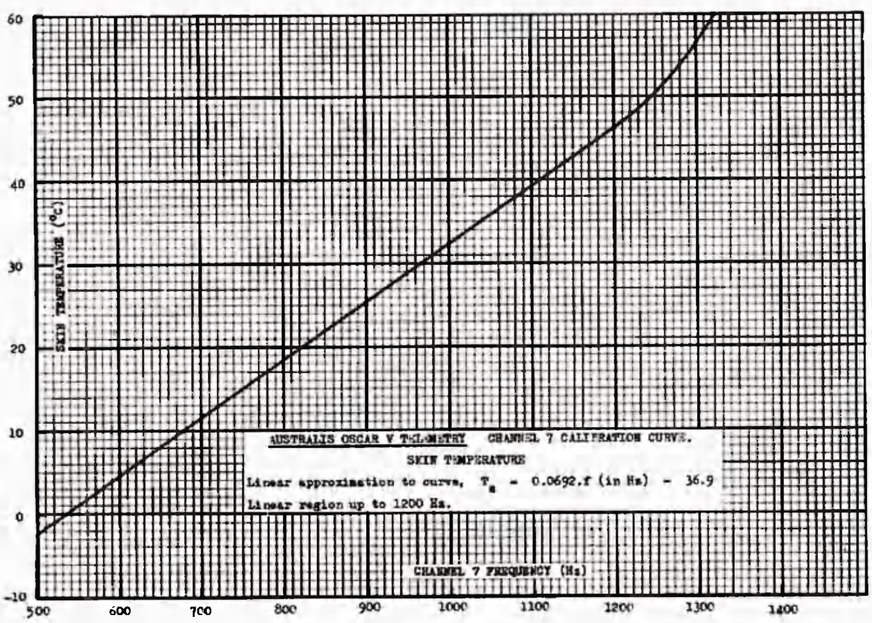
Time (GMT) (Time of Ascend. Node (plus added Minutes)	Azimuth	Elevation
0648 + 84 = 0812 GMT	171	3
+ 86 = 0814 GMT	165	9
+ 88 = 0816 GMT	159	15
+ 90 = 0818 GMT	144	19
+ 92 = 0820 GMT	131	15
+ 94 = 0822 GMT	123	10
+ 96 = 0824 GMT	119	5

Table 3.

Thus, for example, the satellite would be located at an azimuth of 159° and elevation of 15° at 0816 GMT on 31st October, 1969. Ascending nodes will be supplied, on a regular basis, to State Co-ordinators beginning immediately after the launching into orbit of the satellite.

AUSTRALIS OSCAR 5 will be the first Amateur Radio Satellite launched since Oscar 4 went into orbit almost four years ago. Help make the flight of this first Australian-built Amateur Satellite a success! Prepare for the launch, listen for the satellite's signals and send in your reception reports. Every valid reception report will be acknowledged by a handsome QSL card to signify that the recipient helped to make the flight of AUSTRALIS OSCAR 5 a success.





1969 W.A.D.M. CONTEST

To celebrate the foundation of the German Democratic Republic in October 1949, the Radio Club of the G.D.R. sponsors an annual DX Contest. An invitation is extended to all Amateurs to participate in the 1969 W.A.D.M. Contest.

Object: To contact as many DM stations as possible.

When: 1500 GMT, 3rd October, until 1500 GMT, 4th October.

Sections: (a) Single operator; (b) Multi-operator; (c) Short Wave Listeners.

Bands/Mode: All bands 80-10 metres, c.w. only.

Call: "CQ DM".

Exchange: RST plus a three-figure serial number starting from 001.

Points: Complete QSOs, 3 points. Incomplete QSOs, 1 point. Listeners will receive 1 point for each new DM station heard together with the transmitted number.

Multiplier: Obtained by adding the multipliers from each band.

Each band multiplier is equal to the number of DM districts plus the number of DM7, 8 and 0 stations worked on that band. The districts are indicated by the last letter of the DM call signs (A through O). A maximum multiplier of 15 is allowed for each band.

Use a separate log for each band and send within four weeks to: Radio Club of the G.D.R., DM Contest Manager, DM2ATL, DDR 1055, Berlin, P.O. Box 30, German Democratic Republic.

W.I.A. D.X.C.C.

Listed below are the highest twelve members in each section. Position in the list is determined by the first number shown. The first number represents the participant's total countries less any credits given for deleted countries. The second number shown represents the total D.X.C.C. credits given, including deleted countries. Where totals are the same, listings will be alphabetical by call sign.

Credits for new members and those whose totals have been amended are also shown.

PHONE

VK5MS	317/340	VK5AB	298/314
VK3AHO	312/326	VK4FJ	285/304
VK6RU	312/327	VK4TY	285/288
VK4HR	309/327	VK4KS	284/299
VK2JZ	307/324	VK2APK	277/282
VK6MK	304/323	VK3TL	271/277

New Members:

Cert. No.	Call	Total
99	VK2SG	234/236
100	VK3WW	101/101
101	VK3JM	103/103
102	VK4SD	115/115

Amendments:

VK3ZE	233/236	VK3SM	176/179
VK4DO	224/236	VK3AMK	176/176
VK3LW	208/214	VK4RF	145/145
VK3VK	202/202	VK4XJ	134/138
VK4UC	181/181		

C.W.

VK2QL	301/323	VK2APK	270/278
VK3AHQ	301/315	VK3XB	270/284
VK4FJ	290/314	VK3YL	270/287
VK3CX	289/312	VK3ARX	269/278
VK4HR	283/305	VK6RU	266/289
VK2AGH	282/296	VK3NC	264/277

New Members:

Cert. No.	Call	Total
95	VK2SG	138/142

Amendments:

VK4TY	259/272	VK4DO	188/205
VK3KS	229/236	VK4UC	171/172
VK4SD	192/206	VK4RF	128/140

OPEN

VK4HR	313/337	VK6MK	305/324
VK6RU	313/338	VK2EO	302/325
VK2AGH	312/332	VK4FJ	298/322
VK2VN	307/324	VK2APK	294/304
VK4SD	307/321	VK3ARX	292/301
VK4TY	307/321	VK3TL	287/293

New Members:

Cert. No.	Call	Total
119	VK3HE	105/106
120	VK3QV	106/106
121	VK4SD	307/321

Amendments:

VK3XB	279/291	VK4RF	190/202
VK2SG	268/274	VK4XJ	180/187
VK4DO	244/260	VK3OG	107/107
VK4UC	240/241		

ANTENNA FARMING ON 7 Mc.

Rhombics—Signal-to-Noise Ratio

A. J. C. THOMPSON, VK4AT*

BEING old fashioned, but still true to my Amateur status, I naturally am an experimenter. As such, I am entitled to lacerate the big ears of the very learned with my startling interpretation of the contents of sundry text books. In their turn these same gentlemen will themselves do likewise to others higher up in the academic scale. The only apparent solution to that state of affairs is for writers of any standard to write within the limits of their own knowledge and also within the limits of the comprehension of those that they wish to inform.

This particular article is based on the practical experiments that have been conducted here over the past three years. During that time at least four different types of antennas, all on 7 Mc., were actually in use. Chaos reigned supreme for quite awhile. This may sound like a real rat-bag set-up, yet, owing to much early training in experimental work (not in this field), I do work fairly systematically toward a definite goal.

In the present instance experimenting was very necessary if I was to get normal signals into and out of this valley. My QTH is completely surrounded by hills. It is famous for bad radio and t.v. reception. Starting off with a very temperamental off-centre-fed multiband made things worse. Fortunately in experimental work I have passed the stage where I could look at facts and see just what I wanted to see. At this stage of my life I don't, now, even lead my willing self "right up the garden path". Facts to me now are just facts.

Contrary to popular belief, there is still a large unexplored region to explore in the study of antennas. Theorists themselves admit this. They follow only one path in each field. Regardless of how intricate the necessary calculations are, or how delicate the instruments be, there must ultimately come the stage of power to complete the process. This brings things within the capability of us and our own instruments. In my own case I started off with a Command tx on 60 watts on a.m. Due to ignorance and the above disabilities, I was soon able to be recognised as the star performer in all VK4 land when it came to putting out an erratic signal.

After three years of antenna experimenting and still with the same gear on a.m., I am now as consistently strong in the southern States as the others who have better gear and modes. Under bad QRM conditions on 7 Mc. at night I even have all that band to myself as far as the VK4s are concerned. This is due to the excellent signal-to-noise ratio of this big rhombic when used on the receiver. From this experience I am convinced that the most important thing on 7 Mc. is to have good signal-to-noise ratio gear. The rhombic in this regard is far superior to all others tried. At the other end is the multiband. It collects all the QRM that is around.

Modern text books now pay increasing attention to this signal-to-noise ratio, in keeping with modern trends in receiver construction. On the transmitter the rhombic never lived up to its reputation. I have erected three of them, all of 6¼ wavelengths per leg on 7 Mc. in size. The first one had a high ridge running right down the long axis, thus separating each half. The second and third had three legs across steep gullies and the other over comparatively low ground. I now attribute transmitting failures (tested against a dipole and later a 4-element yagi) to the following:

(1) My inability to balance up the two vees forming the rhombic.
(2) The high angle of radiation.
(3) The landscape difficulties causing the above.
(4) The lack of reporting stations E. and W.
(5) The probable fact that it always radiated E. and W.
(6) That although erected as a rhombic, it was acting as two vees in reverse, connected in series.

In order to test the axis behaviour of the rhombic a 4-element yagi was erected beaming right down the rhombic's long axis South to Sydney. Strength 4 against 8 for the yagi there, was 8 and 8 respectively at Adelaide on occasions, but usually 4 there also. It may have been better further out.

Feed-line variations were tried. These included (1) antenna tuners of various brews, (2) half-wave feed lines, (3) tapered lines, (4) stubs, (5) quarter-wave transformers of both 1 and 2 stages, (6) 300 ohm t.v., also home-brew open line of diam. x 6—300 ohms, and diam. x 100—660 ohms, and wider spacers up to 14 inches.

Indicators were used including lamps, fluorescent tubes and field strength meters outside and similar meters, tubes and bulbs inside. A constant recurring feature was the particularly good signal-to-noise ratio when the rhombic was connected to the receiver. I was conscious of this but had kept no track of it. Now, under bad QRN conditions, the contrast between the yagi and rhombic was startling and quite unexpected because both faced S. It didn't take long to adopt the view that they actually were operating at right angles. If this proved to be the case, then a lot of puzzling qeustions were answered.

In support of the view that the rhombic actually was radiating along its short axis was the fact that from a signal-to-noise ratio angle the rhombic was nearly always superior, but when it failed then the yagi came good. A good signal-to-noise effect suggests either an attenuation which is greatest on the unwanted signal or the reverse which could be a beam effect favouring the wanted signal. All this may appear as a back-to-front approach to experimenting—to get results first then look for the cause afterwards—but it is quite in keeping with standard practice, to look for unusual behaviour or a visible misfit.

We now look at the rhombic from this new angle and from the transmitting point of view. Another description of a rhombic is two vees in reverse connected in series. This can be done practically by Zepp feeding either side. Antiresonant feeding the East vee gave no results but feeding the W. side gave similar but better results than normal feed to the rhombic. In this case with the vees not symmetrical, the rhombic radiated along its short axis even without feeding in antiresonance.

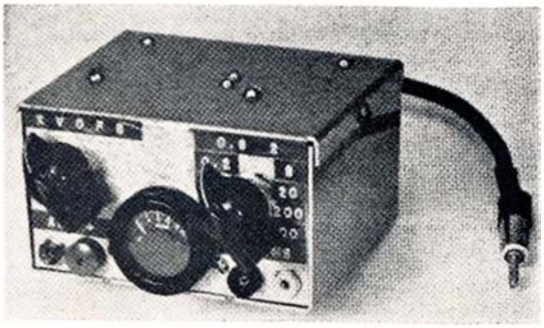
A rhombic at this QTH with its long axis N. and S. but radiating E. and W. along its short axis will drop a received signal by about two S points usually. When that is recovered by the receiver the favourable signal-to-noise ratio on the rhombic would range from just clipping the QRN peaks to as much as quite normal strength at a comfortable listening standard, compared with impossible reading by the yagi and dipole. It is presumed that the QRM would be coming from the South then.

In actual action the antennas are at right angles but tests with other antennas at right angles have not given the same actual results. It should be noted though, that when the rhombic fails, the yagi comes good and is a little better then than either the rhombic or the dipole. It is presumed that the QRM is then coming from the West as the western side vee is fed in antiresonance.

Another factor noted on all three rhombics was that the signal strength on the receiver gave no indication of the probable performance of the transmitter. The only explanation that I have comes from a text book, "that, with a rhombic, the receiver is more tolerant to a mismatch than a transmitter". Thus the law of Reciprocity is not transgressed. But I quote the law—from Jasik, "Antenna Engineering"—he is referring to its application in reference to arrays "Though the reciprocal relationship between transmitter and receiver antennas are easily accepted. It is especially easy to see that the receiver power from an advancing plane wavefront is greater when intercepted by a large broadside array than when intercepted by a small

(continued on page 19)

* Skyrings Creek, Pomona, Qld., 4568.



The completed Multi-Tester. This little device will fit neatly in the palm of one's hand, but its use rivals that of several separate and perhaps much larger instruments. The labels for the jacks and switch positions were made with a tape embossing machine.

A COMPACT MULTI-PURPOSE TEST INSTRUMENT*

YARDLEY BEERS, W0JF, ex-W0EXS

A COMPACT test instrument which was built for use with various suitcase portable stations is shown in the photographs and in Fig. 1. The instrument is useful for stations ranging from transistor outfits with powers of less than a watt to those of the SB-33 transceiver class.[1] Contained in a box 3¾" x 3" x 2⅛" is a device which can perform the functions of all the following equipment:

- Reflectometer-type standing wave detector,
- Multi-range voltmeter,
- Radio-frequency probe,
- Two-range ohmmeter,
- Resistance-substitution box, and
- Frequency calibrator using quartz crystals for reference.

This instrument was designed around a miniature microammeter, 1¼" in outer diameter, with a full-scale reading of 200 microamperes and an internal resistance of 600 ohms. The author bought this meter on the surplus market some years ago. It is unlikley that many readers can obtain an exact duplicate, but several inexpensive miniature meters appear to be good substitutes. With some of these, it may be necessary to use a slightly larger box, and it may be necessary to alter some of the resistance values given in the circuit diagram, in accordance with the procedure which is described later.

Originally, the intent was to build only a standing-wave detector, which is often needed to help match the impedances of the various haywire antennas inevitably used in portable operation. However, it seemed a shame to tie up a sensitive meter for this purpose only. Why not provide an extra switch position which allows the meter to be connected to a pair of pin jacks? This function would be especially useful because some of the small transmitters have no built-in meters, but only include test points for use with an external meter. Then, why not add another pin jack with a crystal diode so that it can be used to detect r.f. or a.c.? By a continuation of this reasoning, the present circuit gradually evolved.

In the early stages of the development of this circuit, the place for S2 and the resistors R3 through R9 was occupied by a 50,000 ohm control. Its sole purpose was to set the needle exactly on full scale on the forward (F) position of the reflectometer or on the high resistance scale of the ohmmeter. However, it was realised that this control could also serve as a multiplier for a voltmeter, which would have a full scale reading of 10 volts. In addition, it was considered desirable to be able to measure the B+ voltage of the SB-33, about 500 volts. If the control value were made a high-enough resistance to serve as a multiplier for this range, its adjustment would be much too critical in other applications. Therefore it was decided to give up the luxury of being able to set the needle exactly on full scale, and the control was replaced by the present stepped resistance scheme which results in a much more versatile instrument. The precision is limited by error of reading the miniature meter, which has only twenty divisions. Therefore, the use of high-precision resistors for the multiplier is not fully justified, and common five and ten-per cent. resistors were used in this network except in a couple of cases for which the junk box just happened to yield a precision resistor of the right value.

CONSTRUCTION

The photographs show the construction layout used by the author. One of the 3¾" x 2⅛" sides of the box serves as the front panel. On this panel are mounted the meter, two rotary switches, and four pin jacks. Of the two switches, S1 selects the function, and S2 controls the sensitivity. On the back are mounted the input and output r.f. connectors, the fifth pin jack (R), and, on the inside, a holder for a 1.5-volt penlight cell.

The heart of the standing-wave detector is a piece of RG-58/U co-axial line about two feet long. The outer plastic covering has been removed, and a piece of enamelled magnet wire has been slipped under the shielding braid. The ends and mid-point are brought out through the shielding. This cable is coiled up and attached to the inside of one of the 3¾" x 3" surfaces by means of some wire, solder lugs, and machine screws. In the centre of this coil is mounted a bracket for holding the two FT-243 quartz crystals used in the frequency calibrator. Also mounted on this surface is a terminal strip which is used mainly to support the other components of the standing wave detector.

The value for R2 is selected with the penlight cell in place, with S1 set at V, and with S2 set at zero. With a jumper connected between the OHMS and the + test jacks, select a value which will give a full-scale meter deflection.

OPERATION

For the sake of protecting the meter, the switches S1 and S2 are left in their off positions when the instrument is not in use. For use, S2 is set to the least sensitive position (R9, or 500 volts full scale), and S1 is set to select the desired function. The sensitivity is then increased by turning S2 towards R3 until the needle reads maximum without going off scale. The selection of the function is not determined solely by S1, but partially by the selection of pin jacks, as described in detail below.

REFLECTOMETER

For the reflectometer, none of the pin jacks are used. The r.f. signal enters and departs on co-axial connectors. This portion of the circuit is standard in design and has been modelled on descriptions contained in "The Radio Amateur's Handbook". S1 is first turned to the forward (F) position and the needle is brought to a high scale reading by turning S2, as given in the paragraph above. Call the value of this reading A. Then S1 is turned to the back (B) position, where the needle reads value C. The voltage reflection coefficient then equals C ÷ A, and the voltage standing wave ratio is $\frac{A + C}{A - C}$.

MEASUREMENT OF D.C. VOLTAGES

For the measurement of d.c. voltages, S1 is turned to V, and the unknown voltage is applied between the pin jacks + and —. The voltage calibration at full scale is obtained by multiplying the full-scale current reading by the sum of the resistances in the circuit (the value selected by S2 plus the internal meter resistance). These full-scale voltage values are given after the respective resistors in the table included with Fig. 1.

MEASUREMENT OF A.C. AND R.F. VOLTAGES

For observation of a.c. and r.f. voltages, the unknown voltage is applied between the pin jacks AC and —, allowing the diode CR3 to be connected in series with the voltmeter circuit. Then the procedure is the same as for d.c. voltages. (The meter should be

* Reprinted from "QST," April 1969.
1 The SB-33 transceiver is rated at 70 watts p.e.p. output on the lower frequency bands. —Editor.

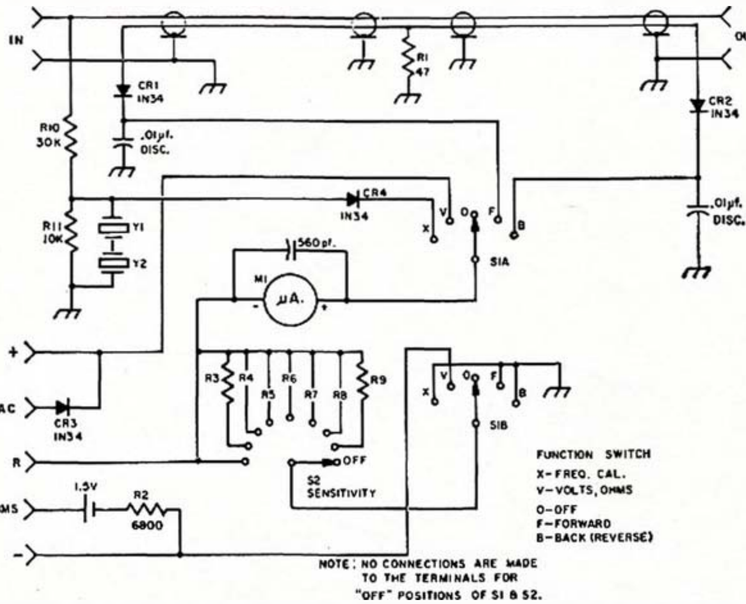


Fig. 1.—Schematic of the Multi-Purpose Test Instrument. Resistances are ½ watt, values in ohms, K equals 1,000. See text for resistance tolerances and modification of values shown. In the author's instrument, Y1 and Y2 are quartz crystals cut for 3995 and 7125 Kc. respectively, although the builder may substitute crystals for any calibration frequencies desired, as explained in the text.

CR1 through CR4—See text.
M1—See text.
R1, R2, R10, R11—See text.
R3—390 (0.2 volt).
R4—3,300 (0.8 volt).
R5—10,000 (2 volts).
R6—39,000 (8 volts).
R7—0.1 meg. (20 volts).
R8—1 meg. (200 volts).
R9—2.5 meg. (500 volts).
S1—Rotary, 1 section, 2 poles, 6 positions (1 position unused), non-shorting.
S2—Rotary, 1 section, 1 pole, 11 positions (2 positions unused), non-shorting.

calibrated previously against known a.c. voltages.) The higher voltage ranges cannot be used for a.c. or r.f. measurements because the diode will be damaged if the peak inverse voltage exceeds a safe value. With 1N34 diodes, the voltage should be kept under 20 volts r.m.s.

R.F. PROBE

The instrument may be used as an r.f. probe by connecting a pick-up loop between the AC and — pin jacks. Alternatively, an antenna may be connected to these jacks. A resistor or an r.f. choke must also be connected between the two jacks, if the antenna does not provide a d.c. return.

OHMMETER

For use of either ohmmeter range, S2 is set to zero and S1 is set to V. For the higher resistance range, the unknown resistance, X, is connected between the OHMS and + pin jacks. R2 has been previously selected to give a full-scale deflection D when a jumper is connected between these two jacks. With X in place, the deflection is E. It may be shown that, if R_M is the meter resistance,

$$X = \frac{(D - E)\ (R2 + R_M)}{E}.$$

This expression may be used to provide a calibration. Alternatively, the scale may be calibrated by connecting a number of known resistors, noting the deflections, and plotting a graph.

For the lower resistance range, the unknown value is connected in parallel with the meter. A jumper is connected between the OHMS and + jacks, and the unknown resistance is connected between the + and the R jacks. The lowest unknown resistance values will give the smallest meter deflections. The calibration can be determined by circuit theory if the meter resistance is known. However, if it is not known, the calibration can be determined by plugging in known resistors and noting the readings. (The internal meter resistance R_M is the same as the value of an "unknown" resistor connected in this manner which gives a one-half scale meter reading, if R2 is very much larger than R_M.)

RESISTANCE SUBSTITUTION BOX

S2 and its associated resistors R3 to R9 may be used as a resistance substitution box. Set S1 on V, and connect to the R and — jacks.

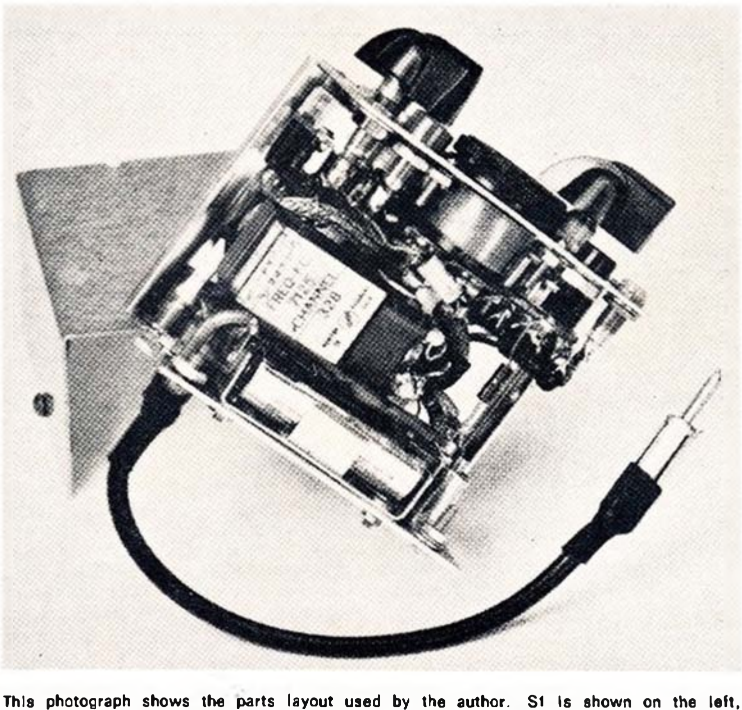
FREQUENCY CALIBRATOR

The crystal frequency calibrator uses two quartz crystals connected in series, the resistors R10 and R11, and the diode CR4. S1 is switched to the X position, and the meter reads the rectified voltage developed across the quartz crystals. R11 parallels the crystals to provide a d.c. return. R10 drops the r.f. voltage from the antenna line down to a couple of volts and also prevents a significant amount of the total transmitter power from being lost in this circuit. CR4 rectifies the r.f. which is read as d.c. on the meter.

As the frequency of the transmitter is varied, the meter reading changes very little except near the resonant frequencies of the crystals. If you tune in the direction of increasing frequency through crystal resonance, the meter suddenly deflects downward, then deflects upward, and then finally returns to a steady value. Either the minimum, the cross-over, or the maximum readings can be used for frequency reference.

If the highest accuracy is desired, a calibration in terms of another fre-

(continued on page 14)



This photograph shows the parts layout used by the author. S1 is shown on the left, the meter at the centre, and S2 on the right of the front panel. The sockets for the crystals are shown mounted near the centre of the instrument, and the penlight cell with its holder are visible on the rear panel. Beneath the quartz crystals may be seen the shield of the co-axial line used in the reflectometer section of the device.

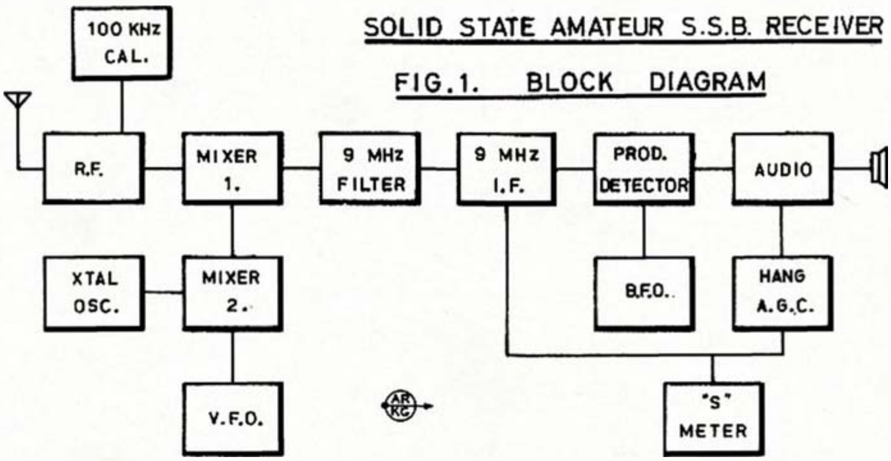
A SOLID STATE AMATEUR S.S.B. RECEIVER

PART ONE

*B. G. CLIFT and A. E. TOBIN**

The first of a series of articles by Fairchild engineers describing the circuitry and construction of a Solid State Amateur S.S.B. Receiver

WITH the rapid development being currently made in the semiconductor industry, technology has advanced to a stage where the uses of linear integrated circuits may be a practical and economical realisation for the Amateur. The aim of this project is to design a high performance receiver using semiconductors from the consumer product range. Where integrated circuits are comparable economically they are used in preference to discrete components. Many engineering "fanciful ideas" have been disregarded because of the economics involved, and so this receiver is not intended to be "state-of-the-art" performance-wise, but will be comparable with present day commercial standards.



SOLID STATE AMATEUR S.S.B. RECEIVER

FIG. 1. BLOCK DIAGRAM

BLOCK SCHEMATIC

As shown by the block schematic (Fig. 1) the system used is one of single conversion with a fixed v.f.o. providing a tuning range of 500 Kc. A 9 Mc. i.f. was chosen because of the readily available Pye 9-0A 4-pole crystal filter. The filter provides about 40 db. skirt selectivity, and is considered just adequate.

A v.f.o. frequency range from 5-5.5 Mc. was chosen since it lends itself readily for direct single conversion of two Amateur bands, 80 metres and 20 metres. The other bands are provided by heterodyning the v.f.o. with suitable crystal oscillators in the second mixer to achieve the desired oscillator injection frequency.

The r.f. amplifier will consist of two cascoded transistors providing better sensitivity than a FET and comparable cross-modulation performance. The problem of spurious signals generated by the two mixers has not been overlooked. Careful attention will be given to the mixer designs to produce the most desirable non-linear law to minimise the problem of harmonics which can produce difference frequencies falling within the crystal filter pass band.

The system lends itself readily for generating a single sideband signal on the same frequency as the received signal. The common elements for transceiver operation are:

1. The b.f.o. frequency as carrier oscillator.
2. The 9 Mc. filter and i.f. for sideband suppression.
3. The oscillator injection frequency for heterodyning the sideband signal to the received signal frequency.

The only additional circuit blocks required to complete the transceiver are:

1. Audio pre-amplifier.
2. Balance modulator.
3. Linear mixer.
4. R.f. amplifier.

It is hoped that the v.f.o. of 5-5.5 Mc. will be replaced with an optional frequency synthesiser using the indirect method of a phase locked loop. This would provide automatic receiver calibration, crystal stability for both receiver and transmitter, and the capability for a digital frequency display in place of the normal dial. It would appear that the economics would now take on new dimensions, but the feasibility of the basic synthesiser is being examined.

CONSTRUCTION

One of the biggest problems in constructing an Amateur receiver is that of mechanical layout and assembly. Coil switching for the various bands usually involves a tailored wafer switch with the coils mounted as close as practical to the appropriate wafer. To avoid this problem a standard 12-position turret tuner has been used to good advantage. On account of the physical dimensions of some of the coils, it has been necessary to restrict the coverage to six bands. These were selected as follows:

- 80 metres (3.5-4 Mc.).
- 40 metres (7-7.5 Mc.).
- 20 metres (14-14.5 Mc.).
- 15 metres (21-21.5 Mc.).
- 10 metres (28-28.5 Mc. and 29-29.5 Mc.).

The r.f. amplifier and first mixer are assembled in the turret tuner which has been suitably modified with an extension shaft and additional switch wafers connected to the rear. An Eddystone die-cast box is used to house the v.f.o., thus providing the mechanical rigidity essential for stable operation.

The receiver is built in an instrument cabinet measuring approximately 19" wide by 6½" high by 13" deep. No attempt has been made to miniaturise the construction, but rather to use modular techniques using plug-in printed circuit boards which are assembled in a rack within the cabinet. The printed circuit boards are arranged to plug in from the rear of the cabinet,

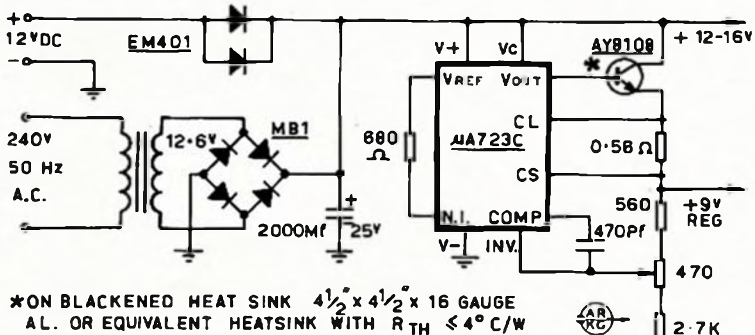


FIG 2 POWER SUPPLY

* Applications Laboratory, Fairchild Australia Pty. Ltd., 420 Mt. Dandenong Road, Croydon, Vic., 3136.

thus making access and any required alterations very simple. The dial is a standard Eddystone 803 straight-line dial assembly mounted directly on the front panel. Further details on layout will be given as the appropriate sections are discussed in the series of articles to follow.

POWER SUPPLY

Fig. 2 shows the circuit diagram of the power supply module which is quite straightforward. Switching from 240 volt a.c. to 12 volt d.c. operation is automatic. Both supply sources may therefore be left connected without damage.

The supply consists of a raw 12 to 16 volt supply plus a regulated short circuit protected 9 volt 1 amp. supply using a μA723C regulator and the AY8108 TO66 power transistor as the series pass element. The trimpot allows for adjustment of the supply within the range of +8.3 volts to +9.7 volts typically, depending on the tolerance of the temperature compensated reference in the μA723C (6.8 volts to 7.5 volts). The cost of a discrete component supply is fractionally less than the μA723C supply, but the performance and reliability are greatly improved.

AUDIO AMPLIFIER

The audio amplifier (as shown in Fig. 3) looks very much like the Fairchild 3-watt circuit, with a few extras thrown in. The circuit was designed for a 50 mW. sensitivity and so required the use of biasing diodes to eliminate the cross-over distortion. The circuit will provide about 1.5 watts of clean audio with a high frequency response roll-off at about 5 Kc.

The 50 μF. capacitor on the base of R1 resistor provides sufficient decoupling to eliminate hash or 100 cycle hum, depending on whether the unit is operated from a battery or mains supply.

The 100 ohm resistor on the output charges the 100 μF. capacitor so that the speaker may be disconnected and reconnected without damage to the output devices. A 15 ohm loudspeaker may be used satisfactorily with a reduction in audio output. However, it is not recommended to operate the amplifier with a load impedance of less than 8 ohms.

In the next article the design of the i.f. strip, product detector and audio derived a.g.c. will be discussed.

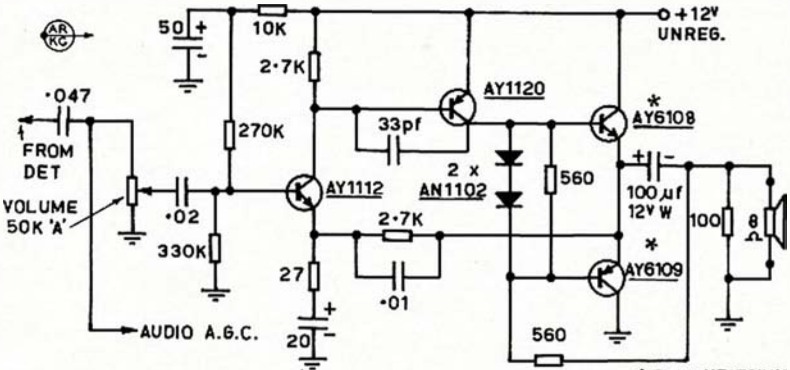


FIG. 3. AUDIO AMPLIFIER CIRCUIT DIAGRAM *FLAG HEATSINK MUST BE USED

LIMITED LICENSEES AND THE COOK BI-CENTENARY AWARD

Editor "A.R.," Dear Sir,

Recently there was a letter in "A.R." re the exclusion of Limited licensees from participation in the Cook Bi-Centenary Award. Following further correspondence by others to me in relation to the same matter, I feel an explanation of the situation may be of interest.

The rules for the award were arrived at after careful consideration of all the factors involved. It was realised that as the rules are now framed it is all but impossible for the holder of a Limited licence to achieve the award. However, one of the main aims of this award was for the participation of overseas stations and in this respect the v.h.f. bands would be of almost no use whatsoever.

After a considerable amount of thought had been given to the subject, a table of requirements for local and overseas stations was drawn up. This may not be ideal but it was considered with the large number of variables involved, it was a reasonable compromise and gives both the local and overseas Amateur a fair chance of working the required number of stations in the time allowed. It was a case of trying to allow for average operation under average conditions, making the award difficult enough to be worth trying for but not so hard as to be impossible. It was also taken into consideration that most Amateurs have limited time available for their hobby and can't be operating many hours each day. Past experience with Limited licensees has shown that activity in the contests such as the "R.D.," etc., has been very poor. Even the interest in V.h.f. Awards comes mainly from holders of Full calls.

On the v.h.f. bands conditions are totally different to the h.f. bands. Where on 80 metres or 40 metres a station could work any other part of VK, it would clearly be impossible on v.h.f. Six metre operators in Brisbane, Melbourne, Wagga and other Channel 0 areas would be lucky to get one contact for the award. Two metre activity is limited to small areas of large population and a multitude of rules would have to be drawn up to make it a fair contest for all concerned. If the Limited licensee wishes to take part in the Award, let him produce a list of workable rules to cover the multitude of factors that would have to be considered if EVERY v.h.f. operator is to have a reasonable chance of attaining the Award. Unless this can be done, and none of the previous correspondents has been able to do this, it is impossible to have a v.h.f. section.

It should also be realised by the Limited licensees that they have only themselves to blame for their v.h.f.-only licence. If they wish to participate in the Award they have only to attain the very easy 10 w.p.m. c.w. exam. and they are then on an equal footing with everyone else. It surely cannot be said that the present requirements for the Full licence are too difficult for any person really interested in his hobby.

—GEOFF. WILSON, VK3AMK,
Federal Awards Manager.

MULTI-PURPOSE TEST INSTRUMENT

(continued from page 12)

quency standard should be made for whichever reference is chosen. Generally the frequency differences between the points are of the order of one Kc., and the precision for resetting the frequency with this device is of this order of magnitude. If the two crystals have resonant frequencies reasonably well separated, the presence of one of the crystals has little effect upon the resonances of the other, but if one is shorted out, the deflections of the meter at resonance for the other are slightly larger.

If more space had been available, it would have been practical to connect additional crystals in series to obtain more calibration points. Incidentally, 7 Mc. crystals give usable calibration points on their third harmonics in the 21 Mc. band. If the power level of the transmitter is greater than 100 watts, the value of R10 probably should be increased.

One undesirable feature of this type of calibrator is that if the transmitter is connected to an antenna, the calibration process is a source of QRM on the air. Therefore, during the use of the calibrator the transmitter should be connected to a dummy load—an incandescent lamp of suitable size will do very well. Alternatively, the antenna can be disconnected, and, to protect the final amplifier, the drive can be reduced by detuning the driver stage or by whatever other means are available.

If the reader is unable to obtain a meter which duplicates the one used by the author, the values of R2 through R9 should be inversely proportional to the full-scale current rating of the meter. Thus if a 1 milliampere meter is used in place of the 200 milliampere meter, all of these resistors should be only one fifth as large as the values shown in Fig. 1. If a 50 microampere meter is used, the resistors should each be made four times larger in value.

TRANSISTORS

DIODES, FETS, RESISTORS, CAPACITORS, etc., etc.

The W.I.A., Victorian Division, has available a wide range of new components. Members of any Division wishing to take advantage of this service may obtain a components' list by sending a s.a.s.e. to:

DISPOSALS COMMITTEE,
P.O. BOX 65,
MT. WAVERLEY,
VIC., 3149.

ROSS HULL MEMORIAL VHF/UHF CONTEST, 1969-70

The Federal Contest Committee of the Wireless Institute of Australia invites all Australian and Overseas Amateurs and Short Wave Listeners to participate in this annual Contest which is held to perpetuate the memory of Ross Hull whose interest in v.h.f./u.h.f. did much to advance the art.

A Perpetual Trophy is awarded annually for competition between members of the W.I.A. in Australia and its Territories, inscribed with the name and life work of the man whom it honours. The name of the winning member of the W.I.A. each year is also inscribed on the Trophy. In addition, this member will receive a suitably inscribed certificate.

OBJECTS

Australian Amateurs will endeavour to contact as many other Amateurs in Australia and Overseas under the following conditions.

DATE OF CONTEST

From 0001 hours E.A.S.T., 6th December, 1969, to 2359 hours E.A.S.T., 11th January, 1970.

DURATION

Any seven calendar days within the dates mentioned above, not necessarily consecutive. These periods are to be at the operator's convenience. A calendar day is from 0001 hours E.A.T. to 2359 hours E.A.T.

RULES

1. There are two divisions, one of 48 hours duration, and one for seven days. In the seven-day division, there are three sections:—
   (a) Transmitting, Open.
   (b) Transmitting, Phone.
   (c) Receiving, Open.

2. All Australian and Overseas Amateurs may enter for the Contest whether their stations are fixed, portable or mobile.

3. All Amateur v.h.f./u.h.f. bands may be used, but no cross-band operating is permitted. Operators are cautioned against operating transmitting equipment on more than one frequency at a time, particularly when passing cyphers. Cross-band operation to assist contest working is prohibited.

Such operation will be grounds for disqualification. Cross mode contacts will be permitted.

4. Amateurs may enter for any of the transmitting sections. The seven-day winner is not eligible for the 48-hour award.

5. Only one contact per band per station is allowed each calendar day.

6. Only one licensed Amateur is permitted to operate any one station under the owner's call sign. Should two or more operate any particular station, each will be considered a contestant and must submit a separate log under his own call sign.

7. Entrants must operate within the terms of their licences.

8. **Cyphers**: Before points may be claimed for a contact, serial numbers must be exchanged. The serial numbers of five or six figures will be made up of the RS (telephony) or RST (c.w.) report plus three figures, commencing in the range 001 to 999, for the first contact, and will then increase in value by one for each successive contact. When a contestant reaches 999 he will then commence again with 001.

9. **Entries must** be set out as shown in the example, using only one side of the paper. Entries must be post-marked not later than 9th February, 1970, and clearly marked "Ross Hull Contest" and addressed to Federal Contest Manager, Box N1002, G.P.O., Perth, W.A., 6001.

10. **Scoring** for all sections will be based on the attached table. Approx. distances to be shown in the log entry as shown in the example. Failure to make this entry will invalidate the particular claim. Some typical distances are given in the attached table.

11. **Logs**: All logs shall be set out as in the example and in addition will carry a summary sheet showing the following information:

Name..........................Call Sign..................
Address.......................Division..................
..................................Claimed Score..........
Operating Dates....................(7 cal. days)
Highest Score over a 48-hour period was......................points.
Operating period:
from............hrs. E.A.T. ....../....../6...
to ....hrs. E.A.T. ....../....../6...

Declaration: I hereby certify that I have operated in accordance with the conditions of my licence and abided by the Rules of the Contest.

Signed..
Date.................... ....

12. Entrants not abiding by the Rules of this Contest will be disqualified.

13. The ruling of the Federal Contest Committee of the W.I.A. will be final. No dispute will be entered into.

14. **Awards**: Certificates will be awarded to the winners of each section in each VK and Overseas Call Area. The VK contestant who returns the highest score in the transmitting section and who is a financial member of the W.I.A., will have his name inscribed on the Trophy which will be held by his Division for the prescribed period. A Certificate will be awarded to the contestant who shall not be the Trophy winner, and who returns the highest scoring log covering a period of any 48 consecutive hours.

Also, Certificates will be awarded for operating in the Ross Hull Contest and breaking any Australian v.h.f./u.h.f. distance record.

SCORING TABLE

Distance in Miles	52 Mc.	144 Mc.	432 Mc.	576 Mc. Higher
Up to 25 Miles	1	1	2	5	20
26 to 50 „	1	1	10	20	50
51 to 100 „	2	5	25	60	100
101 to 200 „	5	10	50	125	200
201 to 300 „	15	15	75	175	250
301 to 500 „	10	20	100	250	300
501 to 1050 „	5	25	200	300	350
1051 to 1500 „	10	50	250	350	400
1501 to 2500 „	20	100	300	450	500
2501 to 3500 „	35	200	400	500	600
3501 to 5000 „	50	300	450	550	650
5001 and over	100	400	500	600	700

RECEIVING SECTION

1. Short Wave Listeners in Australia and Overseas may enter for the Contest, but no transmitting station may enter.

2. Contest times and logging of stations on each band are as for the transmitting sections, however there is no 48 hour sub-section.

3. To count for points, logs will take the same form as for transmitting sections, but will omit the serial number received. Logs must show the call sign of the station heard (not the station worked), the serial number sent by it, and the call sign of the station being worked.

Scoring will be on the same basis as for transmitting stations, i.e. on the distance between the Listener's station and the station heard. See the examples given. It is not sufficient to log a station calling CQ.

4. A station heard may be logged only once per calendar day on each band for scoring purposes.

5. **Awards**: Certificates will be awarded to the highest scorer in VK and Overseas countries.

EXAMPLE OF TRANSMITTING LOG (Brisbane Station)

Date/Time E.A.S.T.	Band Mc.	Emission Power	Call Sign	RST/No. Sent	RST/No. Rcvd.	Dist. Miles	Points Claim.
24th Dec. 0100 E.A.S.T.	52	A3(a)	VK7ZAI	59001	59004	1110	10
0110 E.A.S.T.	52	A3(a)	VK4NG	58002	57051	330	10
0230 E.A.S.T.	144	A3	VK5ZK	56003	55043	990	25
0235 E.A.S.T.	144	A3	VK3ZJO	45004	46021	850	25

EXAMPLE OF RECEIVING LOG (Perth S.w.l.)

Date/Time E.A.S.T.	Band Mc.	Call Heard	RST/No. Sent	Station Called	Dist. Miles	Points Claimed
2nd Jan. 1000 E.A.S.T.	52	VK5ZDX	59221	VK8KK	1330	10
1025 E.A.S.T.	52	VK2ZCF	58195	VK6ZAA	2040	20
1110 E.A.S.T.	432	VK6ZDS/6	57061	VK6LK/6	60	25
3rd Jan. 0500 E.A.S.T.	144	VK5ZHJ	44102	VK6ZCN	1330	50

Radios of a Passing Era

RODNEY CHAMPNESS,* VK3UG

During my stay at Macquarie Island in 1967 I became well acquainted with Dr. Ken McTaggart, VK3NW, with whom I had many interesting QSOs. In this period, and later on, many things were discussed and I discovered one of Ken's activities—amongst other equally interesting hobbies—is the collection and re-conditioning of old radio sets (or wireless sets as they were then known) of the pre-1930 era.

Ken commenced his collection of old radios in 1966 and now has 30 sets all in order, although the number could well be higher by the time this reaches print. As well as many old sets, his collection of old radio valves dating from World War I. to about 1930 is impressive, as can be seen from portion shown in photo No. 3. One 1922 valve in particular (photo No. 4) is the first of the IC's as it contains three triodes and the RC coupling between them all in one envelope. It just plugs into a variety of receivers, the simplest of which has only two coils and a tuning condenser plus the inevitable horn speaker. The circuit of one receiver using this valve is shown, the IC components being indicated by heavy lines.

* 24 O'Dowds Rd., Warragul, Vic., 3820.

The two oldest receivers are a 1923 Western Electric Superhet—yes, they did have superhets. then—and a 1922 Polar Blok 2-valve regeneration set. The latest is a t.r.f. 4-valve a.c. set of 1930 vintage. Right throughout this era superheterodyne sets were being built, although I, like many others, had the mistaken idea that they were rare in the early days. The credit for the development of the type must go to Major Armstrong during W.W. I. He is also responsible for many other radio inventions of note, including the super-regenerative receiver.

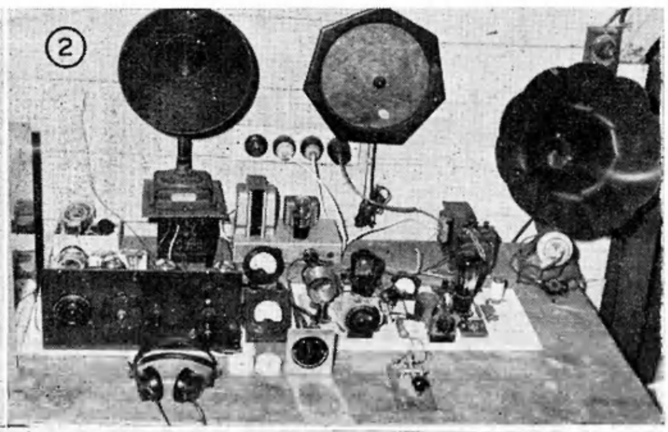
The performance of Ken's "Old Faithfuls" is quite remarkable to people of this generation and the quality of reproduction better than many transistor radios—not that the latter sound wonderful on their 2" speakers. The sensitivity is surprising considering the low gain of the valves and many of the 2 or 3-valve regenerative sets really pull in the DX!

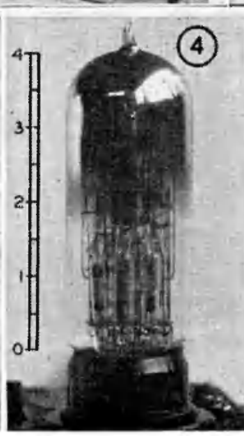
I must admit the old horn speakers do leave much to be desired in quality, but the balanced armature cone speakers are quite good despite widely held ideas to the contrary.

Not only has Ken restored these old receivers, but he has built a couple of transmitters using old parts, old construction methods and the transmitter circuits of this early age in radio's history. A station consisting of a 3-valve receiver and a 2-valve c.w. transmitter is seen in photo No. 2. The receiver line-up is a 201A regen. detector, followed by a 201A audio headphone amplifier to a 201A speaker output valve. The detector runs 45 to 50 volts and the other valves about 100 volts h.t. It tunes from 5,000 metres (60 Kc.) to 40 metres (7 Mc.) using honeycomb coils. This set resolves sideband and the recovered audio is just as good as the average s.s.b. receiver of today. Many might be incredulous, but this is fact.

The transmitter runs two E406 valves, one as the crystal oscillator or v.f.o. and the other as a p.a. Input power is 10 watts c.w. on 80 and 160 metres. Using v.f.o. control, Ken has worked a number of ZL and VK stations with no worse report than T8.

Photo No. 1 is a comparison between Ken using a late model transistorised s.s.b. transceiver and a single-valve transmitter using a W.W. I. Army Type C Mark III. valve (an AT50) in a Hartley circuit. This particular transmitter normally runs 40 watts on 80





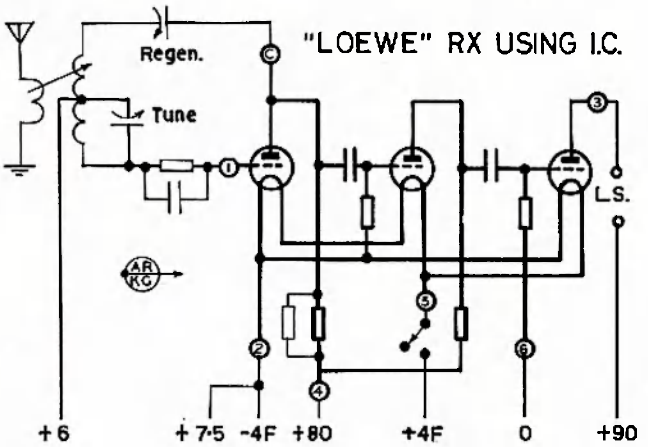
metres although it could run up to 100 watts. Statistics of the AT50 are 8 volts at 2.85 amp. on the heater and 1,000 volts at 100 mA. max. plate dissipation. The Army used it at 50 watts. The valve was manufactured by Marconi, Osram and G.E.C. No illumination is necessary in the shack when this valve is operating due to its tungsten filament which really radiates light.

During the 160 metre contest last year this rig was fitted with a genuine 1927 type 210, running 9 watts input and earned Ken 5th place. Every single report was T9—largely due to the oscillator being run continuously during transmission and the co-ax. feeder to the antenna only being keyed. Since the input to the 210 scarcely altered from key-up to key-down, there was no chirp or click.

Ken operates on several bands from 160 to 10 using c.w. and s.s.b. A three element beam is used on 20, 15 and 10 metres.

In conclusion, I must admit that Ken has a most interesting display of early radio equipment (part of this is shown in photo No. 5) which many of us younger Amateurs would never have the chance to know or see. This collection in my opinion makes a very valuable contribution to the history of radio in Australia and I sincerely wish him luck in obtaining missing items. Perhaps some readers can help in this. Ken VK3NW will always welcome visitors to inspect the old gear, but would appreciate a phone call first (64-4041 ext. 225 at work, and 82-1141 at home) to ensure that he will be there as he often migrates to the peace of the country at week-ends.

"LOEWE" RX USING I.C.



FEDERAL CONSTITUTION CHANGE OF W.I.A.

Notice of Motion following has been given to Federal Executive by the Victorian Division of the W.I.A.:

"That Clause 62 of the Federal Constitution be amended by deleting the word 'March' and inserting in lieu thereof the word "January', and that further, in the interpretative clauses of the Federal Constitution the definition of the term 'Fiscal Year' be deleted and in lieu thereof be inserted 'Fiscal year means the year commencing the first day of January in each year'."

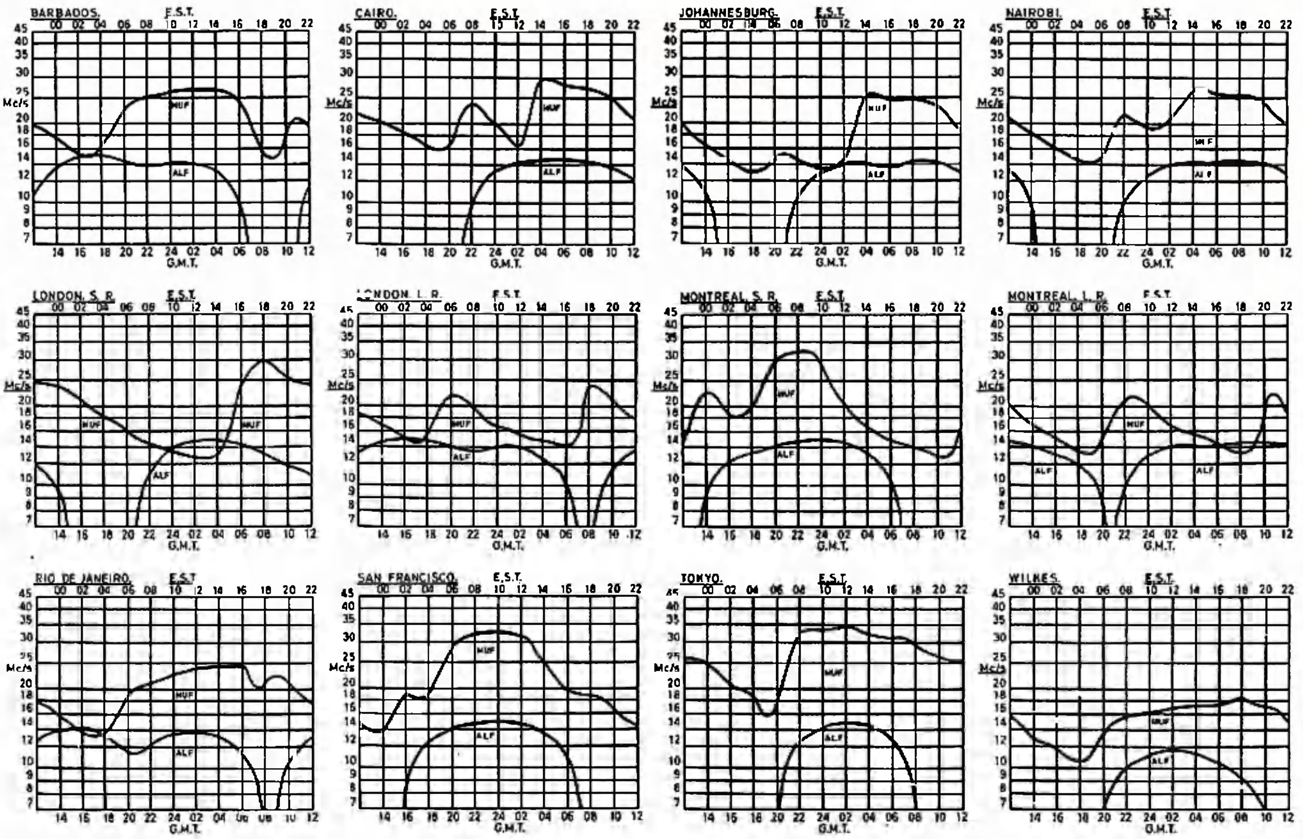
The effect of this is to change the financial year's commencing and finishing dates to allow more time for the preparation of audited statements to be submitted to the Federal Convention.

Article 70 of the Federal Constitution requires the publishing of this notice in two consecutive issues of the Institute's official journal.

—Peter D. Williams, VK3IZ,
Federal Secretary, W.I.A.

PREDICTION CHARTS FOR OCTOBER 1969

(Prediction Charts by courtesy of Ionospheric Prediction Service)



Opening Address for 1969 Remembrance Day Contest

The following is a copy of the Opening Address for the 1969 Remembrance Day Contest by Hon. Phillip Lynch, Minister for the Army and Local Member for Flinders in the House of Representatives:

"Mr. Federal President, Amateurs and Shortwave Listeners.

"At radio sets throughout Australia today the instruments, lights and dials of your radio represent far more than the technicalities of a complex medium for flashing a message of communication across an air space to a colleague seated before an electronic instrument.

"Today is a day of reflection for all Radio Amateurs throughout the length and breadth of this country as you in your nation-wide organisation reflect on the supreme sacrifice paid in two World Wars by the members of the fraternity of wireless.

"It is a day when the wonder of science, when technological expertise and accomplishment, the miracle of communication, should in a very real sense, give way to something that comes from the soul and heart—the memory of a comrade who can no longer be with you.

"Many of you listening know better than any words I may utter just what this Remembrance Day means. Remembrance and honour of one's fallen comrades is not a tangible thing which can be pointed to, or held up for inspection for people to say 'see, here it is'.

"No, it is something much more than that and in the organisation which is bringing this message to you all, it is memory of someone who was special, not only because he was a friend, but he was also a member of a brotherhood, a group of people who have a unique association through the common interest of radio.

"With the manifold achievements of this electronic age the role of the Amateur might be overlooked. But, let it not be forgotten that the Amateur operator contributed to the development of those techniques and inventions which have enabled man to take the giant scientific strides he has. And, today, Amateurs can enjoy the results of these new discoveries through their own enthusiasm for a past time which is as satisfying and productive as it is enjoyable and rewarding.

"Men from this band of Amateur enthusiasts became the first additions to Australia's fighting manpower strength following the declaration of war in 1939. In those days there was an organisation known as the Royal Australian Air Force Amateur Radio Reserve and from these ranks came the first of a long line of Amateurs to give outstanding service to their country and for some to pay the supreme price.

"And, it should be realised that it was during World War II. that man worked and developed radio at an almost unbelievable pace, a standard which has not slowed over the passage of years. Many of the men behind those activities were Amateurs, the only group in the community who had the technical knowledge and skills necessary for specialised work of this type.

"It would be inappropriate if, on such a day, I did not mention that the Wireless Institute of Australia is the oldest radio society in the world. Your organisation is formulating exciting plans for the Institute's 60th anniversary celebrations next year, and with the planning which has already been undertaken I have no doubt that these celebrations will be eminently successful.

"But, let me now comment on the contribution which radio is making today in the field of communications which form so vital a part of the society in which we live.

"Although the events of the past month will no doubt give impetus to making the latter part of the 20th century as the space era, it is only because of the part played by radio and electronics that man's latest achievements have been possible.

"The 20th century must be considered as the epoch of radio and electronics, for it is during this period of time that man has so developed this science that it acts as his dutiful servant in an incredible number of keynote fields.

"As Minister for the Army I am always conscious of the tremendous contribution made by radio. Up to the 1950's radio in the Army was always considered to be a secondary means of communication because of the inherent disadvantages associated with noise, propagation, weights of equipment and like factors, and was used only where line was not available.

"Army requirements always seemed to need communication over distances just beyond ground range into that area known as the 'skip distance', and appeared to be an insuperable problem area as all of you well know.

"However, this is now a matter of history. The size of equipment has been reduced by the advent of transistors, printed circuits and micro-miniaturisation, resulting in greater power-weight ratio. The use of frequency modulation reduced the noise factor and single sideband has almost doubled the efficacy of our high frequency equipment.

"As a result, we find that today's tactical military traffic, whether operational or administrative, is passed by radio, almost to the complete exclusion of other means.

"I should stress, however, that the Army's needs for increased communications go hand in hand with the need for increased efficiency and it has been necessary to rely on the automatic processing of traffic over multi-channel circuits to cope with the million and a quarter words a day which pass over the Army's signal system.

"The world-wide use of satellites is becoming more and more economical in the commercial, military and entertainment spheres. Already Amateurs have moved on to their own satellites with the launching of the Orbital Satellite Carrying Amateur Band (Oscar) series and are currently working in the space field using the moon as a passive reflector.

"When I look back over the history of Radio Amateurs, I am reminded of the many of their ranks who have contributed so much knowledge and experience towards the current state of the art of communications today. This is due to the Amateurs' incessant capacity to imagineer and initiate, thereby placing him constantly in the front rank of technical progress.

"I am also mindful of the many who gave service in the Armed Forces and of the tremendous benefit which their experience afforded to these Forces.

"Today is your memorial day, the day on which you commemorate those of your ranks who gave their lives for their country.

"There could be no better way of perpetuating their interests in such a fascinating, scientific, rewarding and interest consuming pastime than to hold this memorial competition which I am privileged to officially now declare open."

WIRELESS INSTITUTE OF AUSTRALIA
FEDERAL EXECUTIVE

The Institute can now offer annual subscriptions to following Amateur Journals:

★ **"QST"—Associate membership and renewals, $6.40.**

★ **R.S.G.B. "Radio Communication" (ex "The Bulletin") is only sent with membership of Society. $5.50. Send for application form.**

★ **"CQ" Magazine, $5.70; Three Years, $13.50.**

★ **"73" Magazine, $5.50; Three Years, $11.50.**

★ **"Ham" Magazine, $5.50; Three Years, $11.50.**

R.S.G.B., A.R.R.L., "CQ" and "73" Publications available.

Send remittance to Federal Executive, C/o. P.O. Box 36, East Melbourne, Vic., 3002.

Receipt of your first issue will serve as acknowledgment of your sub. Allow six weeks for delivery.

Victorian Division 160 Metre Field Day

Sunday, 3rd August, 1969, saw the greatest yet representation of 160 metre portable and mobile stations in the field in VK3.

The area of operation was the Mornington Peninsula and the shores of Port Phillip and Westernport Bays. Activity started officially at 1100 hours E.A.S.T. after the VK3 Divisional Broadcast, when the call-back was taken by Dick VK3RZ using the call sign VK3AWI/P. Dick continued as control station during the day and took hourly call-backs as well as assisting field stations in contacts. A watch was kept also on 7135 Kc. for reports from stations unable to transmit on 160 metres.

Good signals over the whole of the Peninsula area were heard from Al VK3AP at Elwood Beach. Considerable enterprise was shown by Graeme VK-3BAT and his colleagues, Bob VK3BBR, Robin VK3AYZ and Tony at Arthurs Seat. An antenna erected from the top of the high lookout tower ensured good signals from their modified 62 set.

On the other side of the bay, at Point Henry, Cedric VK3ACH was deterred from using his full 30-foot high vertical antenna because of gale force winds. However, it seemed to make little difference to his signals which were very strong in all areas.

Early in the afternoon, John VK3AUJ made several transmissions from an unnamed location, and invited portable and fixed stations to report their estimates of his position to the control station. The "estimates" varied from one end of the Peninsula to the other, but Don VK3ADP named the spot exactly to win the award. John was in the parking area on Oliver's Hill just out of Frankston.

Further highlights of the day were contacts with Ray VK3ATN at Birchip by Theo VK3AMA, Cedric VK3ACH and John VK3AUJ. The distances involved, between 160 and 200 miles, demonstrated the effectiveness of these portable stations. Harold VK7MZ, at Devonport, worked Theo and was heard by two other portable stations. Theo thus won the longest distance award.

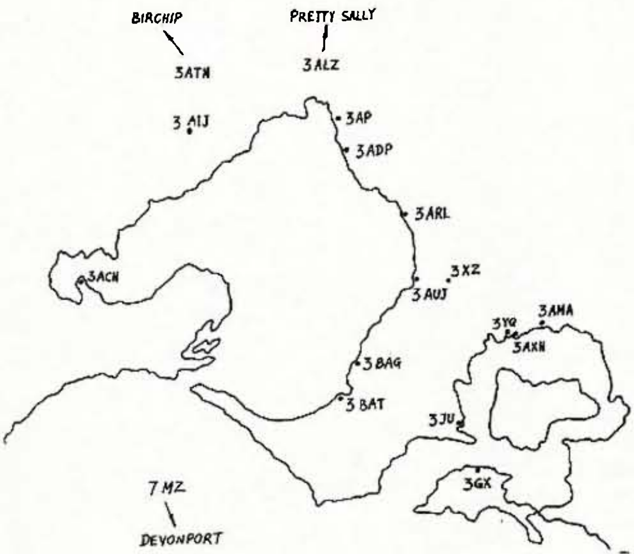
All participants were delighted with the day, and a further outing will be held in the Yarra Valley on 9th November. More details on the VK3 broadcasts. The large number of stations operating portable leaves no doubt of the popularity of the 160 metre band in VK3. Counting fixed and portable stations, there were well over 40 stations on the air during the day. Some of the post-mortems later in the evening from home QTHs were also most interesting.

The Victorian Division expresses its thanks to all portable and fixed stations who helped make the day the success it was. Very special thanks go to Dick VK3RZ who placed his station at the disposal of the Division and operated throughout the day as control station.

A number of S.w.l's submitted reports and have received a VK3AWI QSL card as an acknowledgment. Any other S.w.l. who would like a card should submit their log for the last field day or a log for the next one on 9th November.

STATIONS IN THE FIELD

Cedric VK3ACH—Point Henry.
Keith VK3YQ—Cannons Creek (near Warneet).
Don VK3ADP—Brighton Beach.
Al VK3AP—Elwood Beach.
Russell VK3BAG—Mt. Martha.
Graeme VK3BAT—Dromana.
Lin VK3ARL—Edithvale.
Bob VK3XZ—Langwarrin.
Reg VK3GX—Cowes.
Theo VK3AMA—Tooradin.
John VK3AUJ—Mobile.
Chris VK3JU—Stony Point.
Ian VK3ALZ—Pretty Sally Hill.
Jack VK3AIJ—Werribee.
Ian VK3AXH—Warneet.



ANTENNA FARMING

(continued from page 10)

broadside array. It is not quite so easy to see that, at the transmitter more power will be directed toward a distant receiver by a large antenna than by a small antenna. Reciprocity shows that the latter must be true."

Although very little text book material is included here, I actually do read such books for my pleasure, but not for instructional purposes. These books are available in surprising numbers and at many academic levels, from our Public Libraries. I recommend two books which are at a standard slightly higher than that of our imported periodicals: Jasik "Antenna Engineering" and Thourel "Antennas" (a translation from the French). The former is a big book of many chapters by many writers about many types of antennas. The latter has a slightly different approach to things.

Many Amateurs have failed with rhombics because they must be erected according to the book. I am not the only one either that unexpectedly had short axis radiation. I hope shortly to complete (amongst other things) the description of the 5-element yagi which is in use here on the transmitter. It is light, cheap, easy to construct and erect. In addition, it is surprisingly effective. I extend my thanks to a great number of Amateurs for their assistance and also for their technical advice.

—...—

PROVISIONAL SUNSPOT NUMBERS

JUNE 1969

Dependent on observations at Zurich Observatory and its stations in Locarno and Arosa.

Day	R	Day	R
1	32	16	134
2	47	17	101
3	74	18	92
4	77	19	74
5	116	20	97
6	157	21	84
7	182	22	56
8	186	23	37
9	179	24	33
10	181	25	51
11	180	26	26
12	174	27	35
13	167	28	49
14	161	29	63
15	148	30	71

Mean equals 102.1.

Smoothed Mean for December, 1968, 109.4.

—Swiss Federal Observatory, Zurich.

VICTORIAN DIVISION, W.I.A.

WESTERN ZONE

CONVENTION

HALLS GAP

25th and 26th OCTOBER, 1969

Sat.: Registration, Trade Display, Official Dinner, Entertainment.

Sun.: Wild Flowers, Bus Tour, and Scrambles.

For accommodation, $2 deposit to: "Convention," Box 25, Ararat, 3377.

Overseas Magazine Review

Compiled by Syd Clark, VK3ASC

"73"

July 1969—

This is probably the worst produced example of "73" that I have so far come across. W2NSD/1 frequently upbraids others for their shortcomings and it is good to see that he is also having his troubles. Some of the half-tone reproductions are terrible and some of the print is none too clear. The technical articles in this issue are as follows:

Confessions of an Appliance Operator, by K1YSD. A humourous article by an author who is of the opinion that Amateur Radio can tolerate all kinds.

The Ancient Modulator, WB6BIH. P.p. 1625s or 807s for about 40 watts of audio to be used on any band.

A Slow Scan Television Signal Generator, K7YZZ. Things are really happening on s.s.t.v. Now you can join the fun.

Six Metre Linear Amplifier, WA0ABI. One kilowatt for 10c a watt; why not be heard?

A New Way to QSL, ZE7JV. Simpler, less expensive, faster.

Kilowatt Amplifier for 420 Mc., W2CLL. Sneaky water-cooled final that perks away as you talk. (Tea or coffee any one?)

4 Thirty Twoer, WA3AQS. Converting and transmitting converter for 432 Mc.

Cw Can Get Your Goat, K7TTA. More humour, maybe.

Rio D'Oro, W4QCW. DX-pedition to EA9 complete with incredible frustrations.

Trouble Shooting Antennas, W2OLU. Clever ways to find out what is wrong from the ground.

Six Metre IC Converter, K2ZEL. Two ICs some tuned circuits and a crystal.

Radio Control Revisited, W1OLP. Model airplanes and their modern sophisticated control.

Long Range Propagation Forecasting, Nelson. Our expert explains his magic system.

Simple and Effective R.t.t.y. Terminal Unit, W6JMM. Two ICs, some tuned circuits and not a lot more.

Facts and Fads, W1USM. More history uncovered with negligible reverence.

An IC Audio Notch Filter, W2EEY. One IC, some resistors and pots, and presto!

Converting the VRC-19 for Vh.f. F.m., W6JTT. Another attempt to boost the f.m. population explosion.

The Greatest DX of All, K5JKX. Solar flare detector.

Intelligent Tube Substitution, K3LNZ. Lovely article for tube fans.

Passive Reflectors for Amateurs, W7EEX. Most of us have wondered about this. Here is the information. A repeater with low power requirements.

Whip Antenna Add-Ons, W2EEY. V.h.f. mobileers can get more gain and directivity.

Two Metre Transistor Exciter, WA6AJF. All transistor.

A Stable R.f. V.f.o., WB6BIH. Transistorised PC v.f.o. for any rig.

"QST"

July 1969—

TouchCoder II.—An integrated circuit code "typewriter" by W4UX. Ingenuity has had free play in the design of this keyboard code generator. The outcome is a simple circuit that can be readily duplicated using standard components—and at relatively low cost. The novel approach to generation is worth studying even if you are not in the market for a code machine.

80 and 40 Metre Listening with a Transistor BC Set, W1ICP. This article should be entitled "Have your cake and eat it too" for the b.c. set can be taken out of the case into which it is fitted to become part of a s.w. set and used for its normal purpose. The converter b.f.o. to make the small b.c. unit useable on the Amateur bands uses three FETs, HEP802 or MPF102. Perhaps even my fading eyesight could cope with such a project and so I'll have to interview the man with the box at the next meeting.

The Alpha Special. W3NFT describes an all band perimeter type antenna for mobile operation. If you duplicate it you could find the lumps of PTFE set you back a dollar or two. Perhaps the answer could be in replacing the aluminium supports with rigid PVC water pipe or conduit.

An Improved 5894 Amplifier for 432 Mc., W2AIH. Running about 100 watts input to a 5894, this amplifier should be handy to increase power on u.h.f.

An Inexpensive, Precise Crystal Oven, W3QY. A few years ago the commercial units looked like this. They were precise, inexpensive, never.

The Ductopatch, W4FQV. This relatively simple device attaches to the outside of a telephone handset and gives you inductive pick-up for Amateur use.

Regulated Dual Power Supply, W3TNO/9. Using operational amplifiers, this unit gives tight voltage control of plus and minus 15 volts at 100 mA.

To the Moon and Back on 2300 Mc., W1HDQ.

Moedras. W3ZXV describes a manually operated electro-mechanical digital readout antenna switch. Every keen Amateur should have one!!

Australis-Oscar, VK3ZFB and S. Howard. Design construction and operation. It is good to see the occasional foreign article appearing in "QST".

"RADIO COMMUNICATION"

June 1969—

A Simple Speech Compressor. G3UXH describes a unit using a 2N3819, 2N3707, MPF159, four diodes, a small audio transformer, and few small components. Said to be a simple and satisfactory unit.

Two Metre MOSFET Converter, G3HBW. Designed to fill the needs of the Chesham and District Radio Society for a simple, cheap and sure-fire design. Claimed to have a noise figure of below 2 db. and a gain of about 30 db., it looks interesting.

The Trio JR-500SE Communications Receiver. G3GGK reviews this receiver which is of Japanese manufacture. The reviewer considers that it is good value for the £68 asked for it in England, although it does not give the sophisticated performance which could be expected of a much higher class device. If you are interested in buying one of these read this review and learn what you are getting for the money.

An Improved Design Method for Pi and L Pi Network Couplers, G8CGA. More than a year ago Dr. M. M. Bibby, G3NJY, submitted an article to the R.S.G.B. pointing out inaccuracies in the formulae used to obtain circuit data for pi-networks and suggesting alternatives. Definitely for the mathematically inclined.

Technical Topics. Regular feature by G3VA. Here we have paragraphs on propagation, self oscillating FET mixer, solid state screen clamp, double delta and skeleton slot aerial systems.

Frequency Independent Directional Watt-Meters and an SWR Meter. G3PDM does his best to point up the advantage of having an instrument whose sensitivity does not vary with frequency and describes a very compact logarithmic indicating instrument "accurate to better than 10 per cent. over the range 100 Kc. to over 70 Mc." It looks as though it would even operate on 144 Mc.

"SHORT WAVE MAGAZINE"

June 1969—

Design for an Amateur Band Receiver, by G3TDT. Part 1 of an all silicon solid state double conversion design covering 160 to 10 metres, known as the "Bhim-Tal". The author does not make it clear from whence the name emanated but nevertheless it is an interesting design with a crystal controlled front end feeding into a tuneable i.f. covering the range 5.0-5.5 Mc. Uses MOSFETs and ICs are used.

Easy Two Metre Converter. G3OGR describes a simplified design using a 12AT7 as triode r.f. amp. and mixer with a self excited 6C4 as oscillator. The output can be arranged to be on practically any suitable frequency. A set to interest the beginner in v.h.f.

Linear Amplifier for Two Metres, G3DAH. Part 2 of this article continued from May issue.

"BREAK-IN"

July 1969—

A Linear Amplifier for 3.5-30 Mc. using TT21 Valves. M.O. Valve Co. Report No. 15. Using two of these valves, which are very popular in the U.K., this amplifier gives an output power of 220w. below 7.5 Mc. and 130 watts at 30 Mc. when operated with 1200 volts on their anodes. A simple and compact unit with a pi output tuner into 50 ohms.

Television Sweep Tubes as Class AB Linear Amplifiers, ZL1AFL. The tube manufacturers would probably disown any salesman who replaced one under warranty, but, for years, certain Amateurs have been taking the inexpensive road to high power output using sweep tubes. With care, their lives can be long and happy ones. D. A. Flatt shows you "how".

Although not technical, it was felt that VKs would be interested to know that their Federal President, Michael Owen, VK3KI, figures rather prominently in this issue which reports the Gisborne (N.Z.) Conference held on Saturday, 31st May.

N.Z.A.R.T. CALL BOOK

A copy of the N.Z.A.R.T. Call Book turned up amongst the magazines this month and although I do not intend to produce a "review" of it, I consider that there may be a number of VKs who are interested in a copy so that they can place all the ZLs they work.

"RADIO ZS"

May 1969—

This journal is the official organ of the South Africa Radio League. It is usually content to publish articles which have appeared in other magazines or been contributed by South African or American authors and this issue contains two technical articles by Americans—**Using the Grid Dip Meter**, W2AEF, and **Using a T Network**, W2EEY/1. The first article is true to title and comment is unnecessary; the second deals with a circuit which uses the same components as the pi network but in a different configuration. The author points out the advantages and disadvantages of both systems. Because the losses in inductors tend to be higher than the losses in capacitors of the air-spaced types, this circuit appears to give an improvement in performance over the pi network for loading short antennas of the mobile whip type. This article should be of interest to the mobiler.

June 1969—

Using the Grid Dip Meter, W2AEF. Part III. of an article by this well known American writer. Wilf gives some very useful hints on this relatively simple instrument, which is common in Amateur shacks.

Amateur Band Solid State Receiver, ZS6NG. This receiver covers all the h.f. Amateur bands and is claimed to be very selective and sensitive. It is of use to a number of people from the point of view of the ideas involved. Everyone knows how good the dials and gangs from the "Command" receivers are and ZS6NG makes good use of one in this receiver.

"THE INDIAN RADIO AMATEUR"

This journal is the official organ of the Amateur Radio Society of India. It is not reviewed regularly because it does not seem to reach us regularly every month and, secondly, they appear to have a small number of contributors who are earning their living at one or other of the universities or they reprint from "QST," "CQ," "Wireless World" or other overseas magazines. To be found in this issue are the following offerings:

Modern Trends in "Front End" Design, VU2JN. Balanced mixers using 7360s, FETs and toroidal coils for superior performance.

Double Conversion, Easy on BC348 Receiver, VU2KX. Not only easy, but modern tubes save space. Perhaps a FET conversion would have been better again.

FET Oscillator. VU2JN describes as a "holiday project," a FET crystal oscillator.

A Crystal Controlled Front End Converter for 14, 21 and 28 Mc., VU2KX. Consisting of a 12AT7 in cascode into a 6AK5 mixer with a 6SK7 as crystal controlled h.f. oscillator.

The VU2ZJY Standard of Comparison Converter, VK3ZJY/VU2ZJY. Written by Howard Rider whom some VKs will probably remember, this is an interesting article on a subject obviously dear to the writer's heart.

The balance of the magazine is taken up by regular features.

June 1969—

The 144 Mc. Club Transmitter, VU2ZJY. This call sign does not mean much to many VKs, but I feel sure that many VK3s will remember VK3ZJY, Howard Rider, the writer of this article.

The balance of this magazine consists mainly of reprints from other publications. It is good to note that the quality of the Indian magazine appears to be very much improved over some of the issues which have come to us.

MULLARD OUTLOOK

Australian Edition, May-June, 1969—

Although not normally reviewed, it was thought worthwhile to give this issue a mention as it carries an article on the subject of Colour Television. In this issue is part five of a series which gives details of PAL, NTSC and SECAM systems. No doubt a number of our readers will be interested.

New Equipment

DIGITAL CLOCK

The "Solari," 24-hour, direct read-out digital clock is a compact unit styled for the modern office or home, and is ideal for the Amateur shack. Large easy-to-see figures on the direct-read flaps give the time numerically, minute by minute; there are no hands to misread, and the dial is legible up to 33 feet. It has a silent, 220-240v. 50 c.p.s. synchronous motor, is self-starting, with a simple resetting trigger.

Lightweight, unbreakable plastic case, 7" wide, 3¾" deep, and 3¾" high; colors beige and light grey, with red and green being available shortly. Packed weight 2 lb. Price $32 inc. S.T. The "Solari" digital clock is available also in 12-hour type for general use.

Further information from Bail Electronic Services, 60 Shannon St., Box Hill North, Vic., 3129.

CRYSTAL OVENS

A range of C. R. Snelgrove (Ontario, Canada) crystal ovens with cycling stabilities of between ±0.01°C. to ± 0.25°C. suitable for housing current styles of crystal holder, is now available from R. H. Cunningham Pty. Ltd., 608 Collins St., Melbourne, Vic., 3000.

With cavity accommodation ranging from one to 12 crystals, the units incorporate the finest components, including snap action thermostats with inherent low thermal ageing properties, which ensure maximum reliability and life. A brochure giving full technical data is available from R. H. Cunningham.

PRECIOUS METAL PLATING

A comparatively new electroplating method recently introduced in Australia is finding wide application in electronic manufacture. Known as the "tintillate" electroplating process, it is used exclusively for bright tin plating by the Precious Metal Plating Co. Pty. Ltd., of Clifton Hill, Vic.

Proven advantages of "tintillate" bright tin plating of electronic devices such as transistors, diodes and components with pigtails or leads, includes a high degree of solderability coupled with corrosion resistance throughout the components' life.

Ordinary tin plating tarnishes rapidly in air, and during storage, which generally leads to poor solderability and consequent slowed production. The "tintillate" process prevents low conductivity due to badly soldered connections, or corroded terminal contacts.

Careful formulation of the plating solution concentrate is maintained for the finished product, and patented process materials are essential for this high quality plating work.

Gold and silver plating are other processes carried out by Precious Metal Plating Co. for the electronics industry; applications being printed circuits, terminals, micro-switches, contacts and relays.

Further information from Precious Metal Plating Co. Pty. Ltd., 58 Hoddle St., Clifton Hill, Vic., 3068.

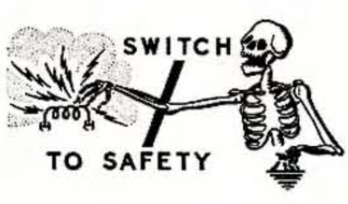
REGULATED POWER SUPPLY

Newly released in Australia is a regulated power supply designed basically for the replacement of storage batteries used in the design and testing of mobile radio, and other laboratory equipment, production testing, manufacturing and service installations.

The heavy duty mains operated unit is of conventional design using a differential comparitor to provide an error signal to control the operation of the four parallel connected power transistors via a voltage amplifier and two Darlington connected low-power transistors. An overload circuit, which operates if the output current exceeds 120 per cent. of the full load current, is provided to switch off the regulator, thereby protecting the regulator and the external circuit.

There are three output ranges of 5-8v. d.c. 20a. max., 10-16v. d.c. 17a. max., and 22-32v. 10a. max; features separate 4" voltmeter and ammeter, and all silicon solid state circuitry.

Full particulars are obtainable from A & R Electronic Equipment Co. Pty. Ltd., 44-46 Lexton Rd., Box Hill, Vic., 3128.



HI-FI STEREO CATALOGUE

A fully illustrated 40-page catalogue outlining a comprehensive range of hi-fi and stereo equipment is now available from Radio Parts Pty. Ltd., 562 Spencer St., Melbourne, or their city depot and East Malvern branch.

Equipment listed includes amplifiers, audio leads, car stereo tape players, gramophone cartridges, gramo motors and pick-ups, gramophone hinged base and cover, head phones, microphones, speakers, tape players, tape recorder accessories and tuners.

Obtainable free of charge, the catalogue provides technical specifications, special features and trade prices for brand equipment including Rapar, PE, Dual, Richard Allan, Kaltro, Sennheiser, Onkyo, Philips and Metrosound.

☆

NAVY WEEK 1969

It is hoped that a representative station of the Royal Naval Amateur Radio Society will be on the air during the 1969 Navy Week, from H.M.A.S. Cerberus, at Crib Point on Westernport Bay, Victoria. On Saturday, 4th October, H.M.A.S. Cerberus will be open to the public, and the Amateur Station will be part of a Naval hobbies exhibition.

There will be a full day's programme of Naval demonstrations and displays, and many static exhibits. Family facilities will include a picnic ground and barbecue area, babies' creche, children's playground and a discotheque for the teenagers. Light refreshments will be on sale. Public transport arrangements will include buses from Frankston station and a vintage steam train direct from Melbourne. These and other details will be given in VK3 Divisional broadcasts before the event.

Amateurs and shortwave listeners will be welcomed. A talk-in station will operate on 2 metres f.m. (Channel A) and also on the h.f. bands if requested.

There will be plenty to occupy the XYL and harmonics while the OM joins the rag-chew in the Ham Shack.

VK2 DIVISION, W.I.A.

FT243 CRYSTALS

The VK2 Division still has a number of FT243 Crystals available to members of any Division. (Frequency range from **3680 to 6405 Kc. at 10 cents each**). This Division is again conducting its Store. Further printings of Amateur Guide material available. A list of items in stock is available, send name, address, postcode, and 2 x 5 cents stamps to:

THE STORE MANAGEMENT,
WIRELESS INSTITUTE CENTRE,
14 ATCHISON STREET,
CROWS NEST, N.S.W., 2065.

Correspondence

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers.

WHAT DO YOU CALL IT?

Editor "A.R.," Dear Sir,

I have noted with interest, a tendency on the part of some parties to abbreviate the new and awkward "Hz" simply to "h", as for example 3800kh. I am much in favour of this simplification, and I should like to suggest a further step.

It should be possible to modify this expression still further to improve clarity. Virtually everyone knows what a kilocycle means, while kiloHertz takes some thinking, and "kh" even more. "kH" is no better: kilo Henry?

This confusion could well be dispelled by adopting a simpler and more explicit term, e.g. "kilocycles," making the above example 3800kc. Although this may introduce some ambiguity, the existence of "3800 kilocuries" of radiation or "3800 kilocoulombs" of electricity seems sufficiently infrequent to cause little concern in Amateur circles. I also note that "Ci" appears to have been adopted as abbreviation for "Curie."

In this matter I propose to set an example to the rest of the world, by using "kc" to represent kilocycles, "Mc" for megacycles, etc., in my articles. Be it noted, therefore, that if Hertzes creep into any of my articles in "A.R." (or elsewhere), it is not my doing!

—R. L. Gunther, VK7RG.

OPERATION IN ZL RARE COUNTIES

Editor "A.R.," Dear Sir,

It would be appreciated if by means of your monthly publication you could bring to the notice of VK stations that the Upper Hutt Branch N.Z.A.R.T., Branch 63, will be operating portable in two unoccupied ZL Counties. The Wiamarino county on the evening of Saturday, 25th October, and the Waitotara County on the evening of Sunday, 26th October. Operations will commence on 80 metres on a frequency between 3.6-3.7 Mc. on a.m. and s.s.b. Time of commencement will be 1900 N.Z.S.T. All contacts will be QSLed 100 per cent. Contacts with ZL2VH will be useful for both W.A.Z.L. and the ZL Counties award.

Hoping to hear VKs in October, 73,

—J. Meachen, ZL2BHF, Branch 63.

IMPROVING THE AMATEUR SERVICE

Editor "A.R.," Dear Sir,

Rex Black's letter in the August issue of "A.R." has served to crystallise many of my own ideas regarding Amateur licensing.

In the first place I do not agree with his statement that Amateur Radio has not been proven to be an essential service. The Tasmanian, Victorian and New South Wales bush fires during the past few years and the P.M.G. use of W.I.C.E.N. are sufficient answer here. However, I do agree that band occupancy is essential and that any move likely to increase this deserves deep consideration.

In the same way as the A.O.L.C.P. has popularised the v.h.f. bands, some form of Novice licensing must increase the overall interest in the Amateur Service. Also, it is becoming clear that as the state of the art advances the present one level theory test and two-level licensing system needs some overhaul with additional graded levels being introduced. The initial jump to a full licence is, in my opinion, either too great if the theory sections are properly examined or the exam. level is too low if the present system endures. Both these extreme views point to a training level being required with the U.S.A. Novice system being a good starting point.

A word about c.w. Anyone interested in serious Amateur Radio work, as I am, will soon find that there are serious limitations to a voice only licence. It has been said that s.s.b. eliminates the requirement for c.w. But consider moonbounce. A superficial calculation would indicate that on 144 Mc., with 400w. p.e.p. output and an antenna of 21-22 db. gain (four widespaced 13-element long Yagis), it should be possible to complete a circuit. But p.e.p. is not average power, so voice contact is impossible. The same applies to tropospheric scatter, auroral scatter and weak signal DX. Any consideration of noise factors leads to a rx bandwidth suitable only for c.w. under these conditions. So there is still a place—indeed a requirement—for c.w. in the Amateur Service.

Further, in such serious work an h.f. link is necessary. The fact that no A.O.L.C.P licence has matched A.O.C.P. performance in work at the frontiers of radio communcation would seem to back this view.

There seems to me to be a dual requirement:

(a) For a graded system of entry to full A.O.C.P. in which it is possible to get onto the air as soon as possible with the minimum of trouble, i.e. Novice licensing as in U.S.A.

(b) For a means of encouraging the A.O.L.C.P. licensee to gain A.O.C.P.

The basic entry test should cover theory to the level required by the equipment to be used and code at 5 w.p.m.

Type (a) Novices—new entrants to the Service—should:

(i) Pass a suitable entrance exam. and code to 5 w.p.m.
(ii) Operate on 160, 80 and 10/11 metres in suitable band segments.
(iii) Be limited to 10-15w. input and crystal control using fundamental crystals (based on consideration of readily available components and harmonic radiation).
(iv) Be supervised during the currency of the licence by one or two full licensees or one A.O.C.P. plus one A.O.L.C.P.
(v) Have a licence period of one year—non renewable.

The supervision requirement is to reinforce the Amateurs' responsibility to supervise and improve the standards of his own service and to remove the need to use commercial gear by Novices. Under this arrangement, all gear and modifications would have automatic clearance by someone qualified to judge the requirements and state of the art of the Service.

Type (b) Novices—A.O.L.C.P. licensees aiming for A.O.C.P. They should be able to gain a Novice type endorsement by passing a 5 w.p.m. Morse test enabling them to practice code on 145—145.100 ONLY—for one year on a non renewable basis. Suitable call signs could be, e.g. VK3Z — —/N.

I am not in favour of the use of a.m. by Novice licensees on h.f. except on 10 and 11 metres and then only in the second year if a two-year Novice licence is used. A.O.L.C.P. Novice endorsed licensees could perhaps have this privilege after one year of A.O.L.C.P.

This is because I regard the prime object of Novice licensing to be to encourage full A.O.C.P. licensing and the use of ALL Amateur bands. This requires that enthusiasm be retained during the difficult period of learning theory and code by providing a means of practice by actual contacts on the air.

Details of implementation I leave to the experts. My hope is that the principles I raise will aid in the improvement of the Amateur Service.

—John Andersen, VK2ZFQ (ex VK3ZFO).

USE OF 5 Mc. EXCITER BOARD

Editor "A.R.," Dear Sir,

I have been contemplating building a relatively simple 80-20 metre or 80-40-20 metre s.s.b. transceiver, suitable for duplication by other Amateurs, via an article in "Amateur Radio". The proposed transceiver would run between 50-100 watts p.e.p. input.

To simplify building of this transceiver, I had intended using the Yaesu Musen F Series 5 Mc. Exciter Board. With no extensive modification other than cutting of two leads, it could be made to function on both transmit and receive.

Unfortunately on contacting Fred Bail, he informs me that these units are no longer being produced. He did, though, tell me that about 80 of these units are in VK. If enough people with these units would like an article along these lines, I will go ahead and build a prototype. If sufficient people were to order these units, I believe a special batch of them could be made up by Yaesu.

Should owners of these filter assemblies want this project, and enough indicate so by writing to me personally, I will go ahead with same. It is anticipated that the unit would be mostly valved using quite a few parts ex-t.v. to cut costs. The unit would be designed with the thoughts of mobile, portable and home station operation.

—Rodney Champness, VK3UG,
24 O'Dowds Rd., Warragul, Vic., 3820.

SPACE CENTRE STATION

Editor "A.R.," Dear Sir,

After writing to Cape Kennedy, I received an interesting letter from W4WEU of the Space Centre Amateur Radio Society at the Kennedy Space Centre:

"The Space Centre Amateur Radio Society of Kennedy Space Centre, Florida, had their club station WB4ICI in operation on 16th July for the Apollo 11 'Special Event'.

"The club members began operation shortly after witnessing the historic launching of astronauts Armstrong, Aldrin and Collins on their way to the moon.

"The club is offering a 'Special Event' certificate to commemorate man's first moon landing mission to all Amateur Radio operators who made contact with any of the club's six stations during this period.

"During the first 17-hour operation period, the club contacted 1,650 stations. Among these were contacts with 235 foreign stations representing 50 countries. Also contacted was W1AW, the American Radio Relay League's headquarter's station, and KF7BSA, the 1969 Boy Scouts of America Jamboree Station.

"Unfortunately, the club operators were unable to contact all the many thousands trying to contact the station. Transmitters were operating on 21.340, 14.340, 7.275 and 3.975 Mc. Additionally to the s.s.b. stations above, transmitters were on 21.150, 14.035 and 7.165 Mc. c.w.

"Operators during the mission included 'Ace' W4WEU, Ambrose W4GHV, Roy K4DJN, Gus W4IQM, Herb WB4HZB, John WA9LJX/4, Allen W3ZNB/4, Howard WA4ZCB, Bill WA4WBG, Mac WB4CAB, Dave K4VTY, 'Buz' WN7LIX/4, and Mark WB4IQD.

"'Buz' WN7LIX, age 10 years, who was visiting 'Ace' W4WEU, was surprised and pleased when he heard the club contact his grandparents, both 'Hams' (Tom WA7DUF and Fran WA7DUG).

"The 'Special Event' certificates (in colour) are being prepared by 'Ace' W4WEU and Roy K4DJN, and should be in the mail soon. There is no charge for the certificates other than a request for three or four 6c stamps to help the clubs with mailing costs.

"In June the club elected officers for the coming year. Elected were 'Ace' Goodwin, W4WEU, President; Ambrose Barry, W4GHV, Vice-President; Evan S. Howell, Sec.-Treas.

"The club is now confirming 'regular' contacts with a newly designed QSL card which resembles the Apollo certificates."—Ambrose Barry, W4GHV, Publicity Chairman.

I think that this special certificate could be of interest to your readers, also stamp collectors who may be lucky and receive an envelope such as the one I received.

A colour emblem of the eagle on the moon to the side of the envelope, Armstrong's first word above and the names and positions of the astronauts below the emblem, plus a stamp showing a view of the earth looking from the moon—very nice!

—Samson Voron, WIA-L2230.

P.S.—Send reports to: Space Centre Amateur Radio Society, P.O. Box 21073, Kennedy Space Centre, Florida, 32815, U.S.A.

OBITUARY

J. M. (CRIEFF) RETALLICK, VK2XO

It is with deep regret that we must record the passing of Crieff VK2XO, who passed away suddenly on Saturday, 2nd August, at 2 p.m., in Sydney Hospital after undergoing an operation on the previous Tuesday.

Crieff celebrated his 72nd birthday last Sunday. He will best be remembered by his work in organising the Urunga Conventions.

Anzac week-end 1948 he arranged a get-together of Amateurs at his boat-shed, the "Do-Me", at Urunga, when about 15 Amateurs attended. Out of this week-end grew the W.I.A. Urunga Radio Convention held every Easter week-end. This year saw the 21st Convention celebrated. Through these Conventions Crieff became well known throughout the world. ZLs, Ws, JAs and others having at one time or another attended these Conventions. He was always active on the h.f. bands talking Amateurs and their families to attend "Urunga, where you feel much younger!" Future Conventions will be in memory of Crieff. He was always active passing traffic in most of the floods on the North Coast.

Apart from Amateur Radio, he was one of the best sleight of hand magicians in his younger days and was always ready to show his skills at all Conventions, plus his home-brew or photography. His passing leaves a gap that will be hard to fill, he enjoyed and served his hobbies well.

We extend our sincere sympathy to Crieff's widow, Jean, his son Richard, daughter Marie and family.

VALE CRIEFF.

VHF

Sub-Editor: CYRIL MAUDE, VK3ZCK
2 Clarendon St., Avondale Heights, Vic., 3034

VICTORIA

Activity over the past month has been at a very low level, although this is typical for this time of the year. An occasional spot of DX has been heard, but nothing to warrant writing about.

Activity on 1296 Mc. is on the increase and there is a demand for suitable u.h.f. dish reflectors between four and twelve feet in diameter. At the moment there are about ten active stations on 1296 and others are building gear at the present time. The gear in use varies from rather large vacuum tube types to miniature solid state devices.

The V.h.f. Convention being held over the week-end 11th/12th October, 1969, will again be a gathering for Amateurs and their families. Among the events this year will be a tour by bus to Walhalla, fox hunts, scrambles both for OMs and YLs/XYLs, and a very novel transmitter hunt, together with the usual games and novelties for kids from 6 months to 60 years and older. Films, sale of disposals goods and of unwanted gear, and supper will be the programme for the Saturday. Listen to the VK3WI broadcast on Sunday, 5th October for the final details.

Field Days.—The list of V.h.f. Field Days given last month should be amended to: No Field Day in February and an additional Field Day in March on Sunday, 15th. There is a small variation to the scoring for some bands and full details will be given in the VK3WI Sunday broadcasts on the Sunday prior to and on the Sunday of the Field Day.

V.h.f. Beacons.—Approval has been granted by the P.M.G. Department for the proposed two metre beacon on 144.700 Mc., and the application for the 432 Mc. beacon is still under consideration. Quite a lot of work has been completed on these beacons but there is still much to be finished. 73, Peter VK3ZYO.

TASMANIA

A late (very) note from Brian VK7RR reports that a repeater for Southern Tasmania is now being tested and should shortly be operational. Activity in the Apple Isle is on the increase on both 6 and 2 metres.

Recently a Trade Fair was held in Hobart, and VK7WI was operated on both h.f. and v.h.f. V.h.f. equipment on display was supplied by VK7ZMK and VK7MD. The effort brought the display a certificate of merit.

AUCKLAND, NEW ZEALAND

The Auckland V.h.f. Group wish to notify VK Amateurs that they will be holding these events: Sunday, 19th Oct., 1530 hours E.A.S.T., two meter tx hunt; Saturday and Sunday, 6th and 7th Dec., V.h.f. Field Day; Saturday and Sunday, 7th and 8th Feb., V.h.f. DX Contest; Saturday, 27th Sept., Matamata ZL1RF Memorial Mobile Rally; and on Saturday and Sunday, 8th and 9th Nov., the Hamilton Week-end.

A small group of Amateurs in ZL1 are attempting records on the upper u.h.f. bands, notably 3000 Mc., 5800 Mc., 10,000 Mc. and one has a klystron on 19,000 Mc., and would like to obtain another.

The above news was supplied by Marion Lister, ZL1TBR, Editor of "Spectrum," the official newsletter of the Auckland V.h.f. Group.

NEW V.H.F. SUB-EDITOR

As from the December issue, the VHF Notes will be compiled by Mr. Eric Jamieson, VK5LP, of Forreston, South Australia.

With the change of Sub-Editor, there will at the same time be a change in format to give a wider coverage to items of general interest to all v.h.f. enthusiasts. To ensure an adequate supply of information, both Divisional and Zone Correspondents are asked to keep Eric advised of interesting items from their areas. At the same time individual operators are invited to forward items direct to Eric. Items particularly required are those covering activities on Moonbounce, v.h.f. beacons, records and other special efforts.

To be sure that Eric is given sufficient time to produce his page each month, all material should be forwarded in time to reach him no later than the 27th of each month. To repeat, Eric's address is:

MR. E. JAMIESON,
FORRESTON,
SOUTH AUSTRALIA, 5233.

VICTORIAN DIVISION, W.I.A.

V.H.F. CONVENTION

will be held on

SATURDAY and SUNDAY, 11th and 12th OCTOBER, 1969

at

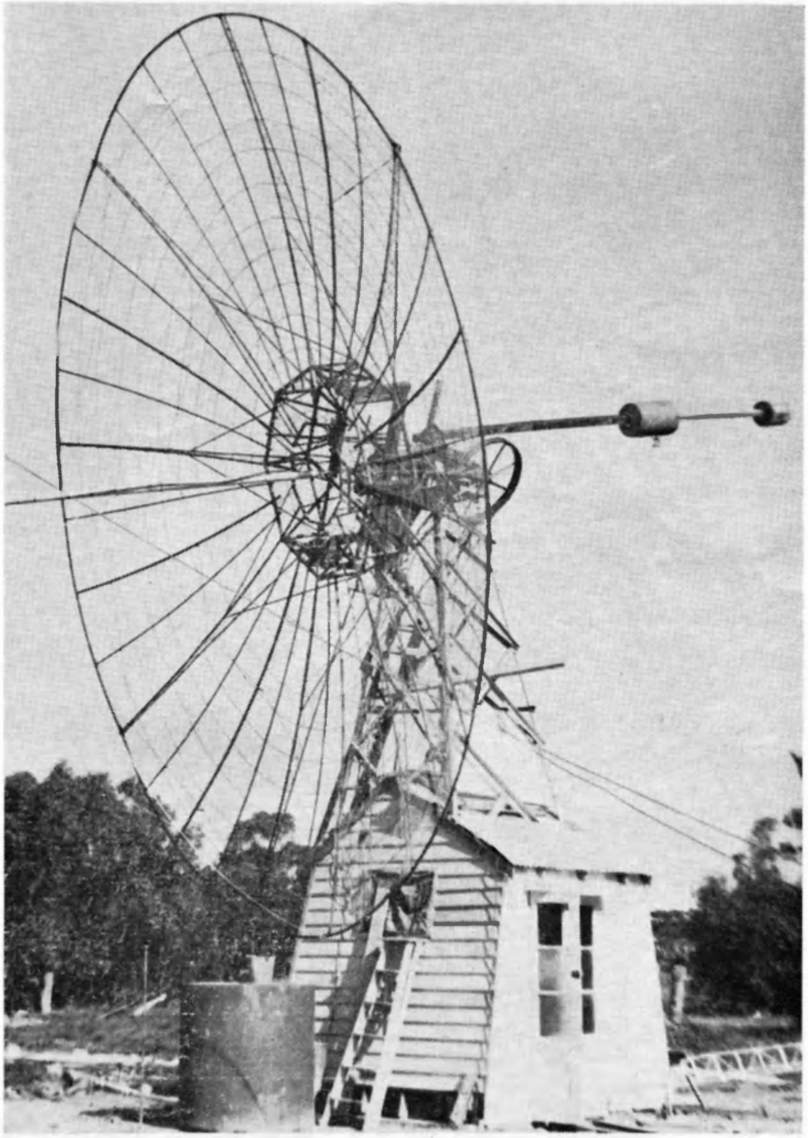
MOONDARRA RESERVOIR

near **MOE, Gippsland**

Meals, Accommodation and Registration: Adults $5.50 each, Children 5-12 years $3, under 5 years free.

Trade Displays, Fox Hunts, Scrambles, Bus Tours, etc.

For further information Phone Gil Sones 288-2794 (Melb.)



The above photograph shows the "dish" used by VK3ATN. Some brief details are that the dish is 28 feet in diameter, the centre octagonal hub being 7 feet in diameter. The actual antennae (which is out of the picture) is 16.2 feet from the vertex. The tower, which is 20 feet high, is 2 feet square at the top and 8 feet square at the base. The foundation is 9½ feet deep and contains approximately 10 tons of concrete. Modifications and further constructional work are still in progress, to enable the dish to be used for 1296 Mc. Moonbounce and Apollo tracking. No details have been supplied for the small structure alongside the tower, and no prizes are being offered for the best suggestions.

DX

Sub-Editor: DON GRANTLEY
P.O. Box 222, Penrith, N.S.W., 2750
(All times in GMT)

It would seem that band conditions are holding up rather well, with some very good openings on the 40 metre band. The sunspot prediction for August, September and October is 95, 93 and 92 with confirmations for March and April being 139 and 105.

Operating from the Space Control Centre during the period in which the Apollo 11 boys were in quarantine, K5USO made many contacts and for these a special QSL is available from Box 29265, New Orleans, 70129, three IRCs to be sent with each QSL.

Operation from Tristan da Cunha by Roy G3KDY is under way using the call ZD7BM. Look for him on 3798 Saturdays and Mondays, 2130z to 2230z, also uses 21310, 391 and 270 on s.s.b., with c.w. operation on 21048. All QSLs to GB2SM. QRV for two years.

ZL1AAT/K, Kermadec Island, is to be activated by ZL2ANX (ex G3KXA), who goes there in mid October as OIC and Medical Officer of the Met. Station on Raoul Is. for at least one year. He will be active on all bands except 160 and using both c.w. and s.s.b. There is only one mail delivery per year to this location, so if you want to contact Roy before he goes, a letter to him, R. Swain, 50 Le Mata Rd., Havelock Nth., N.Z., will do the trick. George ZL2AFZ will handle all QSLs.

9V0 was a special prefix used by 9V1 stations from 9th Aug. to 9th Sept. in connection with the 150th anniversary of the founding of Singapore by Sir Stamford Raffles. Special award has been issued for working ten 9V0 stations during that period, send log extract plus 10 IRCs to Box 777, Singapore.

At the time of writing this, Gus W4BPD was due back at his home QTH. He had been operating from 5Z4ERR and had hoped to operate from TT8 prior to his departure.

Don HH9DL has just returned home after an absence of several months and is again active. He states that recent c.w. activity using his call was illegal.

Navassa Is. appeared on the scene in a surprise visit by W4VPD/KC4 from Aug. 9 to 13. All QSLs to home QTH.

Corsica though fairly active of late is still good DX, the latest jaunt is by F0RS/FC, operated by several DLs and will be a really big one. Frequencies are to be 3535, 7035, 14065, 21065 and 28065 for c.w., and 3797, 7075, 14115, 14265, 21365 and 28665 s.s.b.. An inverted vee will be used on 40 and 80, with a quad on 15 and 10. All QSLs to DL3LL.

Been calling FB8ZZ with no result? Suggest that a listen to your own frequency may find that FB8XX is calling you there.

During the "CQ" W.W. Phone Test, Oct. 25 to 26, there will be operation from PJ0DX by the chaps from W3MSK and W4BVV. There are nine operators listed in the LIDXA bulletin, and the details are 160 metres 0300z-0600z (call 1803, op. on 1826) 80 mx 3799 as long as the band is open, 40, 20 and 15 will be on for 24 hours per day, around the edge of the General Extra Licence boundary, with 10 mx operation on 28575.

Upper Volta XT2AA is reported currently active on 15 and 20 metres, and will be at the QTH for a year. All QSLs to Box 75, Ouagadougou, Upper Volta, although one report says that his manager is WA5REU.

Operation from Turkey is reported by the LIDXA boys, who say that TA2SC is on 14282 (QSL via K4EPI), and TA1KT has been working on 14214 (QSL to K4IEX).

Once again there has been activity allegedly from Albania by a station signing ZA5XQ on 14202. No QSL information given, although much reference to Albania was made, however this operation must be treated as suspect.

Bob Fowler, WB2VUY, from New Jersey, has now got a beam up and is finally getting out. He is on daily at about 2300z on 14240 or 21320 depending on conditions.

Western Carolines are always good for a bit of DX and to assist in this, have a listen for KC6CT on 14265 when QSL manager W9VW skeds him at 1200z Monday, Wednesday and Friday. If not on that frequency, he may be on 14287.

News from Thailand via A.R.R.L. bulletin 232 to the effect that the I.T.U. has reported the withdrawal of Thailand's objection to outside QSOs with its Amateurs. It is understood that this country has been removed from the U.S.A's "banned" list.

St. Helena still continues to provide some rare DX, with the regular operation by ZD7SD, usually at the most inconvenient hour for VK of around 2000z. His QTH for QSLs is W. R. Stevens, St. Helena, South Atlantic Ocean.

New prefixes 4J and 4L are being used by 4J0FR and 4L0CR for their University of Moscow Amur River Expedition over the period Aug. 10 to Sept. 15. QSLs to Box 88, Moscow.

W4QCW reports having worked his 100th country on 80 mx in March, having passed this figure on other bands. He is not first in the 5-band DXCC race, but has put up a really fine effort with scores of 110, 125, 155, 144 and 140 on 80 through to ten in that order. I know of three S.w.l's in Europe who have performed a similar feat.

A letter to hand from Karol OK3UH/VK2 offering to supply the QTH of any OK1-OK5 and OL1-OL0 Amateur. A letter to Karol Nad, OK3UH, F16c Cowper St., C.H. Ltd., Fairymeadow, N.S.W., 2519, will suffice. I suggest a s.a.s.e. as well.

9N1MM, operated by Rev. Fr. Moran, still provides a nice QSO with this country. He stands by for Pacific contacts from 1430z on 14230, and QSLs go to W3KVQ/2, 2308 Branch Pike, Cinnaminson, New Jersey, 08077, U.S.A.

Further to the previous paragraph on the Thailand operational situation, the A.R.R.L. have now announced that they will accept HS QSLs for DXCC credit if the operator is a Thai National. One, HS1CB Chankij, is reported on 21301 at 1300z.

I have had some queries here re the reported operations of CR8JG by VK2BFI and others. Only comment I care to make is that I know nothing whatsoever about it, and unless one of the operators cares to enlighten me officially as to what is going on, then there will be no comment whatsoever in this page. The country is active quite regularly, when CR8AI is operated either by Luiz or Torres when they have time to spare.

There has been a postponement of the TI9CI jaunt to Cocos Is. by Don K6JGS/HK3 and Carlos HK3VA/TI2COF. Seven operators will be going along, and it is expected that two stations will be QRV 10 to 80 mx for five or six days in late Jan. or early Feb., 1970.

Call sign allocations in the German Democratic Republic are as follows: DM2 followed by three letters is issued where the operator is sole operator and owner of the station; DM3 followed by three letters indicates second, third, etc., operators of a club station; DM4 followed by two letters is first operator of a club station; DM6s are special mobile calls; DM9 calls are issued to foreign ops. in DM land, whilst DM0 is issued for special and exhibition stations.

Pirates I guess will always be with us, and PX1GS and 1Z1A are in this category. I understand that I.T.U. have and will not issue any calls beginning with the figures one and zero.

To clarify the prefix situation in the Maldives, the British base on Gan will continue to use VS9 and VS9MB will continue as is, however all other stations will use the prefix 8Q. This is not a new ruling, as 8QAWA (no significance) and 8QAYL have been about for over six months.

New location prefixes issued by Italy were I1 special services, I2 Milan, I3 Venice, I4 Bologna, I5 Firenze, I6 Bari, I7 Naples, I8 Reggio Calabria, I9 Piedmont, I0 Rome.

Operating times for HV3SJ are week days 1700z to 1800z on 14160-190, with occasional use of 21350 or 28550z week days at 1600z. On Thursdays they come on at 2030z 3790 s.s.b., and Sunday's operation is on 7095 s.s.b. at 0530z. All times one hour later in the winter; my card direct ex Bro. Edwin Amran, S.J., Box 9048, Rome. It is requested that cards not be mailed to the Vatican.

PERSONAL NEWS

From Jack VK3AXQ comes a long list of stations heard and worked. Amongst them such prefixes as UR2, YO2, TJ, EA8, FM7WQ, CR8AI, VQ8CC, LX2TRQ, XE, YU2, DJ, UB5, and worked W0BLZ on a 20 mx dipole up only 15 feet.

The proposed use of the AX prefix for the year 1970 has caused a lot of interest both here and overseas, and both Peter VK3APN and Jack VK3AXQ are looking forward to its use. With many of the DX gang prefix-hunting these days, there will be a lot of interesting calls being made into VK (AX) next January from all reports.

The R.D. week-end provided good conditions for that event, too good in fact for the DX was pouring in on 20 and 15 during the contest period. I for one couldn't resist taking a break from the event when CT, 9Y4, 9Q5, 3Z8, FO8 and EL8, to name a few, were coming in.

I mentioned a couple of months ago that Roy Waite, one of the best known of the Newark News boys, and manager of the QSL Bureau operated for Popular Electronics, suffered a stroke. It is pleasing to hear from the States that Roy is now on the mend and has some movement in his left arm. Just as a matter of interest, Roy, who is a listener, has verified 844 prefixes up to May this year.

QSL MANAGER

VE3DLC, Ron Kreger, 30 Zenith Drive, Scarboro, Ontario, Canada, handles QSL chores for the following: HI8XJA, HI8XPM, HS3DR, OX5AY, VP1FW, VP1TM, VP2BGB, VP2GBH, VP2GN, VP2KF, VP2MY/A, VP8JI, YV5ACL, 5Z4KL/5X5, 6Y5CB, 6Y5GB, 6Y5RM, 7X0AH, 8P6AH and AZ, 8P6BM, 8P6BN, 8P6BX, 8P6CD, 8P6CP, 8R1S, 8R1U, 8R1X, 8R1Z and 9Q5EP.

AWARDS

I mentioned previously the prefix hunters, and I am sure that interested persons know all about available awards, recently however, "CQ" magazine made their WPX award available to S.w.l's on a heard basis, the new award being the VPX (verified prefix) award. Applications must be made on official forms and these, plus copies of the rules, can be had for one IRC from VPX Award Manager, K4DSN, Howard Kelley, 6563 Sapphire Drive, Jacksonville, Fla., 32208, U.S.A. Requirements whether worked or heard are, briefly, 400 verified PX mixed modes, 300 VPX on phone, 300 VPX on c.w., 200 on s.s.b., with endorsements for each additional 50 prefixes. Other endorsements are 35 verified on 1.8, 150 verified on 3.5, 250 on 7 Mc., 300 on 14 Mc., 300 on 21 Mc., 250 on 28 Mc. For North American endorsement 126 prefixes, South America requires 88, Europe 146, Africa 80, Asia 68, and Oceania 51. Cost is one dollar U.S., with one IRC for each endorsement. QSLs must be in your possession at the time of claiming, and must show clearly band, mode and date.

SOME QTHs

CP1GN—C/o. U.S. Embassy, La Paz, Bolivia.
FG7XX—Via W2CTN, 159 Ketcham Ave., Amityville, N.Y., 11701.
HC1TH—Box 244A, Quito, Ecuador.
KC4USM—Via WA4NCE.
OA4XK—Box 538, Lima, Peru.
VP8JT—Via VE1ASJ.
YJ8JM—Via Radio Santo, New Hebrides.
YK1AA—Box 35, Damascus, Syria.
YV3QW—Box 41, Acaragua, Venezuela.
4Z4AO—Via WB2WOW.
5N2AAX—Box 3380, Lagos, Nigeria.
8P6AU—Via WB2FCI, 134 Ave. "C", Wayne, N.J., 07470.
8QAYL—All QSLs to 102/11, Templer Rd., Mt. Lavinia.
9Y4KK—Via Koety, 1825 W. Maine St., Jefferson City, M., 65101.

That is about as far as we can go this month, due to the absence of our regular report from the ISWL. My thanks to VK3AXQ, VK3APN, George ZL2AFZ, Mac Hilliard, Maurie Cox, Geoff Watts Bulletin, Newark News Radio Club bulletin, Lew Sharpley, Ray Moseley from G-land, and LIDXA bulletin. I look forward to hearing from more of our VK operators in the following months and hope you all have a good session or two in the VK/ZL Contest this year. 73, Don L2022.

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FEDERAL AWARDS

"CQ" AWARDS

"CQ" Magazine has recently announced that the "CQ" SSB DX Award is to be discontinued. As all applications had to be received in the U.S.A. by 1st October, 1969, it is now too late for any further applications from VK. Despite declining applications from the rest of the world at the time of the withdrawal of the award, the VK applications were steadily increasing each month.

As a result of the withdrawal of this award, there is now only one "CQ" award which the Federal Awards Manager W.I.A. will be able to certify applications for, the "CQ" W.A.Z. Award. Applications for this will be accepted as previously announced in this column. Applicants for the W.P.X. Award offered by "CQ" are asked to contact the magazine direct for application blanks, etc., as no checking of cards is required in this case.

—Geoff Wilson, VK3AMK.
Federal Awards Manager.

AUSTRALIAN RESULTS 1968 "CQ" W.W. DX CONTEST

CW

	Band	Points	Cont.	Zon.	Ctrs.
VK2EO	A	330,264	556	60	138
VK2VN	A	89,540	267	50	60
VK2APK	14	228,053	703		75
VK3RJ	28	13,262	126	16	22
VK3QV	28	3,213	153	9	12
VK3APJ	21	171,666	578	32	67
VK3AXK	21	101,392	417	27	57
VK3ABA	21	27,434	162	22	36
VK3QI	14	20,778	144	21	32
VK3APN	3.5	5,046	103	13	16
VK3OP	3.5	2,052	45	9	10
VK3XB	3.5	1,560	43	9	6
VK4FH	A	159,848	465	54	62
VK5FM	A	103,785	416	25	60
VK5KO	A	12,555	222	45	41
VK6RU	A	667,212	832	96	186
VR1P	A	41,448	209	53	33
VK9DR	A	8,610	76	20	21
VK2BKM/LH	A	703,296	1085	85	137

N.B. 1. VK2BKM/Lord Howe Is. won the World Contest Expedition Trophy, "Dr. Harold Megibow Memorial," donated by D. Miller, W9WNV.

2. VK2APK was sixth highest scorer on 14 Mc.

PHONE

	Band	Points	Cont.	Zon.	Ctrs.
VK2AND	28	42,435	329	21	24
VK2APK	14	320,059	753	37	112
VK3QV	28	27,554	205	20	26
VK3SM	21	864	25	6	6
VK3ARX	14	42,588	179	24	60
VK3KS	14	3,520	74	9	7
VK3XB	7	8,416	89	15	17
VK4FH	A	132,495	384	52	69
VK4CK	A	74,715	295	38	47
VK4SS	28	8,556	64	21	25
VK4SD	14	26,316	83	30	72
VK4UC	14	24,210	102	33	57
VK4DO	14	21,900	103	25	50
VK5LC	28	28,300	120	22	38
VK6RU	A	1,491,644	1543	113	221
VK6XX	28	311,163	1118	27	76
VK9XI	A	21,386	188	16	21
VK9DR	A	40	5	5	5
VK9KS	14	38,432	155	31	61

☆

AGENT MOVES

R. H. Cunningham Pty. Ltd. Queensland agent, L. E. Boughen & Co., formerly of 95 Central Ave., Sherwood, Qld., has moved to a new office at 30 Grimes St., Auchenflower, Qld. The Company's new postal address is P.O. Box 136, Toowong, Qld., 4066; telephone 7-4097.

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CONTEST CALENDAR

4th/5th October: VK/ZL/Oceania DX Contest (Phone).

4th/12th October: Lebanese DX Contest.

11th/12th October: VK/ZL/Oceania DX Contest (CW).

11th/12th October: R.S.G.B. 28 Mc. Telephony Contest.

18th/19th October: W.A.D.M. DX Contest (CW only).

25th/26th October: "CQ" W.W. DX Contest (Phone).

25th/26th October: R.S.G.B. 7 Mc. Contest (CW).

8th November: International OK DX Contest (CW only).

8th/9th November: R.S.G.B. 7 Mc. Contest (Phone).

15th/16th November: R.S.G.B. 1.8 Mc. Contest.

29th/30th November: "CQ" W.W. DX Contest (CW).

6th Dec., 1969, to 11th Jan., 1970: Ross A. Hull V.h.f. Memorial Contest.

6th/7th December: C.H.C. International DX Contest (CW).

13th/14th December: C.H.C. International DX Contest (SSB).

1st/2nd Feb., 1970: John Moyle National Field Day.

7th/8th Feb., 1970: 36th A.R.R.L. International DX Competition (1st Phone week-end).

21st/22nd Feb., 1970: 36th A.R.R.L. International DX Competition (1st CW week-end).

7th/8th March, 1970: 36th A.R.R.L. International DX Competition (2nd Phone week-end).

21st/22nd March, 1970: 36th A.R.R.L. International DX Competition (2nd CW week-end).

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1969 "CQ" W.W. DX CONTEST

PRECIS OF RULES

Starts 0000 GMT Saturday, ends 2400 GMT Sunday. Phone: Oct. 25-26. C.w.: Nov. 29-30.

All Amateur bands 10 through to 160 metres.

Type of Competition:

1. Single operator.
   (a) Singleband.
   (b) All band.
2. Multi-operator (all-band operation only).
   (a) Single transmitter (only one signal permitted).
   (b) Multi-transmitter (only one signal per band permitted).

Two types of multipliers will be used: (1) A multiplier of one (1) for each different zone contacted on each band; (2) a multiplier of one (1) for each different country contacted on each band. Stations are permitted to contact their own country and zone for multiplier credit. The "CQ" Zone Map, DXCC Country List, WAE Country List and WAC continental boundaries are the standards.

Contacts between stations on different continents are worth three (3) points. Contacts between stations on the same continent but different countries are worth one (1) point. Contacts between stations in the same country are permitted for zone or country multiplier credit but have zero (0) point value. Only one contact with the same station on the same band is permitted.

The final score is the result of the total QSO points multiplied by the sum of your zone and country multipliers. Example: 1000 QSO points multiplied by 100 multiplier (30 zone plus 70 countries) equals 100,000 (final score).

All scores will be published. To be eligible for an award a single-operator station must show a minimum of 12 hours of operation. Multi-operator stations must operate a minimum of 24 hours. A single-band log is eligible for a single-band award only. If a log contains more than one band it will be judged as an all-band entry, unless specified otherwise.

Log instructions: All times must be kept in GMT. Use a separate log for each band. Indicate zone and country multipliers only the first time they are contacted on each band. Each entry must be accompanied by a summary sheet showing all scoring information, the category of competition, the contestant's name and address in block letters, and signed declaration that all contest rules and regulations for Amateur Radio in the country have been observed.

All entries must be postmarked no later than 1st December, 1969, for the Phone section, and 15th January, 1970, for the C.w. section. Logs go to: "CQ" W.W. Contest Committee, 14 Vanderventer Avenue, Port Washington, L.I., N.Y., U.S.A. 11050. (Indicate phone or c.w. on envelope.)

SILENT KEY

It is with deep regret that we record the passing of—

VK2XO—J. M. (Crieff) Retallick

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FOR SALE: Galaxy III., spotless condition, complete with matching p.s.-spkr. unit (capable of running 1200w. p.e.p. linear in addition to Galaxy), $320. External VFO, $45. Matching 10 Kc. xtal calibrator, $15. Dynamic PTT Mic., $10. Channelmaster Antenna Rotator, complete with 100 ft. cable, control unit, Channelmaster thrust-bearing, as new, in original carton, $50. New, galv. steel 30 ft. telescopic mast, $22. 48 Orchard St., Glen Waverley, Vic. Phone 232-9492.

FOR SALE: Geloso G209R Receiver; Geloso G222T transmitter. In perfect condition, complete with circuit diagrams and SSB mod. sheet for 209R. $150. J. Nairn, P.O. Box 432, Traralgon, Vic., 3844.

FOR SALE: Hallicrafters SX Communications Receiver, 550 Kc. to 42 Mc., continuous in six bands. Bandspread 80 to 10, product detector, handbook, good performer, will securely crate for transport, price $120. L. Downing, VK4FX, P.O. Box 504, Bundaberg, Qld.

FOR SALE: Two TV Picture Tubes, type Radiotron 17BJP4, 17 inch, 90 deg. One new in sealed original carton, $20. One used as new complete with matching yoke and e.h.t. transformer, guaranteed, $10 the lot. Will freight anywhere. J. Thornton, 23 Esplanade, Pialba, Qld., 4655.

SELL: Marconi CR100 Receiver, complete with handbook and Geloso Front-End Converter, $100 the two, or near offer. Will sell separately if requested. B. L. McCubbin, VK3SO, 3 Kildare St., Burwood, Vic., 3125. Phone: home 288-1587, work 42-1851 ext. 171.

SELL: MR3A High Band 3-Channel, outboard transistor power supply, $50. H. H. Smith, VK3AAF, 17 Duncan St., Box Hill, Vic. Phone 288-2952.

WANTED: AR88 with product detector or SX100 or similar for general coverage b/c and to 30 Mc. or plus. Price and details to J. Thompson, 20 Alexander Ave., Rose Park, S.A., 5067. Phone 31-1638.

WANTED: Electronic Keyer with monitor and, further, TRIO Communications Receiver 9R-59DE with speaker SP5DE or similar equipment. Karol Nad, OK3UH, F16c Cowper St., Fairy Meadow, N.S.W., 2519.

WANTED TO BUY: Collins 351D-2 Mobile Mount, also MP1 Mobile Power Supply for Collins KWM2. G. W. Dennis, VK3TF, 73 Nicholson St., Footscray, Vic. Phone 68-2575, a.h. 314-5543 (Melb.).

WANTED TO RENT: New or used transmitter-receiver until June 1970. C. V. Nelson, 149 Brougham St., Kew, Vic., 3101. Tel. 86-5059. VK3BCN/W1IDA.

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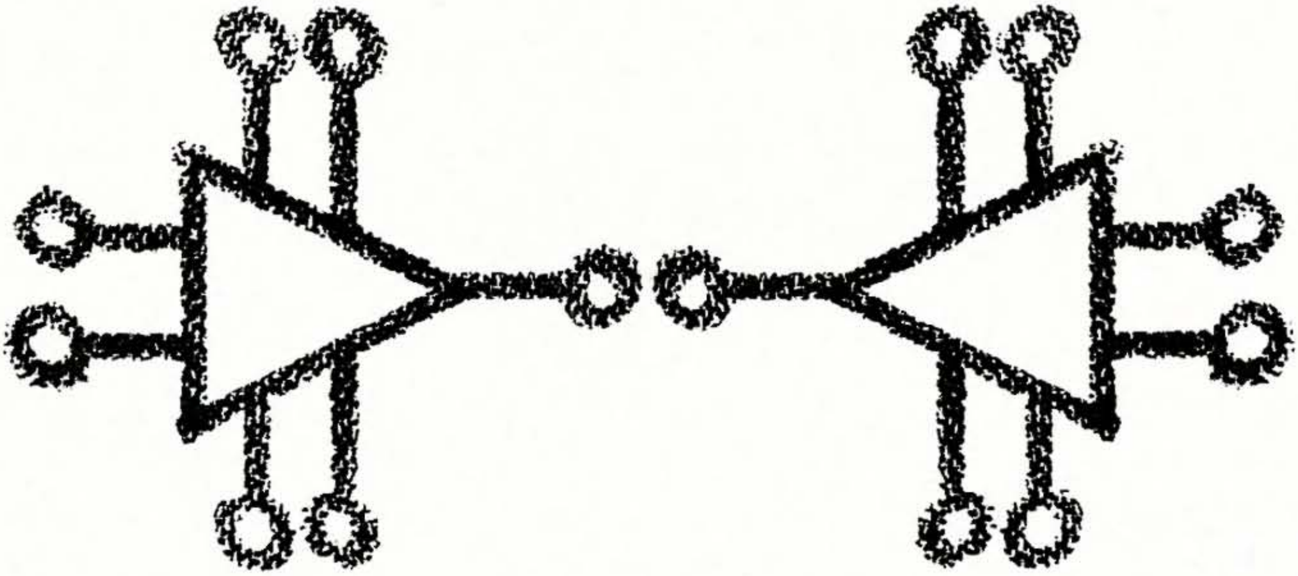

μA739C consisting of two identical operational amplifiers is constructed on a single silicon chip, using the Fairchild Planar epitaxial process. These low noise, high gain amplifiers exhibit extremely stable operating characteristics over a wide range of supply voltage and temperatures.

The μA739C is intended for a variety of applications, its low cost and flexibility making it an ideal building block in home entertainment systems.

FEATURES: LOW NOISE FIGURE, 2.0 dB ☐ HIGH GAIN, 20,000 V/V ☐ OUTPUT SHORT CIRCUIT PROTECTED ☐ NO LATCH UP ☐ LARGE COMMON MODE RANGE ±11V ☐ EXCELLENT GAIN STABILITY VS. SUPPLY VOLTAGE ☐ SINGLE OR DUAL SUPPLY OPERATION.

PART U6E7739393. TEMP. RANGE 0° to 70°C
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Limited supply available off the shelf.

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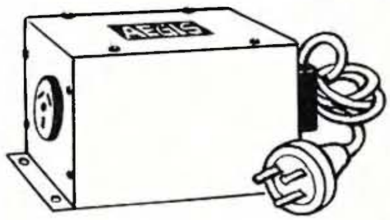

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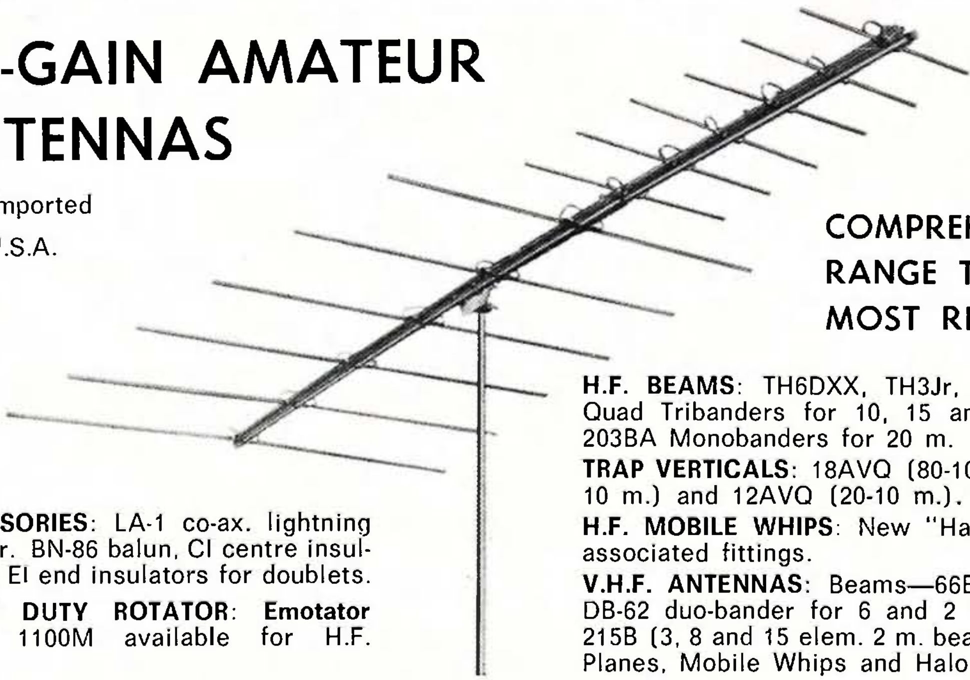

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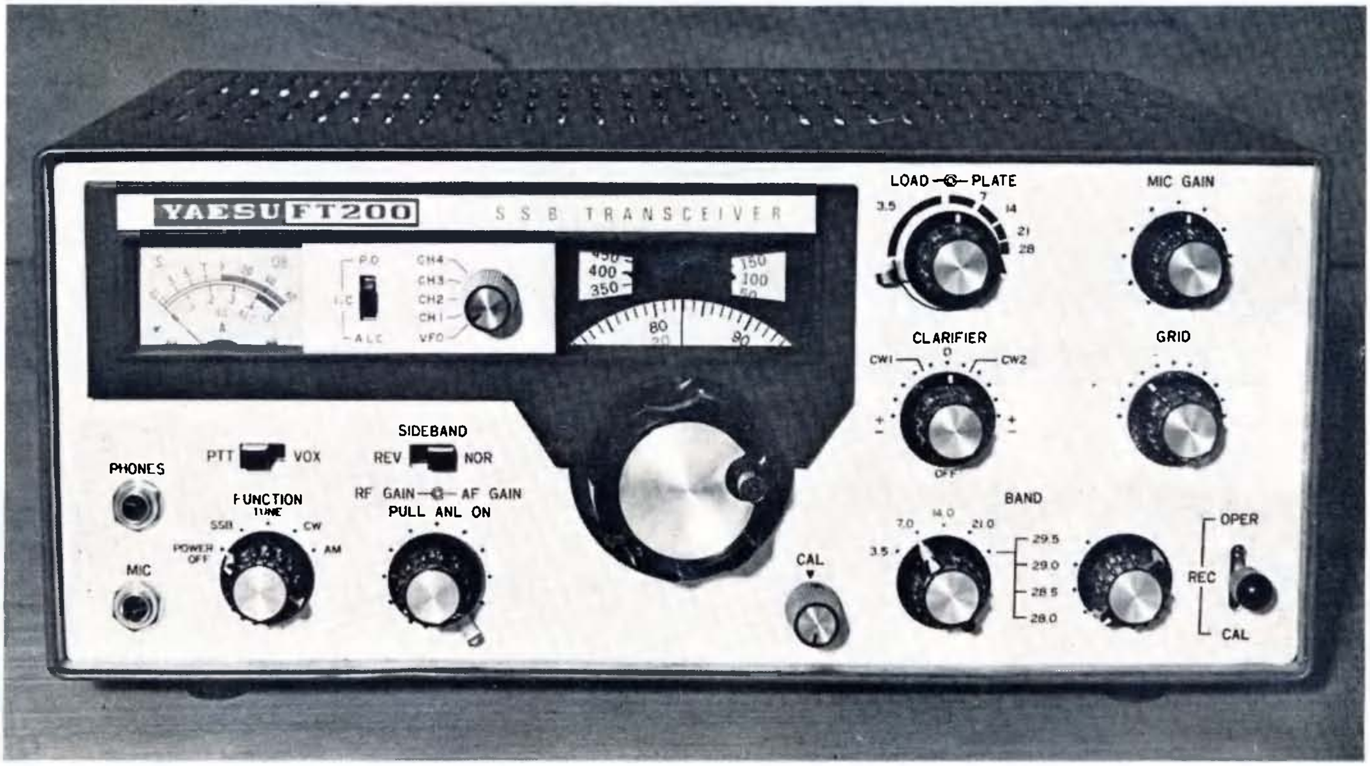

ECONOMICAL SSB! *from YAESU*

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Operates from separate 230 volt 50 c.p.s. AC power supply, which includes built-in speaker. A 12 volt DC power supply is planned for later production. Power take-off available for transverters, etc.

Cabinet finished in communication grey lacquer. Panel, etched, satin finish aluminium.

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Other well known Yaesu Models: FTDX-100 Transistorised Transceiver, FTDX-400 Transceiver, FLDX-2000 Linear Amplifier, FLDX-400 Transmitter, FRDX-400 Receiver, FR-50 Receiver, FTV-650 6 Metre Transverter, FF-30DX Low Pass Filter, 600 c.p.s. CW Mech. Filter for FRDX-400, 600 c.p.s. CW Crystal Filter for the FTDX-400. Also: SWR Meters, Co-ax. Switches, F.S. Meters, Co-ax. Connectors.

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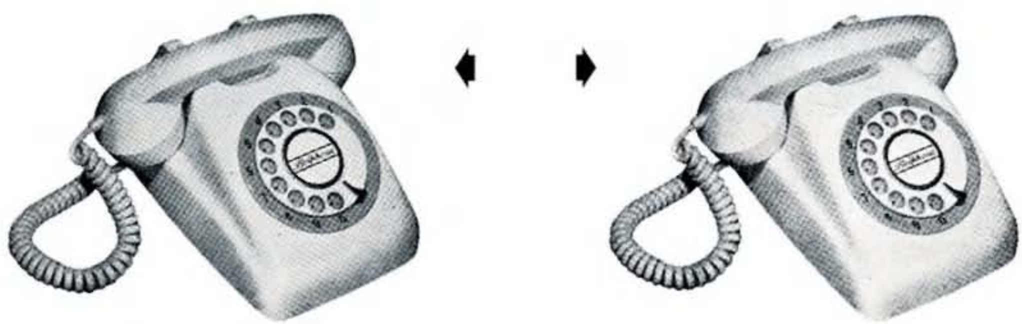

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amateur radio

Vol. 37, No. 11
NOVEMBER, 1969
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MODEL 9R-59DE

Four-band receiver covering 550 Kc. to 30 Mc. continuous, and electrical bandspread on 10, 15, 20, 40 and 80 metres. 8 valves plus 7 diode circuit. 4/8 ohm output and phone jack. SSB-CW, ANL, variable BFO, S meter, sep. bandspread dial, i.f. 455 kc., audio output 1.5w., variable RF and AF gain controls, 115/250v. AC mains. Beautifully designed. Size: 7 x 15 x 10 in. With instruction manual and service data.

PRICE $175 inc. sales tax

Speaker to suit, type SP5D, $15 inc. tax.

MULTIMETER MODEL 200H

20,000 ohms per volt d.c., 10,000 ohms per volt a.c. **Specifications**.—DC Volts: 0-5, 25, 50, 250, 500, 2,500. AC Volts: 0-10, 50, 100, 500, 1,000. DC Current: 0-50 uA.; 25, 250 mA. Resistance: 0-60K ohms, 0-6 meg. Capacity: 0.01-0.3 uF. (at AC 5v.); 0.0001-0.01 uF. (at AC 250v.). Decibel: Minus 20 db plus 22 db. Output range: 0-10, 50, 100, 500, 1,000. Battery used: UM3 1.5v., 1-piece. Dimensions: 3¼ x 4½ x 1⅛ in. **Price $11.00** Post Free. Complete with internal battery, testing leads, prods.

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- Freq. Response: 30 c/s.-500 Kc. within plus or minus 3%; 20 c/s.-10 Mc. within plus or minus 10%.

DC Voltage—
- Measurement Range (in 7 ranges): 0-1.5v., 0-5v., 0-15v., 0-50v., 0-150v., 0-500v., 0-1500v.
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- Accuracy: Within plus or minus 2% full scale.

Resistance—
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- Accuracy: Within plus or minus 3% of the scale length.

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1M5	50c
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6EA8	$1.55
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T.C.A. (Philips), Low Band, F.M. Mobile Units. 6 volt. Crystal locked, 120 Kc. bandwidth. Operating frequency, approx. 80 Mc. Complete with all valves, vibrator and microphone. Suit Amateur conversion. **Good condition.**

OUR PRICE, LESS CRYSTALS, $25.
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Ideal for solid state i.f. applications.

BC455A—bandwidth 5 Kc. at 455 Kc. **45c**
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Insertion loss 1.0 db., input impedance 3.3K ohms

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Type WC334AT—audio power amplifier. Input 0.5v. r.m.s., output 1 watt into 15 ohms. Distortion 2.4% at 1w. on 13.5v. rail. Physical size approx. size top-hat transistor. **Price $7.50 ea.** Post. 10c.

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120 Kc. to 390 Mc. Frequency range (6 bands): 120 Kc. to 130 Mc. on fundamentals; 130 Mc. to 390 Mc. on harmonics. Mod. frequency 400 and 1,000 cyc. Uses 12BH7, 6AR5 plus selenium rectifier. Provision for crystal oscillator by use of external xtal (xtal not supplied). 1 to 15 Mc. Dimensions: 7½ x 10¾ x 4½ inches. Professionally finished, grey crackle enamel. **Price $36.75.**

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M.S.P., incremental, brand new, complete with valves 6ES8 and 6U8. **Price $5.50.**

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100 assorted Resistors, ¼ and 1 watt. Good selection. All popular types. **Price $1.75 packet.**

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amateur radio

JOURNAL OF THE WIRELESS INSTITUTE OF AUSTRALIA FOUNDED 1910

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"AMATEUR RADIO,"
P.O. BOX 36,
EAST MELBOURNE, VIC., 3002.

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CONTENTS

COVER STORY

The illustration on our front cover is the Eddystone EC10, fully transistorised communications receiver, which was featured editorially in September "A.R." One of the most versatile receivers in the Eddystone range, the EC10 is now immediately available from R. H. Cunningham Pty. Ltd.

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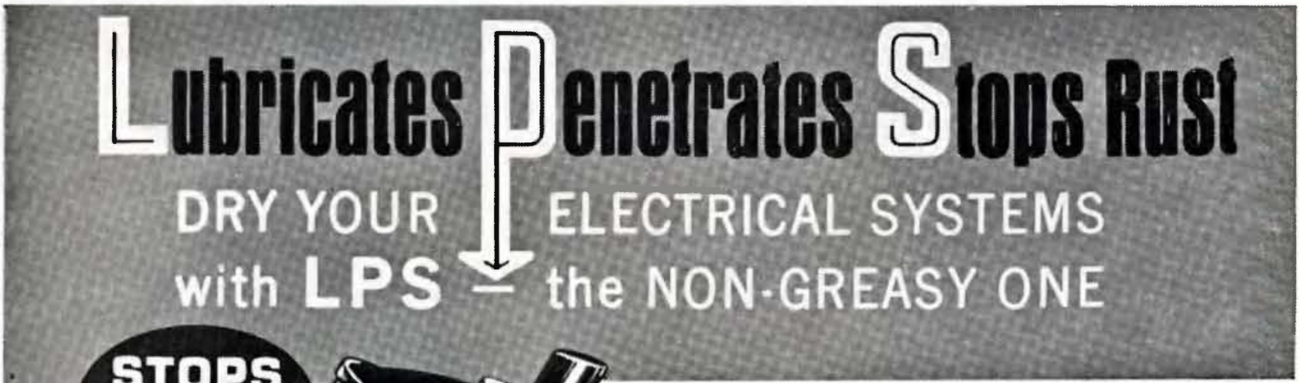

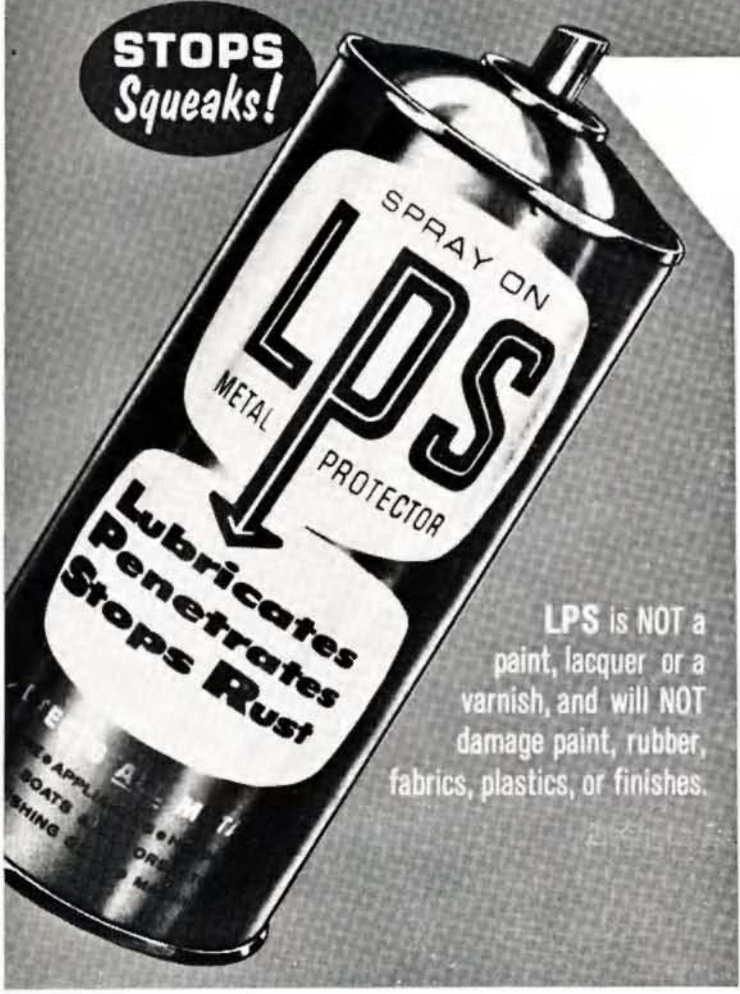

Displaces Moisture Fast!

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Less than 0.0001 inch non-greasy molecular film with capillary action that spreads evenly and easily to seal out moisture at very low cost.

Rust Inhibitor: Protects all metals from rust and corrosion.

Water Displacing Compound: Dries out mechanical and electrical systems fast.

Lubricant: **Lubricates** even the most delicate mechanisms; non-gummy, non-sticky; does not pick up dust or dirt.

Penetrant: Penetrates to loosen frozen parts in seconds.

Volume Resistivity per ASTM D-257: Room temperature, ohm/cm.; 1.04×10^{12}.

Dielectric Constant per ASTM-877:
Dielectric Constant 2.11, Dissipation Factor: 0.02.

Dielectric Strength per ASTM D-150:
Breakdown Voltage 0.1 inch gap, 32,000 volts.
Dielectric Strength volts/inch, 320,000 volts.

Flash Point (Dried Film), 900 degrees F.
Fire Point (Dried Film), 900 degrees F.
TESTS AND RESULTS: 950 degrees F.
Lawrence Hydrogen Embrittlement Test for Safety on High Tensile Strength Steels: Passed. Certified safe within limits of Douglas Service Bulletin 13-1 and Boeing D6 17487.
Mil. Spec. C-16173 D-Grade 3, Passed.
Mil. Spec. C-23411, Passed.
Swiss Federal Government Testing Authority for Industry: Passed 7-Day Rust Test for acid and salt water. Passed Weiland Machine Test for Lubricity as being superior to mineral oil plus additives.

LPS Products conform to Federal Mil. Specs. C-23411 and/or C-161730

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1. LPS PROTECTS all metals from Rust and Corrosion.
2. LPS PENETRATES existing rust—stops it from spreading.
3. LPS DISPLACES moisture on metal—forms fine protective film.
4. LPS LUBRICATES even the most delicate mechanisms at extreme temperatures.
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After my October 1969 "Amateur Radio" story on antennas and beams in particular, a similar presentation on the available commercial SSB sets may be in order to help make a choice out of the large variety available these days.

I shall restrict myself to Transceivers, they satisfy the needs of the bulk of the Amateurs. Separate receiver and transmitter combinations cost nearly twice as much and are only warranted for extreme demands on the receiver side for extra CW selectivity, VHF coverage, etc.

In my opinion, the first decision a buyer should make is: Do I want to operate from 240v. AC at home only or also from 12v. DC mobile or portable, and if so, how important is the mobile operation to me?

For AC operation only, there is little better to choose than the YAESU-MUSEN FT-DX-400, the highest value for money invested per watt of output. For mobile and AC base operation at a somewhat lower power level, approximately half that of the FT-DX-400, the YAESU FT-200 is the most economical. If only portable operation with reduced 12v. battery drain is wanted, or if for some reason one prefers one self-contained unit, with the AC/DC supply built-in, the YAESU FT-DX-100 should be considered, its power level again being about half that of the FT-200.

Where do the SWAN and GALAXY Transceivers fit in? Being much dearer these days than the Japanese products, there must be a valid reason to select these American sets. There definitely is when one wants the maximum mobile power input. As this counts more when mobile than at home where more efficient antennas can be installed, the American Transceivers offer the same high mobile power level as at home.

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—Arie Bles.

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FEDERAL COMMENT:

MR. CARROLL RETIRES

At the Annual Dinner of the Victorian Division of the Wireless Institute of Australia held at Clunies Ross House on 24th September, a presentation was made to Mr. Charles Carroll on behalf of the Federal Council to mark his retirement from the Postmaster General's Department.

Mr. Carroll held the post of Controller, Radio Branch; it is with the person holding this post that the Federal Executive most often has personal contact when making representations to the Central Administration of the Radio Branch on behalf of the Federal Council.

Mr. Carroll became Controller on the retirement of Mr. L. F. Pearson, and at a time when the "Handbook for the Guidance of Operators in the Amateur Service" was about to become under review. This review very quickly became a joint exercise, with both the Departmental Officers and the Institute Officers working together. The result was undeniably very successful. Amateurs were given some new privileges, the book itself became much easier to follow and contained more information than ever before. A number of anomalies and inconsistencies were deleted. Out of these discussions emerged a better understanding and relationship between the Department and the Wireless Institute of Australia.

Unlike the A.R.R.L., the Wireless Institute is not faced with the quasi judicial rule-making procedures of the Federal Communications Commission. Regulatory innovation or amendment are in Australia very much dependent on the individual view of the professional administrator. Thus it is important to the Amateur Service that the person responsible for making the decisions that affect the Service understand Amateurs and the objects of the hobby generally.

Mr. Carroll, we felt, was interested in the W.I.A. as an organisation and not only as another aspect of his administration. He found the time to go to Sydney in 1968 to attend, in his official capacity, the Inaugural I.A.R.U. Region III. Congress and the Federal Convention of the W.I.A.

In addition, he has regularly attended functions in Victoria.

In making the presentation to Mr. Carroll, I pointed out that we were not honouring him because we thought he had been unduly biased in favour of the Amateur Service but because we felt that he had always been prepared to listen to us and had always been fair in his treatment of the Amateur Service.

In his reply, Mr. Carroll made some observations that I think are very significant and are worthy of consideration by all Amateurs.

He referred to the ever increasing pressures on the radio frequency spectrum and pointed out that many other Services had set target dates to achieve the total utilisation of single sideband or other frequency conserving techniques. He suggested that the Amateur Service should give very serious consideration to setting a similar target date for the non-use of double sideband techniques on its high frequency bands. Mr. Carroll stressed that in order to be able to justify its retention of the bands allocated to it, the Amateur Service must not only demonstrate that it is fully using these bands in terms of occupancy, but also that it is using them as effectively as practicable.

Of course what Mr. Carroll has suggested, has for all practical purposes, occurred on the 20 metre band and only to a slightly lesser extent on the 10 and 15 metre bands.

I can well envisage that some hands will be thrown in the air in horror at such a suggestion in relation to the 40 and 80 metre bands. No doubt a conflict instantly arises between the asserted right of the individual to use the techniques and modes of his choice and the importance of using the most modern techniques and modes in part justification of our retention of our bands.

However, experience has shown that in bands subject to the greatest pressure, for example the 20 metre band, Amateurs have attempted to overcome the problem of achieving effective communication notwithstanding dense band occupancy by resorting to the most modern techniques. In the long term it is probably hard to measure the real significance of the techniques adopted by the Amateur Service in the fight for the retention of Amateur frequency space. It cannot, I think, be denied that what Mr. Carroll says is obviously good sense. His experience in this area cannot be disregarded and I urge that full weight be given to his suggestions.

So far as our relationship with the Central Administration of the Postmaster General's Department is concerned, I think that the patterns that have been set in the past will not quickly change and we look forward to a similar relationship with Mr. Carroll's successor as we have enjoyed with him.

MICHAEL. J. OWEN, VK3KI,
Federal President, W.I.A.

Diddley Dah Dah Dah Dah Dit!

COL HARVEY,* VK1AU

EVERY so often a magazine article excites enough interest to break down one's increasing resolve to give up home brewing. The April 1968 "QST article on an integrated circuit electronic auto keyer is one example. Lulled into self justification by pious thoughts of learning the easy way about computer logic, gates, flip flops and what have you, I misjudged the amount of practice that was to be needed before I could send decent auto-generated Morse. Other Amateurs who have tried auto keyers seem to agree that those brought up on a standard "bug" find the transition by no means a quick and easy affair. However, once achieved, the resultant Morse is significantly better copy. Going from a straight key to an auto keyer should not be too difficult, but any thoughts of being hot-stuff simultaneously on all three types of key without lots of practice seems to be a pipe dream. Nevertheless, for those still with the right mental attitude to develop the skills needed to enjoy fast c.w., the following notes will be of interest.

The integrated circuit keyer described in "QST" (Fig. 1) works well and is easier to use and set up than equivalent circuits using blocking oscillators and relays. The Motorola ICs used are cheap, were readily available in Australia† and will fit nicely onto millimetric matrix board. The MC790P dual flip flop sells at about $2.15, and the MC724P gates and MC789P inverters at $1.17 each plus tax. Apart from the polarised tantalum capacitor preferred (but not essential) for the timing circuit, all components are readily available and a good night's work will see the thing wired up on matrix board (mine is about 3½" x 1½"). This method of construction has advantages over printed circuit board if the gadget does not work properly first time! If preferred, sockets‡ can be used to mount the integrated circuits, but this is not really worthwhile other than to improve appearance.

Early recognition of the difficulty of sending decent Morse without off-the-air practice, caused me to add to the basic "QST" keyer, a tone oscillator and integrated circuit amplifier keyed by an extra transistor switch. This provides about 60 mW. of audio and allows "monitoring" on the air, and practice off the air (see Fig. 2).

However the most essential part of the entire project is the "paddle". If you have not got or cannot make an easily adjustable reliable and comfortable paddle, my advice is to forget the project. To perservere with an unsatisfactory paddle means that both you and your audience will be frustrated by frequent errors and correc-

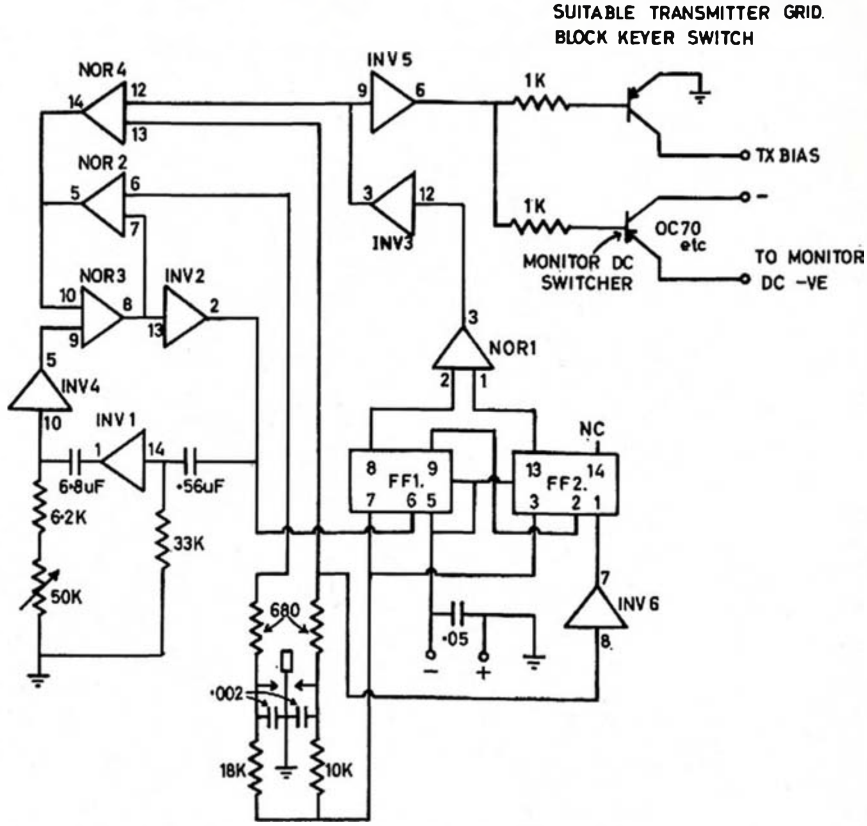


FIG.1. THE BASIC I/C KEYER IN Q.S.T.

Values are not critical. N.B.—Pin 11 of every IC is earthed (positive) and Pin 4 is negative.

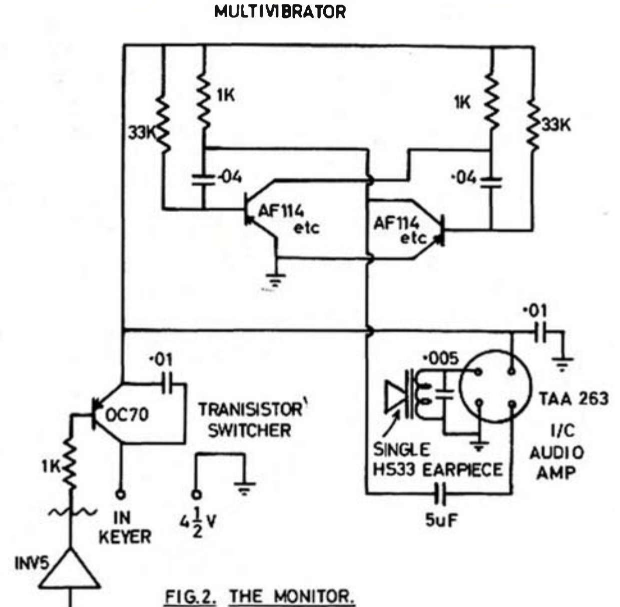


FIG.2. THE MONITOR.

Values are not critical. To decrease the audio tone, increase the 0.04 uF. capacitors in the multivibrator. The 0.005 and 0.01 uF. by-passes can be omitted if there is no evidence of "hash" in nearby equipment.

* 16 Leane St., Hughes, A.C.T., 2605.

† Cannon Electric, P.O. Box 25, Mascot, N.S.W.; Phone Mr. Fisher, 67-1488.

‡ Electrosil—"Augat" Range.

tions during each transmission. With a mechanically sound movement (such as the squelch relay from a TR5043) you can get into business with a moderately successful home-brew paddle.

Here's how: Remove the coil; drill a hole in the outboard end of the armature and add a short piece of plastic as a finger grip; clip two small springs to the armature as shown in Fig. 3 to supplement the very light centering/weight spring originally provided. The armature is now the common earth connection and the old double throw contacts become the Dot and Dash contacts. The relay base needs to be mounted firmly and then makes a reasonable substitute for a commercial paddle. Contrary to experience with some "bugs", only a light touch will be required.

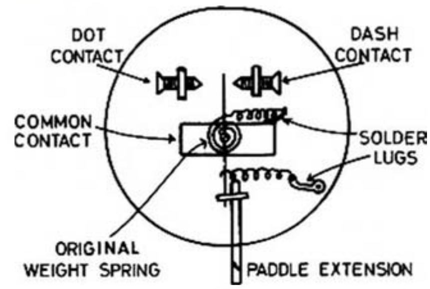


FIG.3. TOP VIEW OF MODIFIED RELAY.

The spring tension is not critical, providing it is strong enough to prevent "chatter". Even rubber bands will do the job.

The keyer should cause little trouble. Because it will need something of the order of 4 volts at 150 mA., it is wise to find this in some way other than from dry batteries. It will work at lower and higher voltages, but the flip flops seem to prefer "standard" pulses (about 3v.) to operate cleanly. Since there are more than 40 "transistors" involved, voltage in excess of about 4 volts does little except unnecessarily increase the current drain.

I use an a.c. half-wave transistor radio supply, set by Zener reference to 5.6 volts output, which is reduced to about 4½ volts at the keyer by appropriate adjustment of a 1K pot. Do not decouple the d.c. supply to FF1-FF2. It seems to affect toggling, causing occasional errors. The ICs are just warm to the touch at this voltage.

Without a miniature iron—even the Miniscope is a little too big—it will be difficult to do a decent job of wiring the ICs since a "bit" about the size of a match is really required.

The layout of the matrix board is best governed by the preferred relationship between power supply, paddle and transmitter. Fig. 4 shows the layout of the VK1AU Keyer. Due to the "low" input to some of the gates, etc., in the keyer and the possibility of diode rectification, precautions need to be taken to minimise r.f. pick-up. The keyer therefore needs to be shielded from strong r.f. fields and the leads to the paddle need to be kept short.

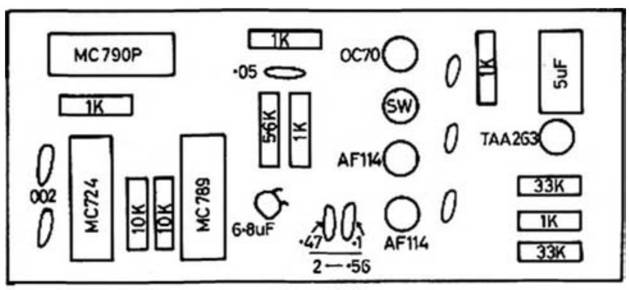
If a bug (such as an Eddystone) is modified to become the paddle, it will be possible to mount the entire keyer (less the power supply) on the bug base, where it will be shielded by the cover.

When considering the options, it is also necessary to recognise that any multivibrator radiates a signal rich in harmonics. Therefore if the monitor output is run in longish unshielded leads (to an ear piece for example) the keyed monitor signal may be heard (as "hash") in an adjacent receiver. If this is unacceptable, an audio oscillator of sufficient output could be substituted for the multivibrator. Alternative methods of keying the monitor exist, but to avoid the use of relays I key the negative return of the multivibrator and IC amplifier by an extra transistor switch turned on by INV5 in the keyer (see Fig. 1). Any GP audio transistor is suitable as a switch. The Mullard IC audio amplifier TAA263 drives an old HS33 ear piece loudly enough to allow practice even when there is a moderate background noise in the shack from radio or t.v. No output transformer is needed.

For the benefit of those whose keyer initially sends gibberish, and who are not confident about fault finding solid state devices, the voltage analysis at Table 1 should prove helpful. It should be read in the sense that gates and flip flops are either in one state or the other, i.e. the output is either low or

(continued next page)

KEYER SECTION MONITOR SECTION



TOP VIEW

Fig. 4.—One suitable layout using matrix board.

Transistor SW is any transistor rated approximately for the voltage to be keyed in the transmitter.

Dash	Dot	Rest		Pin	MC789P HEX INVERTER	Pin		Rest	Dot	Dash
3	4½	4½		8		7		2	2	4½
3	3½	4½		9		6		0	2	3¼
4½	4½	3¾		10	MC789P	5		4½	3	2¾
0	0	0	+	11	HEX	4	—	4½	4½	4½
3¾	3¼	2¼		12	INVERTER	3		4½	3½	3
4	4	4½		13		2		3	3	3
4	4	4		14		1		4½	3½	3½
					Top View	O				

Dash	Dot	Rest		Pin	MC790P Dual J-K FLIP FLOP	Pin		Rest	Dot	Dash
3½	3½	4½		8		7		4½	4½	4½
3½	3½	3¼		9		6		3	3	3
4½	4½	4½		10	MC790P	5		4½	4	4½
0	0	0	+	11	Dual J-K	4	—	4½	4½	4½
4½	4½	4½		12	FLIP FLOP	3		4½	4½	4½
3½	2¾	4½		13		2		3¼	3½	3½
3½	4½	3		14		1		2½	2½	4¼
					Top View	O				

Dash	Dot	Rest		Pin	MC724P QUAD GATES	Pin		Rest	Dot	Dash
3¾	4	4½		8		7		4½	4	3¾
2¾	3	4½		9		6		4½	2½	4
4½	4½	1½		10	MC724P	5		1½	4½	4½
0	0	0	+	11	QUAD	4	—	4½	4½	4½
3	3½	4½		12	GATES	3		2¼	3½	3½
3	4½	4½		13		2		4½	3½	0
4½	4½	1½		14		1		4½	4½	3½
					Top View	O				

Table 1.—Voltage Table.

(50,000 ohms/volt multimeter. Positive probe to earth.)

high (equivalent to false and true). (Note that a high state, involving repetitive dots will show on a multimeter only as half the steady state deflection.)

In the case of inverters, voltage measurements can be misleading. The c.r.o. will be needed to show if the input wave form is being inverted, i.e. positive going at the input and negative going at the output, or vice versa. This can also be shown at INV5, which will if shorted and therefore not inverting, results in "sounder" type back-the-front Morse.

The operation of the JK flip flop pair is complex and will not be described other than to say that correct operation is indicated by evidence that the output state is being "toggled" from high to low state. Since toggling takes place at keying speed it is not easy to fault-find in this portion of the circuit. However the voltage analysis given in Table 1 gives values obtained from a working keyer.

For those with access to a simple c.r.o. the patterns at Table 2 will be useful for comparison. Probing other connections will generally show d.c. voltages toggling between high and low state.

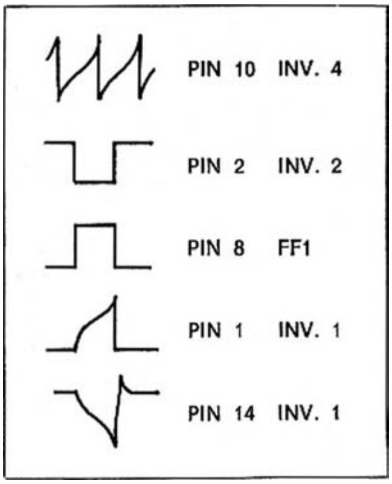


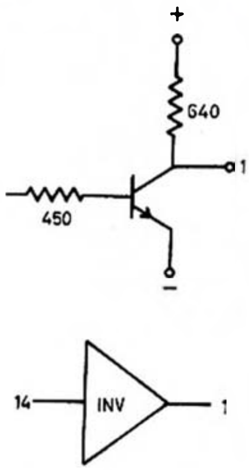
Table 2.—Waveforms (not to scale).
Time Base 50 c.p.s. int. sync. Keyer 20 w.p.m.

Use of the analysis should locate the segment of the circuit not performing according to the rules. Permanent failure of only one section of the quad gate, for example, does not necessarily mean that the entire IC must be scrapped. A transistor gate can be substituted for the faulty IC section. Appropriate circuits given in April "QST" are repeated at Fig. 5, others appear in manufacturers' literature. It should be possible to substitute any available gates, inverters or flip flops in any convenient combination which will achieve the same total function.

Personal skills are needed to send good auto-generated Morse. The initial practice needed to develop these skills has no place on the air, except perhaps for a brief fun contact with a competent and tolerant "buddy".

Practice sessions are best planned to use many foreign language words and English words that are difficult to send accurately at the first attempt (e.g. Neosyd, Motor, Tomorrow, Characteristic). These will develop a quick finger action more rapidly than sessions with easy words (e.g. she is his sister). Even with practice, I still find a tendency to try and send too fast, and therefore to run letters together. Also a momentary lapse of concentration produces hard-to-correct gibberish, while some words even refuse to come out right the first, and even the second time!

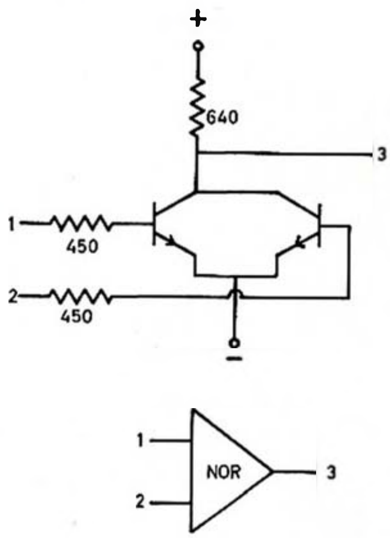
Only when listeners can make sense of such aberrations, without your having to revert to corrections with the hand key, have you got auto-keying made. SK.



(a)

Fig. 5a.—MC789P contains six inverters like this.

In the unlikely event of one section failing, a translator equivalent can be substituted for the failed section. Values of R are not critical.



(b)

Fig. 5b.—MC724P contains four NOR gates like this.

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Some Aspects of Radio Frequency Conductivity in Electro-Deposited Silver

R. G. STONE, VK5PB*

AFTER having made a sweeping statement recently on 40 and 80 metres, I thought I should clarify the situation by offering—for what it is worth—a little article dealing with what happens to be a revolutionary new concept proven beyond all doubt by a fellow colleague, and an Australian who virtually made history recently in America by having a superbly prepared paper, presented to the Technical Sessions of the 1968 American Electroplaters' Society Convention at San Francisco in July of that year, at which I was in attendance. I refer you to the work done by Alan Fowler, of the Australian Post Office Research Laboratory in Melbourne.

It has been the accepted, but erroneous belief, for many years, to always expect an r.f. conductor that has been silver plated to perform more efficiently than one in its natural unplated condition. The purpose of this article is to show some of the relative demerits of a practice widely accepted but now conclusively proved to be most undesirable. Before making a profound statement to a rather technically minded audience, it might be well to outline the basic history and growth of electroplating, especially in the Precious Metal Plating Industry.

Almost any metal can be electrodeposited, the common ones used most universally are copper nickel and chromium. Silver and gold too have their part to play. Prior to 1940, with minor exceptions, these metals were plated from electrolytes that produced a finish of a dull and somewhat rough appearance that required polishing to make them attractive and acceptable. Nickel was found to be an excellent coating for ferrous materials and when certain additives such as coumarin (the basis of vanilla essence) was added in small quantities the grain structure was highly refined and the work came from the bath mirror bright and ready for immediate chromium plating without the usual buffing. Copper also received attention so the bright acid copper was subsequently developed in recent years.

At the commencement of the modern space age, there was a sudden demand for improvement in the deposition of the more rare and precious metals. Silver had been for some time known to be influenced by the small addition of carbon disulphide, to the extent that in the cutlery trade it became almost a common place thing to add the "silver brites" each morning to the tank and thus get a very smooth bright deposit requiring very little, if any, polishing. Gold, too, was found to have a very important part in electronics because of its very excellent resistance to corrosion and its good solderability.

* 120 Coombe Rd., Allenby Gardens, S.A., 5009.

Rinker and Duva developed a gold, based on a cyanide formulation that gave mirror bright deposits from the bath, and several years later released a solution using citrates and other metal complexes to also provide gold alloys that were likewise mirror bright after plating. All this is very wonderful from the point of view of a beautiful decorative finish, but unfortunately to achieve this finish the additives used in the electrolytes quite commonly are co-deposited in the crystal structure and can cause harmful increases in the resistivity at d.c. and radio frequencies.

Unless a silver solution is continually filtered over activated carbon and electrolytically purified, it is impossible even with modern sequestering agents to produce a deposit of 100% purity. Another thought, most platers are not in the least concerned with their counterparts in industry, the electronic design engineers. A plater receives a job to silver plate, not only does he strive to produce a bright finish from a "loaded" solution, but will go even further and apply an undercoat of bright nickel to further enhance the beautiful white finish. Since cross sectional area has no relationship to r.f. conductivity, as r.f. only occupies the skin of a conductor, and that as the frequency increases, still less of it, consider the results of a tank coil with a deposit of nickel as compared to one constructed of plain copper. The conclusion is obvious. This effect, whilst not quite so pronounced, is evident in a silver plated inductor especially one plated from a heavily contaminated or so-called bright solution.

Nickel must be avoided at all costs; because generally the deposits are magnetic and as a result have very high r.f. resistance. A practical case of two r.f. tank coils for a high powered h.f. transmitter constructed from 3" o.d. 1/16" wall thickness copper tube—one plated with nickel and the other left bare copper. The copper one under load was measured for temperature and found to give expected output at 65°C., but the nickel one under similar operating conditions rose to 350°C. This is very near the Curie temperature for nickel, so as the temperature rose the permeability dropped towards 1.0, the skin depth increased, the current flowed in a thicker layer, and as a result the resistance levelled out and losses decreased until a stable condition was reached, but in doing so a very efficient piece of "shack" heating was evolved.

Consider the case of a finish system comprising a nickel undercoat, a layer of silver 500 micro-inches (12.5 microns) thick, followed by a gold protective layer 200 micro-inches (5 microns) thick. At 1 Mc., the thickness of the silver plate is only 20 per cent. of the skin depth, so that most of the current will flow in the nickel underlay, and cause high losses. At 100 Mc. the silver layer is slightly more than 1 skin depth thick, but the thickness of the gold layer is now about half a skin depth.

At 1 Gc. the gold layer is greater than 1 skin depth so that it carries most of the current. If the thickness of the gold layer is reduced to 50 micro-inches (1.25 microns) it will still carry an appreciable part of the current at 1 Gc.

A much thicker layer of silver is required at low frequencies, about 0.004 inch at 1 Mc., and a high conductivity silver plate (greater than 90% I.A.C.S.) must be used if a low loss coating is required. At ultra-high frequencies there seems little point in using a layer of silver, as with the above thicknesses the current will nearly all flow in the final layer of gold.

The problem is basically this, if silver is used, then in most cases, a relatively thick layer of gold is required for corrosion resistance. Apart from the cost, the thick layer of gold cancels out any electrical advantage gained from a layer of high conductivity silver.

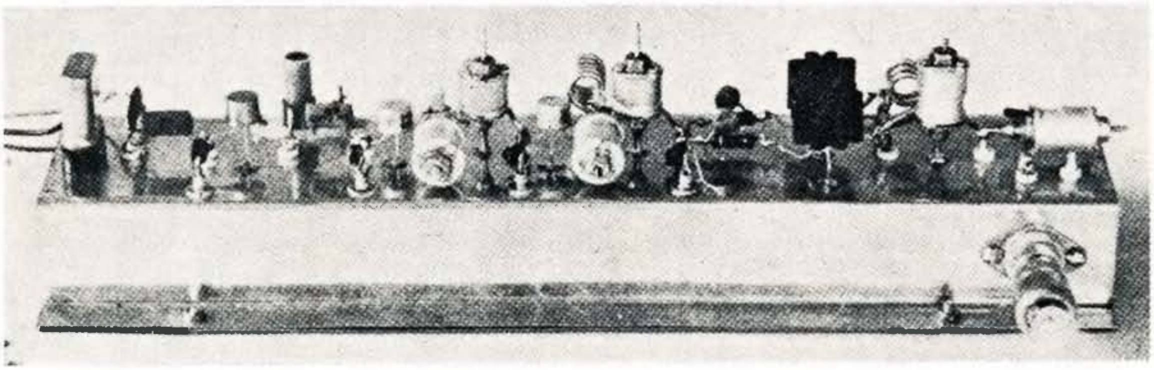
Since silver is the topical metal under discussion, let us assert here that as yet there is no satisfactory silver solution based on an acid electrolyte. They are in fact all composed using cyanide for the metal ion complexing agent.

Cyanide in solution is continually decomposing, the cyanogen content becoming less each day and the resultant carbonate increasing. In doing so, other properties form under electrolysis and the cyanide further undergoes chemical changes to produce complex polymers. Unless removed by carbon treatment, precipitation or low current density treatment they will ultimately build up until they become objectionable and co-deposit with the silver to a degree that even small traces will produce a silver deposit **that is not pure**, and this is the whole crux of the situation.

Recently it was announced from a major copper refiner that a new copper alloy was available with improved conductivity over pure wrought silver, but it is still in the writer's opinion that copper, plated from a pure electrolyte solution, will, on a commercial basis provide a better job than anything else so far. To achieve even greater efficiency it is necessary to have the surface of the conductor as smooth as possible to the extent of buffing by hand to a mirror finish, applying a coating of at least 2-3 times the r.f. skin depth with electro-deposited copper and again polishing and leave the silver well alone.

A thin flash, say, 10-15 micro-inches of gold will preserve the finish and prevent tarnishing and make the sol-

(continued on page 13)



A Two Metre "Snowflake" Transistor Transmitter*

R. J. BARRETT, GW3DFF

THE transmitter described in this article is the result of investigation and experiments over the past few years in an effort to build a cheap 144 Mc. Transistor Transmitter with a reasonable power output that can also be used for portable work.

The design breaks away from the usual highly expensive semi-conductor associated with v.h.f. transmitter stages and uses four 2N2218 "Snowflake" transistors, so called because the internal geometry of this device resembles a snowflake in design (see Texas Instruments 2N2218 Data Sheet No. 633544). At present, these devices are available at 7/9 each.

The 2N2218 has a maximum voltage rating of 60v. between collector and base (V_{CBO}) and an F_T of 250 Mc. These are used in a common base configuration, taking advantage of the high collector base voltage rating. Although the power gain in common base is less than in the more usual common emitter configuration, stability is much improved and unwanted frequencies from the crystal oscillator and multiplier stages are not passed through to the final p.a. so easily.

The oscillator and doubler stages use the well known 2N1613 transistor which has a V_{CBO} of 75 volts, an F_T of 60 Mc., and is priced at 4/3.

The transmitter was designed using easily obtainable parts and may be attempted by anyone who has had a little previous experience with transistor circuitry.

The chassis is made from tin plate folded as shown in Fig. 1 and its rigidity may be improved by fixing a bottom plate cut from the same material with four 6BA screws. This material has been chosen because the design calls for many soldered connections direct to the metal, and no-one wishes to make connections to transistors with a 150 watt soldering iron!

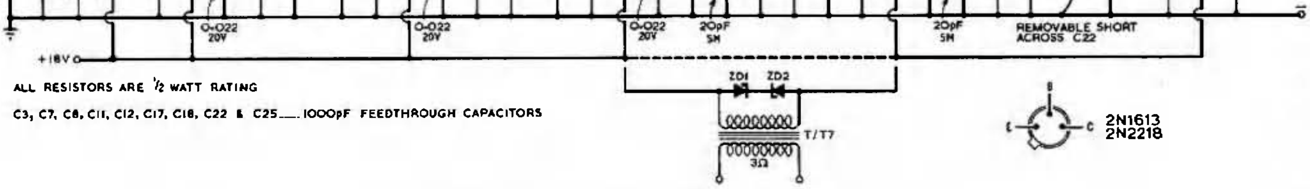
Caution must be taken with the decoupling capacitors and only 1000 pF. feed-through types should be used. Efficient decoupling is of extreme importance in low impedance circuits.

Only the specified radio frequency chokes should be employed. These are critical components and must be of the lowest inductance possible consistent with performance.

Start by drilling the chassis and fixing the feed-through insulators in position. Some of these are used as feed throughs and some as convenient anchor points for components and wires. Note that the feed-through next to the aerial output socket is in fact earthed. This is to provide a convenient earth point when trying various lamp loads should you not wish to use the method described later.

The crystal oscillator uses a 24 Mc. overtone crystal and is built on the underside of the chassis. The emitter biasing components, R1 and C1, are soldered direct to the chassis at the one end with the other ends soldered direct to the emitter of TR1 with no additional support. The normal base biasing resistors are R2 and R3. Feedback through the crystal is achieved by a centre tap on L1. Output from the oscillator stage is taken via C6 to

* Reprinted from "Radio Communication," Feb., 1969.



CIRCUIT DIAGRAM OF THE R.F. STAGES OF THE TRANSMITTER

RFC1, RFC2—25 uH., 90 turns of 36 s.w.g. enamel covered wire pile wound on a 1 megohm 1 watt resistor.

RFC3, RFC4—3 turns of 23 s.w.g. on Radiospares Ferrite bead, toroidal wound.

12 Lektrokit feed through bushes part No. LK2121; 12 Lektrokit soldering pins part No. LK3011; or Radiospares lead through insulators (fit 5/32 in. hole).

L1—16 turns centre tapped 22 s.w.g. enamel covered wire on ¼ in. o.d. former.

L2—8 turns 22 s.w.g. enamel covered wire on ¼ in. o.d. former.

L3—5 turns 16 s.w.g. tinned copper wire ¼ in. i.d., 5/8 in. long.

L4—5 turns 16 s.w.g. tinned copper wire ¼ in. i.d., 5/8 in. long.

L5—4 turns 16 s.w.g. tinned copper wire ¼ in. i.d., 5/8 in. long.

1000 pF. feed through capacitors from Radiospares.

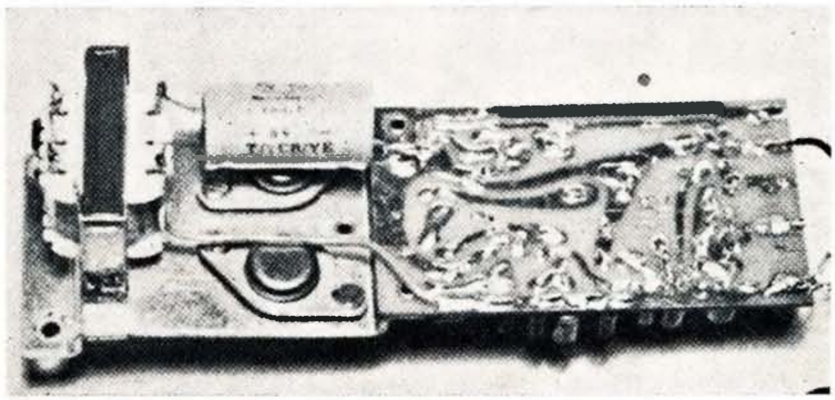
the emitter of TR2. This transistor is connected in common base and its base lead should be cut to approximately 5/8 in. and soldered direct to the chassis. The bias resistor R4 is beneath the chassis and soldered direct to it (see Fig. 2). Reference to Fig. 3 should make the mounting of the transistors quite clear.

Transistor TR2 is doubling to 48 Mc. and output is taken via C10 to TR3 tripling to 144 Mc. Tuning for TR3 is arranged by two concentric trimmers C14 and C15 connected from TR3 collector to chassis. C15 has its centre connections soldered direct to the chassis and C14 is supported by soldering one of its outer connections to the adjacent feed-through insulator. Refer again to Fig. 3. Capacitor C16 which is connected in parallel with C15 is soldered below the chassis. Output from this stage is taken from the junction of C14 and C15 and by adjusting the two capacitors which in effect are tapping up the coil and matching the impedance to the following stage. Transistor amplifiers of this type perform best when heavily loaded and instability may result if the lower capacitor is screwed in too far.

TR4 is the driver stage and feeds TR5 and TR6, the power amplifiers, connected in parallel through separate emitters, thus preventing "current hogging" by one transistor. Should one of the power amplifier transistors become much hotter than the other, increase the value of R8 and R9 slightly. This will reduce the output somewhat, but slightly increase the efficiency. Another way to overcome this trouble is to try various pairs of transistors until they appear to run approximately at the same temperature. Testing with the finger is quite adequate.

All the transistors in this transmitter run quite hot to the touch. To assist cooling, TR5 and TR6 are fitted with small clip-on heat sinks. Silicon transistors can run quite safely to 200°C. so do not become too alarmed if you only have experience of germanium types.

The output stage has been designed to work into a 75 ohm load and lamps which do not approximate to this resistance when hot may give a false indication of the output. A 6v., 60 mA. type is probably best for initial tuning, but it should be possible to light a 6v. 0.1 amp. bulb to the point of burn out when the circuit is peaked for maximum output.



The modulator unit.

No meter is included in the power amplifier circuit of the transistor and this may be viewed with some concern by Amateurs who feel that a transmitter without a meter may be uncomfortable to use. In practice, it has been found that one soon becomes quite accustomed to its absence, but of course a meter may be fitted if desired.

ALIGNMENT

Alignment of the completed transmitter will be assisted by connecting a 6v. 60 mA. pilot lamp as a load across the output and by an absorption wavemeter tuning 24, 48 and 144 Mc.

Unscrew all trimmers to the minimum capacity position. Unscrew both slugs in L1 and L2 as far out as possible. Connect a 0 to 10 volt d.c. meter between C7 and the chassis. Apply positive 18 volts to the supply rail. Screw in the slug in L1 and adjust for maximum meter reading. This should be approximately 2 volts.

Remove the meter and reconnect it between C11 and the chassis. Adjust the slug in L2 for maximum meter reading, approximately 1.5 volts. Connect the meter across C17 and adjust C14 and C15 for maximum voltage on the meter, approximately 1 volt. Connect the meter across C22 and adjust C19 and C20 for maximum voltage, approximately 0.6 volt. Remove the meter and short out C22 to the chassis. Adjust C26 and C27 for maximum brightness in the lamp load.

Connect a 200 mA. meter in the supply to the driver and power amplifier stages. Adjust all slugs and capacitors again, starting with the crystal oscillator, this time for maximum current in the meter, approximately 150 mA. For high level modulation the

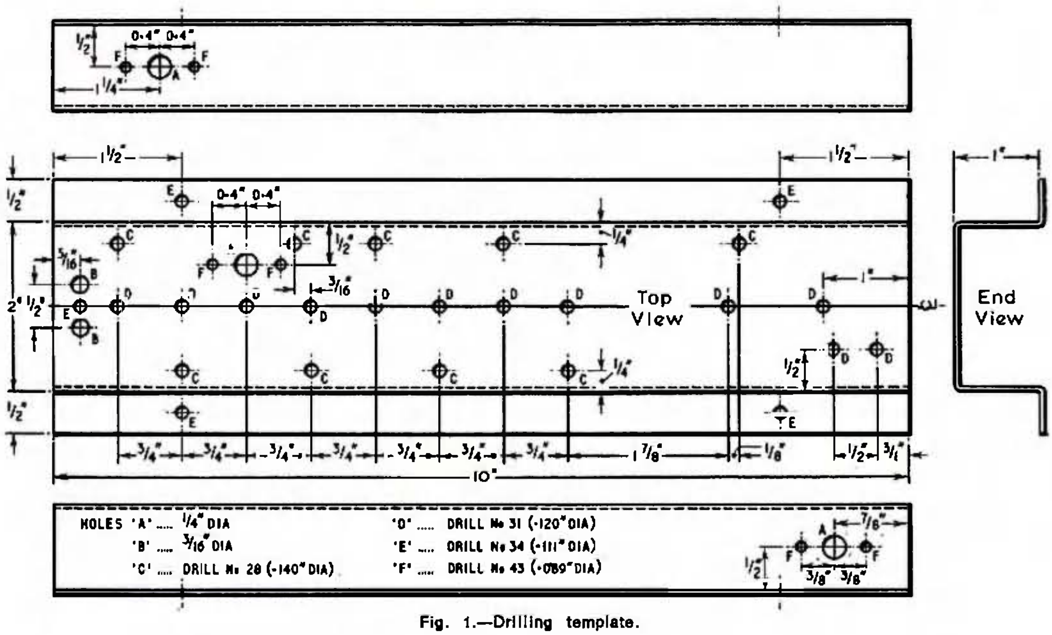


Fig. 1.—Drilling template.

short circuit across C22 should remain. Removal of the short should cause the combined driver and power amplifier current to drop to approximately half. This is the correct condition for low level modulation. With a positive 18 volt supply, power input to TR5 and TR6 is about 2 watts and output at 144 Mc. is approximately 1 watt.

MODULATION

Amplitude modulation of transistor power amplifier stages can be most successful providing one or two precautions are observed. It is most important that the maximum collector to base voltage rating (V_{CBO}) is at no time exceeded, in our case 60 volts. If a supply rail of positive 18 volts is used then twice this voltage can appear at the collector as the tuned circuits are, of course, inductive. Any modulation voltage applied to the collector will be superimposed on the top of this and, therefore, must be limited to 24 volts peak to peak. This is assured by connecting two 12 volt Zener diodes back to back across the modulation transformer secondary, thus clipping off all modulation peaks above 24 volts, thereby safeguarding the final transistors and providing a measure of speech clipping.

The feed-through capacitance in a transistor will allow power to pass through the final ampifier even if down modulating audio has reduced the collector voltage on the final to zero. This produces an under-modulation effect in which it is impossible to modulate fully in the downward direction. This is overcome by modulating the driver stage as well as the final.

A suitable modulator for this transmitter would deliver about 2 watts output and could be completely transistorised. The unit shown in the photograph has been used very successfully and is a type PC5 Newmarket transformerless amplifier which is obtained ready built at a very reasonable price. The output is rated at 3 watts using a negative 12 volt supply, but we are using it on a negative 9 volt rail, reducing its output considerably. Note that this unit uses PNP transistors and must have its own separate battery.

The modulation transformer presented quite a problem as an easily available type was required together with small size. A Radiospares type T/T7 transistor transformer was used, the output of the amplifier being taken via a 500 uF. capacitor to its low resistance winding (3 ohm). The other winding, the centre tap of which is not used, serves as the modulation transformer secondary, and has the two Zener diodes Z1 and Z2 connected back to back across it. Although this transformer is only rated for 500 mW. output, it performs very well, and reports on the modulation have been excellent. The transformer is mounted on the amplifier by a tinplate strap ¼ in. wide, soldered around the laminations, the ends bent around the amplifier heat sink.

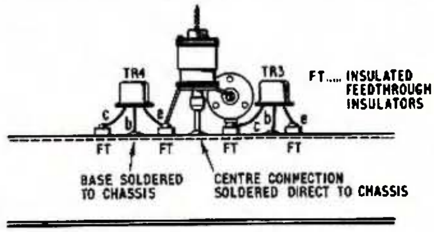
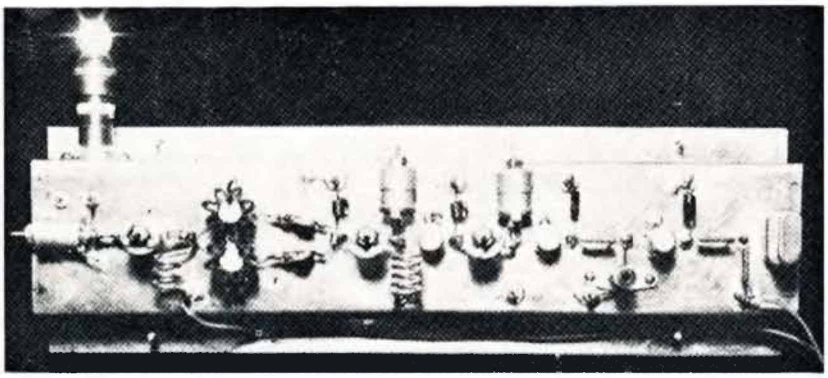


Fig. 3.—Diagram showing detailed layout of the p.a.

The power amplifier stages in the transmitter are working in class B and low level modulation may be successfully applied by removing the short across C22 and feeding audio in at this point. This may be via a large capacitor or R7 may be replaced by a transformer, the secondary resistance of which is approximately 10 ohms. A few milliwatts from a small single ended transistor amplifier will fully modulate the transmitter at this point.

Some success was achieved with narrow band frequency modulation by connecting a type BA107 variable capacitance diode across the crystal. A maximum deviation of about 5 Kc. was achieved at 144 Mc.



General view of transmitter taken during the alignment process.

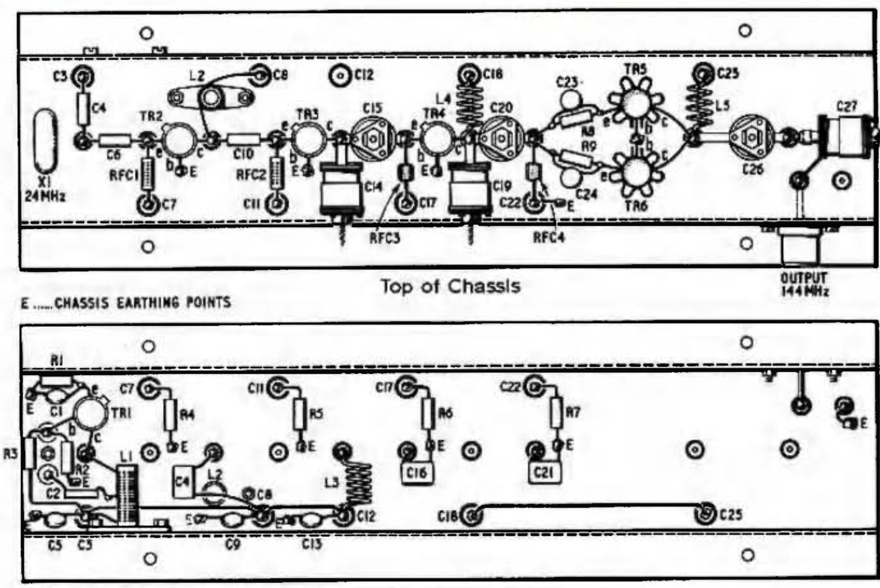


Fig. 2.—Component layout diagram.

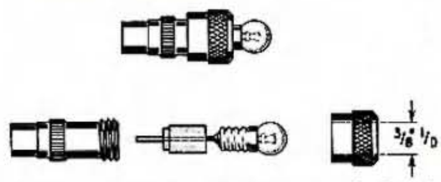


Fig. 4.—Diagram showing construction of r.f. load.

A suitable method of constructing a lamp load by drilling out one section of a standard co-axial aerial plug to hold a pilot lamp is shown in Fig. 4. The lamp is a 6 volt 100 mA. type and has a short length of wire soldered to its centre tip, and this is passed down the body of the plug and soldered to the centre pin.

RESULTS

The transmitter is quite cheap and simple to build. Up to this time four models have been completed, one on a printed circuit board,. All the transmitters produced a similar power output. The best DX result so far is over 200 miles, and stations have often been surprised when told of the low power input, and all transistor construction. The output is sufficient to drive a type 4388 Varactor diode tripling to 432 Mc., giving about 400 mW. at this frequency. Excellent reports have also been received on this band.

Clock Modification for 24-Hour Movement

G. SUTHERLAND,* VK3VW

The June 1968 number of "Electronics Australia" described a method of slowing down a standard a.c. mains-operated electric clock by supplying it with 25 cycle a.c. instead of the normal 50 cycle a.c. There are two disadvantages of such a system.

Firstly, a separate multi-vibrator power supply has to be built up to provide the necessary 25 cycle a.c. supply, and, secondly, when such a power supply system is used, the entire movement is slowed down to half speed, resulting in the minute hand being slowed down to one revolution in every two hours.

For most of us, I would think that a normal minute hand with a one-hour rotation is desirable, particularly when working skeds in either GMT or in local 24-hour time. The solution, therefore, is to slow down the hour hand to half speed, leaving the minute hand to operate at the normal speed. This is not a very difficult matter, although the mechanical problems will be greatly simplified if some lathe facilities are available. I am sure that if necessary most Amateurs would be able to find someone to help them in this direction.

The clock shown in the illustration is a Westclox battery-operated model with a 7" diameter face available at a trade price of about $6.50. However, there is no reason why a mains-operated clock should not be used provided there is sufficient space behind the dial to accommodate the gears.

The author used a battery-operated model in preference to a mains-operated one because it is readily portable and, also, on certain occasions, it is necessary to switch off the entire mains supply to the shack.

It is an easy matter to dismantle this particular clock. The hands and face are removed and a 1:2 reduction gear train is attached to the hour-hand spindle. This, of course, reverses the direction of the hour hand, and a 1:1 gear is then used to return the hour hand to the central spindle, at the same time changing the direction of rotation of the hour hand back to the normal clockwise direction. The accompanying diagram should make this clear.

It is obvious that the two pairs of gears must be of such a diameter that the distance between the centres is the same. The author obtained his gears from the Model Dockyard Ltd. (I trust that they will not object to some unsolicited advertising.) The 1:2 gears were of brass, Meccano type, and the 1:1 gears were of nylon as used in slot cars.

As purchased, the gears were too thick to go behind the clock face, and this is where the lathe work was necessary to turn them down to the desired thinness. This, however, was a relatively simple matter. The smaller gear

is drilled with a hole to fit snugly over the original hour-hand spindle, and if too loose it can be made a firm press-on fit by lightly hammering it in the region of the hole.

One of the 1:1 gears is drilled centrally to allow a press-on fit on to the bush of the larger gear and, if necessary, the bush can be turned down to reduce its bulk. The other 1:1 gear is a loose fit over the original hour-hand spindle, with its bush facing forwards away from the mechanism of the clock. The original hour hand is discarded, and a new one made out of thin metal in the manner shown. This is pressed over the bush of the central 1:1 gear, after the face of the clock has been replaced.

The small stud holding the idler assembly is mounted in a suitable place to one side of the central spindles, preferably in an over-size hole so that some adjustment of the engagement of the teeth of the gears can be obtained. The hole in the face will have to be enlarged somewhat to accommodate the new hour hand and, if necessary, the face can be slightly dished forwards so that more space is available for the gears behind it. This can be done by placing it face down on a pad of newspapers and lightly hammering the central part. In addition, a spacer can be used to hold the face away from the body of the clock (see diagram).

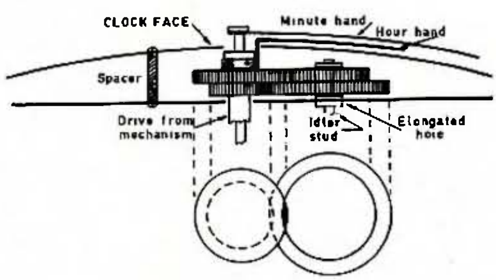


FIG. 1. MODIFICATION TO CLOCK MOVEMENT.

FIG. 2.

Press fits are all that is necessary for the gears, as the amount of torque required to rotate the hour hand is negligible, and it is unnecessary to go to great lengths to firmly fix the appropriate parts together.

In the clock shown in the illustration, the new face was restricted to the peripheral 1½" or so by cutting a "washer" out of drawing paper. A piece of broken razor blade was attached to one limb of a pair of dividers and this was used to remove a circle of paper of sufficient size to leave the original minute markings exposed, but covering up the rest of the dial.

The position of the new numerals was then marked out in pencil and the new numerals were applied by using Letroset transfers, after which the pencil guide marks were erased. If Letroset transfers, or something similar, are not available, then stencils could be used, or even freehand for those of the more artistic amongst us. The new hour hand is, of course, enamelled black.

The only other point to watch is to not engage the gears too tightly, because, as is the case in most clock gear trains, a rather loose engagement of the teeth is desirable to avoid any tendency for binding owing to the very low driving torque available.

— . . . —

R.F. CONDUCTIVITY IN ELECTRO-DEPOSITED SILVER

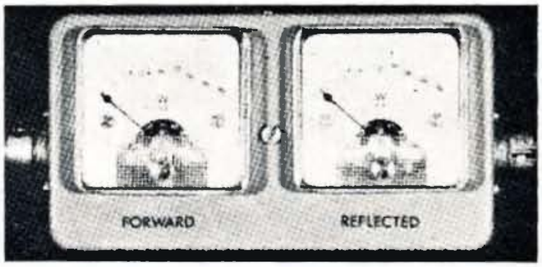
(continued from page 9)

derability angle a lot easier without appreciably increasing the r.f. resistance.

So you fellow Amateurs that go to all the trouble to get on 144 and then have real problems with 432 and 1296 Mc., take a good look at the quality of the finish of your conductors, make sure they are, even under a microscope, a perfect mirror finish in copper, and don't fool yourselves in having some local jobbing plater in the neighbourhood silver or nickel plate them. Decorative silver and nickel, or a combination of each, is sheer murder to r.f. Also on your h.f. and v.h.f. mobile whips, leave the nickel and chrome off, it is costing you at least 2 S points. I work a lot of mobile, maybe you have heard my signal. I am also a plater—I think I know better.

* 48 Darling Street, South Yarra, Vic., 3141.

Frequency-Independent Directional Wattmeter, and an SWR Meter*



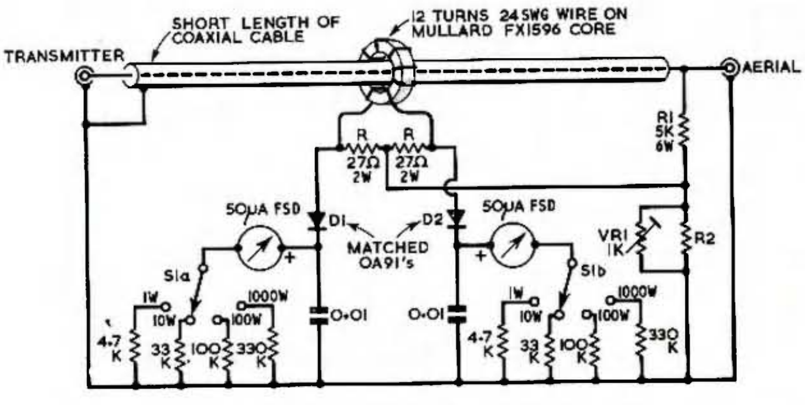
By P. G. MARTIN, B.Sc., G3PDM

THE frequency dependence problem associated with conventional reflectometers precludes their use for accurate power measurement. This arises because the transmission line voltage is sampled by a voltage divider consisting of a fixed resistance and the distributed capacitance of a length of transmission line, and because the line current is detected by an r.f. transformer consisting of a small wire loop inductively coupled to the line. In the first case the capacitive reactance varies with frequency and affects the divider ratio. In the second instance the voltage induced across the loop is proportional to the rate of change of magnetic flux around it, and therefore increases with frequency.

rents of the transmission line. To achieve this one has either the current detector or the voltage detector providing two anti-phase signals so that addition and subtraction can be performed.

A FREQUENCY-INDEPENDENT DIRECTIONAL WATTMETER

M. B. Allenson, G3TGD, has designed a wattmeter using the above principles, where the low resistance in the current transformer secondary circuit is split into two equal parts. The centre connection is taken to the voltage sampling network so that sum and difference voltages are available at the ends of the transformer secondary winding (see Fig. 1).



The sensitivity ranges given in S1a and S1b are double the correct figure. Those in the caption are correct.

Fig. 1.—Circuit of the basic Frequency-Independent Directional Wattmeter, with four ranges corresponding to full scale deflections of 0.5, 5, 50 and 500 watts in 50 ohm lines, when the value of R2 (including VR1, if fitted) should be 220 ohms. For 75 ohm systems R2 equals 150 ohms, and the calibration is different. The co-axial cable acts as an electrostatic screen between its centre conductor and the secondary winding of the toroidal transformer; the cable length is unimportant.

Both these basic failures can be corrected by the use of conventional lumped components instead of the distributed parameters of transmission lines. In particular, the voltage detector should consist of two resistors rather than an R and C, and the current detector should be a toroidal current transformer (which is a conventional transformer with a low value of load resistance across its secondary).

A basic requirement of s.w.r. bridges or directional wattmeters is to generate two voltages proportional to the forward and reflected voltages or cur-

With two meters (or an ex-Government cross-over meter) this circuit can be used as a versatile calibrated directional wattmeter. The unit also enables precise calculations of s.w.r. to be made. The prototype was accurate as a power meter from 100 Kc. to over 70 Mc., within a tolerance of 10%. With a 50 μA. meter the maximum sensitivity is better than five milliwatts; with the multiplier resistors specified in Fig. 1, full scale deflection corresponds to powers of 0.5, 5, 50 and 500 watts. Calibration is non-linear, because the meter samples voltage, and power is proportional to voltage squared. Calibration curves for 75 ohm systems are given in Fig. 2.

THE LOGARITHMIC WATTMETER

The basic instrument can be improved by including a logarithmic network so that the power range switch is redundant and a single meter scale can be used for powers from say one watt to 1,000 watts. (A logarithmic scale would have the 1, 10, 100 and 1,000 watt calibration points equally spaced; see Fig. 3). Apart from the convenience of not having to switch ranges, a logarithmic unit with two meters would enable very low s.w.r.'s to be measured quickly and accurately, as it is possible to measure a very low reflected power and a very high forward power simultaneously with the same percentage accuracy. To achieve this with the previous circuit would necessitate separate switches for forward and reflected sensitivities.

It is simple to add a reasonably accurate **wide-range** logarithmic network to the power meter of Fig. 1. The basis of its operation is that the voltage across a forward-biased p-n junction diode is proportional to the logarithm of the current passing through it. See **Fig. 4.** The logarithmic properties of a silicon junction diode are good over at least eight decades of current (from 5 nA. to 1 A.), which implies that a single meter scale might be calibrated over sixteen decades of power: from 1 picowatt to 10 kW.! In practice a range of 1 to 1,000 watts is more useful, so the logarithmic network must be modified (see Fig. 5). By introducing an insensitive meter the lower decades are condensed, but a resistor in series with the diode is necessary to restore a logarithmic form to the scale.

An experimental logarithmic directional wattmeter is shown in Fig. 6. Fig. 7 shows suitable calibration scales for this instrument, suitable for cutting out and sticking to 1-21/32 inch Japanese meters. The circuit combines the sampling networks of Fig. 1 and two logarithmic adapters as in Fig. 5(b).

A DIRECT READING SWR METER†

An extremely useful device, necessitating only one meter, would be an instrument giving direct indication of the standing wave ratio on a transmission line, **independent of the absolute power levels or the frequency in use.** The s.w.r. can be expressed in

* Reprinted from "Radio Communication," June 1969.

† The instrument described is the subject of a provisional patent specification.

terms of the forward and reflected voltages according to:

$$SWR = \frac{E_f + E_r}{E_f - E_r} \qquad (1)$$

where the symbols have their usual meaning. We wish to generate this function electronically, so that outputs of the two detectors can be used to generate a meter current proportional to s.w.r. This would be rather tedious, though not impossible.

Conveniently, a little manipulation of the offending equation shows that:

$$\frac{E_f}{E_r} = \frac{SWR + 1}{SWR - 1} \qquad (2)$$

which although not proportional to s.w.r., is a function of it only. Electronic division of E_f by E_r is best done by taking logarithms and subtracting. In other words,

$$\log \frac{E_f}{E_r} = \log E_f - \log E_r$$

In Fig. 5(a) the two silicon diode voltages are proportional to the logarithms of their currents, which in turn are proportional to the forward and reflected voltages. The two diode voltages can be subtracted directly by connecting a meter between them, rather than from each one to chassis (see Fig. 8).

Remember of course that the meter cannot be calibrated linearly in s.w.r., because of equation (2). The circuit doesn't take antilogs after subtracting the logs either.

The result of this is beneficial: the s.w.r. meter is increasingly sensitive as the standing wave ratio approaches 1:1. This is where one wants most sensitivity: to make the final adjustments to aerial arrays, to measure variations in s.w.r. over a band, and so on. Note that the meter reading increases as the s.w.r. improves: zero deflection corresponds to infinite s.w.r. (or no power!). The accuracy worsens if the reflected power falls below about a tenth of a watt, because of the reflected voltage detector output becoming comparable with the voltage drop across the logarithmic diode, so that the latter is no longer driven by a constant current source. This is avoidable at the expense of some frequency sensitivity by changing circuit parameters in the voltage and current sampling networks to increase their output.

A differential amplifier could be added to the circuit of Fig. 8, enabling a less sensitive meter to be used. Silicon n-p-n transistors capable of working at low collector currents should be used (e.g. 2N3707).

A PRACTICAL SWR METER

A direct-reading s.w.r. meter was built for experimental purposes around the circuit of Fig. 8. Calibration given in Fig. 10 is suitable for 75 ohm systems.

Layout of the sampling circuits is fairly critical (see Fig. 9). The input and output sockets should be set a few inches apart, and connected together with a short length of co-axial cable. The co-ax. outer must be earthed at one end only so that it acts as an electrostatic screen between the primary and secondary windings of the toroidal transformer. The primary is formed by simply threading a ferrite ring on to the co-ax. Twelve turns of 24 s.w.g. enamelled wire, equally spaced around the entire circumference of the ring form the secondary winding.

A suitable ferrite ring is the Mullard FX1596, although other types can be used. The main requirement is that the ferrite material should maintain a high permeability over the frequency range to be used.

Other components in the sampling circuits should have the shortest possible leads. R1 and R2 must be non-inductive carbon types; for high power levels (above 100 watts), R1 can consist of two or three 2-watt carbon resistors in parallel. VR1 must be a miniature skeleton potentiometer, to keep stray reactance to a minimum, although it can be dispensed with by trying various fixed resistors for R2 until the reflected indication under matched conditions is zero.

The detector diodes (D1 and D2) need to be matched point-contact types (for low capacitance and good h.f. performance) with a p.i.v. rating of 50 volts or so. Mullard OA79 or OA91 diodes are suitable. The current transformer resistors should be matched to five per cent.

Logarithmic diodes should be silicon junction types, such as conventional rectifier diodes, but they need to be matched for similar log characteristics, using the circuit of Fig. 11. P.i.v. ratings are unimportant.

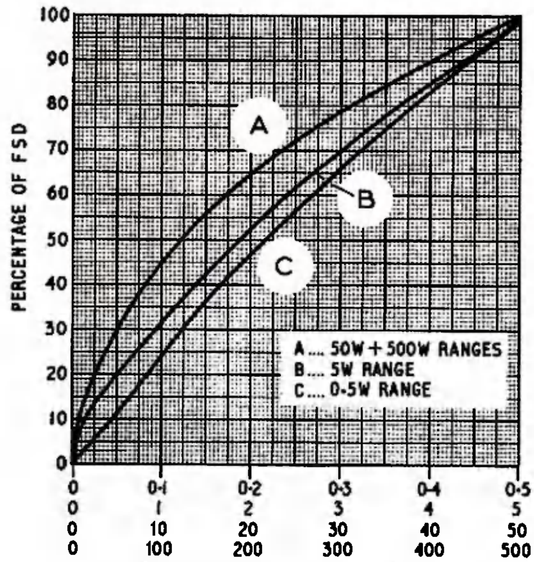


Fig. 2.—Calibration curves for the Directional Wattmeter of Fig. 1.

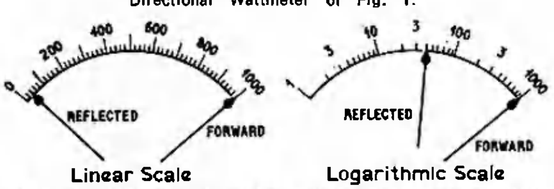


Fig. 3. (a) linear, and (b) logarithmic scales, showing the same standing wave situation; a forward power of 1 kW. and a reflected power of 40 watts. The advantages of logarithmic scales are immediately obvious.

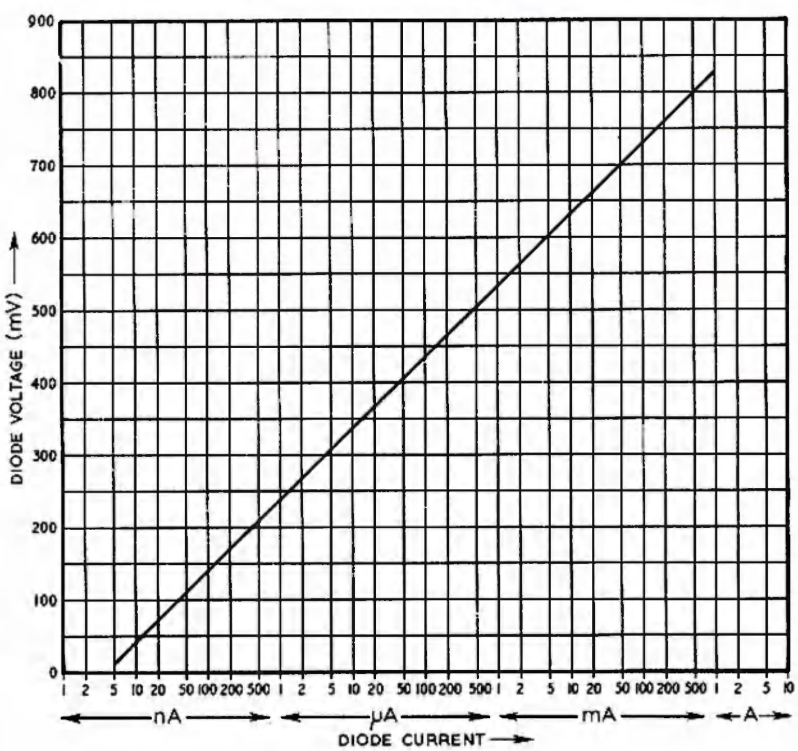


Fig. 4.—Experimental plot of the forward voltage drop across a silicon p-n junction diode (1N4006), as a function of diode current. The V/I relationship is accurately logarithmic for currents between 5 nA. and 1 amp.

In designing a toroidal transformer different to that specified, several factors must be traded against each other. As the number of secondary turns increases, the inter-turn capacitance increases and causes the response to fall at high frequencies. Failure of this nature causes the reflected voltage indication to rise; in other words the directivity of the instrument falls. If the 27 ohm resistors are raised appreciably in value, the instruments will eventually become frequency sensitive.

The ratio of the voltage sampling resistors (R1 and R2) is determined by the sensitivity of the current sensing circuit, as the two sampling voltages must be equal in magnitude under matched conditions. VR1 provides fine adjustment of the ratio. Absolute values of R1 and R2 can be varied considerably, bearing in mind that as the values decrease their dissipation increases, and that as their values increase the stray capacitance appearing across them may need to be compensated for.

USEFUL EQUATIONS

Let the line current be I amps., the line voltage be V volts, and the characteristic impedance of the transmission line in use be Z_o. Then $V = IZ_o$.

If the current transformer ratio is 1:n, and each of the resistors in its secondary circuit has a value of r ohms, then the r.f. voltage across each of these is given by:

$$V_1 = \frac{Ir}{n} \qquad (3)$$

The voltage detector output is obviously

$$V_v = \frac{R_2}{R_1 + R_2} . V = \frac{R_2}{R_1 + R_2} . IZ_o$$

which is, to a good approximation,

$$V_v = \frac{R_2}{R_1} . IZ_o \qquad (4)$$

The main design equation for all the instruments is therefore

$$R_2 = \frac{r . R_1}{n . Z_o}$$

where the value for R2 includes the effect of VR1, if fitted. The dissipation of some of the components specified is quite high. For those planning to design different circuits, the following equations express the dissipation of R1 and the current transformer resistors, r.

$$W_{R1} = \frac{Z_o . W}{R_1} \text{ watts,}$$

where Z_o is the characteristic impedance of the transmission line, and W is the transmitter output power.

$$W_r = \frac{W . r}{n^2 . Z_o}$$

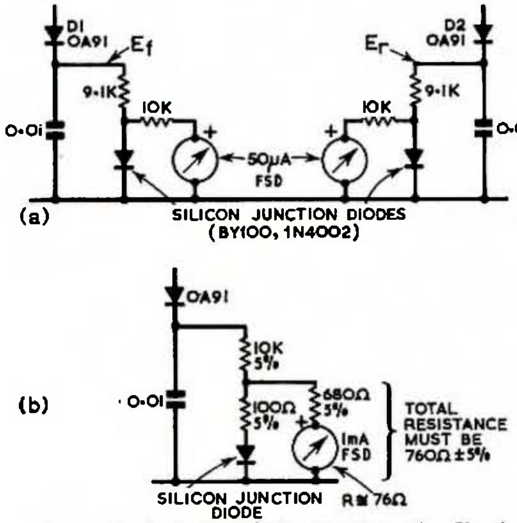


Fig. 5.—(a) Basic logarithmic converter. The 50 uA. meter and its 10 kilohm multiplier resistor form a high impedance voltmeter. With the values given, the meter sensitivity is approximately logarithmic for power levels from 10 mW. to 1 kW. (b) Circuit used to reduce the dynamic range of the logarithmic network. A calibration scale is given in Fig. 7.

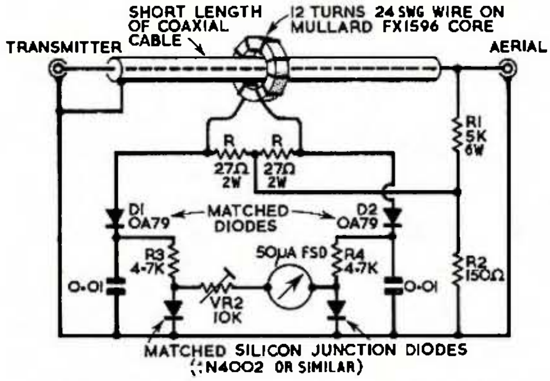


Fig. 8.—Circuit of a direct-reading power-independent s.w.r. meter for 75 ohm systems. At very low reflected power levels (s.w.r. better than about 1.005:1) the meter reading is slightly power sensitive. For this reason VR2 is adjusted for full scale deflection under matched conditions at the highest power level to be used. Fig. 10 includes a scale suitable for use with powers up to 500 watts, when VR2 and the meter resistance total about 7.5 kilohms. The logarithmic diodes (1N4002 or almost any silicon junction diode) must be matched, using the circuit of Fig. 11. VR1 may be connected across R2 as in Fig. 1.

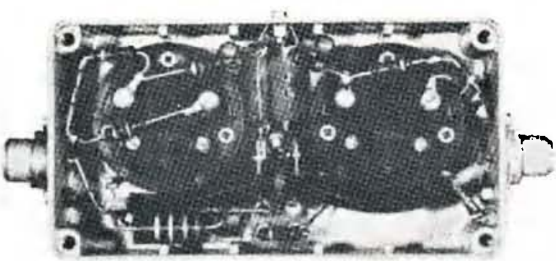


Fig. 6.—An experimental logarithmic wattmeter. Two 1-21/32 inch Japanese 1 mA. meters and their associated components will just fit into one of the smallest diecast boxes (2⅜ x 4⅜ x 1¼ inch). The toroidal transformer, 27 ohm resistors and OA91 detector diodes are mounted centrally on a small sheet of paxolin studded with "turret tags" (Radiospares).

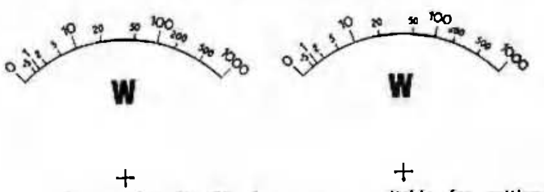


Fig. 7.—Two scales for 50 ohm systems suitable for cutting out and using on the unit shown in Fig. 6.

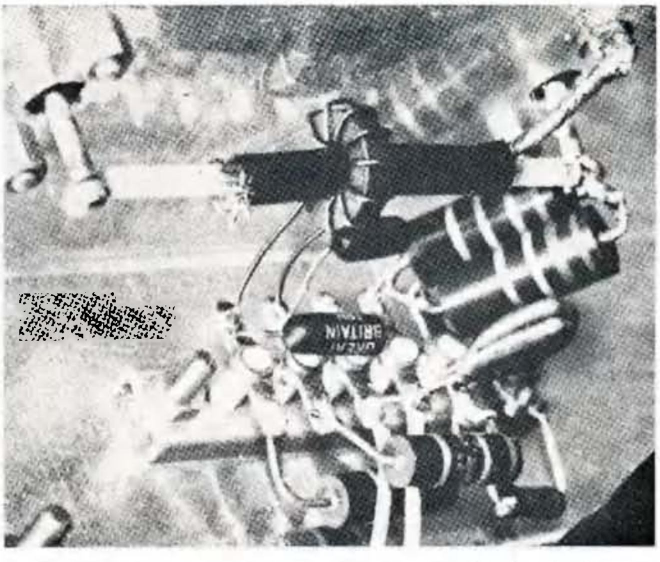


Fig. 9.—Details of the sensing circuits of the unit described in Fig. 8.

where n is the current transformer ratio. In the instruments described, W_{m} is about 5 watts, and W_r 2 watts for a transmitter power of 500 watts.

CALIBRATION

If the linear or logarithmic wattmeters, or the direct-reading s.w.r. meter, are built exactly as described, and used in systems of the correct impedance, the calibration given in Figs. 2, 7 and 10 will be sufficiently accurate for most purposes. For those devising their own circuits, the following procedure is recommended.

Accurate calibration of any of these instruments requires a high power r.f. source (a transmitter) and an r.f. voltmeter. The instruments can be reasonably calibrated without the r.f. voltmeter.

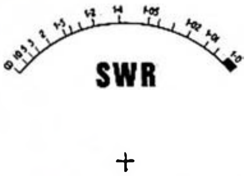


Fig. 10.—Scale for the unit shown in Figs. 8 and 9, for a 75 ohm system. The s.w.r. scale is for forward powers between 50 and 500 watts.

The wattmeters are calibrated by feeding power through the meter into an appropriate dummy load (50 or 75 ohms). VR1 is adjusted for minimum reflected power indication, and the power scale is marked according to the r.f. voltage appearing across the load.

If an r.f. voltmeter is not available, a peak-reading type can be made with a diode, capacitor and d.c. voltmeter. Alternatively, it is possible to infer the peak line voltage from the d.c. output of the forward voltage detector, which can be measured with a high impedance d.c. voltmeter. As the detector output is equal to the peak r.f. voltage applied to it, equation (4) leads to

$$V_{det} = 2.8V \frac{R_2}{R_1} = 2.8\sqrt{WR}\,.\,\frac{R_2}{R_1}$$

where V and W are line voltage and power as before and R is the load resistance.

It would be difficult for most Amateurs to obtain sufficient high power carbon resistors to calibrate an s.w.r. meter by means of deliberate mismatching. An indirect method is therefore proposed.

Disconnect R3 and R4 (Fig. 8) from the detectors, and connect them instead to two variable d.c. supplies. Set the supply connected to the forward circuit to +20 volts,‡ and plot the meter reading as the second voltage is carried between zero and +20 volts. The ratio of these voltages corresponds to a definite s.w.r., which can be determined from equation (1).

Before carrying out this procedure, however, VR2 should be adjusted for full-scale deflection of the meter under matched conditions at the highest level to be encountered.

CONCLUSIONS

All of the instruments described in this article have been tested under

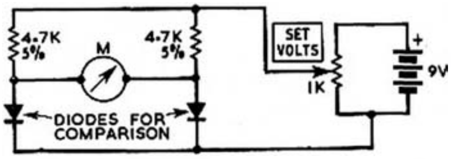


Fig. 11.—Bread-board circuit for comparing the logarithmic properties of silicon junction diodes. The meter should be as sensitive as possible (such as an Avometer on the 50 microamp. range), and should not deflect appreciably from zero as the voltage applied to the circuit is increased from zero to plus 9 volts.

actual operating conditions. Maximum power levels used varied from 100 watts at 2 Mc. and 300 watts at 28 Mc., to 1,200 watts at 3.5, 7, 14 and 21 Mc. With the components specified the instruments will sustain power levels well above the kilowatt level for periods of tens of seconds.

Anyone who has used a reflectometer (of any type) will testify to its usefulness in establishing correct loading conditions. If all transmitter output power is known to be travelling up the feeder and not being reflected at the far end, it must be radiating somewhere.

It is hoped that by introducing frequency independent directional wattmeters, one will be able to make useful comparisons of absolute power levels. The logarithmic scales are an added convenience, and the direct-reading s.w.r. meter offers a saving in meters.

The small physical size of the r.f. sampling networks makes these devices ideal for incorporating into transmitters and transceivers. All that is needed is an extra position on the main meter switch.

‡ This corresponds to a power of about 500 watts in a 50 ohm system.

Notes from Federal Repeater Secretariat

We woud like to take this opportunity to introduce ourselves to all Australian and overseas Amateurs. Following the Wodonga Conference in September last year, it was moved that personnel from VK2 would be nominated to fill this Federal position and at the last F.E. Convention in Canberra our term of office was extended for another three years.

The members who form this committee are Ian Mackenzie, VK2ZIM; Chris Jones, VK2ZDD; and Tim Mills, VK2ZTM, together with some additional help from John Rufus, VK2ZJQ, and Ross Mudie, VK2ZRQ. As a committee, we are a part of Federal Executive and our duties are the co-ordination of matters dealing with Repeaters, Translators and allied v.h.f. and u.h.f. subjects. We may be contacted either via Federal Executive or directly at P.O. Box 342, Crows Nest, N.S.W., 2065.

Our task up to now has been to establish contact with groups known to be interested in Repeaters, both in Australia and overseas, to continue the pattern of development set down at Wodonga and the last Convention, and to help frame future policies for what we hope will be the best available system for the Amateurs of Australia.

In looking back over the last 12 months it is pleasing to note that standardisation is largely being observed. In old Channel A (2 metre f.m.) areas, like VK3, most operation has moved to the National Simplex channel—Channel B (146.000 Mc.)—and new areas (VK6) have started on Channel B. All States have now started work on Repeater systems and except for a report that Southern VK7 may use Channel 3, all groups indicate that they will be using either Channel 1 or 4. (V.h.f. Notes in recent issues of "A.R." have indicated some of the channels and areas to be used.)

It would appear that Repeaters will be the next major phase of Amateur activity in this Region and other parts of the world. Most of the American magazines for the past few months have carried articles on repeaters and f.m. The A.R.R.L. have formed an expert committee to investigate their own Repeater position. The N.Z.A.R.T. are at work along similar lines to us. July "Break-In" reports that they have chosen f.m. simplex channels of 145.8, 146.0 and 146.2; as well as an a.m. Repeater on 2 metres in the Christchurch area.

On the Australian scene we will outline what we know and would ask anybody with additional information to contact us.

Applications to establish Repeaters have been submitted to the Department from Brisbane, Orange, Sydney (as well as a 6 metre a.m. system), Geelong and Hobart. At the time these notes were compiled no unattended permission had been granted.

VK2: Recent net frequency changes took place and in future Channel C will be 146.146, not 146.1; 6 metre f.m. simplex will be 52.525 Mc., not 53.950 Mc., which will be retained for W.I. C.E.N. links. A big release of low band f.m. units will help the equipment gap, both on 6 and 2 metres.

VK1: There is between 15 and 20 units operating on 52.525 in Canberra.

VK4 recently formed a State Repeater Committee with VK4ZEL as chairman and VK4ZAW as secretary. They are thinking of one Repeater for Brisbane and another for the Gold Coast area.

VK5: We understand that they will be setting up a Channel 4 system for the Adelaide area. This was a brief report from VK5ZDY who passed through Sydney recently.

VK6: Graham VK6ZDB advised that some operation had started on Channel B in the Perth area and, together with Mac VK6MM, will be building a Channel 1 Repeater for the West.

The Repeater Secretariat is working on a small publication of all information we can gather to help in the establishment of Repeaters and advice will be given through this column when it is available. By the time you read this report there could be some changes in the above information, due to the time lag between the closing date of notes and the issue of "A.R." If you have any information please send it early in November and we will try and get it in the January issue.

—Federal Repeater Secretariat.

CIRCUIT BOARDS FROM ODDS AND ENDS

T. W. BARNES, VK2ABI*

Trial "hook-up" of circuit elements or even the permanent wiring of some circuit or device may be nicely managed without the use of matrix board, backed or unbacked, or of circuit board. This may be done by the use of various lugs available from at least two sources and of insulating sheet; apart from the lugs some specialised tools and punches are available.

Formica or other finishing sheet of similar kind available is apparently based on bakelite; Formica has been found very satisfactory. This material may be left over from some job, or may be purchased as an off-cut. Insulation resistance is very high.

Many of the plastic bottles sold containing half a gallon of detergent are also good insulating material, apparently polyethylene or polybutylene. With a sharp pair of scissors a useful piece of sheet can be cut from one of these bottles. Perspex sheet is also useful.

* 74 Cabbagetree Lane, Fairymeadow, N.S.W., 2519.

Formica and Perspex can readily be cut by first scoring with a file, ground to a chisel edge. After clamping the sheet between suitable blocks, a sharp bend will break the sheet along the score mark. Formica breaks more cleanly when the sheet is scored on each face at the position of the cut.

Components are fixed by use of the various lugs available from Zephyr or elsewhere. Two particularly useful lugs are the smallest plain eyelet and the tagged eyelet (Fig. 1); however, other types are available for special purposes.

These two lugs are of a length suitable for 1/16" sheet. To fix them, a hole is drilled in the sheet with a number 41 drill. An eyelet is inserted through the sheet and placed with its head against a flat steel surface. The open end may then be lightly swelled with a centre punch. If the lightly swelled end is now placed against the steel surface, another light blow with the centre punch will neatly flatten the open end of the eyelet and tighten it on the sheet. There are special tools for this and other operations.

Where many holes are needed a drilling jig can be made from 1/8" mild steel plate, through which a 41 drill quickly and accurately locates the position of the holes. Carefully "laid out" and made, one jig permits quite long rows of holes to be drilled, as shown in Fig. 2. This figure shows the clock portion of a counter and the lugs ready placed for the wiring of a gated flip-flop. Point to point wiring and component placement may be above and/or below the board.

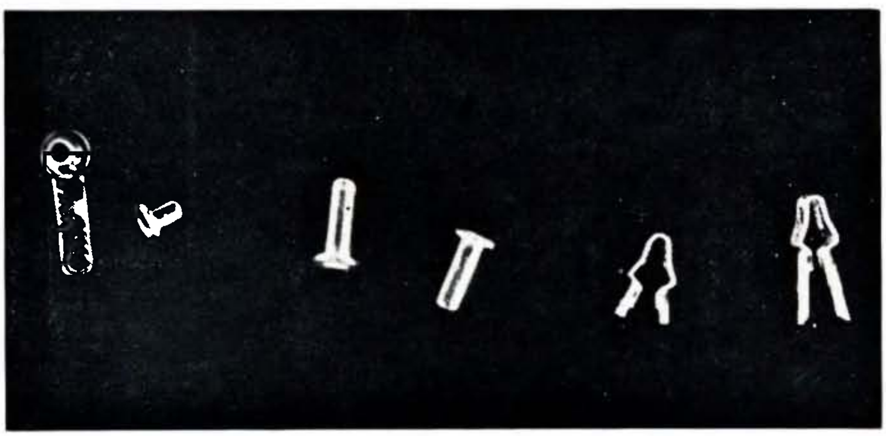


Fig. 1.

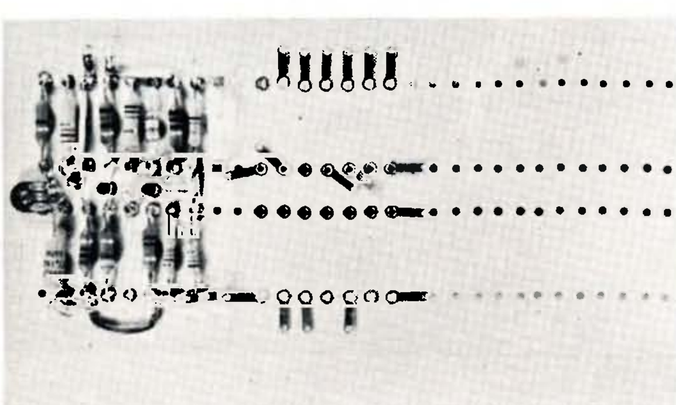


Fig. 2.

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Retirement of Mr. Carroll

Late in September a presentation was made to Mr. Charles Carroll, who was Controller Radio Branch until his recent retirement. The occasion was the Annual Dinner of the VK3 Division. Among those present were Senior Officers of the Postmaster General's Department and members of Federal Executive. Michael Owen, VK3KI, Federal President of the W.I.A., made the presentation of a suitably inscribed desk set to Mr. Carroll.

Mr. Carroll will be remembered as being the chief Post Office negotiator when the new Handbook was being discussed and has been responsible for the many privileges recently afforded the Australian Amateur Service following Institute representation, as for example, beacon and v.h.f. repeater operation.

New Equipment

SOLID STATE 4-BAND RECEIVER

Weston Electronics Pty. Ltd. have recently introduced to Australia an all solid-state 4-band communications receiver that is creating more than unusual interest for a number of reasons. Known as the Realistic DX150, this receiver features a wide performance spectrum. Another outstanding feature is its ability to operate from a variety of power sources: from a.c. mains, or, dry cells—if current fails or is not available, it will also operate from a car cigarette lighter or any 12v. d.c. source.

Technically the Realistic DX150 is a single conversion, four bands, superhet., tuned r.f. stage, two i.f. stages, full wave product detector for s.s.b.-c.w., fast and slow a.g.c., variable pitch b.f.o., illuminated electrical bandspread, fully calibrated for Amateur bands, cascade r.f. stage, a.n.l. for r.f. and a.f., zener stabilised, o.t.l. audio, illuminated S meter, built-in monitor speaker, frequency range 0.535 Mc. to 30 Mc., front panel antenna trimmer, r.f. gain control, operation from 240v. a.c. or 12 volts d.c., eight D type dry cells give approximately 100 hours continuous operation. Dimensions: 6½" h. x 14" w. x 9" d.; weight 17 lbs.

Housed in attractive grey metal cabinet with substantial polished metal front panel and solid metal knobs, the Realistic DX150 is a classic example of "handsome is as handsome does," it looks good and performs accordingly.

Literature is freely available from Weston Electronics Pty. Ltd., 376 Eastern Valley Way, Roseville, N.S.W., 2069.

HORWOOD R.F. INSTRUMENTS

Two new r.f. test instruments that will find ready acceptance by Amateurs and commercial users, are the PM502/T r.f. power meter, and the SW502 v.s.w.r. meter. These units are small in size, both offering portability, due to their light weight and small size, making each ideal for field day experiments and mobile application. They are designed specifically for assessing the performance of experimental circuits, transmission lines and antenna systems. Detailed specifications are featured in Radio Parts' advertisement on the back cover of this issue.

QUARTER CENTURY WIRELESS ASSOCIATION

A meeting was hed on Wednesday night, 17th September, 1969, at The Combined Services Club, 5 Barrack St., Sydney, wherein the Sydney chapter of the above Association was inaugurated.

The following officers were elected: H. Caldercott, VK2DA, chairman; G. Wilson, VK2AGO, secretary; B. Anderson, VK2AND, treasurer.

It was decided to hold a monthly dinner get-together on the first Wednesday of each month, January excepted, at 6.30 p.m. at the Combined Services Club, 5 Barrack St., Sydney.

Any Amateur who has held a licence for twenty-five years or more is welcome to join. The subscription is: joining fee $3.00, 3-year subscription $5.00 or life membership $8.00. For further particulars, phone the Secretary, at Sydney, telephone 43-2427, or write to 31 Glenview Street, Greenwich, N.S.W., 2065.

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PROVISIONAL SUNSPOT NUMBERS

JULY 1969

Day	R	Day	R
1	106	16	64
2	111	17	71
3	167	18	66
4	155	19	59
5	131	20	54
6	130	21	55
7	103	22	51
8	121	23	43
9	114	24	51
10	112	25	43
11	109	26	49
12	98	27	49
13	92	28	79
14	69	29	84
15	71	30	90
		31	128

Mean equals 87.9.

—Swiss Federal Observatory, Zurich.

AUSTRALIS OSCAR 5 LAUNCH IMMINENT

The launching into orbit of the first Australian-built Amateur Radio satellite, **Australis Oscar** 5 is now expected to take place about the middle of November.

A summary of the **Australis Oscar** project appeared in "A.R." last month. One important change has occurred since that summary was published. A problem has arisen with the command receiver in the satellite and it will not be possible to command the 29.450 Mc. transmitter on and off. For this reason, both of the satellite's transmitters will operate continuously from launch until the end of the satellite's active life. Because of this, it is expected that **Australis Oscar** 5 will transmit for three to four weeks after launch. This, of course, makes it most important that Amateurs intending to track the satellite should be ready to do so when it goes up, rather than a week or two afterwards.

The latest news on the launching date can be obtained by listening to the W.I.A. weekly Divisional broadcasts, by participating in the Australis skeds on 3555 Kc. at 1000 GMT each Friday or by contacting the Oscar State Co-ordinators. The State Co-ordinators have information available on when the satellite will be audible to Amateurs and S.w.l.'s in Australia. The names of the State Co-ordinators appeared in October "A.R.," on page 7.

Book Review

ADVANCED TECHNIQUES FOR TROUBLESHOOTING WITH THE OSCILLOSCOPE

Robert L. Goodman

Here is a practical guidebook on using modern scopes, including those employing triggered-sweep and dual-trace capabilities. As many progressive technicians have learned, a triggered-sweep scope is an invaluable aid in locating circuit troubles in modern electronic equipment. No longer a luxury item, it is a vital link in efficient, profitable troubleshooting.

A triggered-sweep scope belongs in every t.v. shop, and there are models priced within the budgets of most t.v. shops. This book describes several reasonably-priced models (including a kit type), how they work, and how they can be used to cut down troubleshooting time. The book shows how to interpret waveform displays (with over 100 photos), and how to employ the advantages of a single-or dual-trace triggered sweep in tube-type or solid state circuits.

Despite the emphasis on triggered sweep, most of the troubleshooting procedures described can be performed with a standard service scope. Triggered-sweep just makes the job easier.

For openers on practical applications, the author suggests stereo troubleshooting procedures, f.m. multiplex tests and alignment, separation and subcarrier phase checks, and "complementary symmetry" solid state stereo amplifiers. Chapter 7 gets down to the brass tacks of solid state servicing—the do's and don'ts as they apply to specific circuits—including pulse and squarewave tests for transistor and IC circuits. Also described is a simple inexpensive curve-tracer for solid state component checks.

Triggered-sweep scope applications in video i.f. and remote control circuit alignment are covered in Chapter 9, including Zenith's "speed aligner" generator. The author describes i.f. and trap adjustment, colour bandpass alignment, and overall v.h.f. tuner i.f. checks, as well as f.m. receiver alignment and tuner tracking. Chapter 10 goes into colour receiver troubleshooting, with many case histories of horizontal output circuit troubles, boost amplifier "spooks," burst amplifier checks, colour oscillator a.f.c. defects, etc. In this age of increasingly complex electronic devices, this book will help the reader become familiar with the use of a triggered scope in a minimum amount of time, thus preparing him not only for the present but for what lies ahead.

256 pages, 267 illustrations, 11 chapters. Price $US7.95 hardbound, $US4.95 paper.

HOW TO FIX TRANSISTOR RADIOS AND PRINTED CIRCUITS

Leonard C. Lane

Here is a completely updated, revised edition of the famous best-selling classic on transistor radio repair—a totally new, second edition of an all-time best seller. In addition to extensive enrichment and re-arrangement of the first edition, the author brings FETs, zener diodes, f.m. radios—in fact, everything related to the current state of the art—into the picture. Here's the perfect reference and guide for electronic technicians who need to understand and repair semiconductor circuits efficiently. For beginners, this single volume provides the practical knowledge needed to fix any transistor radio.

For those interested in transistor physics, fundamentals are emphasised in the first two chapters. Chapter 2 explains how transistors are "put together," and introduces basic circuits. The real "meat" begins in chapter 3 which thoroughly covers amplifier fundamentals, basic circuit configurations, biasing, FETs, JFETs and IGFETs. The next two chapters are devoted to r.f. and i.f. amplifiers, detector and a.g.c. circuits, plus more advanced radio circuits, including output stages. Chapter 6 concentrates on auto radios and chapter 7 on f.m. radios. In describing each type of receiver, the author begins his description at the "front end" and "works" through to the output stages.

The next three chapters explain solid state servicing, repair techniques, measurements, transistor testing, and alignment, while chapter 11 covers the same categories in regard to printed circuits. Chapter 12 presents numerous troubleshooting charts designed to help locate and repair all common complaints in transistor radios.

256 pages, over 150 illustrations, 12 big chapters. Price: $US7.95 hardbound, $US4.95 paperbound.

REMEMBRANCE DAY CONTEST RESULTS

TASMANIA WINS R.D.

To Tasmania for the second year in succession goes the honour of winning the R.D. Contest. Their high percentage of participation and high State points kept them on top. This year's highest scorer, VK9DJ, entered a log of 1,969 points for approximately 22 hours of operation. Quite an effort to help his Division.

—Neil Penfold, F.C.M., for F.C.C.

DETAILS OF DIVISIONAL SCORES

Division	Log Entry	Licensees	% Participation	Average Top Six Logs	Points per Contact of Top Six Logs	Total State Points	State Score
VK2+1+9	111	1,972	5.6	1,071	2.7	32,948	2,926
VK3	82	1,785	4.6	781	2.2	21,014	1,746
VK4+9	79	752	10.7	1,276	2.9	33,463	4,544
VK5+8	89	769	11.4	1,024	2.1	25,337	3,920
VK6+9	56	436	12.4	916	2.4	17,456	3,083
VK7	59	238	24.7	1,068	2.2	15,810	4,987

DIVISIONAL TROPHY WINNER

TASMANIA

NEW SOUTH WALES
(including A.C.T. and Norfolk Island)

Transmitting Phone (a)

VK2ASZ	1256 Pts.	VK2EY	209 Pts.
1JG	1105	2BMK	204
2XT	1054	2KA	198
2AD	1015	2RU	143
1VP	1002	2GV	135
1AN	991	1JL	128
2TS	848	1DR	119
2YN	816	2BNA	116
2DM	794	2BNK	114
2ABA	776	2GN	109
2BGF	754	2CU	105
2AKX	698	2PN	104
2AJY	677	2UJ	90
2APP	662	1EM	86
2SB	653	1WT	84
2APQ	651	2AND	83
2FM	636	2BJT	74
2RX	613	2ABC	71
2ATT	600	2ZCF	70
2ADJ	595	2SG	55
2AMM	571	2AIM	55
2DK	549	2AFY	50
2AXL	506	2AAH	50
2RB	462	2AOX	48
2BDB	456	2AKL	44
2CK	455	2AKV	43
2AGF	454	1CR	42
2ADA	414	2ZCT/P	41
2AFD	407	2DO	37
2BKM	396	2AAT	33
2AEO	366	2RP	31
2BHD	349	2ZVF	28
1AOP	339	1ZWP	25
2QZ	332	1DA	23
2AKO	319	4ZLO/P	21
2CN	302	2IJ	19
1LF	300	2CS	18
1RY	296	1ZMR	18
2AJL	296	1ZTA	18
2MW	280	2AUC	17
2AXJ	279	2ZPC	17
2FC	265	2ZIC	15
1MR	256	1ZRH	15
2ACD	246	2ZKF/P	13
2AEC	237	1ML	13
2AWN	227	1ZRN	11
2WT	211	1RD	6
2AIC	211	2ZTQ	5

Transmitting C.W. (b)

VK2QL	405 Pts.	VK2ZO	120 Pts.
2VN	292	2RJ	116
2BF	255	2PQ	105
2HW	172	2IC	47
2RA	157	2JY	30
2BKH	148	2HZ	19

Transmitting Open (c)

VK2BO	1173 Pts.	VK1AR	365 Pts.
2PU	519		

VICTORIA

Transmitting Phone (a)

VK3VK	880 Pts.	VK3HE	205
3ADW	817	3EF	203
3AMK	784	3AR	178
3AXM	750	3AOW	148
3WW	749	3PR	137
3AXV	724	3AAJ	128
3AUJ	706	3ZX	114
3AGF	655	3WIA	103
3JI	655	3ASV	100
3AUL	650	3FJ	95
3ASQ	627	3PW	94
3AYF	592	3ARO	89
3RV	583	3UG	76
3KI	501	3DY	76
3BA	433	3AUO	73
3AOS	432	3AER	58
3WK	373	3VF	46
3YQ	369	3AFI	40
3IZ	335	3LV	37
3ASN	332	3AJP	36
3SM	331	3AIS	32
3OP	327	3AEL	31
3BBB/T	311	3ZCJ	29
3EG	272	3ZPP	28
3QZ	270	3ZBB	26
3AVR	263	3WQ	25
3QV	262	3ALP	12
3AUN	254	3ADP	9
3ASI	231	3ZBI	5
3AMO	216	3RA	5
3RZ	212	3ZVJ	5

Transmitting C.W. (b)

VK3XY	278 Pts.	VK3AMA	127 Pts.
3APN	277	3ACA	101
3AUT	214	3AXK	72
3AUH	200	3RJ	69
3IB	141		

Transmitting Open (c)

VK3QI	687 Pts.	VK3QP	99 Pts.
3ARM	481	3YO	92
3CDR	275	3JU	36
3YC	256	3ABA	30
3XB	246		

QUEENSLAND
(including Christmas Island)

Transmitting Phone (a)

VK9DJ	1969 Pts.	VK4LZ	908 Pts.
4EQ	1312	4GI	885
4LT	1283	4NO	801
4WW	1279	4LJ	792
4DP	908	4LB	758

Transmitting Phone (continued)

VK4LE	728 Pts.	VK4SA	88 Pts.
4XY/P	660	4RZ	86
9BK	649	4EH	81
4FA/P	640	4XV	78
4FH	587	4JI	74
4UC	559	4LO	72
4KH	537	4ZW	72
4RF	531	4GG	69
4FN	516	4QW	68
4MW	473	4XJ/M	64
9RY	408	4FP	56
4SF	389	9BS	56
4ZT	378	4LN	32
4HW	353	4GT	31
4DZ	328	4NV	30
4ES	315	4BQ	29
4NP	315	4TC	29
9WD	313	4QT	28
4PJ	303	4VJ	27
4WY	286	4TK	27
4NS	262	4JW	26
4RE	253	4AQ	21
4BL	233	4VX	21
4SR	215	4ZZ	20
4BG	193	4KS	19
4OF	191	4XZ	16
4CZ	183	4UG	16
4MJ	157	4ZJE	12
4QA	117	4ZAL	7
4HZ	106	4AR	6

Transmitting C.W. (b)

VK4KX	445 Pts.	VK4MY	86 Pts.
4LV	367	4KK	35
4XW	252	4DU	32
4XP	157		

Transmitting Open (c)

VK4DB	658 Pts.	VK4GW	335 Pts.
4UA	352		

SOUTH AUSTRALIA
(including Northern Territory)

Transmitting Phone (a)

VK5FT	1160 Pts.	VK5PB	104 Pts.
5NN	1103	5JC	99
5BI	1039	5DO	84
5QX	982	5ZX	67
5TY	973	5TW	66
5EJ	885	5TU	60
5EF	870	5MS	60
5ZK	853	5KC	60
5XW	808	5RR	55
5LN	663	5ZKK	52
5GZ	645	5KY	43
5GV	559	5XY	42
5AX	454	5ZNH	42
5FL	446	5VA	41
5LP	353	5GF	39
8CM	329	5ZDX	32
5VL	312	5UC	25
5EK	271	5ZBT	22
5HH	252	5ZBU	21
5GM	215	5DF	21
5CY	183	5CA	16
5IF	179	5KO	16
5PH	177	5ZFJ	14
5MF	174	5ZRG	13
5LQ	167	5ZQ	11
5UF	137	5ZWW	7
5LC	121	5ZHM	6
5VB	118	5CJ	5
5ZA	115		

Transmitting C.W. (b)

VK5XK	322 Pts.	VK5LD	122 Pts.
5FH	249	5HO	113
5PC	162	5TL	79
8HA	161	5MZ	66
5OR	156	5RK	31
5AU	149	5JG	21
5MY	133	5KU	17
5LF	125		

Transmitting Open (c)

VK5GW	1172 Pts.	VK5HM	285 Pts.
5FO	1167	5NJ	269
5KG	995	5RG	264
5PF	621	5DV	244
8KK	561	5WI	241
5FM	536	5WN	140
5CV	378	5FY	91
5WO	376	5QR	66
5VW	349		

WESTERN AUSTRALIA
(including Papua-New Guinea)

Transmitting Phone (a)

VK6CT	931 Pts.	VK6AO	164 Pts.
6ID	812 ,,	6TS	156 ,,
6TR	782 ,,	6DC	154 ,,
6ZK	740 ,,	6TU	136 ,,
6TG	705 ,,	6WD	131 ,,
6DT	694 ,,	6RG	124 ,,
6DA	683 ,,	6TX	92 ,,
6KK	370 ,,	6WL	90 ,,
6KM	360 ,,	6KN	53 ,,
6WY	355 ,,	6WI	31 ,,
6NM	352 ,,	6ZDB	30 ,,
6FG	314 ,,	6XW	27 ,,
6CA	304 ,,	6MO	23 ,,
6BT	276 ,,	6GL	22 ,,
6JY	254 ,,	6XY	22 ,,
6TB	245 ,,	6TM	22 ,,
6EP	219 ,,	6MM	20 ,,
6XX	204 ,,	6ZBT	14 ,,
6GR	178 ,,	6ZEQ	7 ,,
6DI	175 ,,		

Transmitting C.W. (b)

VK6WT	472 Pts.	VK6CR	49 Pts.
6AJ	82 ,,	6GA	33 ,,
6ZZ	50 ,,		

Transmitting Open (c)

VK6CW	1136 Pts.	VK6JK	367 Pts.
6BE	1031 ,,	6QJ	280 ,,
6MA	818 ,,	6ZW	237 ,,
6RU	726 ,,	6OV	265 ,,
9XI	598 ,,	9DR	230 ,,
6ED	573 ,,	6AI	52 ,,

TASMANIA

Transmitting Phone (a)

VK7AZ	1236 Pts.	VK7PF	133 Pts.
7KJ	1180 ,,	7IL	118 ,,
7JV	1173 ,,	7FM	117 ,,
7TX	1164 ,,	7AB	79 ,,
7FB	836 ,,	7UV	68 ,,
7MD	819 ,,	7SF	50 ,,
7RC	788 ,,	7UX	43 ,,
7KK	666 ,,	7JD	40 ,,
7ZX	581 ,,	7MR	34 ,,
7WF	534 ,,	7ZRO	33 ,,
7PA	477 ,,	7HJ	32 ,,
7RZ	472 ,,	7ZMS	30 ,,
7EJ	270 ,,	7JO	25 ,,
7WH	262 ,,	7PS	24 ,,
7NC	262 ,,	7ZOR	21 ,,
7KH	206 ,,	7LZ	19 ,,
7JF	192 ,,	7DR	18 ,,
7LS	186 ,,	7WK	17 ,,
7DK	178 ,,	7ZTG	15 ,,
7MX	173 ,,	7LD	14 ,,
7BM	161 ,,	7BQ	12 ,,
7EB	150 ,,		

Transmitting C.W. (b)

VK7CH	287 Pts.	VK7KS	48 Pts.
7GC	248 ,,	7BJ	48 ,,
7MZ	175 ,,	7JB	27 ,,
7RR	140 ,,	7GV	25 ,,
7LJ	128 ,,	7YL	15 ,,
7CM	117 ,,	7KA	14 ,,
7RY	100 ,,		

Transmitting Open (c)

VK7ZZ	750 Pts.	VK7OM	56 Pts.
7AL	720 ,,		

AUST. CAPITAL TERRITORY

Transmitting Phone (a)

VK1JG	1105 Pts.	VK1WT	84 Pts.
1VP	1002 ,,	1CR	42 ,,
1AN	991 ,,	1ZWP	25 ,,
1AOP	339 ,,	1DA	23 ,,
1LF	300 ,,	1ZTA	18 ,,
1RY	296 ,,	1ZMR	18 ,,
1MR	256 ,,	1ZRH	15 ,,
1JL	126 ,,	1ML	13 ,,
1DR	119 ,,	1ZRN	11 ,,
1EM	85 ,,	1RD	6 ,,

Transmitting Open (c)

VK1AR .. .. 365 Pts.

NORTHERN TERRITORY

Transmitting

VK8KK	561 Pts.	—Open
8CM	329 ,,	—Phone
8HA	161 ,,	—C.W.

PAPUA-NEW GUINEA AND TERRITORIES

Transmitting Phone (a)

VK9DJ	1969 Pts.	—Score to VK4
9BK	649 ,,	,, ,, ,,
9RY	408 ,,	,, ,, ,,
9WD	313 ,,	,, ,, ,,
9BS	36 ,,	,, ,, ,,

Transmitting Open (c)

VK9XI	598 Pts.	—Score to VK6
9DR	230 ,,	,, ,, ,,

LISTENERS' SECTION

VK2	L3377/2—T. Hambling	848 Pts.
	L2022—D. Grantley	537 ,,
	L2074—J. Hilliard	513 ,,
	R. Carter	502 ,,
	L2161—C. Kilduff	471 ,,
	L2259—P. Vernon	378 ,,
	S. Voron	350 ,,
	L2033—D. Shepard	150 ,,
	A. Peters	134 ,,
	R. Davis	Incorrect Log
VK3	St. Paul's College R.C.	1053 Pts.
	R. Hanel	763 ,,
	A. Cox	611 ,,
	M. Batt	516 ,,
	M. Cox	483 ,,
	P. Barker	451 ,,
	E. Trebilcock	266 ,,
	G. Earl	217 ,,
	R. Major	101 ,,
	Traralgon Tech. R.C.	Incorrect Log
	K. Wood	Incorrect Log
VK4	C. Kenny	864 Pts.
	K. Cunningham	741 ,,
	M. Joyce	573 ,,
	E. Moore	399 ,,
	C. Thorpe	302 ,,
	G. Franks	89 ,,
VK5	L. Earl	1677 Pts.
	S. Ruediger	1342 ,,
	T. Hannaford	502 ,,
	R. Edmeades	416 ,,
	R. Walpole	202 ,,
VK6	P. Drew	1576 Pts.
	R. Wake	350 ,,
	D. Smedley	113 ,,
VK7	R. Mutton	1318 Pts.
	A. Dixon	1031 ,,
	B. Livingston	928 ,,
	R. Everett	906 ,,

ANALYSIS OF R.D. RESULTS

TOP SIX LOGS

VK2ASZ	1256 Pts.	429 Contacts
1JG	1105 ,,	431 ,,
2XT	1054 ,,	336 ,,
2AD	1015 ,,	367 ,,
1VP	1002 ,,	385 ,,
1AN	991 ,,	426 ,,
	6423 Pts.	2374 Contacts

VK3VK	880 Pts.	383 Contacts
3ADW	817 ,,	334 ,,
3AMK	764 ,,	312 ,,
3AXM	750 ,,	350 ,,
3WW	749 ,,	329 ,,
3AXV	724 ,,	316 ,,
	4684 Pts.	2024 Contacts

VK9DJ	1969 Pts.	685 Contacts
4EQ	1312 ,,	463 ,,
4LT	1283 ,,	400 ,,
4WW	1279 ,,	392 ,,
4DP	908 ,,	311 ,,
4LZ	908 ,,	330 ,,
	7659 Pts.	2581 Contacts

VK5FT	1160 Pts.	448 Contacts
5NN	1103 ,,	461 ,,
5BI	1039 ,,	417 ,,
5QX	982 ,,	393 ,,
5TY	973 ,,	409 ,,
5EJ	885 ,,	355 ,,
	6142 Pts.	2483 Contacts

VK6CW	1136 Pts.	484 Contacts
6BE	1031 ,,	477 ,,
6CT	931 ,,	388 ,,
6MA	818 ,,	354 ,,
6ID	812 ,,	350 ,,
6TR	782 ,,	339 ,,
	5510 Pts.	2296 Contacts

VK7AZ	1236 Pts.	579 Contacts
7KJ	1180 ,,	537 ,,
7JV	1173 ,,	514 ,,
7TX	1164 ,,	502 ,,
7FB	836 ,,	365 ,,
7MD	819 ,,	421 ,,
	6408 Pts.	2918 Contacts

MODE OF TRANSMISSION

From a sample of 365 logs entered in the Contest, of interest perhaps is the following breakdown of stations' mode of operation:—

	SSB	AM	Mode Not Shown
VK2	65	7	8
3	45	14	8
4	58	8	5
5	39	10	13
6	36	2	6
7	33	5	3
	276	46	43

That is 76% used SSB, 12.6% used AM, and 11.4% didn't indicate the type of emission on their log.

☆

CONTEST CALENDAR

9th Nov.: International OK DX Contest (c.w. only).
8th/9th Nov.: R.S.G.B. 7 Mc. Contest (phone).
29th/30th Nov.: "CQ" W.W. DX Contest (c.w.).
6th Dec. '69 to 11th Jan. '70: Ross A. Hull V.h.f. Memorial Contest.
6th/7th Dec.: C.H.C. International DX Contest (c.w.).
13th/14th Dec.: C.H.C. International DX Contest (s.s.b.).
7th/8th Feb.: *John M. Moyle National Field Day.
7th/8th Feb.: 36th A.R.R.L. International DX Competition (1st phone week-end).
21st/22nd Feb.: 36th A.R.R.L. International DX Competition (1st c.w. week-end).
7th/8th March: 36th A.R.R.L. International DX Competition (2nd phone week-end).
21st/22nd March: 36th A.R.R.L. International DX Competition (2nd c.w. week-end).

*N.B.—The dates given previously for the Field Day Contest (1st/2nd Feb.) were incorrect. The dates above are correct.

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and at Melbourne — Brisbane — Adelaide — Perth — Newcastle

Overseas Magazine Review

Compiled by Syd Clark, VK3ASC

Shortly after I began doing "odd jobs" for the Editor of "A.R." he handed me a pile of overseas magazines and asked me to check them and suggest articles which would be suitable for reprinting. The magazines were duly culled and an index of the contents transcribed onto paper together with comments and suggestions. To my very great surprise, I found the "resume" published as a review in "A.R." Some readers have been kind enough to read what had been written and some of them even commented favourably on the writings and so the "review" has been turned into a regular feature, not only in "A.R." but also on the W.I.A. Victorian Division Sunday morning broadcasts. It is heartening to the writer to know that his fellow Amateurs find something to interest them in the reviews from time to time and the hours spent compiling the notes will have been well spent if the level of knowledge in the Amateur ranks is improved thereby. To those who have commented favourably—THANK YOU.

"QST"

August 1969

More Power on 144 Mc. with Transistors, WA6BWP. Getting above the milliwatt level with solid state devices.

Fixing the Station Receiver, K4IPV. Some useful pointers on making success of a failure. Various methods of fault-finding are discussed.

A Frequency Counter with Binary Coded Decimal Readout, WB2MEX. A reasonably simple device using a handful of ICs to count to 9 Mc.

Long Wire Inverted Vee Antennas and Tuner, W3FQJ. The author of this article describes how to make simple "droopy dipoles" operate on a number of bands with low impedance feed.

A Modification for the Heath HD-10 Electronic Keyer, K1TVF.

Building a Novice Rig from an old TV Set. W1ICP describes how to build a 75 watt transmitter for c.w. operation on 80, 40 and 15 metres. The only part of the t.v. set he appears to have made use of is the power supply.

Fast and Easy Printed Circuit Boards, W8EYM. The title is self explanatory.

D.C. Voltages and the PI Network, W4PPB. This author raises a point which is often not clearly explained in pi network design data. Most designers recommend the use of an r.f. choke between the antenna terminal and earth. W8EYM suggests this is not the only reason.

College Competition — Impending Disaster, K4FW. Perhaps they indulge in different sorts of activities at American colleges?

The New Ham Alphabet, W7RGL. The most up-to-date Amateur jargon.

"BREAK-IN"

August 1969

It is the New Zealand practice for various clubs and divisions of the N.Z.A.R.T. to take the responsibility for the technical content of various issues of their magazine. This issue has been produced by the "Central Institute of Technology" at Petone, near Wellington.

Instant Audio, ZL2AMJ. Using a TAA300 IC.

A Solid State Phase Modulator, ZL2ACF. If you have an a.m. 144 Mc. transceiver and want to use it on the f.m. net, this is for you.

OP HR QLZ (Operator Lazy), ZL2AVK describes a simple way of avoiding four or five switches for transmit receive change over.

The New Improved Double-Action, Large Economy Size Speaking Vertical by Zerstreut Verruckte. The writer of this article must have been innoculated with a gramophone needle. A sort of super-Joystick!

The CIT Signal Injector, ZL2ALC. The multivibrator again. BC107, BC177, cell, switch and little else.

A Simple Electronic Keyer, and it's cheap, ZL2AVK. The only one transistor keyer in the literature.

PC Layout Enlargement, ZL2ARP. For those who find the standard p.c.b. too small.

A Crystal Substandard using Integrated Circuits, ZL2ACF. This unit produces outputs at 500 Kc. intervals throughout the spectrum and uses two SN17819, one SN17911 integrated circuit and a 2N3826 buffer.

"CQ"

July 1969

Slow Scan Television, W9NTP, Part 1. Described as a new frontier of Amateur communication. This article even includes a picture which was received by VK3AHR on 20 metres.

Swiss Radio Amateurs Help the International Committee of the Red Cross to Help Humanity, HB9SI, 4U1SU, etc. Describes one way that Amateur Radio is serving society.

Transmission Lines, David P. Costa. Describes the various types, compares performance, etc.

Separate KW. Amplifiers for the Contest Man, K9LKA and W6SAI. One for each band with a 4/1000A.

Integrated Circuit R.F. Pre-amplifier, W2EEY. A small IC is the heart of this cascode r.f. amplifier that may be used for single or multi-band operation. Can be operated from a variety of power sources. IC used, PA-713.

Resistance Tuning Crystal B.F.O. Oscillators, W2EEY. Using resistance variation to directly change the crystal oscillator frequency. The method is capable of being used directly at the oscillator or by using an FET as the resistance element; can be remotely controlled.

Weather Warnings with V.H.F. Receivers, W9VCL. Describes a method of detecting approaching storms using a v.h.f. receiver.

Twin Lead Multiple Dipoles and Vees, by W4MND. A simple method of fabricating aerials from commonly available materials.

A Portable Dipole, W1CEJ. All-band 40-10 metres.

Product Detector and A.G.C. for the Knight Kit R-100A Receiver, W2AEF.

"CQ" Reviews the Allied Model A-2515 Receiver, W2AEF.

"RADIO COMMUNICATION"

July 1969

A V.F.O. Controlled Two Metre Transmitter, G3NOH. The v.f.o. operates over the frequency range 18.18-16.18 Mc. and after amplification is mixed with a frequency of 162.18 Mc. produced by a crystal oscillator on 27.03 Mc. which is multiplied by six before mixing to produce an output in the two metre band. The final amplifier uses a QQV03/20A operating with 400v. on the plates.

Simple Filters for Transmiters on 144 and 432 Mc., G6JP. A three-element strip line filter is described which is 20 db. down 10 Mc. off resonance.

Conversion of Circuit Diagrams to Veroboard, Tag-Board and Printed Circuit Layout, G3PEQ. Some useful clues to achieve a clean layout on that piece of home-built gear.

Technical Topics, G3VA. Pat Hawker reviews articles from a number of sources. Those of greatest interest are: SIC Transceiver. Line Output Valves as Linear Amplifiers, R.F. Power Transistors.

Which Filter? G3XIW. his article discusses filter designs for various purposes.

August 1969

A C.W. Keyer using Digital ICs, G3LBX. A very sophisticated keyer for use with a double paddle. In the hands of an expert it is stated to produce faultless Morse in an effortless manner. Not guaranteed to correct operator mistakes.

Long Term Observations of Meteor Scatter on 70 Mc., G3MNQ. Describes equipment as well as results. Could be of interest to anyone on v.h.f.

Technical Topics, G3VA. Pat Hawker reviews publications and comments on technical articles from magazines which are published for the professionals. He turns up some very useful information, his articles are always interesting. This month the "new one" is "Miniature Active Receiving Aerials". In case you do not know these are aerials with an active element right in the aerial. The active element to date has been a transistor, some amazing results are being claimed. A v.h.f. version for Airtraffic Control work has been designed to survive a lightning strike without a transistor failure.

I.A.R.U. Region I. Brussels Conference, by G2BVN. The agenda is given for a conference which could be of great significance world wide.

Bringing the Lafayette HA350 on to Top Band and Medium Wave, G3IAG. Since some of these receivers have been sold in Australia this article could be of interest to many.

A Case of No T.V.I. Now, G3TR. John Graham discusses various methods of reducing the incidence of t.v.i. There has, of recent months, been a resurgence of interest in this subject. This would appear to indicate that t.v.i. is becoming more common and that steps to kill it are once again necessary. The countries which are producing the information on how to combat t.v.i. are the U.S.A. and England. From my reading of some of them, it appears that colour t.v. is much more susceptable to t.v.i. than monochrome. In the U.S.A. they use 300 ohm ribbon feeder cable similar to that used in Australia, and t.v.i. appears to be more prevalent where an unbalanced situation exists. In England, most antenna systems are cabled in co-ax and there much of the trouble would appear to be due to the fact that the earthed braid of the co-ax. is part of the signal circuit and the interfering voltages are therefore injected into the receiver in series with the wanted signals. Perhaps one good answer to this problem would be to use "twin shielded" cable of the appropriate impedance, the braid could then be kept apart from the signal circuits. If anyone has any figures of the relative immunity to interference of any sort whatsoever I would like him to contact me.

Bridge Balun for the 80 and 40 Metre Bands, G3TR. A device which should be of much use to the average Amateur and is easy to construct.

"SHORTWAVE MAGAZINE"

August 1969

This magazine publishes a minimum number of articles each month but they appear to be of a consistently high technical standard. August is no exception, and offer the following:

Aerial Tuning Unit for All-Band Operation, G3KFE. Incorporating a v.s.w.r. indicator, this tuner covers all Amateur bands from top band to 10 metres and matches the low impedance output of a transmitter to a single wire end fed aerial.

Coil Changing on a G.D.O. GW3PJT suggests that by using an old octal type tube base and connecting to suitable pins that arrangements can be made to tap the coil at appropriate places and ensure that four ranges can be covered with one tapped coil. Taps are changed by rotating the coil in the socket.

Application of the Inverse Balun, G8COB. This appears to be the "gem" of the August issue. It deals with a new type of balun used by J-Beam Engineering Ltd. in their aerials from h.f. through to u.h.f. Insufficient data is given to permit construction without experiment. It appears to be a very useful gadget for use at the centre of a dipole, in a quad driven element or elsewhere when it is desired to convert an impedance from balanced to unbalanced without changing its value.

Transistor Gain Measuring Meter, A. Langton. A simple meter to permit you to keep tabs on your transistors.

Vanguard, Valiant, LG-50, DX-40U. G3OGR takes the beginning Amateur for a run over some of the transmitters built in Britain and popular in Amateur circles immediately pre-s.s.b. He suggests they are good buying as second hand units for the beginning Amateur to cut his teeth on.

Design for an Amateur Band Receiver, by G3TDT. Part 3, the last of three articles covering the construction of a solid state Amateur Receiver.

Mobile on a Bicycle. G3WPR, who is seventeen years of age, describes how he fitted 2 metre gear to his two wheeler.

Group Morse Training, GW8PG. The author takes students through the complete training syllabus stage by stage. It would be well for any Amateur who wishes to become proficient in what is today, a dying art, to study this article in detail.

"COMPREHENSIVE QUADS"

As its name implies, this publication deals with Quad aerials. It is published by "The Cornish Radio Amateur Club" and was compiled by "A Square Fella," John G3OFN, who is reported to have spent some three years of spare time comparing Quad performance. He deals with and compares all of the well known designs including those by Bill Orr, W6SAI, Labgear and others, and then goes on to add a design of his own. This small booklet of sixteen pages would be a useful adjunct to anyone's library. The review copy was supplied by Bert Semmens, VK3GS.

DX

Sub-Editor: DON GRANTLEY
P.O. Box 222, Penrith, N.S.W., 2750
(All times in GMT)

It is pleasing to note that conditions on all bands have been good, the DX on 15 and 20 metres has been in many cases better than usual, while some of the openings on 10 have been described as the best ever. The lower frequencies still have a goodly share of DX, and top band in particular has shown increased activity this month. Indications are that there will be a minor peak in sunspot activity before the long decline continues, this is reflected in the forecast figures for October and November, which are the same as May and June—that is 89 and 88.

Without being accused of favouritism, I would like to dwell on 160 metre doings. George Allen over in Perth has always concentrated on this band, and up to time of writing had logged K1BPW, W1BB/1, K2ANR, W2EQS, W3DPJ, K8DHT, W8ANO, W8GDQ, W8BKA, W9BKA/8 and W9UCW. George mentions that Peter Drew has logged the same stations plus W5RTQ. VK6NK and VK6CW have been active as well.

A suggestion from K2GNC in a letter to George is of interest and I quote: "The QRM at the 1800-1810 end of the band at the appearance of just one VK is terrific, and I would like to let the VK gang know that we will QSX 1825-1830, thus they will be heard and we will have many more QSOs."

Recent openings on 160 were recorded when K1PBW took over from K3DPJ on 20th Sept. and started the ball rolling by working VK-3KS, on which night Ivor and Mavis worked seven W and VE stations. Barry VK5BS sends a list similar to George Allen, but with VE-3DU and W9UCP included. He also reports hearing JAs. With the high noise level here, I could only hear VKs 3QI and 3AUJ.

W5NW, the Vice-President of the A.R.R.L., is due in this country early in the new year and will be in VK5 in February.

Further activity from the Chatham Is. will take place from October until April 1970 by Lester, using the call ZL3PO/C. He will be using a mini beam for 20 metres and trap dipoles for other bands. A Trio TS510 transceiver will be used, with a separate v.f.o., and the frequencies are: c.w. 3520, 7020, 14020, 14045, 28050; s.s.b. 3790, 7065, 14150, 14185 and 28600. All frequencies plus or minus 5 Kc., answer as directed, and QSL to George ZL-2AFZ, who will also be handling the QSL chores for the ZL operation next year from VK0.

VR1Q has changed his QSL manager, WA-3ATP Ben Schafer, 7649 Malvern Drive, Philadelphia, P.A., 19141, took over on 1st Sept.

New prefixes still appear, but I guess that with the rat race now extended to new prefixes by Amateurs and Short Wave Listeners alike, this will continue. ZM will be used by the ZL gang as an optional prefix for the Cook Bi-Centenary year, Poland is now using 3Z1 through to 3Z9 from July 22, 1969, to July 22, 1970, to celebrate the 25th anniversary of the Liberation of the Polish people. The PA chaps are using PD3 at the moment, and PD3KOR was logged here a few nights ago. 4J and 4L were mentioned last month and further to this, we can report that they were operating from Zone 19. PD3 prefix mentioned above was for the Idzerda Memorial Contest over the last week in Sept.

The Pacific net still continues as a major source of DX; note however that the Friday night operation now starts at 0600z, with KH6GLU, Box 762, Kaunakakai, Hawaii, 96748, as net control. ZS1ANT in African Antarctica was a participant this week.

KA1C operation from Ogasawara Is., formerly Iwo Jima, went according to plan from Sept. 21-26 and his QSLs will go via WA8NZH. Please enclose s.a.s.e. or s.a.e./IRC, but donations will not be accepted.

GC2LU was packing the proverbial wallop into VK2 last week on 20. He is H. Chater, Flat 1, 14 Clarendon St., St. Helier, Jersey.

A couple of months ago I mentioned the prolonged illness of Frank Diehl, of Buffalo, New York. Frank passed away in the intervening period and will be missed by his many friends throughout the world.

Ed W3KVQ/2, 2308 Branch Pike, Cinnaminson, N.J., 08077, U.S.A., reports that he is the one and only manager for Fr. Moran 9N1MM. It would appear that much mail for Ed actually finishes up at either WN3KDQ and K3KVQ.

As you have probably noticed, Bill VK0MI is now on 20 s.s.b., and c.w./a.m. all bands to 10 metres. QSLs go to Greg VK7KJ. Greg, by the way, is having a great run of DX, and supplied quite a list of stations worked, ranging from VK0 to OX. As a matter of interest, "A.R." policy these days is to publish where possible current DX news and not long lists of countries worked. But, please send them in as this information is sought after by many of the publications who supply us with information and is also circulated by tape amongst the ever increasing circle of contacts we have here.

It is pleasing to note that Stew W1BB is back on the air again. He has been logged across the Atlantic by one of our G-land contacts, Frank Dyball, of Coventry.

Re cards for ex VK4HG, Willis Is. Eric Trebilcock reports that the VK3 Bureau is unable to deliver them, but they can still handle QSLs for ex VK4EV of Willis Is. Despite his heavy commitments with the Bureau, Eric Trebilcock, with a record of 302 countries heard, 299 confirmed, is still our number one S.w.l.

For those a.m. addicts, VE0NEC/MM was on 20 metres a few weeks ago using this mode. Steve Ruediger over in VK5 reported him at very low strength, about four by three, but with little QRM.

Operation from EA9ER continues, the night before he works DX, he takes a list of would be callers from an Italian station and works these the next evening. At the first sign of a breaker, he goes QRT.

Recent operation by WA4MMO/KC6 now completed, and QSLs are being handled by DX-pedition of the month, W2GHK, Box 7388, Newark, N.J., 07107. Processing of logs commenced Sept. 20.

Following an outcry by the proverbial DX gang, the proposed cancellation of the "CQ" DXCC for s.s.b. will not now take place. Rules are the same as for DXCC phone, except that all contacts must be two-way s.s.b. There are separate certificates for 100, 200 and 300 countries. Further data from W8HDB.

Further to recent operation by TI8NAM/TI9, TI4JP is sending the necessary papers to the A.R.R.L. DXCC Awards Committee substantiating this operation. The landing was made from a U.S. registered vessel and is documented in the ship's log. TI2CAP will be doing the QSL chores on behalf of the Radio Club of Costa Rica.

Recent Falkland Is. operation on 3.5/7 Mc. operation was made, with the express purpose of assisting 5-band DXCC hunters. If you missed this, you can usually arrange a sked by contacting Eric Chulvers, 1 Grove Rd., Lydney, Glocs., England.

Operation from Guernsey will continue into October by GC5AET on all bands. QSL for the operation to DJ1QP, G. Schnautz, DX Editor, Falkstr. 1, 58 Siegen, Germany. IRC's but no s.a.s.e.

It has been confirmed that 7G1CG was not operating from Guinea and manager WA3HUP will return all QSLs received.

GD3PBD, Peter Dodd, is now on the air from the Isle of Man. No trouble with QSLs for this one as they are handled by DX-pedition of the Month. QTH shown in preceding text.

WF6NNW is not a rare piece of DX but a special prefix for the American National Newspaper Week prefix hunters. Operating on the low end of 10, 15 and 20 for the early part of October, he will be on s.s.b., and requests QSLs to WA6AHF, Robin Hughes, 17,494, via Alamitos, San Lorenzo, Calif., 94580, with SAE/IRC.

The proposed operation from Serrana Bank by K6JGS and party was cancelled due to transport difficulties. Now expected to go next April.

YU2NFJ is on Dalmation Is., Zone 16, usually using 14250; op. is Zlatko and QRV island of HVAR.

Ulli Dehning, 35 Bellevue Street, Kloof Nek, Cape Town, Rep. of Sth. Africa, is the QTH of ex 7P8AR, now licensed as ZS1UD. QSLs for ZS8L, ZS9D and 7P8AR may be sent to this QTH, and Ulli wishes to thank all who offered their services as QSL manager when W4BRE was forced to quit.

U.S.A. personnel will receive operating permits for HS as from October 1, and HS3AL (W9SZR) will be first on, QRV 14045 and 21045 c.w.

KJ6CF is usually active in the Pacific net and will QSL via P.M.R., Box 141, A.P.O., San Francisco, Calif., 96305. Also in the vicinity is KC6JC on Senyavin Is., East Carolines, QSL W2RDD.

For island hunters, KL7GPB is on Adreanof Is., W6IBU/KL7 on Rat Is., with KL7EIJ on Kodiak Is.

The new operator for KM6BI is now QRV in more ways than one. He found over 1,000 unanswered QSLs there, on his arrival, and is going to reply to the lot. He is R. McCormick, Amateur Radio Station KM6BI, F.P.O. San Francisco, Calif., 96614.

Trucial Oman activity still plentiful, with MP4TDB QSL via ON5MG; MP4TCQ, J. Hammond, Radio Troop, 222 Signal Sqdn., B.F.P.O. 64; and MP4TDA, Ray, QSL via G3HSE, D. French, 78 Brocklehurst St., London, S.E.14, doing the honors.

SK6CF was a special prefix used for some unknown reason recently. QSLs for this operation go to Bengt-Arne Johansson, Gullregnsvagen, 434 CO Kungsbacka, Sweden. He requests a SAE/IRC.

TA2EA is apparently legitimate, as he is Vice-Pres. of T.R.A.C., is stated to be QRV on 3.5, 14 and 21 c.w. at present, and soon will be on all bands c.w./s.s.b. SM7DQC is stated to be his QSL manager. This info from Geoff Watts, DX news-sheet.

TF is a reasonably rare country for us down here. There are several active stations, listed here with their QSL managers. TF2WLM (K4SAK), TF2WLQ (WA2WIB), TF2WLR (K7NTW), and TF2WLS (WA5RTB); finally TF2WLW via WA0GCI.

Operation from Kure Island is planned for Nov. 10-14 by KH6s NR and SP on 14230, 21295 s.s.b., QSX 14240, 21295, also some c.w. operation. Calls most likely KH6KI or KH6NR/KH6.

6O1KM operating 14185 and 14215 from 1400z daily is now active. He will be at the QTH for one year, and requests QSLs as follows: four IRCs for airmail QSL, five IRCs for airmail registered, all others by sea mail at end of quarter. Kelly Wayne McCamy, Box 948, Mogagiscio, Somali Republic.

TA1NC is active and reported genuine on 14276 and 210, with the QSLs going to either DJ0UC or Box 95, Karakoy, Istanbul.

UA1KED is still heard from Franz-Josef Land, Zone 40, but a further expedition by UA1CK and other operators from UA1KBW are scheduled from there next April as UA1-KBW/1.

VQ8CFB is active and expects to be at the St. Brandon Met. Station for about six months. He has been spotted on 3650 at 1500z and uses 14320 u.s.b./l.s.b. QSL to VQ8 Bureau, Box 467, Pt. Louis, Mauritius. He is Zone 39.

New Zealand stations are due to start using the ZM prefix for the Cook Bi-Centenary year as from 1st October, until 31st December, 1970, with the Kermadec Is. operation by ZL2ANX using ZM1AAT/K, and the Chatham Is. ZL-3PO jaunt using ZM3PO/C. Proposed Campbell Is. operation cancelled.

AWARDS

Trans Canadian Award: Five contacts in each of the VE call areas, a total of 40 cards, plus 5 in VO1 or 2, plus one VE0MM. Of the five VE8s worked and confirmed, one must be in the Yukon, and one in the N/W territory offshore islands.

Sea Way Award: Ten contacts along the St. Lawrence sea-way. One in Pt. Arthur or Pt. William, one in Greater Toronto, one Montreal, one in Greater Quebec City, other six in other municipalities en route.

Provincial Capital Award: Ten cards, one in each of ten provincial capitals.

To claim the awards, you need the QSLs as listed, plus 10 IRCs or one U.S. dollar for each award to VE3ACD, Mort Wolfson, 305 Rosemary Rd., Toronto 10, Canada.

Nth. Illinois DX Assn. Award: DX stations need to work seven Nth. Illinois stations since 1st Jan. 1968. Log info, plus 75c or five IRCs, to Bud Frohardt, 3620, N. Oleander Ave., Chicago, Illinois, 60634, U.S.A. Some of the stations you can work are K9CSW, KDI, KYF, LUI, VLE, WEH; W9ARV, BPW, BZW, DWQ, DY, EXE, FKC, GXH, ILW, JUV, LKJ, NZM, OD, OHH, OPD, QQN, WYB, and WA9IVL.

W4BPD Award: Class one for working Gus from five locations, class 2 for 10 locations, class 3 for 15 locations. QSL info., plus one dollar U.S.

OE Award: Issued for working 100 OE stations since April 1954. QSLs plus 10 IRCs to Award Manager, Box 999, A-1014 Vienna, Austria.

Unfortunately I had to omit any QTH and managers' lists, due to the fact that they have not arrived from the U.K. The response from readers has been very pleasing this month and I acknowledge tapes or letters from Barry VK5BS, Ivor VK3XB, Greg VK7KJ, George Allen, Maurie Batt, ZL2AFZ, Steve Ruediger, Mac Hilliard, and Maurie Cox via phone, Bernard Hughes ISWL, Geoff Watts DX Newssheet, Long Is. DX Assn., Eric Trebilcock, and my own observations on the bands.

As well as the following, I have had a number of letters, phone calls and even callers not enumerated above, commenting on the lack of provision for the S.w.l's in the Bi-Centenary year. I will make no comment on the matter in this page, as my comments could be interpreted as being official. I suggest that all queries in the matter should go to your Federal Councillor. 73, Don L2022.

TECHNOLOGY CAMP AT BLUE LAGOON C.Y.C.

"Receiver on . . . lights on . . . prepare to launch" — final commands came clearly over the walkie-talkie — "Let her go NOW!"

The giant eight-foot box kite soared into the night sky, sixty, eighty, a hundred feet up. Yards of nylon cord were paid out as the U.F.O.-like machine, with radio controlled flashing lights, climbed like an eagle into the darkness. This was another absorbing project that thrilled both campers and leaders alike at Tasmania's first Technology Camp at Blue Lagoon Christian Youth Camp near Dodges Ferry.

Transistor radios, monophonic organs, model motors and a radio controlled camera to take aerial photographs from a kite were just some of the other constructional projects completed by senior high school boys.

An Amateur station set up on the site with call sign of VK7TC/Portable provided an introduction to radio communication and a thrill to many with QSOs to Japan and U.S.A.

Why all this bother for five days? To open new doors to good challenging hobbies and careers, to deepen insights, to raise relevant questions and get some solutions.

An engineer, a research scientist, a technician, teachers and others gave generously of their time and talents with the result that some boys completed practical work for Y.R.S. certificates. As the camp came to an end, many were asking about the possibility of another one next August holidays.

—Brian L. Jones, B.Sc., Dip.Ed.

CHANGE OF PREFIX FOR NEW ZEALAND

To draw greater attention to the Cook Bi-Centenary Celebrations (celebrating Captain James Cook's first landfall in the Pacific Ocean at Gisborne, New Zealand, on 9th October, 1769), the New Zealand Post Office has authorised the optional use of ZM1, ZM2, ZM3, ZM4, and ZM5 in place of ZL1, ZL2, ZL3, ZL4 and ZL5 from 1st October, 1969, to 31st December, 1970.

ZM COOK BI-CENTENARY AWARD

1. Applicants must contact 50 different stations during the period 1st October, 1969, to 31st December, 1970, using the prefix ZM— with at least one station from districts ZM1 to ZM4.
2. Applicants must forward a check list of stations contacted with full log data, which has been certified correct by two other Amateurs (no QSL cards are required).
3. Post to N.Z.A.R.T. Awards Manager, ZL-2GX, 152 Lytton Road, Gisborne, New Zealand, with three I.R.C. to cover mailing costs. Extra must be sent if airmail is required.
4. Endorsements will be made for c.w., phone and band of operation.

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VHF

Sub-Editor: CYRIL MAUDE, VK3ZCK
2 Clarendon St., Avondale Heights, Vic., 3034

Well this is the last lot of V.h.f. News that I will be editing as Eric Jamieson, VK5LP, is taking over the position. I would like to thank all those contributors who have sent in news in the past and hope that they will continue to send it to Eric Jamieson, VK5LP, Forreston, South Australia, 5233.

I hope that I will be speaking to many of you v.h.f. enthusiasts during the coming summer. 73, Cyril VK3ZCK.

VICTORIA

Quite a number of DX contacts have been made in VK3 over the past few months, including all adjoining States, but alas only a favoured few appear to have been around at the right time to work these stations. Going back a year or so, it may have taken lower powered stations up to an hour or more to work the DX stations, and even those with after-burners had to wait their turn; not so recently, DX stations have been heard waiting for VK3 city stations to answer them. Judging by the prediction charts, 6 metre DX could be possible to JA and W areas between 1100 and 1600 daily, so six metre enthusiasts now is your chance. (See news below from N.T.)

Last month the VK3 V.h.f. Group held their 6th Annual Convention at the Moondarra Dam near Moe in Gippsland. Many well known Amateurs and their families attended and all reported that they had a very enjoyable week-end. Everyone wishes to thank the Eastern Zone boys for their part in arranging the accommodation and other details that make these functions a success. 73, Peter VK3ZYO.

Midland Zone: Activity in the Zone is on the increase, both on v.h.f. and on the lower frequencies. There are now 17 earphone units in regular use, also many of the Zone members are active on two metre a.m. The Zone plans to test a channel 4 repeater in the very near future and because of this is changing to Channel B for every-day use, so as not to cause interference. 73, Bill VK3AJX.

North-Western Zone: The boys in the Mildura area are planning to start a net on six metres for the coming summer, the frequency they intend to use is 53.032 Mc. Max VK3AKT and others are very busy at the present converting some Pye Mark III. Reporters to this frequency. Also, the Mildura Technical School has formed a radio club and has applied to the P.M.G. for a club call sign. The club will be on the air once a month and will be under the control of the Zone members. 73, Noel VK3AGF.

NORTHERN TERRITORY

Six Metres: The band has been patchy but very good generally speaking. Prior to May, I was only using the low powered a.m. mobile and nightly worked JAs using the TH6DX antenna. Now I have the 9-element back in service and the 200 p.e.p. o/p. s.s.b., things are back to normal. The last contact for the season just concluded was with WA6SXM in Dublin, a Los Angeles suburb, on 27th May, 1969. The band then went dead until late August when the JAs started to appear. At this time I commenced skeds with HL9WI on 14156 and 52.010 concurrently. We were rewarded with a three-hour two-way (s.s.b. and c.w.) QSO on 4/9/69; this now makes 11 countries to my six metre list.

Overseas v.h.f. DX news: AP2MR (West Pakistan) is on the air after having trouble paying import dues. He's a very keen Amateur. Al KR6TAB reports not much good up there, somehow think that he is not listening. Hong Kong reported on 50 Mc., but not worked.

VK9DJ hopes to be s.s.b. soon with very high power. Lance VK4ZAZ has been heard working JAs and HL9WI, but cannot hear Lance. Darwin Radio Club uses 146.0 Mc. f.m. and the 10 stations have great fun. Will be in VK2/VK3 in November and December. 73, Doug VK8KK.

SILENT KEY

It is with deep regret that we record the passing of—

VK2BSP—Stephen Pedemont.
Harry Major, VK3 Associate.

HAMADS

Minimum $1 for forty words.
Extra words, 3 cents each.

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AR7, original appearance, fitted with prod. det., all new condensers, mod. r.f. and i.f. valves with B.C.D. and bandspread 20 and 10 mx coil boxes. Packed and crated on rail, $100. T. H. Talbot, Jnr., Brunswick Junction, W.A., VK6TH.

FOR SALE: Bendix Frequency Meter BC221J $35; Pye PTCA2750 low band 500 watt a.m. base station, with transistor modulator, receiver muting, 6/40 final, complete with microphone in good order, $60; R.S.G.B. Handbook, 3rd edition, $3; all sorts of valves, capacitors, etc., available, write stating your requirements. Wanted: Circuit or Handbook for TCA1645/B transceiver for copying. Will pay postage both ways. VK3UG, 24 O'Dowds Road, Warragul, Vic., 3820.

FOR SALE: Collins 75A3 receiver, $250. Halicrafter HT37 transmitter, $200. Heathkit HW22 transceiver covers 80, 40, 20 mx, plus heavy duty a.c. and mobile power supplies, $210. Heathkit O-Multi-plier, $8. All items excellent condition. Heathkit HP10 d.c./d.c. power supply, unused, plus spare transistors, $45. 240v./115v. 500w. transformer, variable output voltage, $10. Ray Baty, VK2ANB, 41 Lawson Pde., St. Ives, N.S.W., 2075. Phone 44-3707.

FOR SALE: Eddystone 888A Rsvr., mechanical and electrical condition good, 160 mx to 10 mx Amateur bands, $175. Also complete AR7, nearest offer to $55. VK3ADO, 1 Tennyson Ave., Kilsyth, Vic., or phone 723-2645 after 6 p.m.

FOR SALE: FL100B Tx, complete with new spare 6DQ5 final, p.t.t. mic., manual, covers 80-10 mx, u.s.b.-l.s.b., vox, pwr. supply in-built, can be heard on air, $190. T. J. Lally, Box 257, Clare, Sth. Aus., 5453. Phone Farrell Flat 7.

FOR SALE: Large quantity of Ham gear in good order including 9 Mc. s.s.b. exciter, pi coupler unit, tx and rx tuning condensers, power xformers and chokes, etc. S.a.e. for list to VK3PR, W. R. Jardine, P.O. Box 95, Leongatha, Vic., 3953.

FOR SALE: MR3A Carphone Junior, 2 mx f.m. transceiver, complete, $40.00. Heathkit Mohican GC-1A solid state all-band rx, 450 Kc. to 32.00 Mc., $120.00. H.B. 80-10 mx s.s.b.-a.m. tx, 220w. p.e.p., 8236 p.a., 9 Mc. McCoy filter, cost $350, sell $150. VK3ZX, Phone Traralgon 73-135.

FOR SALE: Swan 350 u. and l.s.b., latest xtal filter, matching pwr. supply, xtal cal., full 10 mx band, will trade 3-band transceiver. N. Sneddon, P.O. Wamberal, N.S.W., 2251.

FOR SALE: Yaesu Musen FL-DX-2000 Linear Amplifier, mint condx, $190 o.n.o. D. D. Kinnersley, VK4XI, 27 Oxley St., Edge Hill, Cairns, Qld. 4870. Phone 53-2068.

FOR SALE: Yaesu Musen FT-100 tcvr., 12 months old, s.w.r., quad, mast, 80/40 trap, okay, $450 offer. R. Ellison, VK6SE, Lot 51, Glenisla Road, Carmel, W.A., 6076. Phone 93-5265.

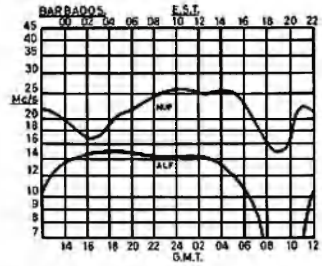
FREQUENCY METERS, BC221, in original sealed cartons with in-built 6v. d.c./230v. a.c. supply, earphones, charts, manual and spare valves. Few left at $70. Advise transport. G. B. Lance, 123 Webster St., Ballarat, Vic., 3350.

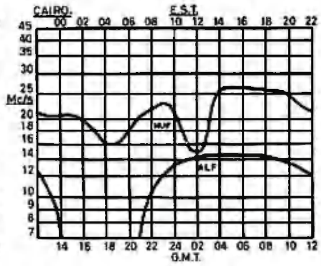
SELL: Collins PTO 70 c.p.s. 2.5-3.5 Mc., $25. Pabst 230v. blowers 100 c.f.m. similar to Rotron for blowing finals, three only, $7 each. BC348 with double conversion 85 Kc. Command i.f., no pwr. supply, not operating, $15. Bendix Freq. Meter and spare 1 Mc. xtal, $55. Transformer A & R type 1939 450 aside at 200 mills., 6.3v. 6 amp., new, $10. A & R type 1371, 1000, 850, 750 aside at 400 mills., new, $20. All items posted or freighted free. Williams, VK3IZ. Phone 437-1811 (Melb.).

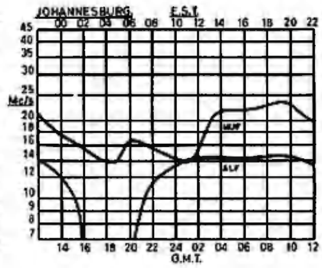
WANTED: Cheap AR7 or similar. Condition unimportant. Phone Melb. 69-4989. 64 O'Grady St., Albert Park, Vic., 3206.

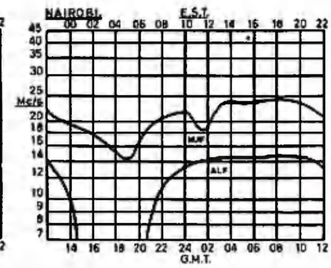
PREDICTION CHARTS FOR NOVEMBER 1969

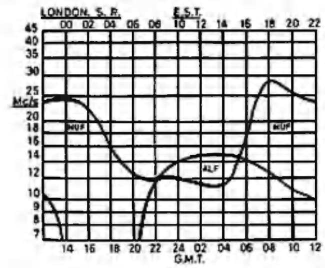
(Prediction Charts by courtesy of Ionospheric Prediction Service)

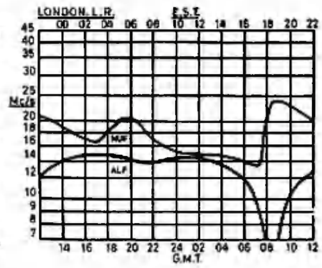


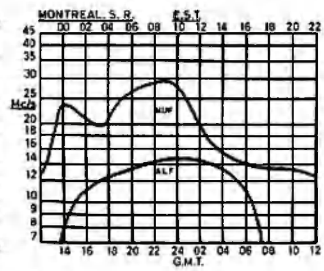


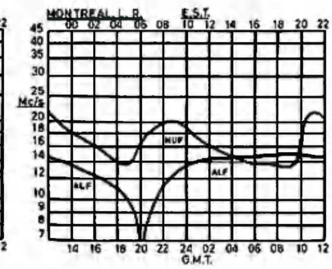


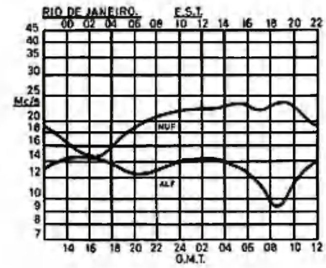


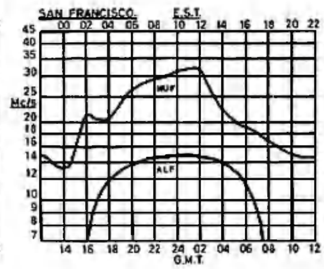


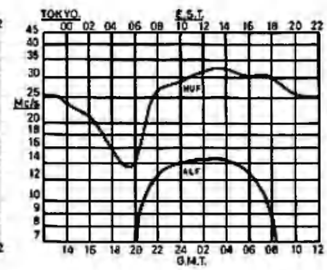


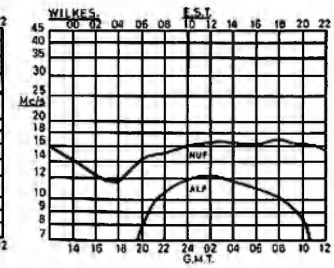












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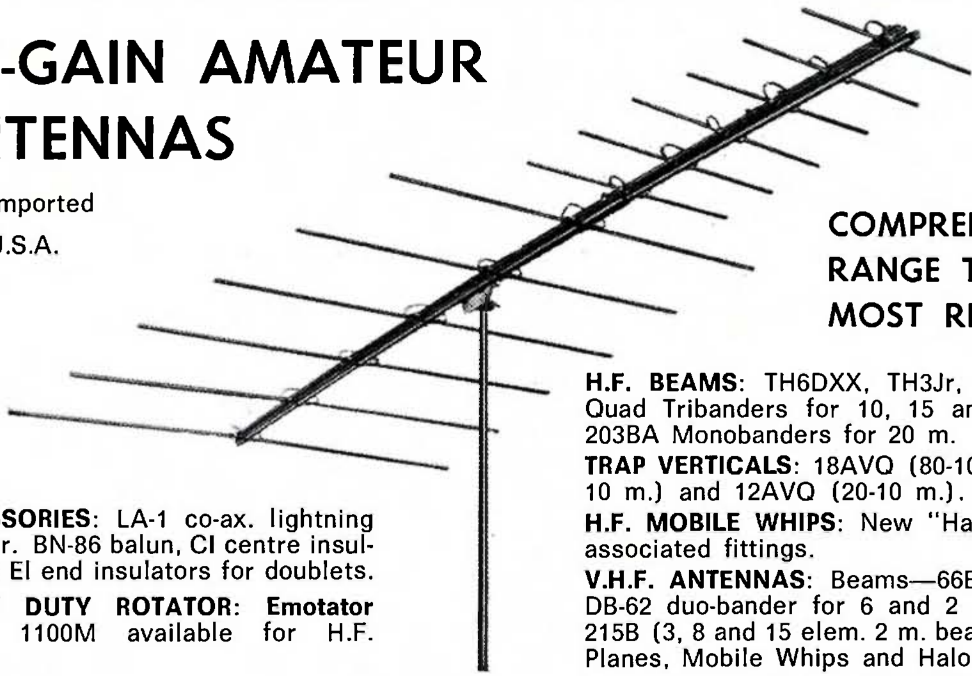

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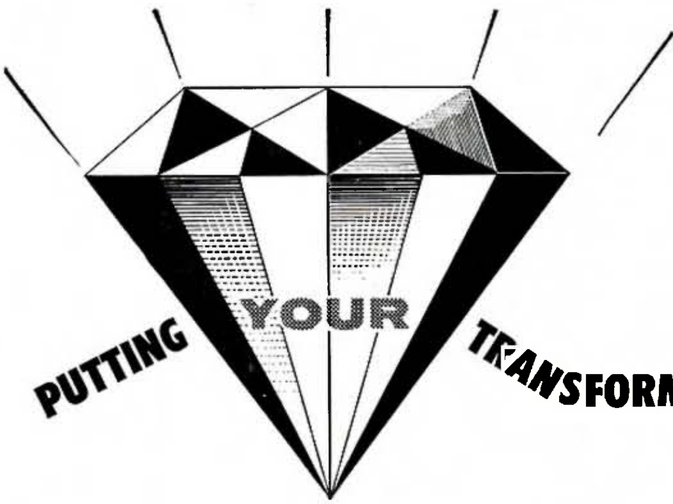

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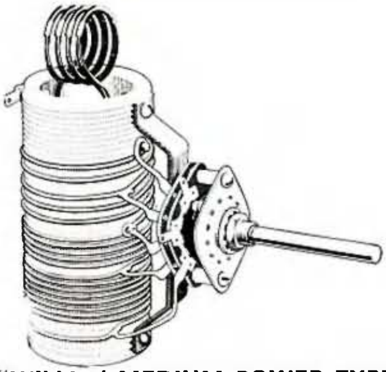

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3-16	¾	16	3	No. 3011	90c
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References: A.R.R.L. Handbook, 1961;
"QST," March, 1959;
"Amateur Radio," Dec. 1959.

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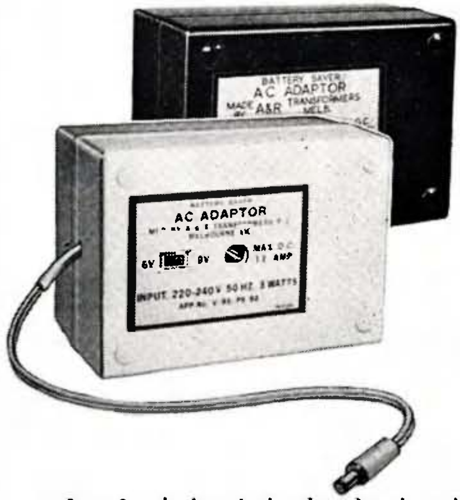

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DECEMBER, 1969

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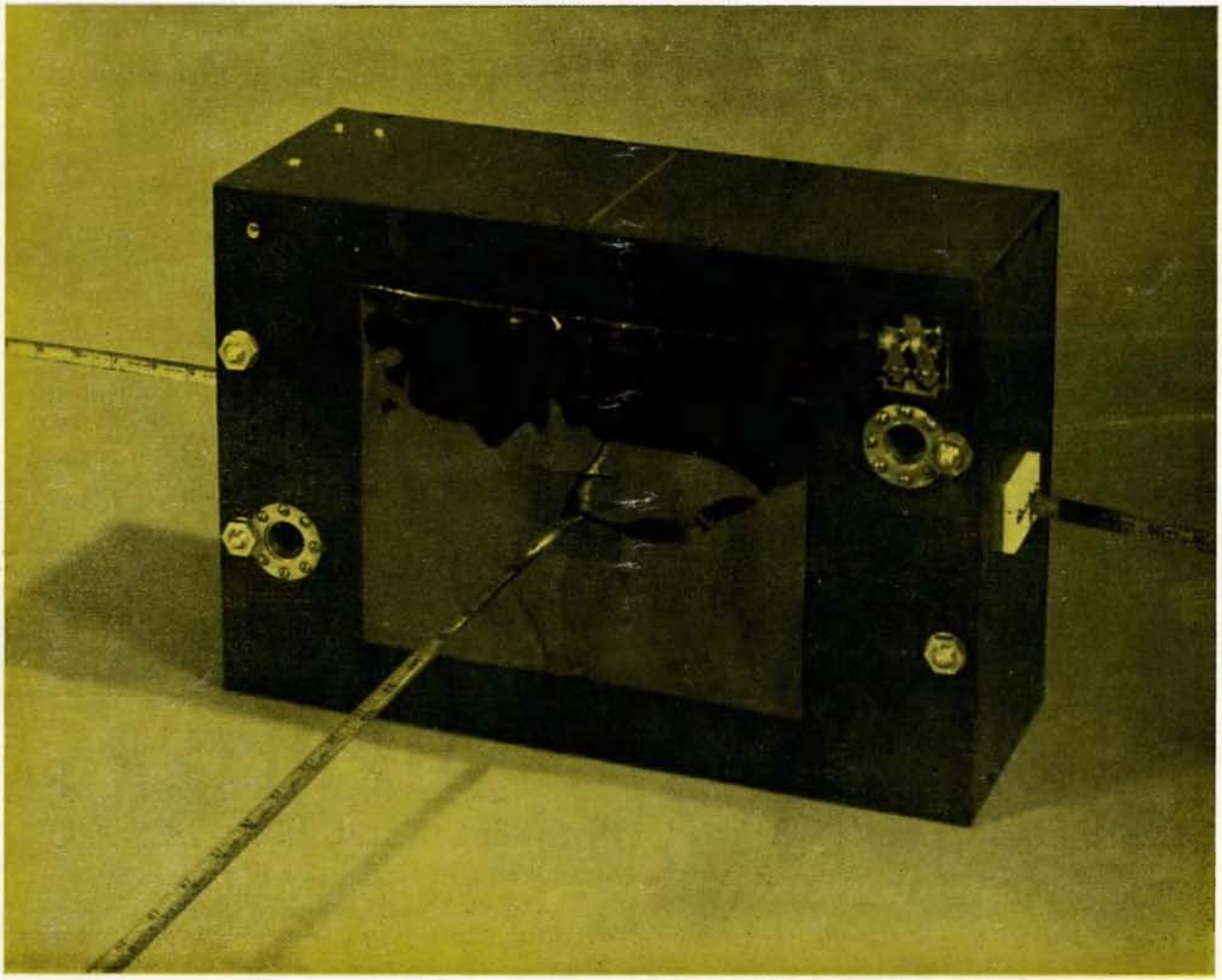

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amateur radio

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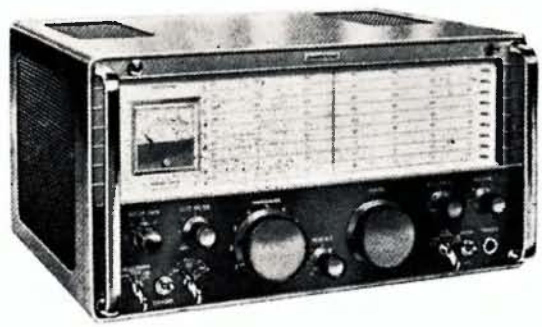

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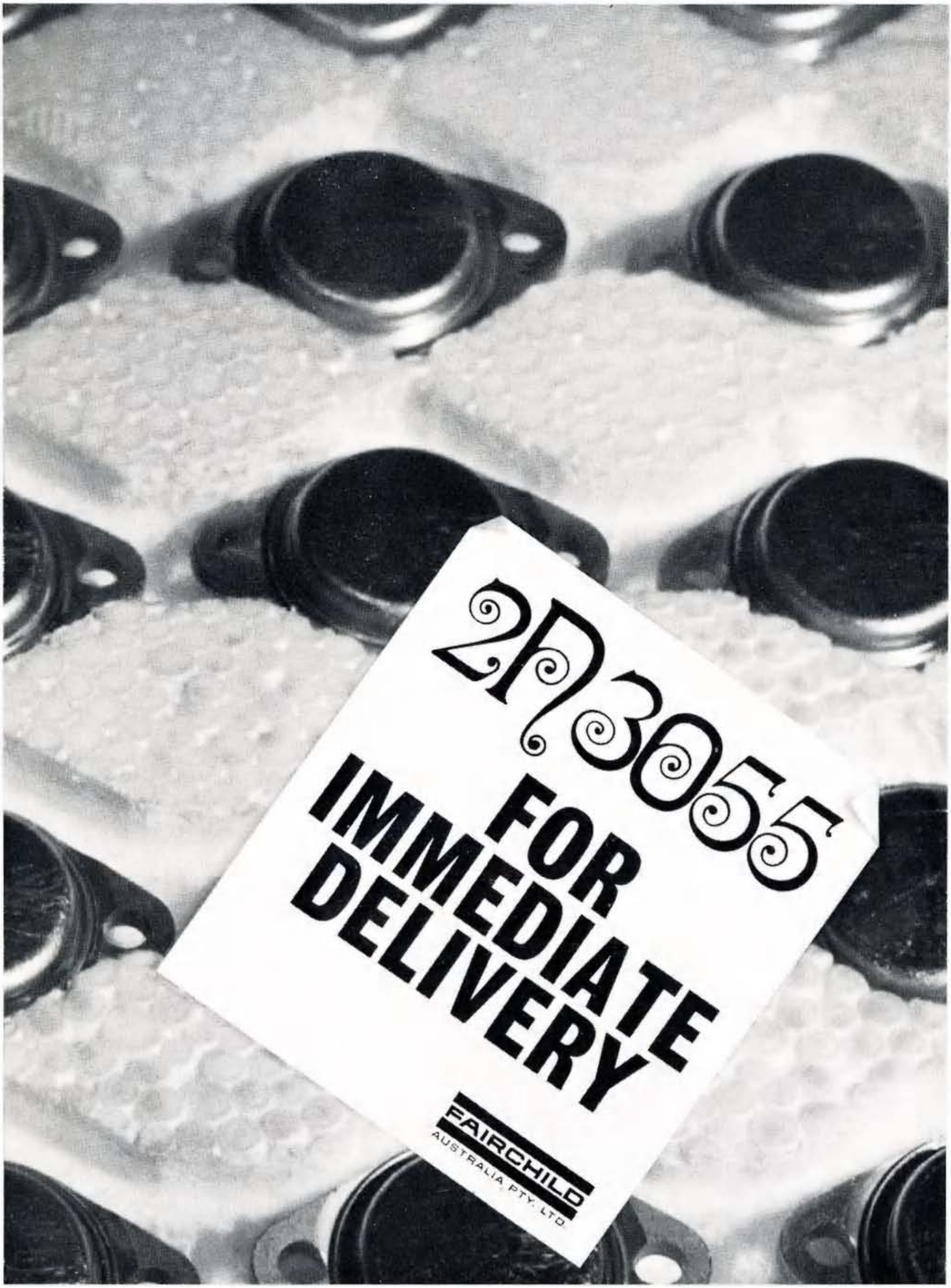
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—Arie Bles

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4CX250B[1]	AB1/SSB	2000	.1/.25[3]	350	−55[5]	0	0/.005[3]	0	300	6.0 / 2.5
	C/CW	2000	.25	250	−90	2.9	.019	.026	390	
	C/AM	1500	.20	250	−100	1.7	.02	.014	235	
4CX300A	AB1/SSB	2500[6]	.1/.25[3]	350	−55[5]	0	0/.004	0	400	6.0 / 2.5
	C/CW	2500[6]	.25	250	−90	2.8	.016	.025	500	
	C/AM	1500	.20	250	−100	1.7	.02	.014	235	
4CX1000A	AB1/SSB	3000	.25/.90[3]	325	−60[5]	0	−.002/.035	0	1680	6.0 / 10.5
4-65A	AB1/SSB	3000	.015/.065[3]	360	−85[5]	0	0/.006	0	130	6.0 / 3.5
	C/CW	3000	.112	250	−105	1.6	.022	.009	270	
	C/AM	2500	.102	250	−150	3.1	.026	.013	210	
4-125A	AB1/SSB	3000	.03/.105[3]	510	−95[5]	0	0/.006	0	200	5.0 / 6.5
	B/SSB[4]	3000	.02/.115[3]	0	0	16	0/.03	0/.055	240	
	C/CW	3000	.167	350	−150	2.5	.03	.009	375	
	C/AM	2500	.152	350	−210	3.3	.03	.009	300	
4-250A	AB1/SSB	3000	.055/.21	600	−110[5]	0	0/.012	0	400	5.0 / 14.5
	C/CW	3000	.345	500	−180	2.6	.06	.01	800	
	C/AM	3000	.225	400	−310	3.2	.03	.009	510	
4-400A	AB1/SSB	3000	.09/.30[3]	810	−140[5]	0	0/.018	0	500	5.0 / 14.5
	B/SSB[2][4]	3000	.07/.30[3]	0	0	40	0/.055	0/.10	520	
	C/CW	3000	.35	500	−220	6.1	.046	.019	800	
	C/AM	3000	.275	500	−220	3.5	.026	.012	630	
4-1000A	AB1/SSB	4000	.17/.48[3]	1000	−130[5]	0	0/.04	0	1130	7.5 / 21.0
	B/SSB[4]	4000	.12/.67[3]	0	0	105	0/.08	0/.15	1870	
	C/CW	4000	.70	500	−150	12	.137	.039	2100	
	C/AM	4000	.60	500	−200	11	.132	.033	1910	
3CX100A5	C/CW[7]	800	.08	—	−20	6	—	.03	27	6.3 / 1.0
2C39A	C/AM[7]	600	.065	—	−16	5	—	.035	16	

[1] Ratings also apply to 4X250B.
[2] Ratings apply to 4-250A within plate dissipation limitation.
[3] Zero signal and maximum signal dc current.
[4] Grid and screen grounded, cathode driven.
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ETG 1169

COMMENT:

A VK HI IN THE SKY

Don't brag; don't appear patronising; and let me check your spelling. That was the Editor's advice to me before I wrote my first Federal Comment.

But this time we are going to brag—we've certainly got something to brag about! With any luck, shortly after this issue is published, Australis Oscar 5 will be launched! (That's why we have the special cover for this issue.)

The four Amateur Satellites launched to date have all been built in the United States. The fifth to be launched was designed and built in Australia. That is something to brag about! It represents a tremendous achievement for the many people involved; in particular the W.I.A. Project Australis Group.

The package has passed its sophisticated and lengthy pre-launch tests. It has "qualified' to be launched! Now, all we have to hope is that the launch is successful.

Whatever happens now cannot take away any of the credit that belongs to the group that have built Australis Oscar 5.

We can all be proud of this group of Australian Amateurs. Their achievement is something that we can all share by observing the satellite. But to them must be given the credit; to the W.I.A. Project Australis Group we say "Good luck and congratulations!"

NOVICE LICENSING

Between 1959 and 1968 it was the policy of the Wireless Institute of Australia to advocate a form a Novice licence system in this country. In detail, the following was the specific proposal advanced by the Institute:

(a) Morse code test of 5 words per minute.
(b) Elementary examination in radio theory and P.M.G. Regulations at a lower standard than that required for A.O.C.P.
(c) Operation to be allowed on the 3.5, 27 and 28 Mc. bands using c.w. only and crystal control.
(d) Power input maximum of ten watts.
(e) The A.O.C.P. exam. must be taken by the end of 12 months. The licence is not to be renewable except at the discretion of the Postmaster General's Department.

Attempts to persuade the Australian Administration to introduce such a system had always met with failure—which, in itself, is of course no reason for abandoning a policy. However, at the 1968 Federal Convention, the Divisions decided, through the Federal Council, that we, as an organisation, should no longer advocate the issue of a Novice licence by our Administration.

It was obvious that, despite the result, the issue was still an open one. In fact, three Divisions voted in favour of the change, two against and one abstained. Two factors that may have played some part in the change of policy were the reduction by the Australian Administration of the code standard for Amateur licensees from 14 words per minute to 10 words per minute and the lowering of the age limit at which an Amateur licence could be held.

The last nine months has seen a much revived interest in Novice licensing. Many people, some deeply involved in the Youth Radio Club Scheme, have drawn attention to the Institute's present policy, both in our own journal and in other journals. "Amateur Radio" has received a number of letters to the Editor on this topic and perhaps significantly, not one has opposed the concept of Novice licensing. This interest has led the Federal Executive to the view that the Federal Council should again review the Institute's policy towards Novice licensing. Accordingly, it will propose the appropriate motion at the next Federal Convention. This is not to say that the Executive is advocating a change; on this matter the Executive simply raises the issue, but at least at this time, makes no recommendation to the Federal Council. I have referred to this matter at this early stage in a Federal Comment because a Novice licensing system will affect all Amateurs. By raising the issue at an early stage, I hope that all Divisions will be able to obtain the views of their members well before the Federal Convention. I hope that all Amateurs give some thought to this undoubtedly difficult question.

The arguments advanced by those for and against a Novice licensing system are fairly well known. Those in favour say that through this means we will attract new Amateurs to our ranks that we would not have otherwise attracted; that the Novice licence is particularly suitable for young people where some practical experience, particularly within the framework of the Youth Radio Club scheme is the best training. Those in favour also rely on the fact that other countries (apart from the U.S.A.) issue such a licence, apparently quite successfully.

Those opposed to a Novice licence system argue that the evidence does not support the contention that people who become Amateurs would not have become Amateurs in any event; that limited frequency band allocations to licensees with severely limited privileges create "ghettos of the underprivileged" where novices lead each other into bad operating habits; that the standard in Australia for the Full licence is such that with application, anybody can attain it; that the Novice licence creates an underprivileged minority which is not in the best interests of Amateur Radio.

I do not pretend that the points I have mentioned are the only points for and against a Novice licence—they are not. Nor do I pretend that the points I have mentioned are necessarily the best points that either side would raise. I have quoted them as an example of the sort of issues that are raised by this question. One does not have to look far before one finds the arguments, particularly those in favour of a Novice licence, presented very ably indeed. I urge all Divisional Councils and all members to give this matter serious consideration before the 1970 Federal Convention. I hope that this matter will be a topic at least at one general meeting in each Division before Easter 1970.

But please do not only ask the question, "Should we have a Novice licence" —do not assume that if the Institute answers that question, "Yes," that the Institute must necessarily have to advocate the form of licence it previously advocated, which is quoted above. If one concludes that we should have a Novice licence, then I think one should ask the question, "In what form do we want a Novice licence?" Indeed, it may well be easier to decide the first question after one has given some consideration at least to the second question. Open discussion on this sort of topic is, I believe, essential and one of the things that the Institute is all about. Don't be a fence sitter. Let your Council know what you think. Give your Federal Councillor any material that you think may be of assistance to him.

Whatever the result of a review of this question at the Federal Convention, I think that the criteria to be applied in judging the issue is clear. What is in the best interests of Amateur Radio? What do you think?

—Michael J. Owen, VK3KI,
Federal President, W.I.A.

THE F.M. SYSTEM

R. F. DANNECKER,[*] VK4ZFD

SINCE the introduction of the 146 Mc f.m. net frequencies to this country, many Amateurs have come to realise the advantages that frequency modulation provides. However, many Amateurs have only a rather sketchy knowledge of the processes involved in the frequency modulation system. It is the purpose of this article to discuss some fundamental aspects of the f.m. system.

DEVIATION

Everyone is aware of the process involved when an a.m. signal is produced. If the modulating signal is, say, 1 Kc., two sidebands, one at carrier frequency minus 1 Kc. (lower sideband, l.s.b.) and the other at carrier frequency plus 1 Kc. (upper sideband, u.s.b.) are produced. The total power in the sidebands is half the carrier power for 100% modulation (see Fig. 1a).

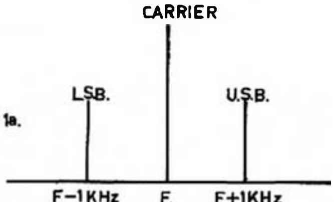
When a frequency modulated signal is produced with 1 Kc. modulating frequency, sidebands are produced at 1 Kc. intervals **to infinity** (see Fig. 1b).

However, beyond a certain point the amount of power contained in higher order sidebands is insignificant. The number of significant sidebands and the amount of power transmitted in them can be determined using Bessel functions. Two Bessel function charts are shown in Figs. 2a and 2b.

There are several points to note with reference to Fig. 1b:—

* 52 Pohlman Street, Southport, Qld., 4215.

FIG 1a.



A.M. SIGNAL WITH 1.KHZ. MODULATION.

(a) The carrier power diminishes during modulation.
(b) The energy taken from the carrier goes into the sidebands—greater amplitude of modulating signal produces more energy in the sidebands.
(c) One or more sidebands can contain **more** power than the carrier.

A small amplitude audio modulating signal of frequency 1 Kc. may produce sidebands as shown in Fig. 3a. If the amplitude is increased, the frequency spectrum of the signal may change to that shown in Fig. 3b. The signal in Fig. 3b has greater deviation than that in Fig. 3a.

A signal modulated with a 1 Kc. tone with 10 significant sidebands requires a total bandwidth of 20 Kc., while a 100 cycle tone giving rise to 10 significant sidebands requires a total bandwidth of 2 Kc.

The bandwidth required for a signal therefore depends on:

(i) The intensity of the modulating signal.
(ii) The frequency of this signal.

The modulation index of a frequency modulated signal is defined as:

$$\text{modulation index} = \frac{\text{Deviation of F.M. Carrier}}{\text{Audio Freq. producing this Deviation.}}$$

For a maximum carrier shift of ($\pm$) 15 Kc. and a highest modulating frequency of 3 Kc., the modulation index $= 15 \div 3 = 5$.

From Fig. 2a we see that there are eight significant sidebands in this signal, i.e. although the carrier has shifted only ($\pm$) 15 Kc., significant sidebands have been produced to $8 \times 3 = (\pm)$ 24 Kc.

The relative **amplitudes** of the sideband sets are obtained from Fig. 2b and are shown in Fig. 4 applied to a carrier aerial current of 9.0 amps.

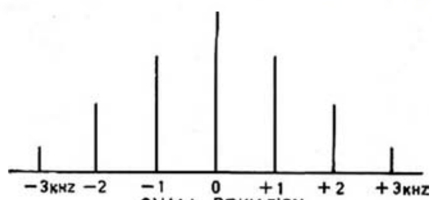
Note that although the carrier is never shifted beyond ($\pm$) 15 Kc., significant sidebands are produced beyond this limit. Hence the seemingly wide spacing between f.m. channels.

Note also that for a modulation index less than 0.4, only two significant sidebands are produced. A modulation index of 0.4 with an upper audio limit of 3 Kc. corresponds to a carrier deviation of ($\pm$) 1.2 Kc. (see Fig. 5).

PHASE MODULATION

Consider an audio signal modulating a carrier such that the phase of the carrier is changed corresponding to change in the amplitude of the modulating signal. This is shown in Fig. 6a relative to a reference carrier whose phase is constant. An alternative representation in terms of rotating phasors is shown in Fig. 6b where OB is the reference carrier and OA is the phase modulated signal.

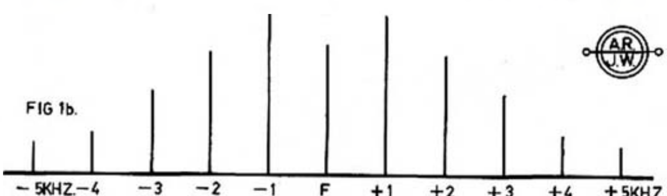
Actually, in Fig. 6b, OA is rotating at angular frequency ω, while the phase varies, relatively, very slowly. Consider now the change in vector OA in going from (i) to (ii) and (iv) to (v) in Fig. 6b. In the first case OA must speed up to go from position (1) to



SMALL DEVIATION

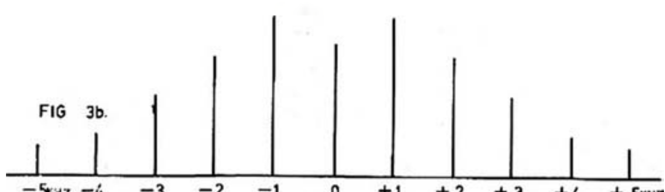
Fig. 3a.

FIG 1b.



FM SIGNAL WITH 1.KHZ MODULATION.

FIG 3b.



LARGE DEVIATION

Modulation Index	Number of Significant Sidebands Above Carrier	Number of Significant Sidebands Below Carrier	Bandwidth Required
0.01	1	1	2f
0.05	1	1	2f
0.20	1	1	2f
0.40	1	1	2f
0.50	2	2	4f
1.00	3	3	6f
4.00	7	7	14f
5.00	8	8	16f
7.00	10	10	20f
10.00	14	14	28f

Note: f equals frequency of audio signal.

Fig. 2a.—Bessel Function Chart (1)

Modulation Index	Carrier Value	1st Set of Sidebands	2nd Set	3rd Set	4th Set	5th Set	6th Set	7th Set	8th Set	9th Set	10th Set	11th Set	12th Set	13th Set	14th Set
0.00	1.000	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0.01	1.000	0.005	—	—	—	—	—	—	—	—	—	—	—	—	—
0.05	.9994	.025	—	—	—	—	—	—	—	—	—	—	—	—	—
0.20	.9900	.0995	—	—	—	—	—	—	—	—	—	—	—	—	—
1.00	.7652	.4401	.1149	.0020	—	—	—	—	—	—	—	—	—	—	—
2.00	.2239	.5767	.3528	.1289	.0341	—	—	—	—	—	—	—	—	—	—
4.00	−.3971	−.0661	.3641	.4302	.2811	.1321	.0491	.0152	—	—	—	—	—	—	—
5.00	−.1776	−.3276	.0466	.3648	.3912	.2611	.1310	.0534	.0184	—	—	—	—	—	—
7.00	.3001	−.0047	−.3014	−.1676	.1578	.3479	.3392	.2336	.1280	.0589	.0235	—	—	—	—
10.00	−.2459	.0435	.2546	.0584	−.2196	−.2341	−.0145	.2167	.3179	.2919	.2075	.1231	.0634	.0290	.0120

Note: Where blank spaces are indicated the values of the sidebands are insignificant.

Fig. 2b.—Bessel Function Chart (2).

position (2), in the second case OA must slow down to go from position (1) to position (3). This speeding up corresponds to an increase in frequency of the carrier represented by OA and the slowing down corresponds to a decrease in carrier frequency.

Each time the carrier phasor wobbles back and forth to reach the new phase positions dictated by the audio modulation, we find the frequency also changes in order to have the phasors reach the new positions. Note, however, that over the whole audio cycle, the average frequency of the carrier represented by OA is constant.

In producing phase moduation of the carrier we have in fact produced indirect f.m. What we are doing is adding sufficient change either positive or negative to a fixed frequency to permit the carrier to reach the desired phase position. In "pure" f.m. the carrier frequency itself is **directly** affected and shifted in response to the modulating voltage.

FACTORS AFFECTING INDIRECT F.M.

The amount of indirect f.m. produced depends on the extent of phase shift and the frequency of the modulating audio signal. The extent of indirect f.m. produced varies directly with both the frequency and maximum phase shift of the carrier.

In direct f.m. the value of the carrier itself swings between its maximum limits. The carrier is shifted directly by the modulation. In indirect f.m. (from p.m.) the carrier is not actually shifted by the modulation. Rather, the effect of the phase shifts is to either add to or subtract frequency variations from a fixed carrier.

Sideband Set	Amplitude (Amps.)	Power (Arbitrary)
Carrier	1.598	2.50
1st Set	2.948	8.70
2nd	0.419	0.175
3rd	3.283	10.80
4th	3.521	12.40
5th	2.350	5.52
6th	1.179	1.39
7th	0.481	0.231
8th	0.166	0.0276

Fig. 4—Power in Sidebands

INTERFERENCE

Consider two carrier waves slightly different in amplitude and frequency. The resultant of these two waves is shown in Fig. 7. There are two types of variation in this signal as compared to carrier 1. They are: (1) amplitude, (2) phase.

In a.m. systems type (1) produces beat frequencies (e.g. 10 Kc. whistle).

In f.m. systems type (1) is eliminated by limiters in the receiver, but type (2) is still present at the detector. Note that this phase modulation produces indirect f.m. With a 2:1 ratio of desired to unwanted signals, a maximum phase shift of 30 degrees is produced.

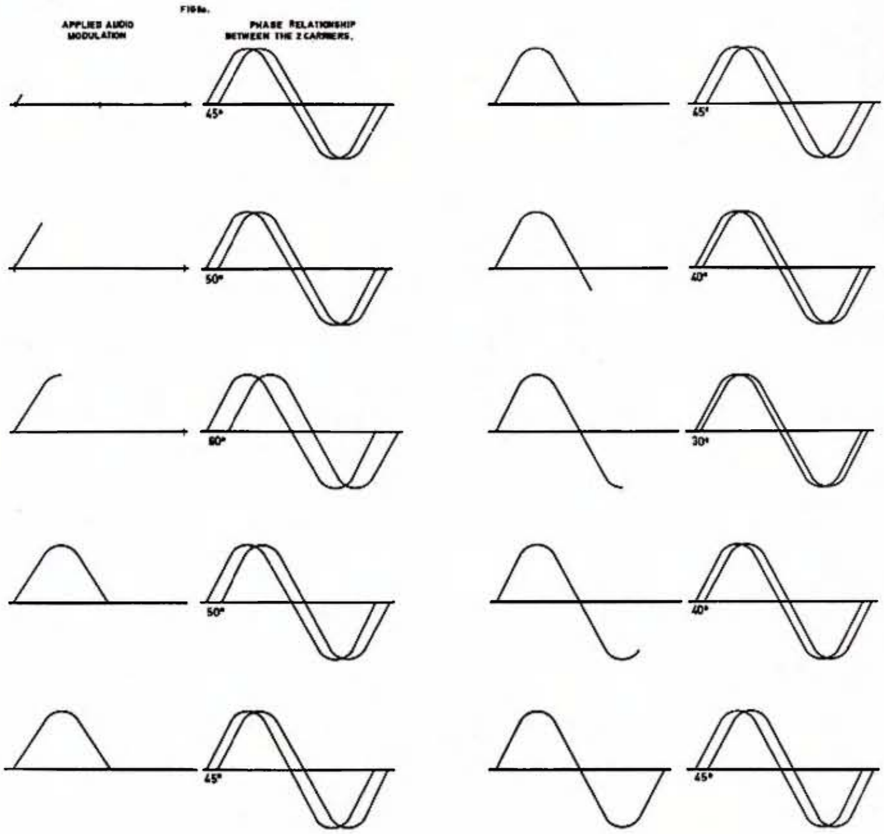


Fig. 6a.—A simplified illustration of Phase Modulation.

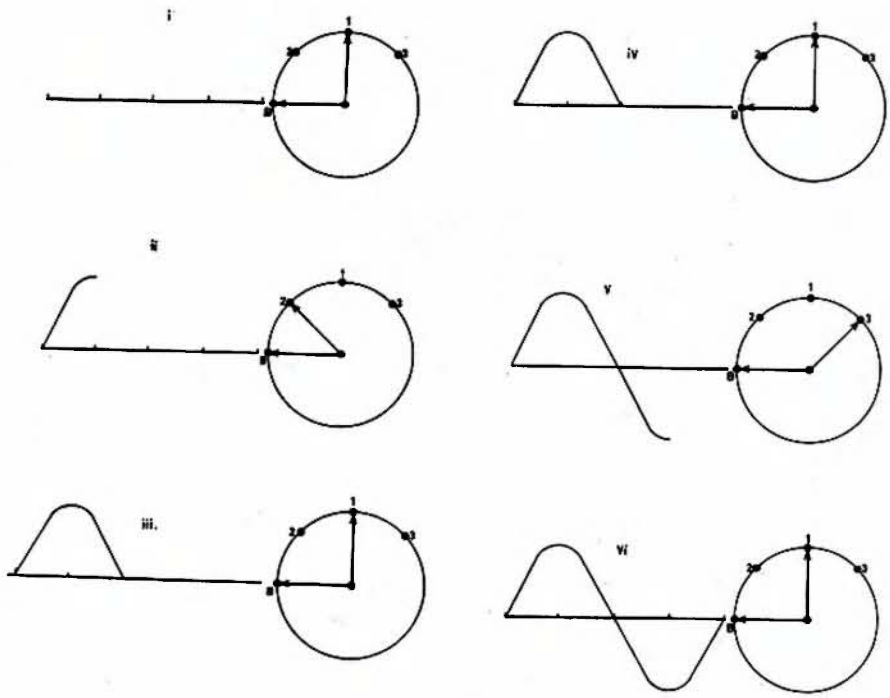
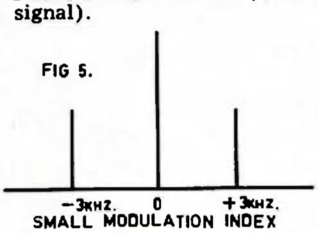


Fig. 6b.

The indirect f.m. cannot be eliminated, but in wideband f.m. systems it can be minimised.

As noted before, the indirect f.m. is directly proportional to the modulation frequency (in cycles) and the maximum phase angle (in radians) of carrier shift.

Now suppose that the interfering signal differs by 1000 cycles from the desired signal and is only half as strong as the desired signal. As noted before, a maximum phase shift of 30 degrees (approx. 0.5 radians) in the desired signal will be produced. The frequency shift (indirect f.m. produced) in the desired signal is in fact 1000 x 0.5 or 500 cycles. The shift is periodically above and below the average frequency of the stronger signal. The frequency variations shift at a rate of 1000 times a second (1000 cycles mod. signal).



If the ordinary f.m. signal is deviated to (±) 15 Kc. then the (±) 500 cycles produced by the interfering signal produces an audio signal greatly smaller than the desired audio signal.

For a S/N ratio of 10:1 this effect is even more marked. Thus the wideband f.m. completely swamps the small indirect f.m. developed from the interference. Herein lies the interference reduction power of f.m.

Note that if the two signals are of the same frequency, no interfering indirect f.m. is produced and the greater the frequency separation of the two signals the greater the amount of interference produced. However, the amplitude will be reduced by the bandpass characteristics of the receiver.

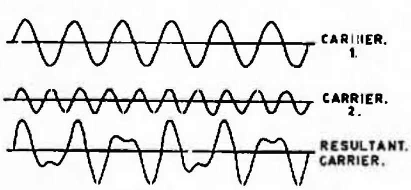


FIG 7.

Fig. 7.—The combination of two carriers to form a resultant which is amplitude and phase-modulated.

DOMINATION BY THE STRONGER SIGNAL

When two signals are comparable in amplitude, the moment one signal becomes even a trifle stronger, the response changes and the stronger signal assumes noticeable control. The process is complete when the ratio reaches the 2:1 point. (For a comparable amount of interference in an a.m. system, a ratio of 100:1 is required.)

Consider two signals of nearly equal amplitude and only slightly different frequency (see Fig. 8).

Let 1 be the stronger signal, 2 be the interfering signal and R be the resultant carrier due to these two signals. As 2 rotates around relative to 1 (different in frequency), R changes greatly in phase but its average frequency is still that of 1, the stronger signal. Hence by bringing the two signals close in amplitude we have produced more phase modulation in the resultant phasor R, but R still follows signal 1, so we hear signal 1 but with some distortion produced by the indirect f.m. caused by signal 2 interacting with 1. If 2 was stronger than 1, then the phasor R would follow signal 2, hence the sharp transition from one signal to the other and this is why the predominant signal assumes control in f.m. systems.

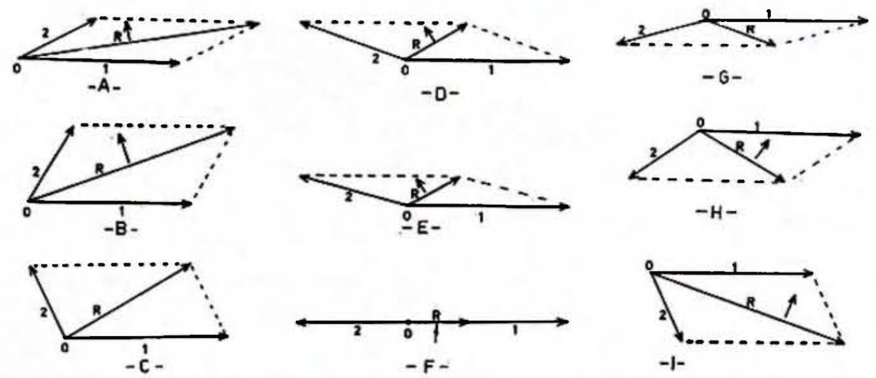
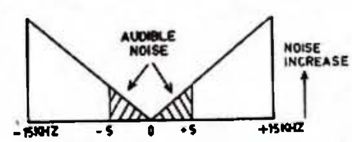
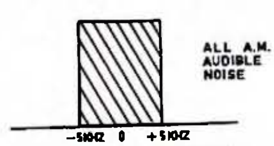


Fig. 8.—The amplitude and phase variation of a resultant (R) carrier due to the interaction of two signals. The small arrows on R indicate whether its phase (with respect to the desired signal, 1) is going in a positive or negative direction.



NOISE IN F.M. SYSTEM

FIG. 9a.



NOISE IN A.M. SYSTEM

FIG 9b.

NOISE

Consider random noise in the receiver. Interactions between random noise voltages and the carrier also interactions between the random noise voltages produces:

(1) Amplitude modulation of the carrier;

(2) Phase modulation (and thus indirect f.m.) of the carrier.

The amplitude variations are eliminated in the limiters but the phase variations (indirect f.m.) still result in noise.

The amount of indirect f.m. (i.e. noise) is proportional to the frequency difference between the carrier and each random noise voltage, i.e. zero at carrier frequency and increasing directly with increase in bandwidth (see Fig. 9a). Above 5 Kc. we have inaudible noise (considering the response of receiver audio systems). The comparable "noise spectrum" for an a.m. system is shown in Fig. 9b. Note the greater improvement in the amount of noise in the f.m. receiver compared to an a.m. receiver. This can be shown mathematically to be 18.75 decibels or a S/N voltage ratio of 8.65:1.

Let us now consider the effect of reducing the modulation index of the f.m. system. Figs. 10a to 10b to 10c show successive reductions in modulation index until in 10c, with a modulation index of 1, i.e. a comparable bandwidth to the a.m. system, the S/N ratio improvement of f.m. over a.m. is 4.1875 decibels. Hence the importance of obtaining the highest modulation index possible.

PRE-EMPHASIS AND DE-EMPHASIS

It is well known that most of the energy of a voice modulated transmission is contained at the lower audio frequencies, i.e. up to 3 Kc. In addi-

(Continued on Page 24)

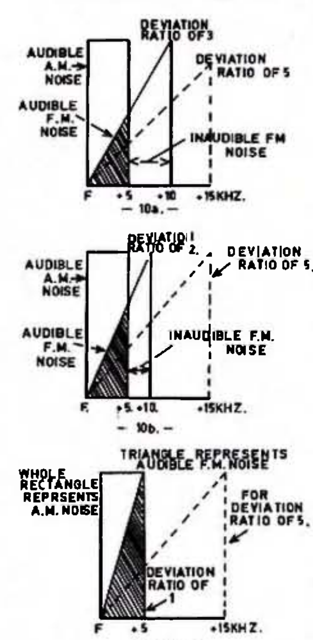


Fig. 10.—Further comparisons between the noise in A.M. and F.M. systems with various F.M. deviation ratios.

Sideband the Expensive Way (how to avoid it)

RODNEY CHAMPNESS,* VK3UG

IT is not uncommon to hear on the air and by other means of some Amateur who has just blown up his nice new Spurious Signal Breather transceiver. What happened? Well it seems that the final tubes melted into a molten mess inside the "well" ventilated p.a. cage. Why did this happen? What are the cures? That is what this article hopes to bring to your notice.

This all started rather slowly, and is a progression of thoughts and realisations over the three years that I have been on sideband. There are a number of things that I will bring to light, that many s.s.b. operators and commercial equipment operators, in particular, seem to ignore. They think either the manufacturer has solved all their problems, or that they, through ignorance or pure laziness and lack of an inquiring mind, have not bothered to think about it.

First, I will start with your table-top transceiver, which, according to manufacturer's literature, runs 500w. p.e.p. input to a pair of, say, 6KD6 valves. Wonderful what you can get out of these colour t.v. line sweep valves. Wonderful how many watts per cubic inch these miniature rigs run to. Funny thing, though, the case of the transceiver is almost too hot to leave your hand on for long. Ever tried touching the p.a. final valves when they are just running with class AB1 bias and not being driven? You could boil water on them.

The normal p.a. tube in the majority of s.s.b. rigs is run with a standing current which is very little below the allowable dissipation rating of the valve. Then you go and talk the thing up to some astronomic current, not even marked on some popular rigs. Boy, are you then exceeding the dissipation ratings, and how!

As an example, take a 6DQ5. This will run in class AB1 maximum of 750 volts and 280 mA., which works out to a d.c. input of 210 watts d.c. I believe some rigs do run these valves at these figures in AB1 in the c.w. mode. Allowing for a 50% duty cycle still in excess of a 100 watts and the 6DQ5 has only a 32 watt dissipation rating. Class AB1 is rarely much more efficient than about 55%, so this would mean that the 6DQ5 would be dissipating about 47 watts, which is about 50% above maximum ratings. Now sideband runs, according to many, a duty factor of about 30%, so in this case the valve would be just inside its ratings—or would it? No, it is not, as its normal standing current is nearly the maximum dissipation ratings. So once again you are exceeding the ratings unless you use VOX.

Now many loud mouthed Amateurs believe that the rig should read in p.a. current, nearly as much as it should in the c.w. position with the key down. Wow, have you heard their signals? They are the sort of signal that can be tuned as splatter from one end of the band to the other, and I'm not exaggerating, ask Ron Fisher, VK3OM. We experienced a "perfect" example of this one night on 80 metres. To accomplish this high p.a. reading, the audio is turned up, the microphone bellowed into, a compresser and/or pre-amp. fitted and hope to blazes the a.l.c. takes care of this abuse.

The a.l.c. is not designed to act as a speech compressor but more really as an overdrive preventer and splatter preventer. The a.l.c. can only tolerate a certain amount of overdrive, then in most cases glorious splatter emerges. It must also be remembered that there must also be a correct ratio of carrier to audio in the balanced modulator. The audio is considerably weaker, usually by a ratio of about 10:1. If, through your compressor, pre-amp., you decrease this ratio up comes your distortion almost straight away. Once there is distortion in the signal, nothing you can do will effectively get rid of it.

Take pride in the quality of your signal, not how many db. over S9 it is.

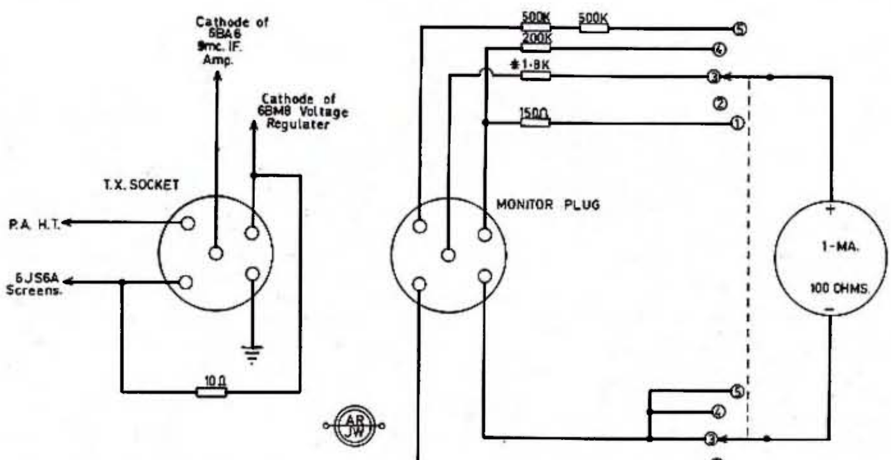
So now it can be seen that by driving your p.a. tubes hard, through either calculated commercial over-rating, or breathing heavily into the microphone system, expensive damage can be done to the p.a. valves. In these small transceivers and transmitters the ventilation is far from adequate, so still more derating of the valves is required. I have extreme doubts that any commercially made Amateur transceiver would come anywhere near the reliability in transmitting time, that a commercial service transmitter would or, for that matter, the old a.m. rig you threw out, when you got this new s.s.b. rig. The 807 in it is still probably the original, and it was still running at least 80% of its new performance.

Well, having dispensed with the preceding causes of poor s.s.b. signals and causes of red hot p.a. tubes, I'll pass onto another perhaps more subtle cause of trouble in s.s.b. transceivers and transmitters.

Many months ago I became plagued with a mysterious sudden increase in p.a. current in my Yaesu FL200B transmitter whilst I was talking. I would find that my resting p.a. current would suddenly jump from 60 mA. to about 250 mA. The only way to get it back to normal was to release the transmit button. What was wrong? All sorts of thoughts ran through my mind from grid-cathode shorts, to bias failure, grid emission, ad nauseum.

At about the same time I was also getting intermittent reports of something wrong with my signal. Eventually Ron VK3OM said to me that my signal was f.m.-ing. Horrors, well what could cause this. Variation in v.f.o. h.t. voltage? Yes, this proved to be the answer, but why? The Yaesu uses a rather sophisticated h.t. regulation system which feeds not only the v.f.o. but also the p.a. screens. What had occurred was that I had tuned the rig up ah la book to give the required p.a. current and general expected output level. The way I had loaded the tx was such that the screen current was much higher than it should have been, due to rather light loading of the p.a.

To get the p.a. plate current up, the drive was increased. I went onto speech,



* See text

YAESU FL200B.TX MONITOR

Switch Position 1—Screen current. 0-25 mA.
" " 2—Off.
" " 3—A.L.C.
" " 4—Regulated H.T. 0-200 Volts.
" " 5—P.A. H.T. 0-1000 Volts.

* 24 O'Dowds Road, Warragul, Vic., 3820.

then on speech peaks the screen current exceeded the c.w. level, so causing the voltage regulator to be overdrawn, so loss of regulation. The moment regulation is lost the voltage tends to climb as the regulator requires a higher ignition voltage than maintaining voltage. Speech peak over, the voltage rises as current drain is reduced, but then due to higher voltage on the screens, they draw more current and so do the plates, due to having a much higher screen voltage. The regulator is unable to regain regulation so this destructive situation prevails.

The solution to this problem is fairly obvious. I must load the transmitter so that the screen current is much more reasonable. How can I tell that this current is about right? There is no meter on the Yaesu or to my knowledge any other s.s.b. rig. Anyone who has done some reading about s.s.b. will perhaps vaguely remember something about screen current being observed for tuning a s.s.b. rig final. High s.w.r. readings and slap-happy methods of tuning will cause screen currents to be dangerously high for the tubes. In my experience in commercial s.s.b. transmitting equipment up to about 3kw. d.c. input, this proved quite a problem with reactive aerials. A lightly loaded final, whether s.s.b. or a.m., can almost be considered as being a final in which the plate circuit is open circuit and the screen has the doubtful pleasure of acting as the plate. It attempts to draw currents such as the plate would draw, but due to its structure its dissipation is low and therefore grossly exceeded. The screen gets red, then white hot, and then disintegrates. Exit the p.a.

Notice in the preceding paragraph that I lumped the a.m. and s.s.b. finals in together, in regard to light loading and the effects on the screens. Now you will say if this is so, how come I didn't blow my old 807 up with light loading? The reason is quite simple. Consider the old a.m. final, an 807, with 600 volts on the plate and the screen running at 300 volts fed through a 37,500 ohm resistor from the 600 volt supply. The screen current is 8 mA. Now lightly load the final and the screen attempts to draw say 16 mA., the screen voltage will be a big fat **zero**. So in the case of the lightly loaded a.m. final, the screen current cannot rise much, as the voltage will be reduced to the screen very drastically. The screen is thereby fairly well protected.

Now the case of your nice new s.s.b. final. The situation here is much different. The screen voltage must be regulated for the linear to function in a linear manner. Now with the final lightly loaded, the screen current does rise to this level of 16 mA., using the same set of figures as stated for the a.m. rig with the exception of no screen resistor. The screen voltage is regulated and stays the same as with normal loading. We'll load the final more lightly again, more screen current and less plate current. We're well on the way to destroying the final p.a. screen grids. We've already got a signal that isn't all it should be in the way of quality.

Well I hope from the preceding information that I have perhaps helped to clear some of the fog which seems to descend when we change from a.m. to s.s.b. The things which were of little importance, so we thought, in the days of a.m. are quite important in regard to proper operation of s.s.b.

Before I finish this article, I will just show you how screen current varies as a function of plate current in my Yaesu tx, and will describe what I call my "Tx Monitor". This device is just a meter with shunts and multipliers so that I can monitor screen current, regulated h.t., p.a. h.t., and a.l.c. With 300 mA. h.t. current drawn by the p.a., I find that loading the final so that a screen current of 8 mA. is drawn gives best results, with my FL200B tx.

The following table should give you some idea of how screen current escalates with increased drive levels, such as when the gain is turned up full bore (p.a. tune and loading left untouched):

PA Current	Screen Current CW	Screen Current SSB
100 mA.	0.5 mA.	Approx.
150 mA.	1 mA.	double c.w.
200 mA.	2 mA.	reading for
250 mA.	4 mA.	same p.a.
300 mA.	8 mA.	current.

Table for two 6JS6A valves in parallel in Yaesu Musen FL200B.

"TX MONITOR"

Now to the "Tx Monitor". This was built into a plastic case 6" x 3½" x 2½", available from "A.R." advertiser. The meter is a 1 mA. movement of the MO-65 style. The switch was an ordinary Oak MSP 2-pole 5-position single bank switch. The unit is attached via a five-core cable to a miniature 5-pin plug which fits a miniature 5-pin McMurdo socket on the rear apron of my transmitter.

The transmitter wiring modifications are self evident from the diagram. The metering ranges are as follows: (1) screen current, 0-25 mA.; (2) no connection; (3) a.l.c. (no levels marked); (4) regulated screen voltage, 0-200v. (normal 150 volts); (5) p.a. h.t., 0-1000 volts (normal 600v.).

The 150 ohm resistor presupposes that the meter resistance is 100 ohms, so making up a total of 250 ohms. The 1.8K ohm resistor is subject to experiment to get full scale reading in the a.l.c. position with no modulation. It may need to be higher or lower in value. Unless you use 1% resistors in all positions, you may need to play around with the exact values to get correct readings.

This is shown as made to suit my Yaesu tx but could be easily adapted to suit any transceiver or transmitter. I find this little unit to be an extremely handy accessory to my transmitter. I would not think now of tuning the rig without monitoring both the p.a. plate current, or actually cathode current, and separately the screen current. I know a little more with this monitor about what is going on inside and find this most rewarding, and I might add I haven't blown up any p.a. valves yet. This unit is part of my insurance that I don't.

I would recommend for your reading the various articles that have been in the s.s.b. notes which appeared a few years back. Most were written by VK5NN. A recent article in "A.R." which bears close study is the one appearing towards the end of 1968 by VK2AOU. This gives excellent data for anyone wanting to build or just perhaps to understand a little more about this mysterious mode many use, called s.s.b. Mysterious, because few really understand much about its finer points, and I'm one of those who has got a lot to learn yet.

SWAN NEWS LETTER

Swan Electronics are now rapidly expanding their operations into other products and to further this end they recently purchased the well known antenna company of HORNET ANTENNAS.

This now gives Swan a full range of very sophisticated antennas for both commercial and amateur operation. These antenna are now known as Swan Hornet antenna and cover multiband beams, both full sized and shortened; trapped vertical, all band; trapped dipole, and mobile whip types.

As the Swan factory distributor for Australia, W.F.S. Electronic Supply Co. will shortly have stocks of these very fine antennas; the following types will be the first to be available:

TB1000-4	FOUR ELEMENT TRIBAND BEAM	1000 WATTS
TB1000-3	THREE ELEMENT TRIBAND BEAM	1000 WATTS
TB750-3	THREE ELEMENT TRIBAND BEAM	750 WATTS

W.F.S. ELECTRONIC SUPPLY CO.

12 BOWDEN ST., NORTH PARRAMATTA, N.S.W., 2151. Ph. 630-1621

also **SWAN SERVICE, 14 Glebe Street, Edgecliffe, N.S.W., 2027. Phone 32-5465**

Conversion of Circuit Diagrams to Veroboard, Tag-Board and Printed Circuit Layout*

A. T. CAMPBELL, G3PEQ

WE have all had the frustration of wiring up a circuit from a diagram, painfully trying to avoid errors and to miss nothing out. Then after a quick check through, the circuit has been connected to power—and it hasn't worked. Frequently more time is now spent in finding and correcting the fault than was occupied in the actual construction.

The method I am going to describe avoids all this. It enables the layout to be achieved automatically, except for printed circuit boards where a **little** thought is required. Checking is easy and thorough, and can be done systematically on paper without the need for poking about among a complex of wires and, according to Murphy's Law, missing the one thing one is looking for.

Normally one traces through a part of the circuit, taking the components involved one by one and connecting them, one hopes, to the right places. Let us forget all that, relegate the components to a secondary position, and concentrate on the junction points. We will illustrate this with a simple one-transistor amplifier which we will lay out for Veroboard construction.

VEROBOARD

Fig. 1 shows seven junction points, for the negative and positive lines can be considered as extended points, as shown in Fig. 2. It does not matter how we number these points, except that it is advisable to number the leads of the transistor in the same order as they emerge from the case so as to avoid twisting them, with risk of breaking off or shorting when we insert the transistor. In the diagram I have not put in the value of the components, but have lettered them in order to make reference easier in the following descriptions.

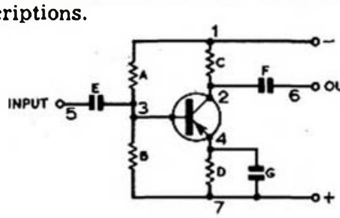


Fig. 1.—A simple amplifier.

After a little practice, you can now immediately wire up the circuit; but until experienced, it is well to go through the following stages, first laying out on paper and then checking.

On a sheet of paper, draw seven lines, numbering them from 1 to 7 to correspond with the junction points of Fig. 1 (see Fig. 3). Now proceed to draw in the components; you may do so in the literal order, A to G, to avoid the possibility of missing any; or, if you have any spatial imagery, insert them in the order which will waste least space, which is what I have done here.

Taking then the resistor A, we note it is connected between 1 and 3. Mark clear dots on lines 1 and 3, join them with the resistor symbol and label A (in practice, of course, with the actual value). C is connected between 1 and 2 in the same way, and the capacitor F between 2 and 6. Now mark in the transistor at 2, 3 and 4, indicating either the collector or emitter; if you have labelled the transistor leads consecutively you need label nothing else

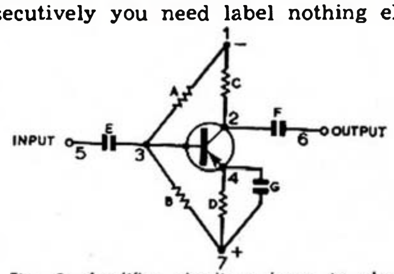


Fig. 2.—Amplifier circuit re-drawn to show positive and negative rails as points.

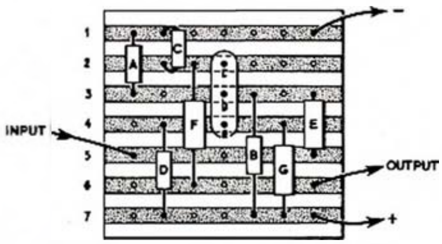


Fig. 3.—Veroboard layout of the amplifier.

because the leads will automatically come in the right place. Similarly we mark in B, D, G and E and indicate four points for the connection of input, output and power. It does not matter, of course, at which end of the lines you mark these last four points; you suit your own convenience entirely.

The layout is finished; checking must begin.

Quick Check: Count the number of components on the diagram and layout. If these do not agree, find the error. If they agree, refer to point 1. There are three connections at this point; there should be three dots on line 1. At point 2 there are three connections and again three dots; at point 3 there are four connections and should be four dots; and so on for the remaining junction points. This is a sufficient check in most circumstances, but you can, if you wish, proceed to the:

Certain Check: Consider component A; one end is connected to C and the negative line; the other to B, E and the base of the transistor. Check that these connections actually take place in the layout diagram, and proceed to check each component in the same way; finally checking that positive and negative lines, input and output are correctly connected. If everything tallies, you cannot be wrong!

Cut a piece of Veroboard to size. Select the components required and check them thoroughly. This is a point often overlooked (through laziness!) and causes more trouble than anything else. You can spend hours looking for a wiring fault, when it is a component that is faulty, or wrong value. Resistors are easily verified with a testmeter, but if you have no method of checking capacitors, which are much more likely to be faulty, build yourself a capacity bridge; it will repay the time spent on it over and over again. Measure at least the forward and reverse resistances of the transistor diodes; but if you are using it in, say, a phase shift oscillator circuit, you must measure the gain also—a simple thing to do with a quick hook-up.

Having checked components, label the rows of Veroboard in some way to show the numbering. A strip of gummed paper may be stuck on, or a piece of Sellotape-X, or they may be marked with a reed pen or a grease pencil. Do not omit this, unless you are less fallible than I am! Now bend the leads to fit into the right holes, remembering that the vertical positioning of resistors is often a great help; clean the leads where they will make contact with the foil, bend them over, cut off, leaving about $\frac{1}{8}$" of wire, and solder. Conclude by soldering in either pins or wires for the connections to power, input and output and mark them with a piece of gummed paper, grease crayon, or other means.

You have finished and **you can't be wrong!**

Now let us tackle a multi-vibrator used as an audio oscillator. The snag here is that as both transistors have a common connection to the emitter, we cannot number the leads consecutively, but we get over this by numbering the collector and base of TR1 as 2 and 3 and follow immediately with TR2 numbered 4, 5 and 6. Then the emitter of TR1 will also go to 6, the length of the leads normally being more than enough to do this. So Fig. 5 becomes the layout of Fig. 4.

In anything more complicated than these two simple circuits, one difficulty sure to occur is that the number of junction points is greater than the number of stripes of copper available. To cope with this we break a number of strips at one or more points to provide the requisite number of connections, obviously choosing strips for breaking which have only a small number of connections going to them. If

* Reprinted from "Radio Communication," July 1969.

the strips are carefully numbered on the Veroboard, no difficulty in connection can arise. If much Veroboard work is done, a spot face cutter should certainly be acquired as it saves much work and makes a good job; but if this is lacking, a 3/16" twist drill rotated in the fingers will break the strip easily and cleanly.

It may be found advisable, in order to get a leadout in a more suitable position, to break a short strip where required for the leadout and connect with a link of insulated wire to the point it derives from. The same method can be adopted if the lead of TR1 is not long enough to reach to strip 6. This, and many other useful dodges will quickly be realised as soon as you have laid out and built one or two Veroboard circuits.

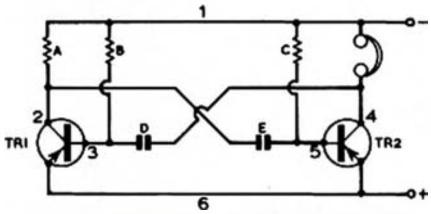


Fig. 4.—A multi-vibrator as an audio oscillator.

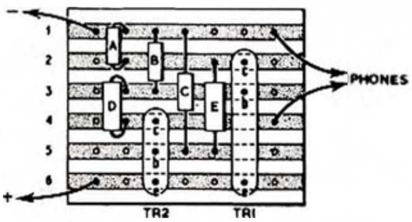


Fig. 5.—Veroboard layout of the oscillator.

I was so pleased with the above method of construction that I built several dozen small and large pieces of apparatus, quite satisfied that this was the ultimate in building methods. But gradually disadvantages from the experimenter's, rather than the builder's point of view began to appear. The experimenter wishes to change components to examine the effect of varying values, and to make measurements from different points of the circuit. Neither of these is easy with Veroboard construction. For these purposes, tag-board construction has many advantages; but in my opinion, it is ungainly in appearance; one seldom has the right size of group-board available, and connecting up and checking is a tedious procedure. The last of these difficulties disappeared on a little reflection, and an adaptation of the methods used for Veroboard made layout and checking completely straightforward. How to get over the difficulty of the awkwardness of group-boards?

TAG-BOARD (OR GROUP-BOARD)

The first approach was to drill paxolin sheet to take turret tags in the required positions and thus to build up a tailor-made group-board. The result was pleasing and satisfactory, but time-consuming. The method I invariably use now is to build up my group-board with soldering pins on plain Veroboard, achieving quick construction and one which looks really well when finished and in which the components are more securely fixed whilst at the same time they can be easily removed and changed, and measurements are quickly made from any required pin.

The most convenient board I find is the Lektrokit Chassis Plate No. 4, LK-141, obtained from Home Radio at 3/- each. These are approxivately 5" x 4" and contain 40 rows of 35 holes spaced 1/10" apart. Each will provide three 20-way group-boards or half a dozen or more smaller ones. The soldering pins are sold in packets of 100, their ordering number being LK-3011. The plate is most easily cut with a pair of side-cutters; if each edge of the plate is cut with them at the required spot, the whole separates neatly.

But let us first deal with the layout, then the construction. For convenience, we will use the circuit of Fig. 1 for our design.

The first step again is to number the junctions, but this time we need pay no attention to the transistor leads, but may number them in any order we like. However, to save another diagram, we will use the same numbering already on the figure.

There are eight components, so we draw an 8-way group-board, as in Fig. 6, then draw in the symbols for the components. It will ease wiring if we group together components connected to each other, so we begin with the components associated with junction point 3, where there are four leads connected. Note that it is perfectly easy to insert another pin for the base connection of the transistor, so we do so, offsetting the base pin towards the emitter to prevent error when we come to put the transistor into circuit. The top (or bottom) ends of E, A and B are labelled with their number, 3, and the other ends will be 5, 1 and 7 respectively, and the transistor 2, 3 and 4.

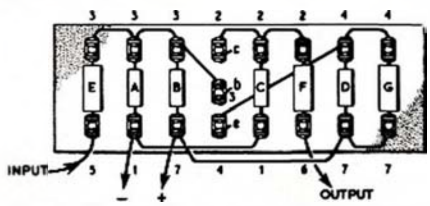


Fig. 6.—The amplifier arranged for group-board.

The other components are drawn in, keeping together so far as is possible those connected to each other, and numbering the ends in the way which seems likely to need least wiring. Follow all this in Fig. 6.

The complications of wiring reduce to one simple rule: join all the corresponding numbers! I use a red pen for this, but I have no doubt it will be reproduced in black.

One thing remains to ease our work; take a piece of tracing paper and trace the tags and joining wires and then reverse the paper. This is how the wiring will appear on the back of our group-board.

Checking is as with the Veroboard. Take point 1, observe what is connected in the circuit diagram and check that they are all wired together on the tag-board. Checking each component similarly can be done if thought necessary, but it is a work of supererogation.

Take a piece of plain Veroboard and with the fingers insert the pins as in Fig. 6. I leave one space between each pair of pins and seven spaces between the two rows, giving a width of 0.9", which is about right for ¼ watt resistors and miniature capacitors, but you may, of course, modify the spacing as you wish. Having inserted the pins, take a pair of small pliers and press them in firmly, keeping the heads at a uniform height above the board.

Reverse the board and wire up. Tinned copper wire 26 s.w.g. is just right for this; it is easy to work and sufficiently rigid for there to be no danger of the loops 1 and 7 touching each other if bent away in the first place. When there appears a danger of wires touching, slip a piece of sleeving over one of them.

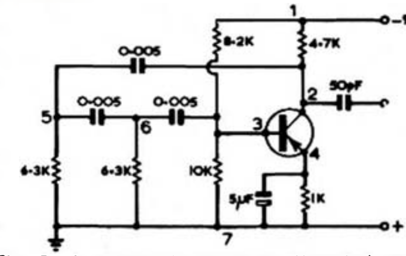


Fig. 7.—A phase-shift oscillator. Unmarked units are kilohms or microfarads.

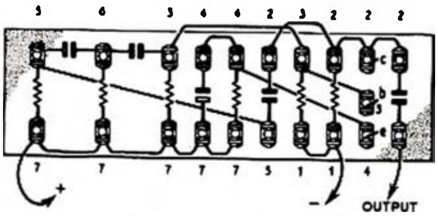


Fig. 8.—Group-board layout of phase-shift oscillator.

If you are ultra-cautious, restore the board to its original position and with an ohm-meter check that the pins are connected as in Fig. 6. This should reveal any dry joints.

Nothing remains now but to check all components (**yes!**) and solder them into position as in Fig. 6.

The method is fool-proof—but I admit there are fools **and** fools!

I think one should refrain from connecting components across the board between separated tags, as is a very common practice, but there are times when a departure from this rule can be advantageous. A good example is the phase-shift oscillator, Fig. 7. Here connecting the two 0.005 uF. capacitors between the ends of the resistors (see Fig. 8) is obviously economical of space, time and wiring and by allowing two spaces between tags 5, 6 and 3, instead of the usual one on the plain Veroboard, the fitting-in of the components becomes physically easy.

If you build this phase-shift oscillator, don't forget you **must** use a high-gain transistor to overcome the attenuation introduced by the three phase-shift circuits.

PRINTED CIRCUIT

And so we come to what many regard as the ultimate in lay-out difficulty—the printed circuit. Using our methods, this involves no more difficulty than the other layouts, but does require a little thought and care in arrangement.

Turning again to our audio amplifier, Fig. 1, we first evolve the tag-board layout of Fig. 6. This obviously cannot be used as it stands for a printed circuit as two leads cross, but it is a simple matter to re-arrange them as in Fig. 9, from which is immediately derived the printed circuit of Fig. 10. Place a piece of tracing paper over Fig. 10, trace it, reverse the paper, mark through on to the copper foil of the printed circuit and you are all set for etching, drilling, etc.

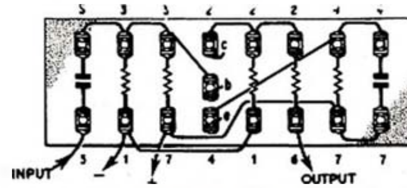


Fig. 9.—The group-board wiring of the simple amplifier modified for printed circuit.

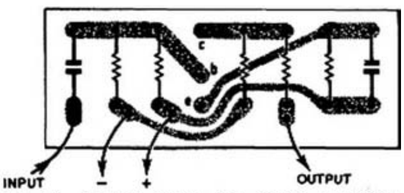


Fig. 10.—Printed circuit for simple amplifier.

Similarly the circuit of the phase-shift oscillator first becomes the tag-board of Fig. 8 and is then easily transformed into the printed circuit of Fig. 11.

With a complicated circuit you may easily find that the avoidance of crossing wires involves a complicated circumperambulation all over the board, or is altogether impossible. This may be sometimes cured by a simple re-arrangement of the components; but a very simple, and always certain, cure is to solder a link of insulated wire between the two points to be connected.

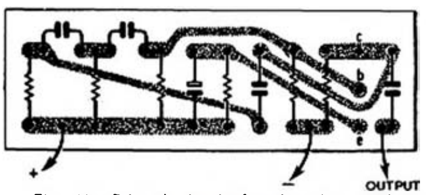


Fig. 11.—Printed circuit for the phase-shift oscillator.

Using the above methods, especially the first two, I find myself much freer to experiment when an interesting circuit swims into my ken. Unless it is complicated, I can have the circuit built and working in an hour—often in half an hour. I usually confine my construction now to the tag-board method, and if the finished item is not needed to be retained, the components are easily unsoldered and ready for use again, all leads cut to the right length, tinned and ready to be soldered directly into the next bit of equipment built.

JOE

A. J. C. THOMPSON, VK4AT*

People appear to think that staid people like myself should be playing bowls instead of taking up Radio. They even ask for details of the events that led up to the decision of selecting such an unusual hobby.

Actually those circumstances occurred in my far distant youthful days. It has just been the fear of doubts being cast on my veracity that has kept me quiet for so long.

Being home from College on holidays at one time, it was rightly assumed that I knew all about electricity. It was no surprise to me that I was chosen by some vegetable-growing foreign-born citizens to explain the mysteries of an electric fence that they had recently acquired. These things were mysteries to all at that time, including myself.

Having mastered Ohms Law and the art of throwing switches, little things like electric fences would be nothing to me.

In a dignified manner I ushered the bashful foreigners into my sanctum.

In a truly professional manner I soon had the cover off.

I remembered then that our College instructor spent a lot of his time warning the unruly members of our tribe on the danger of going up in smoke if we placed our fingers here and also there.

It appeared to be quite a good take-off point. The language difficulty gave me an opportunity to air my French.

"You touchee here, you touchee there, muchee blue sparksie go upski, muchee corpsey plonk go downski."

Charlie appeared surprised at my knowledge of foreign languages, but Joe grasped eagerly at the only word that evidently he understood. He tapped his red shirt all smiles, "Blue Blue".

I patiently explained to him that it was only in France that blue was red. It was evident, at this stage, that the language business was going to be tough.

I tried a new tack. I connected up the gadget to the battery according to the instructions and off it went, tick, tick. I pointed to the little spark on the points, but they made it clear that they desired big sparks.

I remembered then that our teacher lined the whole class up, and then put a little tingle through all our fingers as we held hands. He used a little gadget that looked like this.

A couple of 6-inch nails made good handles when the bare wires were attached from the two output terminals. Joe held one and I had the other, while I held his hand to make the circuit. Before I switched it on, I decided that it was a pity to leave Charlie right out of things.

* Skyring Creek, Pomona, Qld., 4568.

After a bit of thought, I decided to improve on the College method. I could let Charlie observe the spark at the same time as Joe felt the tingle. I explained to Charlie, who evidently understood our language, that, instead of holding Joe's hand, I would, instead, make the blue spark go on to his ear from my fingers. This would be at a convenient height where we could observe it easily.

All being set, I approached Joe's ear with my finger, while Charlie and I pressed close to see how far the spark would jump. Joe, with a happy smile, cocked his eyes sideways in the hope of seeing the tip of his ear at the crucial moment.

When I closed the switch things happened quickly. To our astonishment (mine was much different to Charlie's), Joe's ear disappeared upward, with Joe still attached to it. When he came down again he lay on the floor muttering.

Charlie tended him. Mystified, I asked Charlie what Joe was doing down there? Charlie shook his head: "Too muchee blue sparksie". Joe still muttered.

"What is he saying now, Charlie?"

"Him say him understand corpsey now. Him head hit the roof, but him feet stay on floor."

Patiently I explained to Charlie that we ourselves had seen Joe ascend and descend all in one piece. I explained that if I had been holding Joe's ear then he might quite easily have lost it.

At this stage, Joe started threshing around.

"What is biting Joe now, Charlie?" I wanted to know.

"Him want looking glass" was the unexpected reply.

However his wants were easily supplied, but his behaviour was peculiar. Instead of looking at the bump on his head, he was examining himself all over. He even got Charlie to hold the mirror while he rolled over. He then studied his back.

Curiosity got the better of me. "What is he doing that for Charlie?" I asked. The reply explained all.

"Him very worried man. Him afraid him turn round before him head get back on."

We got Joe up and soothed down, but he would not stay. He felt all right but he thought he would just walk home.

Just after he had left, my fond parent arrived with suitable refreshments. She observed Joe's stately walk with some astonishment, then asked Charlie, "What is Joe doing walking like that? And why is he holding his head with both hands?"

Charlie's reply completely mystified her. "Him hold him head on for fear him head fall off again."

These events impressed me greatly. It was quite natural that I should take up Radio after witnessing the strange effects of such electrical gadgets.

I often wonder though if Joe took up Radio too.

HIGH VOLTAGE REGULATORS

RODNEY CHAMPNESS, VK3UG*

THE majority of high voltage regulators seem to use either the old 807 or 6AS7 valves, the first being a rather high impedance valve and the latter a rather expensive valve. There is nothing that could be called new in either of the two regulators that are described below. The first one (Fig. 1) is rather simple and as long as you can stay within the dissipation ratings of the valve currents of up to 75 mA., voltages up to 220 volts d.c. can be obtained, so saving on using series parallel banks of VR tubes for some applications.

The larger regulator (Fig. 2) can supply voltages up to 300 volts at currents up to 200 mA., and with the possibility of even being able to supply currents up to 250 to 280 mA. with the substitution of other series losser valves.

The 6GV8 is a t.v. vertical section valve and has characteristics such that at rather low screen voltages of below 150 volts, it can draw currents up around 75 mA. without the grid approaching closer than a few volts of zero grid bias. The grid bias must at all times remain negative in this and the larger regulator, otherwise regulation ceases.

Consider the operation of the triode section first. The unregulated voltage is supplied through a ½ meg. resistor to the plate. The grid will be at earth potential if the slider is at the earth end of the 50K pot. The NE2 neon lamp will tend to light and will assume a voltage drop somewhere about 60 volts, so the cathode of the valve will be 60 volts positive to the grid and the valve will be cut off. The pentode section will then receive positive grid voltage via the ½ meg. resistor, causing this valve to conduct heavily, which will mean that the cathode will be about the same potential as the grid. However, this will not be the same as the unregulated h.t. as the grid current will cause a voltage drop across the ½ meg. resistor.

If now the slider across the 50K pot. is removed from the earth end of the travel to mid travel, so that the slider is sampling about quarter of the voltage present at the pentode cathode, the regulator will now be operating. As the cathode of the triode is at about 60 volts positive, the grid will be about 55 volts positive in approximate figures and drawing a certain amount of current which will be causing the plate voltage to settle at about 200 to 215 volts, depending on the current being drawn from the regulator. This voltage is applied directly to the grid of the pentode and the cathode will assume a voltage from 5 to about 15 volts more positive, depending on current drain, so giving the pentode a negative bias of this amount. The cathode will be approximately at 220 volts due to the voltage divider arrangement in its cathode circuit. If the slider is at the top of the pot., it will be sampling half the voltage of the output to the triode grid, which will still be at about 55 volts and so the cathode of the pentode will now assume about 110 volts positive, as its grid will be about the 100 mark, plus or minus a few volts depending on the current drain.

Now assuming the pot. is set such that an output voltage of 200 volts is obtained at 5 to 10 mA., the triode grid will be about 55 volts and the triode plate pentode grid will be about 185 volts. Now the load is increased to say 60 mA., the output voltage will tend to drop, causing the voltage on the grid of the triode to drop, so causing it to conduct less and the plate voltage to rise. As the pentode grid is directly connected its grid voltage will rise or its negative bias will become less, causing the valve to conduct more and so restore the original output voltage. This output voltage can also be maintained at a constant voltage with variations in the unregulated supply voltage input.

The main things to remember with this simple supply are that the minimum difference voltage between the unregulated input, and the regulated output, should be at least 120 volts and that the current is not to exceed 75 mA. and that the output voltage is not to exceed 220 volts, unless the heater of the valve is supplied from a separate supply, as the cathode-heater maximum voltage rating is 220 volts. The plate dissipation rating of 9 watts should not be exceeded.

The resistor potentiometer in the pentode cathode circuit can be altered to suit a specific design need. The unregulated supply input will determine to a certain extent the output voltage. The NE2 neon can be replaced with a zener diode of about ¼ watt rating, 60 volts, or nearest convenient voltage. Using a zener in the cathode will mean that the output voltage will drop should the current drain be such as to cause the pentode to draw grid current. As soon as the excess load is removed, the supply will resume normal operation.

With the neon lamp, however, this is not the same. If the pentode draws grid current, the neon will drop out of conduction and the voltage drops. If the load isn't dropped much below overload, the voltage will then go high by perhaps 40 to 50 volts. As the neon requires perhaps 90 volts to ignite it, the plate voltage will not rise enough, as the pentode will still be drawing grid current because of this "new 90 volts" reference voltage causing the supply to think it has to supply 50% more output voltage. With this higher output voltage, more current is drawn by the supplied unit and more or less locks the regulator out of regulation. For this reason a zener diode reference source is preferred.

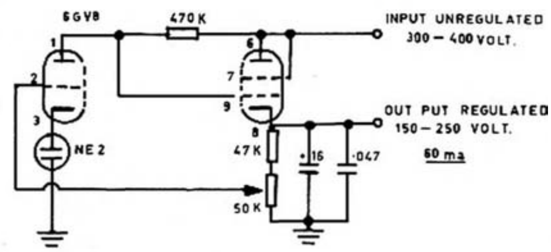


FIG. 1 60 Ma REGULATED SUPPLY.

As a point of interest, f.m. caused on one variety of s.s.b. transmitter is from this reason. The transmitter is incorrectly tuned, causing excess screen current to be drawn by the screen on speech, the regulator goes out of regulation, sometimes staying out as the screen draws high standing current when the voltage jumps to 200 volts from 150 volts. The v.f.o. is on the same 150 volt line, so is it any wonder that the v.f.o. jumps around in frequency. The regulator doesn't always lock out and the result is a beaut case

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TECHNICAL ARTICLES

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of f.m. How to cure this? Tune the transmitter properly.

Now we turn to the larger of the two supplies (Fig. 2). This is designed around t.v. line output valves such as the 6CM5 in this instance, although I feel a 6DQ6 could be better due to higher plate dissipation. The reason for the choice of these particular valves in preference to the old and trusty 807 is simple. The screen of the series losser is virtually connected to the plate, the 807 requires about 300 volts for it to draw reasonable current, but the likes of the 6CM5 require only 100 volts or a little more between plate/screen and cathode to draw identical currents. This simply means that with an 807 as the series losser, an unregulated input of about 600 volts will be needed for a 300 volt output, whereas with the 6CM5 a 400 volt unregulated supply could be sufficient. This is considerably more economical on power and cost of the necessary transformer iron.

of 100 volts, so be warned! There is no worry in regard to the 6AU6 cathode-heater rating as the voltage is only about 60 volts across these two, which is well below the allowable maximum.

Layout of parts for the supply is not critical, except to make sure the losser valves have adequate ventilation.

Considering that the 6CM5 valves are only rated at 13 watts each, the estimated current drains must be calculated so that the valves are not ruined. With 400 volts input and 300 volts output, we have a drop of 100 volts. This means that W (watts) = I (current) × E (voltage); in this case W is 26, E 100, therefore I is 26 ÷ 100 = 260 mA. maximum current. With an output voltage of 200, however, I = 26 ÷ 200 = 130 mA. maximum current. In between voltages will mean different output currents.

Using 6DQ6A valves which have a 5 watt higher dissipation, will mean at the lower voltages more current can be drawn. In the case of 200 volt out-

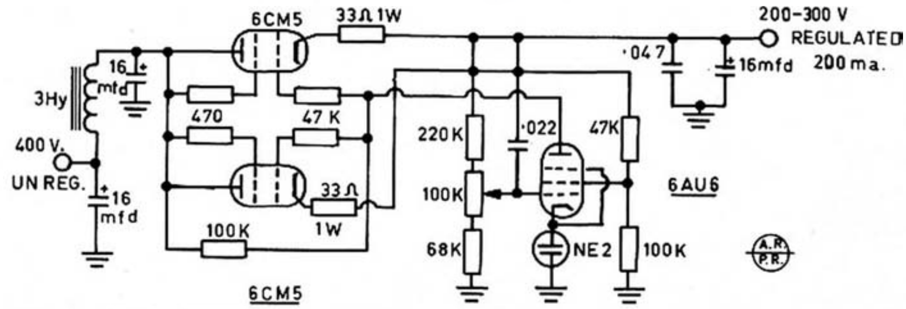

FIG. 2 200 Ma. REGULATED SUPPLY.

There are a few noticeable differences between this larger supply and the smaller one. It will be noticed that the screen and grid of both series losser 6CM5 valves have stoppers in their leads. This, strange as it may seem, is absolutely essential in many cases, particularly when two valves are paralleled. Even though this is a supposedly d.c. circuit, these valves take off very effectively at all sorts of odd frequencies, up to at least the 14 Mc. band, and the regulation just doesn't work. The 33 ohm resistors in the cathodes of the two series lossers is for current equalisation, so that both valves take approximately the same current. Without these resistors, one slightly seedy 6CM5 would let its fellow take most of the current and go red in the face.

The 0.022 uF. capacitor from regulated output to regulator control grid (6AU6) is designed to inject some hum from the regulated output into the regulator circuit to improve output voltage filtering. Another way of achieving the same thing is to break the 100K ohm resistor between the 6CM5 plates and the 6AU6 plate into two 47K ohm resistors with an 8 uF. capacitor connected to the junction of the two resistors and the other end to earth.

The only other point to note is that for 6CM5 valves, or whatever valves of this type used, a separate filament supply will be necessary that is not tied to ground, as the heater-cathode rating of these valves is only of the order

put, the current maximum is 180 mA., although I feel these particular valves are rather conservatively rated and you may, with experimentation, just to see how they take it, try them at 200 mA. on 200 volts. I've seen some of these 6DQ6A valves take a thrashing in s.s.b. linears, and have run personally 80 watts c.w. to one without an ounce of trouble. This was with the unit running into dummy load for minutes on end with the key down and not a sign of red gills. The 6CM5 and 6DQ6 have identical pin connections, so can be interchanged with little trouble.

This article on voltage regulators will perhaps help some to get away from the feeling that banks of VR tubes are necessary to handle large voltages and currents. Both supplies work quite well although I feel currents in excess of 200 mA. may cause poor regulation at high output voltages with the large supply and no higher than 75 mA. in the case of the smaller, although 60 mA. may be a safer figure for best regulation.

A variant of the smaller supply is used quite a bit in some Yaesu Musen equipment. The larger supply is an adaption of a supply published in Radiotron Designers Handbook.

One very desirable feature of these types of supplies is that you are not tied to a definite regulated output voltage as by just varying the position of the slider on the voltage control potentiometer, a reasonable range of output voltage can be obtained.

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Note: Cert. No. 102 shown last month should read VK2AXI not VK4SD.

Amendments:

VK2AAK	270/275	VK4UC	199/199
VK3ZE	237/240	VK3AMK	185/185
VK3ACD	232/235	VK4RF	155/155
VK4PX	216/217	VK3SX	145/148
VK4MY	202/202	VK4SD	114/115

C.W.

VK3AHQ	301/315	VK2APK	274/282
VK2QL	300/323	VK3YL	271/288
VK3CX	289/312	VK3XB	270/287
VK4FJ	289/314	VK3ARX	269/278
VK4HR	285/307	VK6RU	266/289
VK2AGH	282/296	VK3NC	263/286

Amendments:

VK3RJ	246/260	VK4RF	135/147
VK4MY	152/152	VK4PX	104/106

OPEN

VK6RU	314/339	VK6MK	304/324
VK4HR	313/338	VK2EO	302/325
VK2AGH	312/332	VK4FJ	297/322
VK2VN	308/325	VK2APK	294/305
VK4SD	306/321	VK3ARX	292/301
VK4TY	306/321	VK4KS	288/307

Amendments:

VK3NC	264/287	VK4MY	226/226
VK4UC	246/247	VK4RF	199/211
VK3ACD	232/236	VK3SX	154/157
VK4PX	232/237		

The W8NWU Teeter Totter Tuners*

JOHN J. SCHULTZ, W2EEY/1

● The author's article on T Networks in the "CQ" issue of May, 1968, resulted in correspondence with various Amateurs who developed T Network designs. One of the most interesting variations on the theme of T Networks was W8NWU's series of tuners.

THE original article on T networks mainly emphasised their low-loss possibilities and their application in matching relatively short antennas on the low frequency bands.

W8NWU found a much wider application possible for this handy network, including usage at v.h.f. frequencies where the components for other networks may become trickier to adjust. He also found various inexpensive sources for the components that could be used in a variety of the lower frequency versions of a T network.

THE BASIC TEETER TOTTER

Fig. 1 shows the basic T network which was named the Teeter Totter. If both the input and output impedances are the same, the value of both capacitors will be the same at resonance. When the output impedance is greater than the input impedance, the value of the capacitor in the output leg will decrease to match the higher impedance at the output while the value of the capacitor in the input leg must increase in order to keep the combination of the two capacitors and the coil in resonance. When the output impedance is lower than the input impedance, the opposite setting of relative capacitor values is necessary. This seesaw action of the capacitor values resulted in the Teeter Totter name.

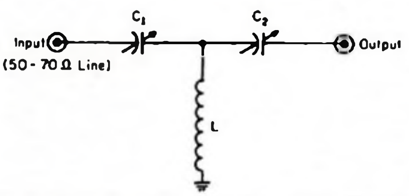


Fig. 1.—Basic Teeter Totter version of a T network.

The circuit was tried on 80 through 2 metres. The range of impedances that can be matched depends upon the tuning range of the components used, but it will cover at least 4 to 1. That is, with a 50 ohm input reactive impedances from at least 12 to 200 ohms can be accommodated.

A typical circuit for use on 80 metres was constructed using a 20 uH. coil and two 140 pF. variable capacitors. The unit was constructed in a small aluminium enclosure using the components that were available from a surplus BC375 tuning unit. Although no power tests were tried, it would seem that the spacing of these capacitors and the heavy coil would allow operation with even a kw. rig. Fig. 2 shows the construction used.

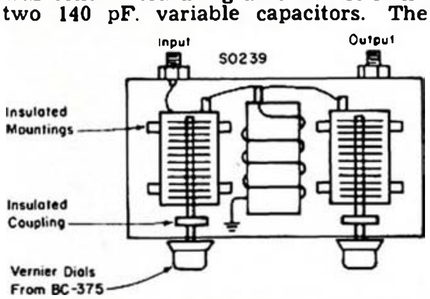


Fig. 2.—Construction of the network of Fig. 1 for 80 metres. Both capacitors are 140 pF. units from a BC375 tuning unit. The inductor can be a 20 uH. unit air wound from 1/8 inch copper tubing or wound on the ceramic form in the BC375 tuning unit, double spacing all but four turns at one end of the ribbed form.

CIRCUIT VARIATIONS

In order to eliminate the need for having to insulate the two variable capacitors from ground, the circuit of Fig. 3 was developed. Basically it works the same as the circuit of Fig. 1 except that it is a half-wave instead of a quarter-wave circuit. The proportionate amount of inductance in each leg varies according to the impedance ratio being matched while the impedance at the point where the variable capacitor is connected remains infinite. The range of impedances which can be matched is again at least 4:1.

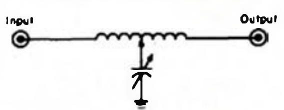


Fig. 3.—A variation of the basic network which allows use of a capacitor with a grounded rotor.

A simple procedure is possible to initially determine the coil and capacitor values. Both ends of the coil instead of being connected to any external circuit are grounded, each through a 50 ohm resistor (for use in a 50 ohm co-axial line at the input). The capacitor is placed at the centre of the coil. Then a grid dip oscillator is loosely coupled to the coil and tuned to the band of interest. The coil is symmetrically dimensioned and the capacitor value adjusted for resonance. The resistor representing the output load can be replaced by different values and the resistive range which the circuit can match determined as the components are resonated again for each different load value.[1]

Fig. 4 shows the construction of such a tuner for use on 80 metres. The contact on the roller inductor must be modified to permit a separate lead to the variable capacitor. By removing the two t.v. doorknob capacitors, which are in series, from their parallel connection to the variable capacitor, the same component values will work on 40 mx.

Low power versions of the circuit, particularly for use on 10 metres, have been constructed using XR-50 coil forms and 25-50 pF. receiver type variable capacitors. Such a circuit constructed in a minibox would be particularly useful, for example, at the base of a fixed station or mobile vertical antenna which didn't present an exact match to the type of co-axial line that was available. When the impedance transformation was not too great, as it would be when going from a 30-36 ohm whip base impedance to a 52 or 70 ohm co-axial line, no re-tuning of the circuit is necessary over any major segment of a band. Instead of a variable capacitor being used, the slugs in the coil form could also be used for tuning and a fixed 47 pF. mica capacitor used.

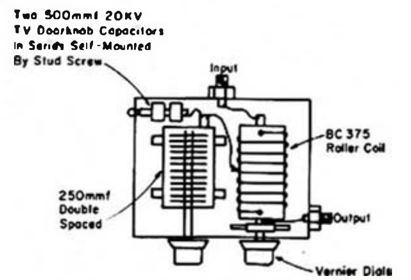


Fig. 4.—Construction of network of Fig. 3 for 80 or 40 metres utilising mainly BC375 components.

MULTIBAND VERSIONS

Multiband versions of either form of the network can be constructed as shown in Figs. 5(A) and 5(B). Which circuit is best is a moot question and the choice must be left to the individual builder. Each circuit has various constructional advantages and disadvantages. The circuit of Fig. 5(A) requires two insulated capacitor mountings but the dissipative losses in the capacitors may be less than in the inductors of Fig. 5(B). The arm of the inductor bandswitch can be grounded thus lowering its insulation requirements. The single capacitor of Fig. 5(B) is certainly easier to mount on a chassis. However, the insulation requirements of the inductor bandswitch, if it is mounted on a metal panel, may be rather high when a high impedance is being matched at the output.

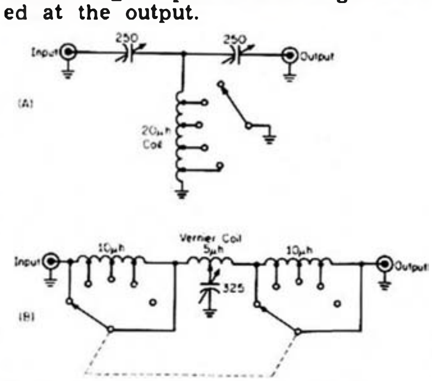


Fig. 5.—Two methods for constructing bandswitched couplers. Typical values are shown which should allow complete 80-10 metre coverage. Coil taps must be found by experimentation for each band.

[1] You may use a low power exciter and s.w.r. meter to the network's input.

* Reprinted from "CQ," February, 1969.

AUSTRALIS OSCAR 5 PROGRESS REPORT

*RICHARD TONKIN**

The launching into orbit of the **Australis Oscar** 5 satellite has been delayed by problems with the launch vehicle with which it is hoped the satellite will hitch a ride into space. However, it seems likely that the launch will occur before the end of the year. Latest launch information may be obtained by listening to the weekly W.I.A. Divisional broadcasts.

AMSAT have now completed the pre-launch tests on the satellite, which have been under way since May. The satellite has passed the rigorous vibration and thermal vacuum tests very successfully and it is now considered ready for launch.

A problem which arose in the command receiver ("A.R." November 1969, page 19) has now been at least partially corrected and it seems likely that the 29.450 Mc. transmitter will be switched **on** at about 0700 GMT each Friday and **off** at around 0700 GMT each Monday. This, of course, will conserve the satellite's chemical batteries and will enable both transmitters to operate for a longer period.

Final alignment of the satellite's transmitters resulted in the following power outputs:

29.450 Mc. transmitter	180 mW.
144.050 Mc. transmitter	120 mW.

These power outputs will gradually decrease as the battery runs down. It is expected that the 2 metre transmitter will operate for about six weeks and the 10 metre transmitter for more than eight weeks (at week-ends only).

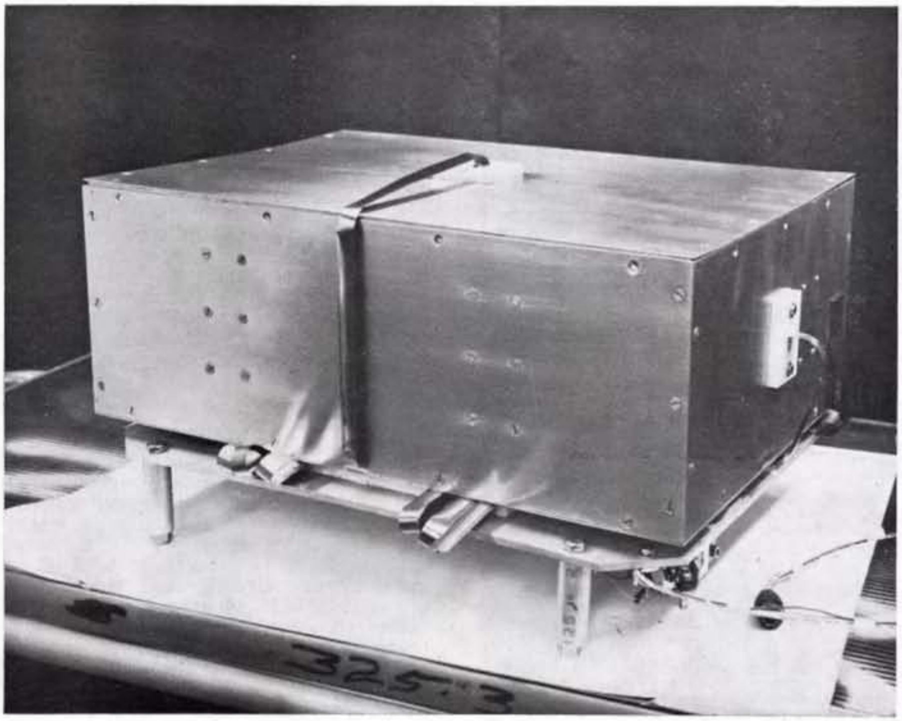
Amateurs and S.w.l's intending to track the satellite should read the following articles which have appeared in "A.R.":

Australis Oscar "A"—Users' Guide, February 1968, page 3.

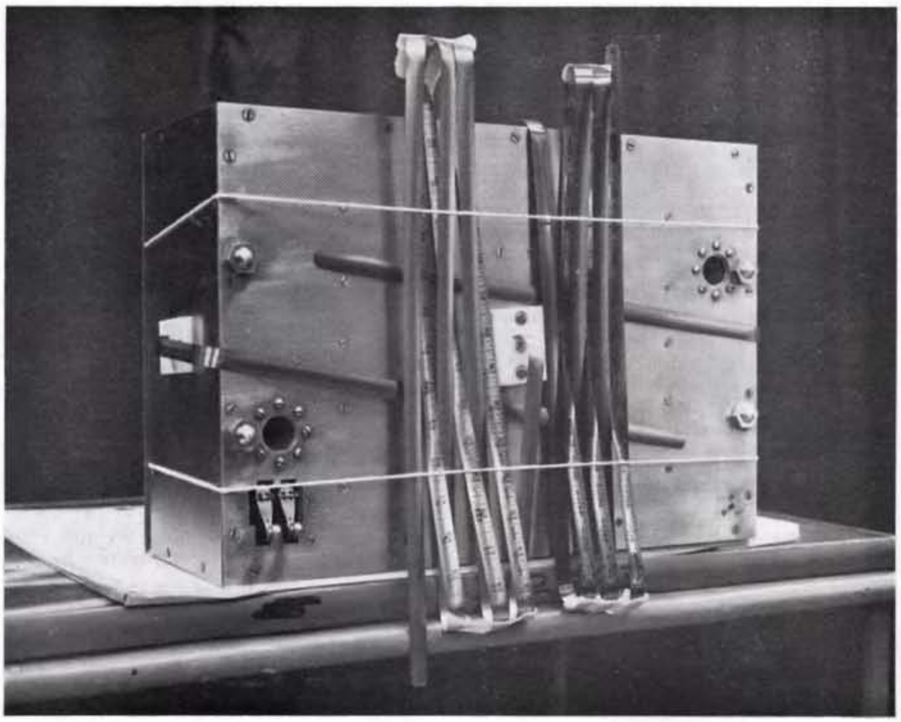
Australis Oscar "A"—Users' Guide, Part Two, March 1968, page 10.

Australis Oscar 5 Satellite Ready for Launch, Oct. 1969, page 7.

The telemetry calibration graphs which appeared in the October 1969 issue of "A.R." are the ones which should be used by those tracking the satellite. Additional copies of the calibration graphs, telemetry reporting forms and information on when to listen for the satellite may be obtained from the Oscar State Co-ordinators, whose names appeared on page 7 of October 1969 "A.R."



The Australis Oscar 5 Satellite in launch configuration.



Antenna folding pattern.

* Chairman, Project Australis, 5/39 Tooronga Road, East Malvern, Vic., 3145.

OBSERVATIONS FROM AUSTRALIS OSCAR 5*

JAN A. KING, K8VTR

While tracking a satellite is an important and interesting Amateur activity, it is far from being the main objective of **Australis Oscar** 5. This is a telemetry satellite and reports information about itself as well as its environment; the former is useful to designers of future satellites and the latter gives data for ionospheric propagation and space research. Project Australis-Oscar and AMSAT need this information from every Amateur listening to the satellite. Some suggestions for observations are given below:

1. **Acquiring the satellite.**—Generally, listen for the 2 metre beacon before trying the 10 metre beacon, which may be **on** intermittently or only during week-ends. Observe telemetry channel 1 to see if the 10 metre beacon is **on**; a current of 50 to 60 mA. (during the first month of operation) indicates the beacon is **on**, while 25 to 30 mA. shows it is **off.**

2. **Temperature record.**—Keep an accurate record of the temperature (channels 5 and 7) during each part of a pass. Overhead passes will occur at your location around 1500 local time every day. Data for these and other passes is of interest for the thermal designer of future satellites. Of great interest is the temperature during the North-South pass at 0300 local time daily, when the satellite will be going through a dark (colder) period. Another useful measurement is the difference in temperature between the skin and inside of the space craft.

3. **Horizon sensor.** — This experiment is a first for Amateur Radio. Three horizon sensors are mounted on the satellite with the following alignment:

X axis sensor—parallel with the 2 metre antennas.
Y axis sensor—perpendicular to all antennas.
Z axis sensor—parallel with the 10 metre antennas.

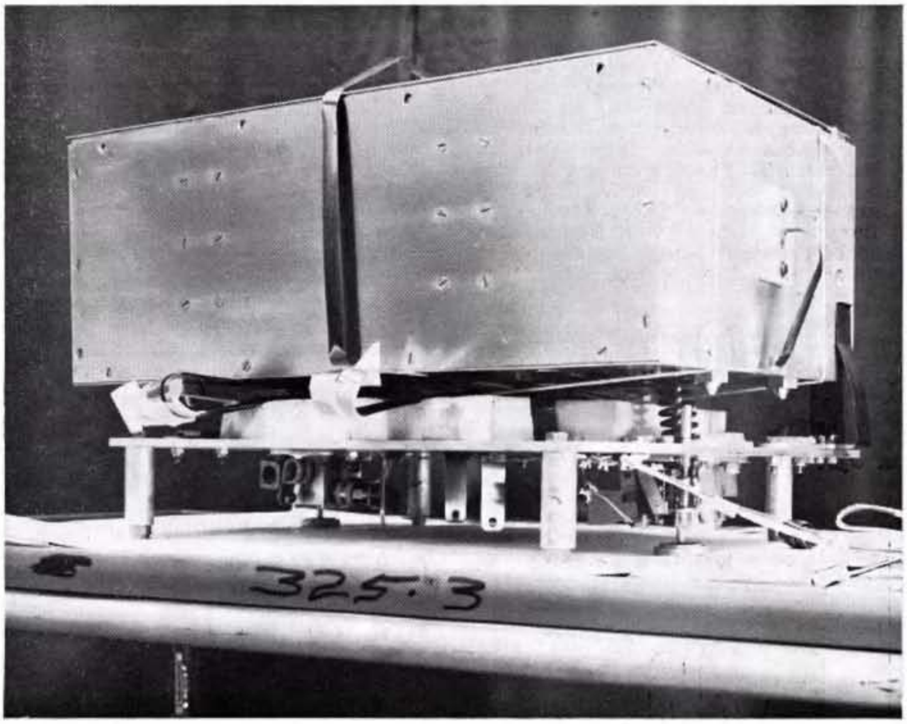
When a sensor is not viewing the earth, the telemetry channel emits a tone between 510 and 640 cycles; when it views a portion of the earth, the tone will be higher, probably around 1000 to 1200 cycles. Measure these values for each axis and add them to your telemetry report.

A word of caution. If the satellite spin rate is high about a given axis, one or two sensors may have an **on** time shorter than the duration of the sampling period. In this case, be careful not to confuse the **on-off** transition with a telemetry channel change. Probably the spin rate around the Z axis will be slow (about 4 r.p.m.), but confusion may sometimes arise even at this slow rate.

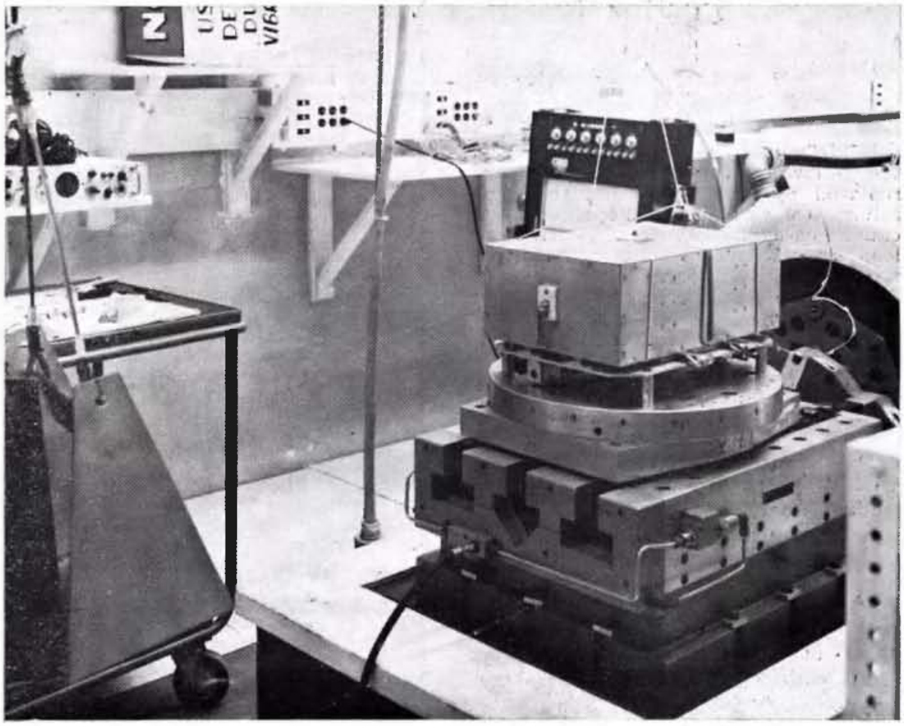
Occasionally a short transition may occur on one of the sensors as it sweeps across the sun or the moon. Note the

(Continued on Page 24)

* Reprinted from "AMSAT Newsletter," October 1969.



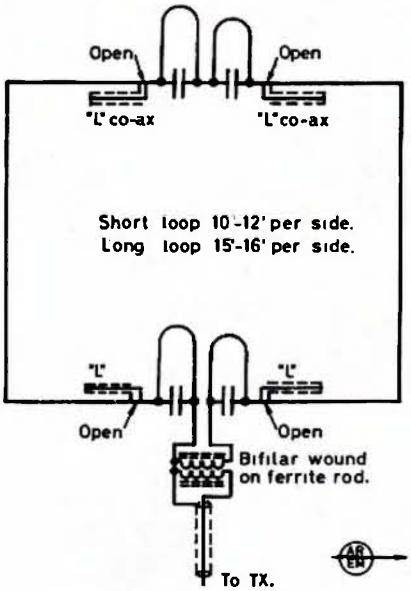
Satellite on separation plate. Note separation spring.



Vibration test configuration.
Photographs by courtesy of National Aeronautics and Space Administration

More on the Single-Loop, Triband Cubical Quad Beam Element

Experiments have shown that the energy transfer from the feedline to the radiator quad element can be greatly improved—especially on 10 mx—if a simple ferrite transformer is installed between the lower pair of tuned circuits. The ferrite is a 2" long ½" diameter rod, like those used for balun transformers. Three turns each bifilar and tightly wound insulated wire of sufficient gauge for the power used are wound on to the rod.



DJ2UT used with excellent results the following version: The coils are replaced by wire loops and the capacitors are formed by pieces of open ended co-axial cable. The radiator loop has 15 feet and the reflector 16 feet per side, this larger loop gives of course more gain and less "L" is needed for the tuning coils or loops. With the larger loop it was necessary to have a similar set of tuned circuits at the bottom and at the top of each quad loop, to prevent the radiation lobe on 10 metres from showing to one side.

The same tuning units were also used by him with a small loop, by extending it with four pieces of co-ax. (the far end short-circuited) instead of loading coils near the tuning units.

JA1BHG described in the JA Amateur magazine the translation of my "A.R." paper and his successful experiments with several forms of the single loop quad. Dimensions and s.w.r. graphs were published. Sorry, I can't read the JA text.

—H. F. Ruckert, VK2AOU.

PROVISIONAL SUNSPOT NUMBERS

AUGUST 1969

Dependent on observations at Zurich Observatory and its stations in Locarno and Arosa.

Day	R	Day	R
1	175	16	46
2	182	17	38
3	161	18	32
4	174	19	29
5	158	20	23
6	134	21	38
7	126	22	46
8	96	23	62
9	105	24	66
10	90	25	75
11	73	26	90
12	60	27	98
13	47	28	107
14	50	29	124
15	62	30	138
		31	114

Mean equals 90.9.
Mean for February 1969: 107.6.

Predictions of the Smoothed Monthly Sunspot Numbers

November 93 — January 90
December 92 — February 89

—Swiss Federal Observatory, Zurich.

PROVISIONAL SUNSPOT NUMBERS

SEPTEMBER 1969

Dependent on observations at Zurich Observatory and its stations in Locarno and Arosa.

Day	R	Day	R
1	81	16	107
2	76	17	110
3	72	18	110
4	67	19	69
5	62	20	49
6	69	21	63
7	63	22	85
8	68	23	85
9	40	24	88
10	45	25	112
11	64	26	115
12	67	27	123
13	82	28	110
14	75	29	88
15	105	30	81

Mean equals 81.0.
Smoothed Mean for March 1969: 105.3.

Predictions of the Smoothed Monthly Sunspot Numbers

December 87 — February 84
January 85 — March 82

—Swiss Federal Observatory, Zurich.

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Transistors on Computer Boards—Some Further Thoughts

R. L. GUNTHER, VK7RG*

In Part 1 of this series ("A.R." Aug. 1969) were described the approximate electrical characteristics of the transistors which have been found on computer circuit boards. It is possible that other types will be discovered, but those were the only ones we saw, out of many thousands examined. In the following discussion, I shall investigtae related topics in somewhat more detail.

ILLEGIBLE NUMBERS

From time to time the number designation has been rubbed off the top of a transistor. There are several ways to meet this problem.

(1) Compare the board with others. If an identical configuration of parts is found, numbers may be read from the other board.

(2) Do a few simple tests: PNP/NPN, BV_{EBO} v. BV_{CBO}, BV_{CER}. That will tell you the polarity, whether the transistor is alloy junction (e.g. 033, 083) or alloy diffused (e.g. 015, 065), and whether it is likely low power (e.g. 033) or medium power (e.g. 030).

(3) At the worst, if you don't know the number, it won't matter in most instances, as long as you know the polarity. Most transistors are 033, 083, or similar, and you are not likely to be wrong if you make that assumption. If application is other than that of "general purpose" type, tests could be useful, depending on specific characteristics required. For properties such as low noise or high voltage or high gain, individual testing is necessary in any event.

BREAKDOWN VOLTAGES

There is no need to panic when you see apparently obscure designations like "BV_{CBO}" and related parameters; this is the shorthand of transistor volttage designations, and as we discussed in Part 1, they can be very useful to untangle the voltage rating behaviour of a transistor under various conditions. The main points to be made are these: If resistance in the base circuit is relatively high (e.g. over a few kilohms for ordinary types), the collector breakdown voltage drops sharply, finally ending at BV_{CEO} with infinite base circuit resistance. Unfortunately, there is so much variation in BV_{CER} between individual transistors, there is no way to forecast this behaviour except by testing each unit, if voltage rating matters.

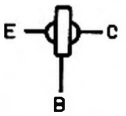
Another point is that voltage rating may matter more often than you believe. If there is an inductive load, collector voltage can rise to alarming levels, particularly if the collector current is pulsed, e.g. in Class C, or even in Class A if the transistor is overdriven on a peak. A peak, that is all it needs if you are too close to BV_{CE}. Take note.

* 32 Waterworks Road, Dynnyrne, Tas., 7005.

The other point where voltage matters is the problem of overdriving amplifiers in Class C; I have discussed this at length in the series on transistor transmitter design in late 1967 issues of "E.E.B.", and in "Amateur Radio" (Sept. 1967, p. 14), and there is no need to go into it further here. But bear in mind that you cannot, without impunity, crank up the drive on a transistor as you would a valve, particularly if the base is already back-biased (even by a base-leak). If you don't believe this, try it on an 015 or 065 with various values of drive and bias; this can be illuminating, and it can also give you a feel of the limits to which you can push these transistors. It is practical in this instance because of the unusually low cost of these items.

These germanium transistors can resist transients somewhat better than silicon, because of their relatively sloppy reverse characteristics, but there is more latitude among the TO-5 case types than in the TO-18 (small) case ones. Owing to their low leakage and high impedance characteristics, the TO-18 types are often as sensitive to overvoltages as silicon; I have punctured them with as little as 3 μA. of reverse current, collector to base. They are best tested by constant-current methods, as described in "E.E.B." for May 1967.

Perhaps you may be interested to know why the BV_{EBO} characteristics of the alloy junction (e.g. 033) types differ so much from all the others. It is caused by the symmetrical arrangement of the collector and emitter dots on the base chip; this causes about the same breakdown level on either side:



The other types all have better frequency response and a much lower base-emitter than collector-base breakdown. This will also be evident from the construction of the diffused alloy types:

This geometry reduces transit times, depletion layers, etc., and improves frequency response greatly. The mesa types are similar, but with part of the collector chip etched away. Planar add further degrees of sophistication; I must write an article about this one day for "A.R." or "E.E.B."

There is a peculiar property transistors show when there is a very high resistance in the base circuit. As collector-emitter voltage increases, the collector current will increase sharply at BV_{CEO}, as one would expect, but it rises faster than it ought. If the power supply is current limited (as with a large resistor), the collector voltage will be seen to increase and whereas collector current increases, the collector voltage will **decrease**. If you continue to increase I_{CR}, second-breakdown will occur, and the junction will vanish. But between these two points, the collector shows a negative resistance characteristic. It seems reasonable to assume that this occurs because, with no external current possible to the base, leakage from the collector forward biases the base, increasing collector current, thereby lowering collector voltage. This property has been put to practical use with computer transistors for an oscillator in a signal injector circuit,[1] and many applications suggest themselves. A similar effect (though for different reasons) can be observed just beyond the zener point of some diodes, allowing them to be used as oscillators! This may be verified quite simply while testing reverse characteristics of a batch of diodes, if you place a small transistor radio near the testing power supply. As you pass the zener voltage, some diodes will cause a noticeable series of squawks or buzzes at r.f., presumably from a kind of tunnel-diode action in combination with distributed inductance and capacitance of the power supply circuit.

On a more serious level, the whole phenomenon of second breakdown is well covered in the "R.C.A. Silicon Power Circuits Manual," beginning on p. 84.

EFFECT OF HEAT ON FREQUENCY RESPONSE AND BETA

Although some of us who were involved with testing these transistors are not wholly in agreement, it is possible that the spread of f_T actually found has been made large by adverse effect of heating while desoldering—or through circuit abuse. This would have the effect of lowering the apparent minimum. Rather, I should say the actual minimum, since once the frequency response has been degraded, the change is permanent.

In any event, we have definite evidence that excessive heat can introduce instabilities, and lower punch-through voltage and impedance. If, then, you want to preserve optimum operating characteristics of the transistors, the minimum possible desoldering heat should be employed. Preferably, high frequency transistors should be removed from boards by sawing them out, leaving some of the printed circuit wiring attached for easy connection. If sufficient board is included with the transistor, it can also provide a simple means of supporting or mounting it.

Beware, therefore, of claims that "circuit board transistors can stand a lot of heat". They can, but may suffer in some respects even though they still

1—"E.E.B.," June-July 1967.

amplify. Indeed, a strange result is that they may amplify even better! (at low frequencies). I performed a number of tests in which transistors were forced to dissipate about 5 watts for several seconds. The result was that the alloy diffused types increased their d.c. amplification factor (β) from 10% to 50%, but the alloy junction types were apparently unaffected. An increase of β, so obtained, was permanent, but slightly too much heating could degrade it suddenly. Presumably the heating decreased the frequency response while increasing the d.c. amplification factor. Amazing!

ACTUAL HIGH FREQUENCY PERFORMANCE

The figures given in the Tables of Part 1 of this series were mostly obtained (by an engineer friend) from actual measurements of f_T, by measuring the slope of h_{FE} with f above $f_{\alpha E}$. It seemed to me, however, that a practical way to evaluate the high frequency performance of a transistor would be to use it in an actual circuit. The simplest way to do this is to make the transistor part of a feedback oscillator. The maximum frequency of oscillation may be taken as a guide to the upper limit of performance of a given transistor. It may amplify up to that frequency, but it certainly won't amplify much beyond it under ordinary experimenters' conditions, because the transistor oscillates in the first instance only because it still amplifies. You can assume that an ordinary Hartley or Colpitts configuration will give the maximum practical amplification/oscillation frequency for a given transistor connected in common-emitter configuration. The maximum practical frequency for a transistor in common-base is suggested by the maximum oscillation frequency of a common-base oscillator,[2] assuming good geometry for both. I take the liberty of reproducing here (Fig. 1) a circuit which has been used[2] for this purpose. When C1 is large (e.g. 100 pF.), the oscillator behaves like a tapped-coil type. When C1 is minimum, the oscillator is essentially parasitic, or common-base type with feedback only via the internal capacities of the transistor. Further details of theory and use may be read in the "Break-In" article, which, incidentally, will be re-printed in "E.E.B."

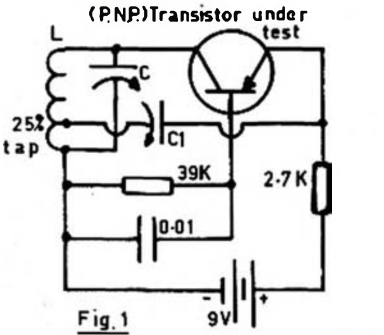


Fig. 1.—Transistor frequency testing oscillator. L/C should be high for best response. C1: See text.

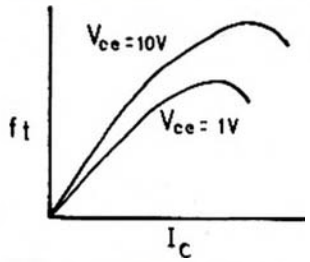
2—"The Common-Base Oscillator, and its Applications," by C. P. Smith, VK2CD, and R. L. Gunther, VK1RG, "Break-In", March 1968, p. 45.

I have called the maximum oscillation frequency so obtained, "f_{osc}". It is not necessarily equivalent to f_{MAX}; the latter is the maximum theoretical frequency at which a transistor will amplify, i.e. when power gain is unity. Because of the usual circuit inefficiencies, P.G. was much likely higher than that for maximum frequency of oscillation here. I did, however, find an apparent relationship between f_{osc} and f_T, as shown in this chart:

Type	f_T* Mc.	f_{osc}* Mc.	F %
Mesa	100-300	25-100	25-40
Alloy diffused	40-100	25-45	25-50
Alloy junction	≈4-20	5-20	80-150

(* At 5V./2mA.)

Here, $F = f_{osc}/f_T$. If F were constant, this relation might allow you to find f_{osc} or f_T if one were known. f_T will be constant for a given type of transistor, within the production limits. But f_{osc} depends not only on f_T, but also on base resistance and collector capacitance. Since each of these can vary widely from one transistor to another, our engineer friend maintains that there is no great value in finding values for F. In addition, he points out that f_{osc} will also depend on the matching of the oscillator to the input and output impedance of each transistor.



Effect of collector voltage and current on f_T.

Although this is true, I maintain that there is a consistent pattern of F for a given transistor type, as shown in the above chart, and that f_{osc} is a useful parameter because of its obvious practical value.

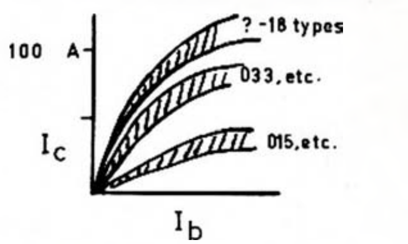
From the chart it may be seen that F is about the same for the first two types, but that f_{osc} is about the same as f_T for the low-frequency ones. This has practical value, because it shows that appreciable performance can be obtained even from the "low frequency" types (compare with OC71!), and that the oscillator performance of the high-frequency transistors is not as impressive as the range of f_T appears to indicate. Indeed, the TO-18s appear to be only slightly better than the TO-5s at I_C = 2 mA., even though the f_T of the latter is considerably higher. It is quite possible that this was caused by inadequacy of design of my test oscillator, but again this is the actual, not the ideal situation, therefore useful for you.

On the other hand, it is essential to realise that frequency response of a transistor depends on collector voltage and collector current. This may be seen readily by observing the gain-bandwidth product curves of various transistors. Owing to the varicap properties of the junctions, f_T increases with voltage, and increases to a maximum with current. The latter behaviour is well illustrated by the curves of Fig. 2 of the preceding article; f_T of a given type 153 went up from 270 Mc. at 1 mA. to 500 Mc. at 5 mA., and likely even higher at 10 mA; for that same transistor f_{osc} was 240 Mc., just about the limit of my absorption wavemeter (used to measure the frequency of the test oscillator).

Since the average power dissipation limits of the TO-18 mesa types must not be exceeded, it is evident that their best response will be obtained under pulsed operating conditions (10-30 mA.), not surprisingly the condition found in computers. It would also apply to Class C, but most of the 20-18 types have too low a voltage rating for effective use in transmitter stages. They will work well indeed in receiver and instrument applications, and best with moderately high currents, as long as they do not become too hot. But they are best in their use as switches.

Conversely, because of the relatively constant f_T (with I_C) of the TO-5 alloy diffused types (015, etc.), they are not suitable for high speed switching in computers, because they saturate at low currents (e.g. 20 mA.), although they make good high frequency amplifiers. The alloy junction types (e.g. 033) do not saturate until currents of 100 mA. or so are reached, but their transient-response time is not good enough for use in switching circuits; they make lovely amplifiers, though. Unfortunately, data books do not always stress this difference between switching and amplifier behaviour, and even professional engineers can make the wrong choice (or so I am told by a professional engineer).

Saturation characteristics



In summary, f_{osc} will often be a better guide to actual performance of transistors in a real circuit, than will f_T, though one must remember that it does depend on V_C and I_C, and that amplifiers may oscillate better than they will amplify at some high frequency—a fact which is well known to all students of Murphy's Law.[3] The performance of the amplifier will also be highly dependent on geometry, neutralisation, and unilateralisation. This matter has been discussed in 1967 issues of "E.E.B." and will be the subject of a forthcoming article in "A.R." Under optimum conditions, a rule of thumb would say that the maximum useful common-emitter frequency (e.g. P.G. = 10 db.) will be found at quarter to half f_T, depending. But this is only useful if you know f_T.

3—If something can go wrong, it will!

SPREAD OF CHARACTERISTICS

Our engineer friend suggests that one reason for the wide variation found within a given type may be that some of the transistors developed faults during use, which made them unsuitable for computer use. After all, that is likely one of the reasons why the boards have been declared surplus in the first instance. It is possible that "typical" values lie above the pessimistic minima we have shown, and the results of our averages imply this. But again, the fact remains that these minima are the real values encountered by the experimenter stripping the boards. A transistor which may be degraded[4] for computer use may be perfectly satisfactory for an experimenter, for many applications—as long as he is not building a computer!

In any event, the wide spread of characteristics within a given type makes nonsense of any attempt to specify commercial equivalent types. There is a superficial resemblance between the alloy junction types and the 2N1302-9 series; and alloy diffused types and 2N1300-1, 2N1654 or 2N1683; and the mesa types to 2N705, 2N711, 2N971 or 2N1204. The situation, however, of the connection of collector or base to case, and the fact that it is difficult to find adequate agreement with an average of important parameters, leads us to believe that these are special computer transistors manufactured specially for the purpose.

Since there is often more variation of characteristics with a given type number than between type numbers, and since these transistors appear to be special types, there seems little point in trying to find a specific type number that they can replace. The only sane procedure is to ascertain the principal characteristics of a transistor in a given circuit, and then choose computer board transistors which match it most closely. Those characteristics may be found from the various data manuals, or simply by circuit inspection; in an ordinary low power audio amplifier, virtually any of the transistors will work, having the correct polarity. In a circuit amplifying 1 Mc., the alloy junction types will suffice; for 10 Mc., the alloy diffused types; for 100 Mc. at low voltage, the small mesa types; above that use commercial transistors.

Even the difference between silicon and germanium is not always large. It may alter the bias requirements a bit, but this is easily done. In base-stabilised circuits, the germanium would need about one-quarter volt less base voltage than silicon. If the bias was not altered, the effect would be to increase the collector current of the germanium unit somewhat.

It is not really necessary to dwell on this matter of replacement, but I mention it only because I am constantly approached by desperate young men who must know "what shall I use to replace the transistor in this circuit; I can't buy it locally?" They look startled when I say that "it probably does not matter". In view of the fact that in any handful of transistors you pick up, most of them will work in most circuits, it is truly depressing that manufacturers continue to issue their plethora of type numbers, each differing infinitesimally from the last.

4—C.f. "E.E.B.," May and June 1967, Sept. 1968.

TESTING TRANSISTORS

Throughout these pages we have insisted that the data charts can only be approximate guides to characteristics and that optimum use of a given transistor can only be obtained if you test it. If you test it, you will be able more effectively to design it into a circuit, by the simple rules of the excellent design articles which have appeared in "A.R." and elsewhere.

The extent of your tests will depend on your applications. For a simple LT AF oscillator you can probably take it as-is, without testing (though trouble-shooting is facilitated if you know at least that you are starting with a good transistor). For critical h.f. work, a frequency test is desirable; use the oscillator of Fig. 1, and measure its maximum frequency with an absorption wavemeter (or with a g.d.o. if the test oscillator is just beyond the maximum frequency). For h.t. power supply or r.f. power amplifier work, a voltage test and possibly BV_{CER} test is indicated, particularly if there is appreciable resistance in the base circuit to be used. For a.f., a gain check can show you the best transistors to use when high gain is desirable in a stage (high gain isn't always necessary).

One important property of transistors is often overlooked when testing; the amplification factor (e.g. β) can vary appreciably with different values of collector current; the more linear is the characteristics, the less is this variation (viz., shallower slope, $d\beta/dI_C$). This behaviour is most clearly visualised by examining h_{FE} v. I_C curves from various data sheets, and in lesser degree, from the curves in Part 1 of this series. Therefore, it is better to test a transistor at the current at which it will actually be used, than at some arbitrary level (usually 1 mA.). The conventional 1 mA. figure may be all right for ordinary lower power types, but it tells you nothing about intermediate (2N1038 or 028) or high power (2N301, 036, 042, 2N1100) types. In addition, it may be useful to know the actual linearity of a transistor—as when choosing for units to go into a low-distortion amplifier.

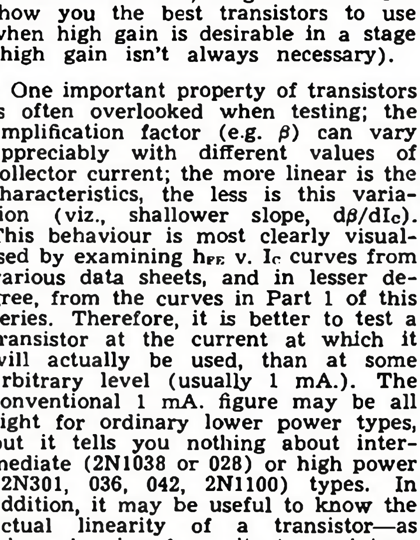


Fig. 2.—Simple transistor gain tester (by L. J. Yelland). For low power transistors, R can be 5K, smaller for higher power; Vcc at least 6v., preferably same voltage as used for test transistor in actual application.

A very clever and useful device for making such tests simply has been suggested by L. J. Yelland, of Melbourne, to whom I am grateful for the circuit of Fig. 2. Tr1 is a standard transistor whose gain is known as a function of collector current (a calibration curve as in Fig. 3 can be kept at hand). Tr2 is the transistor under test. Note that the two transistors must be opposite polarity, but same type (e.g., germanium, same power range, etc.). Where I_1 is the current read on M_1, and I_2 on M_2, R is adjusted until I_2 is at the desired level, whence

$$h_{FE2} = (I_2 \div I_1)\ (h_{FE1})$$

or

$$h_{FE2} = I_2\ (h_{FE1} \div I_1).$$

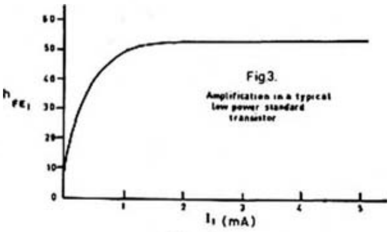


Fig. 3.

This avoids the nuisance of having to measure very small base currents, and measures gain at actual current levels desired, quickly. A calibration curve of gain v. current should be made for each standard transistor, e.g. Fig. 3. From this should be made a plot of $(h_{FE1} \div I_1)$ v. I_1, as in Fig. 4 (merely an example, please note). From the right hand form of the above equation, it may be seen that the d.c. current gain of the unknown transistor (No. 2) can be obtained simply by multiplying I_2 by the fraction obtained from a Fig. 4-type plot. Indeed, for simple general tests, where I_2 is taken at a standard 1 mA., the gain of transistor 2 may be read directly from the ordinate.

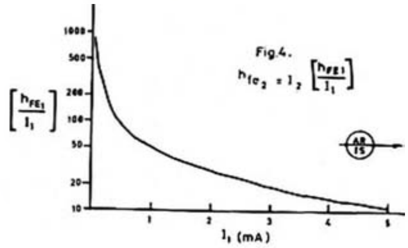


Fig. 4.

I should like to express my appreciation for the help and insights received from R. W. Brown, VK7ZRO, R. S. Maddever of Geelong, Vic., and our engineer friend who has been so patient and helpful.

CHANGE OF ADDRESS

W.I.A. members are requested to promptly notify any change of address to their Divisional Secretary —not direct to "Amateur Radio."

Burglary at VK2WI (Dural) and also at Crows Nest

The New South Wales Division's station at Dural was burglared some time on Thursday night, 23rd October. It would appear that the burglary was done by person or persons with an intimate knowledge of the station and its equipment.

Set out below is a list of items stolen. If anyone knows anything at all regarding the present location of any of this equipment, or if anyone is offered any of the equipment, they are requested to contact Gordon Clarke, Divisional President, by Phoning 94-2353 (work) or 94-6596 (home).

Any information will be handled with the strictest confidence.

1—Pye 20 watt a.m. v.h.f. Transmitter Type P.T.C. 330N, Reference No. 28444G, Serial No. 113. With Type D Crystal for 53.866 Mc.
1—Pye a.m. v.h.f. Receiver Type P.T.C. 3002N, Reference No. 284451, Serial No. 136, with Type D Crystal for 53.866 Mc.
1—Kingsley Type AR7 Communications Receiver, Serial No. 1177, Chassis No. 02625, with "D" band coil box and 2 metre converter.
1—Kingsley Type AR7 Communications Receiver, Serial No. 245B/S1746, Chassis No. 01407, with "D" band coil box and 80 metre converter.
5—Coil boxes for Kingsley Receivers.
3—Power Supplies for Kingsley Receivers, 250 volt a.c., 12v. d.c.
1—829B transmitting valve.
2—Quartz Crystals Type D, frequencies 2247.916 Kc. and 11190.0 Kc.
2—Quartz Crystals Type 5587 holders, frequency 3525 Kc.
2—Quartz Crystals Type 5587 holders, frequency 3573 Kc.
1—Bendix Frequency Meter, Type BC221.
1—S.W.R. Meter, "2WI" stencilled on case.
1—Philips Cathode Ray Oscillograph, "2WI" stencilled on case.
1—A.W.A. Portable Beat Frequency Oscillator, "2WI" stencilled on case, Type 4R7490, No. 786.
5—Co-ax. Cable Connectors, Type PL259.
1—Desk Microphone and Control Box with pilot light and push button.
1—Palec Valve Testing Set.
1—Multimeter.
2—Pairs Headphones with plugs and cords.

The N.S.W. Division suffered another blow on 12th November, 1969, when the offices at 14 Aitchison Street, Crows Nest, were broken into and the following equipment stolen:

1—Hallicrafter Communications Receiver, Model SX111, Serial No. 1110109/23168.
1—R.C.A. Communications Receiver, Type AR88. No serial number.
1—Paros Transceiver.
1—only 522 transmitter, no serial number. Mounted on 19 x 9 inch blue metal panel.
1—only 522 Transmitter and Receiver in black case.
1—Adcola Soldering Iron, 240 volt.
1—A.W.A. Type MR10B Carphone with 240v. a.c. power supply.
155—2N3819 Semiconductors.
8—V.h.f. Pre-amps.
2—Six Metre Converters.
75—T1S88s.
150—TT3564s.
40—2N3055s.
50—NJ480s.
7500—Resistors.
Call Books, Log Books, P.M.G. Handbooks, and coil formers.

AUSTRALIS OSCAR 5

(Continued from Page 19)

time, particular sensor, and tone frequency when this happens. Also note if the signal is in a null or a peak at the time. You may like to compute the exact attitude of the space craft and to correlate it with the signal strength and polarisation of the two beacons.

The X axis sensor data can be used to assess the effect of the magnetic attitude stabilisation system; the X axis spin rate should gradually decrease during several days as the axis comes into alignment with the geomagnetic field.

4. **The propagation experiment.**—The 10 metre beacon operating at 29.450 Mc. is potentially **Australis Oscar** 5's most important source for scientific information. It also requires greater sophistication on the part of the Amateur.

To fully participate it will be necessary to track both beacons simultaneously and preferably to record them on magnetic tape or paper charts.

Estimate the time when you expect to acquire the satellite and start listening several minutes beforehand. Note the time difference between acquisition of the two signals (2 metre and 10 metre). Similarly, note the time difference between loss of signals. Note any anomalies.

Using the 2 metre signal as a reference, try to time correlate the 10 metre signal to it. Make corrections for any pointing errors with either antenna. Discount the fairly regular nulls in signals caused by satellite spin.

An interesting number to be reported would be S_{10}/S_2, i.e. the ratio of signal strengths at 10 metres and 2 metres, measured in linear units or in db. Compute this ratio for as many points during a pass as possible. Compare it with similar passes on other days. Does it stay particularly large or small during certain periods? Check for other Amateur activity at 10 metres affecting the observed signal.

The S_{10}/S_2 observations assist in the analysis of ionospheric effects at the two wavelengths. In addition, try to observe antipodal reception by listening for the 10 metre signal when the satellite is on the exact opposite side of the earth from you. Such observations should be well documented and reported to Project Australis.

5. **Other experiments.** — The above list is not comprehensive. Imaginative Amateurs will certainly think up many new experiments. If you have any ideas or suggestions, please send them in. Remember, your participation is essential to the continuation of an Amateur satellite programme.

THE F.M. SYSTEM

(Continued from Page 9)

tion, it has further been brought to light that the greatest irritating noise generated is located from 3 Kc. up. To reduce the effect of this noise, a pre-emphasis network is inserted in the audio section of the transmitter. Its purpose is to boost the frequencies above 1 Kc.

At the receiver there is a de-emphasis network to reduce frequencies above 1 Kc. to their original values. The overall effect is a return of the signal to its proper relative proportions, but with a considerable reduction in noise.

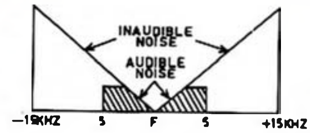


FIG.11.

Fig. 11.—Improvement in noise reduction due to pre-emphasis circuit in transmitter.

Another beneficial effect of de-emphasis is concerned with the noise produced by another signal or the ever-present random noise.

As previously noted, the greater the difference between the carrier frequency and the interference, the greater the indirect f.m. produced. By the use of the de-emphasis network, the triangular response of Fig. 10 is modified to the trapezium of Fig. 11. The de-emphasis action, by reducing the level of all frequencies above 1 Kc., slices off a considerable portion of the noise.

I trust that this article has been able to shed some light on the rather neglected subject of the theory behind the f.m. system and it will enable Amateurs to speak with a little more authority about the effects observed in their equipment.

INOUE IC-700

My quest, in Japan, was for modern high quality Amateur equipment of very good value. INOUE is selling in Japan, England, Germany, U.S.A. and elsewhere. The IC-700 Transceiver covers all Amateur bands from 3.5 to 29.7 Mc. in 500 Kc. segments with 1 Kc. read-out; plus WWV (10 Mc.). Using 9 Mc., 2.4 Kc. filters in both rx and tx, this single conversion design is free of unwanted spurious. Sensitivity is better than 1 uV. for 10 db S+N/N ratio. Operates on a.m. or c.w. (500 c. bandwidth) and s.s.b.

BOOMLESS QUAD

Identical electrical spacing on 20, 15, 10. **Centre Castings** c/w. bolts $10 pr. **Canes** 16-18 ft. $1.25 ea. $8 per set. **Fibreglass** 11.5 ft. long $9 ea. **Kits** triband, complete (castings, canes, wire and nylon line) $30. Prices include Sales Tax. Freight forward.

S. T. CLARK

26 Bellevue Av., Rosanna, Vic., 3084

Phone 45-3002

JOHN MOYLE MEMORIAL NATIONAL FIELD DAY CONTEST, 1970

SATURDAY, 7th FEBRUARY, TO SUNDAY, 8th FEBRUARY, 1970

The Federal Contest Committee of the Wireless Institute of Australia invites all Australian Amateurs and Short Wave Listeners to participate in this Annual Contest, which is held to perpetuate the memory of John Moyle, whose efforts advanced the Amateur Radio Service.

There are two divisions of this Contest, one of 24 hours continuous duration, and one of 6 hours continuous duration. The six-hour period has been included to encourage the operator who is unable to participate for the full 24-hour period. The 24-hour continuous operation is to be chosen by operator from 26-hour period.

Operators using 25 watts or less input to the final stage will be considered for a certificate where his activity warrants its issue.

DATE

From 0600 GMT, 7th February, 1970, to 0800 GMT, 8th February, 1970.

OBJECTS

The operators of Portable and Mobile Stations within all VK Call Areas will endeavour to contact other Portable/Mobile and Fixed Stations in VK Call Areas and Foreign Call Areas.

RULES

1. There are two divisions, one of six (6) hours, and one of twenty-four (24) hours duration. The six-hour period for operating may be chosen from any time during the Contest, but the six-hour period so chosen **must** be **continuous**. In each division, there are six sections:—
   - (a) Portable/Mobile Transmitting, Phone.
   - (b) Portable/Mobile Transmitting, C.w.
   - (c) Portable/Mobile Transmitting, Open.
   - (d) Portable/Mobile Transmitting, Multiple Operation, open only.
   - (e) Fixed Transmitting Stations working Portable/Mobile Stations, open only.
   - (f) Reception of Portable/Mobile Stations.

2. All Australian Amateurs are encouraged to take part. Operators will be limited to their licensed power. This power shall be derived from a self-contained and fully portable source.

(a) Portable/Mobile Stations shall not be situated in any occupied dwelling or building. Portable/Mobile Stations may be moved from place to place during the Contest.

No apparatus shall be set up on the site earlier than 24 hours prior to the Contest.

All Amateur bands may be used, but no cross band operating is permitted. Cross mode operation is permitted.

Entrants in Section (d) for Multiple Operator Stations can set up separate transmitters to work on different bands at the same time. All such units of a Multiple Operator Station must be located within an area that can be encompassed by a circle not greater than half a mile diameter.

For each transmitter of a Multiple Operator Station a separate log shall be kept with serial numbers starting from 001, and increasing by one for each successive contact. All logs of a Multiple Operator Station shall be submitted by the operator under whose Call Sign the transmitters are working. No two transmitters of a Multiple Operator Station are permitted to operate on the same band at any time.

3. Amateurs may enter for any section.

4. One contact per station for phone to phone, also one for c.w. to c.w. per band is permitted. Cross mode operation will be accepted for scoring.

5. Entrants must operate within the terms of their licences and in particular observe the regulations with regards to portable operation.

6. The exchange of serial numbers, consisting of RS or RST report plus three figures, commencing with 001 and increasing by one for each successive contact by the VK Station, shall be proof of contact.

7. **Scoring—**

(a) **Portable/Mobile Stations:**

For contacts with Portable/Mobile Stations outside entrant's Call Area .... **15 points**

For contacts with Portable/Mobile Stations within entrant's Call Area .... **10 points**

For contacts with Fixed Stations outside the entrant's Call Area .... **5 points**

For contacts with Fixed Stations within the entrant's Call Area .... **2 points**

(b) **Fixed Stations:**

For contacts with Portable/Mobile Statons outside entrant's Call Area .... **15 points**

For contacts with Portable/Mobile Stations within entrant's Call Area .... **10 points**

8. The following shall constitute Call Areas: VK1, VK2, VK3, VK4, VK5, VK6, VK7, VK8, VK9 and VK0.

Example of Victorian S.w.l's Log

Date Time (GMT)	Band	Call Sign Heard	RST No. Sent	Station Worked	Points Claim.
7/2/70 0600 GMT	80 mx	VK2AAH/P	59001	VK3ATL/P	15
0610	80 mx	VK3ATL/P	59006	VK3QV	10
0620	40 mx	VK2AAH/P	599004	VK6VF/P	15
0640	20 mx	VK3QV	59010	VK5QX/P	*
0900	20 mx	VK4OF/P	59040	VK4OX/P	15

* No claim Fixed Station.

9. All logs shall be set out under the following headings: Date/Time (G.M.T.), Band, Emission, Call Sign, RST/No. Sent, RST/No. Received, Points Claimed. Contacts must be listed in numerical order.

In addition, there shall be a front sheet showing the following information:—

Name........................Address......................

Call Sign...................Section........................

Division...................(6-hour or 24-hour)

Points Claimed..

Call Sign of other op./s (if any)...........

Location of Portable/Mobile Station.....

From................hours to..................hours

A brief description of equipment used, and points claimed, followed by the declaration:

"I hereby certify that I have operated in accordance with the rules and spirit of the Contest."

Signed.................Date.................

10. The right is reserved to disqualify any entrant who, during the Contest, has not observed the Regulations and the Rules of this Contest, or who has consistently departed from the accepted code of operating ethics.

11. The decision of the Federal Contest Manager of the Wireless Institute of Australia is final and no disputes will be entered into.

12. Certificates will be awarded to the highest scorer of each section of each division. Additional certificates may be issued at the discretion of the F.C.C. The six-hour certificates cannot be won by a 24-hour entrant.

13. **Return of Logs:**

All entries must be postmarked not later than **28th February, 1970,** and be clearly marked "John Moyle Memorial National Field Day Contest, 1970," and addressed to:—

Federal Contest Manager, W.I.A.,
Box N1002, G.P.O.,
Perth, W.A., 6001.

RECEIVING SECTION

14. This section is open to all Short Wave Listeners in VK Call Areas. The Rules shall be the same as for the Transmitting Stations, but may omit the serial numbers received.

Logs must show the Call Sign of the Portable/Mobile Station heard, the serial number sent by it, and the Call Sign of the Station being worked.

Scoring will be on the same basis as for Transmitting Stations. It will not be sufficient to log a station calling CQ. A portable/mobile station may be logged once only for phone and once only for c.w. in each band.

Awards: Certificates will be awarded for the Highest Scorer in each Call Area, for the 6-hour and the 24-hour divisions.

New Equipment

HY-GAIN LIGHTNING ARRESTOR

The precision-built Model LA-1 will safely by-pass to ground 10 or more direct lightning strokes. It is designed for installation in any standard 52 or 72 ohm co-axial feedline, and effectively removes static build-up around your antenna system, thus reducing the possibility of your equipment being hit by a direct stroke of lightning.

The unit will accept type SO-239 u.h.f. co-ax. connectors, the insertion loss is negligible, and weight is 5 oz. Price $29 including sales tax.

Further information from Bail Electronic Services, 60 Shannon St., Box Hill, Vic., 3129.

SWE-CHECK FET METER

A new addition to the range of quality test equipment available from Radio Parts Pty. Ltd. is the Swe-Check "Volt-Ohm-A" FET Meter. Of robust, plastic coated, steel construction, the meter case has a 60° tilting device to enable easy readout when bench mounted.

Ranges—DC volts: 0-1, 3, 10, 30, 100, 300, 1K and 3K. AC volts: 0-3, 10, 30, 100, 300 and 1K. DC current: 0-300 uA., 1 mA., 10 mA., 100 mA. and 1 A. Ohms: R x 1 to R x 1 meg. in seven ranges. Price $99 plus 15% sales tax where applicable.

Further details from Radio Parts Pty. Ltd., 562 Spencer St., Melbourne, or city and suburban branches.

Correspondence

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers.

RADIO OPERATOR OF THE ILL-FATED "NOONGAH"

Editor "A.R.," Dear Sir,

It may not be realised by some of your readers that S. R. Pedemont, VK2BSP, who appeared in Silent Keys last month, was the Radio Operator of the "Noongah" lost at sea in August.

He was a "first tripper," and had just joined the ship in Port Kembla on what was to be her last voyage. Although suffering from severe sea-sickness, he cleared his distress traffic in a very efficient manner. Everyone who heard the distress messages agreed that the general operating procedure and "fist" of Mr. Pedemont was amazing, considering his lack of marine experience and the stresses he must have been under at the time.

I feel that his Amateur Radio experience must have contributed to the cool manner in which he discharged his duties on this tragic occasion, and that he deserves salutations from his brother Amateurs for a job well done.

—Noel Roberts, VK3NR.

C.W. REQUIREMENTS

Editor "A.R.," Dear Sir,

I am prompted by VK2ZFQ's letter in October "A.R." to make some comments concerning the c.w. requirement in the A.O.C.P. examination. I am convinced that the time has come to eliminate this archaic, unnecessary and unjust section of the examination. Further, I have very grave doubts as to the wisdom of introducing a Novice licence which included a c.w. requirement. My experience shows that the principal factor that is at present deterring a number of prospective Amateurs is, in fact, the c.w. examination. This fact is borne out by the great popularity of the Limited licence. Surely the main aim of the introduction of a Novice licence is to popularise Amateur Radio, and surely the saddling of the Novice licence with a c.w. examination would defeat this purpose.

The answer to the problem is, of course, to abolish the present c.w. requirement in the A.O.C.P. examination, without lowering the standard of the theory section. The standard of scientific education nowadays is so high that very few candidates have much trouble with the theory paper, but the c.w. test is a different kettle of fish!

However, I also base my opposition to the c.w. requirement on several other grounds, and these are as follows:—

(1) There are many Amateurs (like myself) who have found that they have neither the time nor the aptitude to master the art of c.w. Why should such Amateurs be denied the use of six of their bands simply because they are not proficient in c.w. And if c.w. is such a necessary thing, why is it not made compulsory for the v.h.f. bands as well as for h.f.?

(2) There are many Amateurs (including full A.O.C.P. holders), whose main interest lies in phone operation, and who would seldom (if ever) want to pound the brass. Why should these Amateurs be required to pass an examination in a mode they do not intend to use?

(3) VK2ZFQ says that c.w. is the most effective mode for weak signal DX work, and that phone has its limitations for DX of that sort. This is very true; I quite agree that c.w. occupies a most important place in Amateur practice. However, I cannot agree that this is any justification at all for imposing a c.w. examination on all Amateurs. Many Amateurs may not be interested in weak signal DX work, and there are many like myself who still prefer the more personal touch of the microphone, even for DX work.

(4) I feel that it is unfair to stratify Amateurs into different classes such as "Full", "Limited", and so on. After all, we are all Amateurs, and all Amateurs should be permitted to operate on any and all Amateur bands, provided their technical knowledge and operating procedure are of a certain standard. The restrictions at present imposed on Limited licensees are contrary to their rights as licensed Amateurs.

Finally, let me reiterate that I am not opposed to c.w. as a mode, and neither am I opposed to the holding of c.w. examinations. Certainly, no one should be permitted to transmit c.w. unless they are capable of so doing, and an examination is the best way of making sure of this. However, why should a pass in the c.w. examination be a prerequisite for phone operation on the DX bands? Let's be fair about this: certainly there must be a c.w. licence for those who want it, but why force it on those who don't? And why should those Amateurs who are not interested in c.w. be penalised by being deprived of the use of six of their bands?

I hope that these comments will arouse some discussion of the c.w. question amongst the readers of "A.R."

—John Martin, VK3ZJC.

☆

AUSTRALIA TO CORNWALL, U.K., WITH ONE WATT S.S.B.

G6XN, on holidays in Australia and using the call VK7LM/P VK2 worked G3DDN and G2AYQ on 21/10/69, frequency 14155, using a one-watt s.s.b. rig. Reports from both Cornish stations to him were R5/S5. How's that for long path DX on QRP?

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Book Review

MODERN ELECTRONIC TROUBLESHOOTING

Using Up-to-Date Test Instruments and Advanced Servicing Techniques

Editors, Electronic Technician/Dealer

A new down-to-earth handbook that deals with today's electronic servicing problems on a practical level, using modern test instruments and advanced troubleshooting procedures to cope with the special problems created by printed boards and solid state circuitry. It is hard to conceive of a book that encompasses monochrome and colour t.v., multiband radio receivers, hi-fi equipment, tape recorders, two-way communications equipment, and test instruments for servicing all this equipment. Yet this book does. How? By getting right to the subject of how to service the equipment without the usual wordy theoreticall discussions of how the circuits work.

This is a book for professional service technicians, dealing with the problems which are currently causing them the biggest headaches. The content is divided into five sections. The first four deal with troubleshooting techniques and test instruments for servicing solid state circuitry (in radio, t.v., hi-fi, and communications gear), colour t.v. circuits, hi-fi and stereo equipment and two-way communications transceivers. The final section is on test equipment—not the usual run-of-the-mill theory, but special information such as how to add a triggered sweep to your old scope, how to use an R/C bridge effectively, how to service your own test equipment, etc.

In all, the 24 chapters provide the kind of all-inclusive servicing guidebook service technicians have been asking for—one that defines the troubles most prevalent in today's electronic equipment, and concentrates on quick troubleshooting procedures for locating the causes.

256 pages, over 100 illustrations, five big sections, 24 chapters. Price: $US7.95 hardbound, $US4.95 paper.

WORKING WITH SEMICONDUCTORS

Al Saunders

A brand-new and practical guide to semiconductor circuit operation and application—of value to technicians and others who work with solid state equipment. The wonderful aspect of this book is that the reader—be he technician, hobbyist or engineer—can really develop a thorough understanding of semiconductors—and actually enjoy doing it! In striking contrast to the usual textbook approach, this brand-new volume avoids the dry, theoretical mathematical explanation—it simply tells how and why things work, backed up by large, clear illustrations. Under the expert guidance of veteran technician and instructor Al Saunders, many facets of semiconductors are exposed in a different light. With several all-transistor t.v's on the market, it is more urgent than ever that service technicians understand semiconductor circuits.

The author begins with a clear-cut explanation of simple junction diodes, N- and P-type semiconductors, and PNP and NPN transistors. The next chapter outlines simple but reliable tests and operating parameters. Chapter 3 describes basic circuit configurations and compares them to vacuum tube equivalents. The effects of temperature and biasing are treated in chapter 4, along with basic feedback techniques and curve tracing.

In chapter 5 the author begins to put things together, interstage coupling, impedance matching, temperature compensation; and continues in chapter 6 with actual practical circuits: Class A and B amplifiers, complementary PNP-NPN circuits, phase inverters, etc. Chapter 7 goes into r.f. and i.f. amplifiers, detectors, automatic volume control, and differential amplifiers. More advanced circuits are covered in chapter 8, preceded by an introduction to transistor oscillators, and then multivibrators, Eccles-Jordan and Schmitt trigger circuits, and crystal controlled generators, concluding with a thorough explanation of counting by "flip-flop" and binary arithmetic.

Succeeding chapters deal with power supplies, high-frequency circuits, field-effect transistors, unijunction transistors, tunnel diodes, SCRs, plus a dozen or so special purpose circuits designed for a variety of applications from audio amplifiers to zener diode functions (accompanied by component values for construction-minded readers).

224 pages, over 185 illustrations, 15 chapters. Price: $US7.95 hardbound, $US4.95 paperbound.

99 WAYS TO USE YOUR OSCILLOSCOPE

A. C. W. Saunders

Here is one of the most useful test equipment guidebooks to be published in recent years. Its pictured-text guide, with step-by-step instructions, encompassing just about every service application for the oscilloscope shows how to determine waveform frequency or amplitude, measure inductance and inductive reactance, check distortion and gain of transistor and integrated circuits, etc. Many applications deal with t.v. circuits, especially those used in colour receivers. More specialised uses include testing SCRs, tunnel diode oscillators and multivibrators, checking capacitors, aligning i.f. and chrominance circuits.

Written to give specific instructions for using the oscilloscope in servicing t.v. receivers and other home-entertainment equipment, numerous waveform photos are included to show ideal results, plus displays indicating circuit troubles and improper equipment set-up. In all complete information is included for performing 99 different analysis tests, encompassing just about every application the reader might encounter.

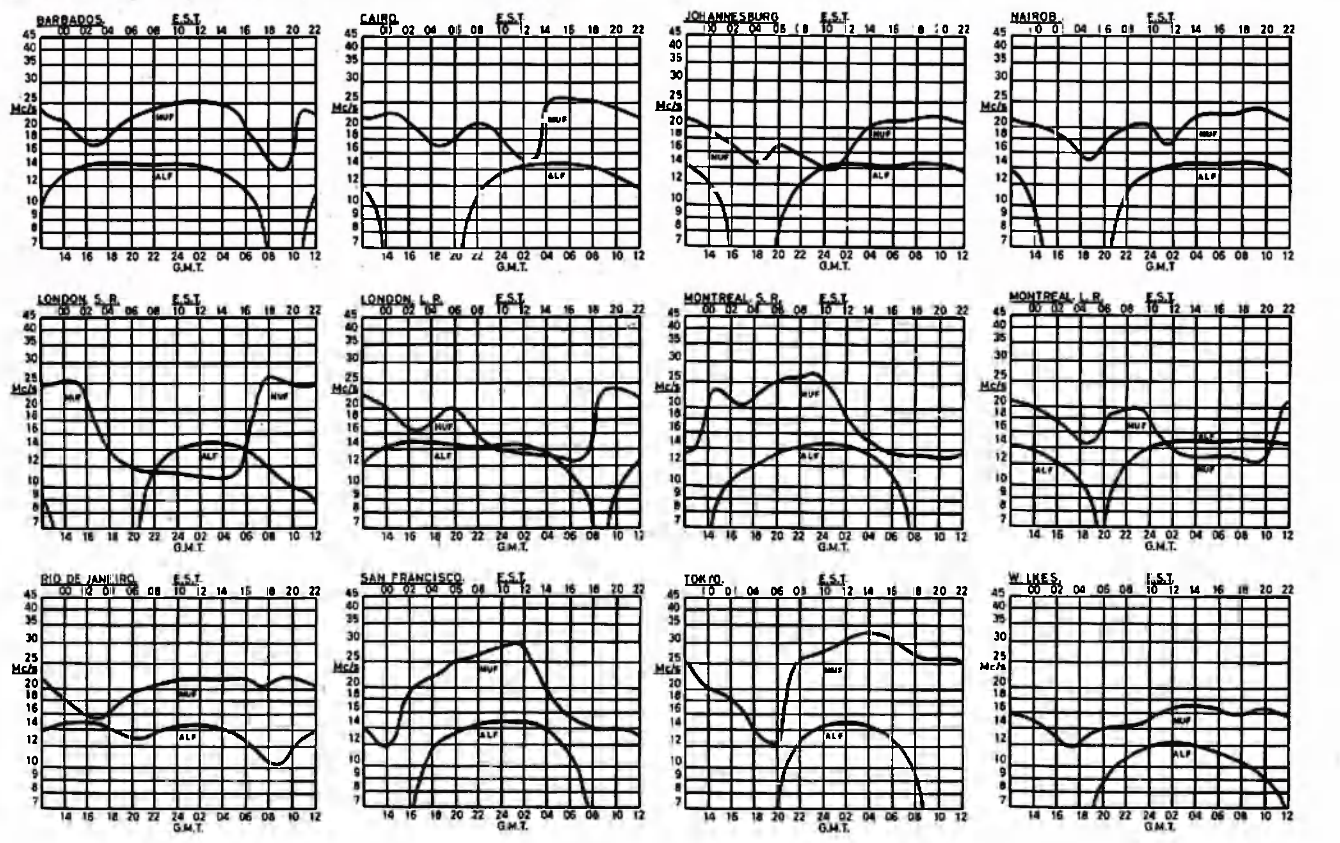
In each case, the text fully describes the procedure and a full-page pictorial diagram shows how to connect and adjust the equipment. Numerous waveforms photos are included to show ideal results.

Typical subjects covered include: Measuring inductance/reactance, power rectifier tests, transistor curve tracer, integrated circuit testing, stereo amplifier tests, testing audio by-pass capacitors, circular trace applications, matching capacitors, dual and triple trace tests, checking amplifier response, observing deflection waveforms, i.f. amplifier alignment, sound detector alignment (4.5 Mc.), 3.58 Mc. oscillator tests, checking colour-difference signals, keyed a.g.c. waveforms, synchroguide waveforms, flyback circuit waveforms, colour gating pulses, colour t.v. alignment notes, etc.

192 pages, over 100 illustrations, plus more than 200 waveform photos. Price $US6.95 hardbound, $US4.95 paperbound.

PREDICTION CHARTS FOR DECEMBER 1969

(Prediction Charts by courtesy of Ionospheric Prediction Service)



Overseas Magazine Review

Compiled by Syd Clark, VK3ASC

"BREAK-IN"

September 1969—

Stand-by Battery Float Charger, ZL1BHN. How to keep your car or field day batteries fully charged. Should appeal to some v.h.f. operators.

A 9 Mc. Bilateral I.F. Amplifier, ZL3AAY. One section of a transistor transceiver.

Linear Power Amplifiers, ZL2BFR. Handy theory session.

Generating R.T.T.Y. Tones, ZL2AVF. For those interested in the mode.

Suppression of Transistor Power Supply Noise, ZL2BBO. He says that the whine is not necessary.

Diode R.F. and A.G.C. Circuit for Receivers, ZL4IO. Covers some interesting areas of receiver design.

Chatham Island DX-pedition, ZL1TU/C and ZL1IL/C. Part two of the story.

"CQ"

August 1969—

Putting the Central Electronics 100V and 200V on 160 Metres, KH6IJ. This author suggests that some of the older secondhand units will make good 160 metre rigs.

Results of the 1968 "CQ" World Wide DX (CW) Contest, W1WY. All the details for those interested in DX.

Signals from Space, W3ASK. Satellite DX can be satisfying.

Slow Scan Television. Part two of an article begun in the July issue.

"CQ" Reviews the Swan 250C 6 Metre Transceiver, W2AEF. This is a new model of Swan's six metre transceiver and mainly discusses the improvements.

The S-DEC Unit, W2AEF. This is a system of bread-boarding equipment simply by pushing the wire ends of components into holes in a board. Up to date I have not seen it in Australia.

Converting the Heath CB-1 to Six Metres, W6GNV/4. This article describes the conversion of a CB transceiver to six metre operation. Also includes the addition of a simple audio squelch circuit.

The Inductotuner, W6SAI. The ingredients of a versatile antenna system to operate from 1.8 to 30 Mc., patterned after the AN/SRA25, makes use of a 35 ft. whip, a variable impedance matching transformer, loading coil and s.w.r. bridge. It will work into random lengths of wire.

Australis Oscar, W3ASK. Australis Oscar, the fifth in a series of satellites designed and built by Radio Amateurs is due to be launched soon. This article discusses how its signals can be received and tracked, how its telemetry signals can be used for scientific experiments, and QSL cards obtained for space listener reports.

September 1969—

Herbert Hoover, Jnr., W6ZH. 1903 to 1969.

The Evolution of a Circulator Coupled Paramp., W6NLZ. The circulator is the key to success with parametric amplifiers. Noise figure about 1 db.

Remote Antenna Tuning, WB2CQM. 1-2 r.p.m. motor and continuously variable capacitor produces do it yourself r.c.

Australis Oscar, W3ASK. The latest dope.

"CQ" W.W. DX Contest Records. For the DX man.

An Automatic Transistor Checker, W2EEY. Lamp type Go-No-Go indications.

Build a Complete Six Metre Station, WA-2NDM. Part one, small mobile valve job.

Receiver Sensitivity and Noise Figure, by W2EEY. Do you confuse sensitivity and noise figure? If so, this is for you.

The Integrated Circuit Electronic Keyer, by GW3NJY.

Modifying the Heath HP24 Power Supply for use with S.G. Tubes, W2EEY.

"CQ" Reviews the Heathkit SB-500 Two Metre Transverter, W2AEF.

"DAS DL QTC"

The journal of the German Amateur Radio Club, August 1969. This publication is of interest to those Amateurs who can read German or can get the articles translated. In the August issue is an article on an s.s.b. transmitter for the h.f. bands by Hans VK2AOU (ex DL1EZ). The German society is frequently in the forefront of developments and some of their articles look quite interesting.

In the August issue is one by DL9JH who describes how either a variable capacitor or a variable inductor (variometer) can be used to tune an L antenna to operate on either 80 or 40 metres. Perhaps some of the disposals equipment available out here would yield such components for use by VKs or perhaps a ferrite rod may give similar results.

Co-axial Fed L Antenna for 80 and 40 mx

This translation is pretty rough because it was done by someone who is non-technical and just dressed up a little by the writer.

"Once the inverted L type antenna was very popular. A normal pi network made it easy. I had one which because it consisted of 41 metres of 3.5 mm. phosphor bronze wire, I considered it too good to throw away.

"Upon converting to s.s.b. I found myself faced with a pi network which would only match over the range 40 to 120 ohms and this did not match the 20 mx long open feeder of the inverted L. The question was, how to feed the antenna with 60 ohm (common impedance in Germany, designed to supersede both 50 and 75 ohms) co-axial cable and still work in 80 and 40 mx bands.

"The higher frequency bands were not considered, as experience had shown that a ground plane was superior to the L on the DX bands. The problem was solved elegantly by using odds and ends from the 'bag of tricks'. The circuit can be arranged in either of two ways. A fixed inductor and variable capacitor or fixed capacitors and a variable inductor may be used. Using the fixed inductor-variable capacitor combination, I found that I could only obtain a low s.w.r. at one point in each band so I took a variometer of 6-36 microhenries from an old Army transmitter. A capacitive divider was formed from values of 1 nF. and 60 pF. in series across the variometer and the 60 ohm cable fed to the junction of the capacitors with the larger value between the centre conductor and ground. The grid dipper showed that this combination covered the range 3.4-8 Mc. Because of the exceptionally high quality of the variometer the dynamic impedance of the circuit is about 40K ohms. Because the impedance of the L antenna was in the region of 3K ohms, it was easy to tap it onto a suitable point about one-third of twenty turns up from ground.

"The s.w.r. is now less than 1:1.05 in both the 80 and 40 metre bands and the harmonic suppression is of the order of 40 db.

"Experimenting showed this variometer to be useful up to input powers of about 150w. (r.f.) beyond which it needed special doping with a good insulator, such as UHU-pus, or arc-over was likely to occur. For best results the variometer should be located at the end of the antenna with a very short feeder. My variometer was tuned remotely by a small motor and the feed should be through a substantial insulator."

"HAM RADIO"

Although I have been a reader of American magazines for over thirty years, I did not really note the name Jim Fisk, W1DTY, until I was presented with a copy of a new Amateur magazine called "Ham Radio" at a convention in New York, during March 1965. Your Publications Committee has now obtained copies of this new publication for the current year.

"Ham Radio" is similar in page size to "QST", "CQ" and "73", pages are roughly half the size of our own "Amateur Radio" and measure 6½ x 9½ inches. Issues at present average 100 pages.

I have been surprised recently by some of the content of one of the American magazines which appears to be very "anti-A.R.R.L." I think this sort of attitude is very unfortunate in a magazine and I am happy to say that Jim Fisk's new publication does not seem to be "anti" anyone, he fills his issues with as much technical information as he can in well written and informative articles with quite a lot of meat in them. The magazine is well organised from cover to cover, layout is neat and the printing is beyond reproach. The cover price is 60c. whereas the cover prices of the others mentioned above is 75c, this probably means that you can buy "Ham Radio" for less than the others and if you are interested, I would suggest that you contact the subscriptions manager of the W.I.A. Our copies will be reviewed in sequence.

January 1969—

V.H.F./U.H.F. Effects in Gridded Tubes, W6UOV. In all tubes the connecting leads have inductance and capacitance and at v.h.f./u.h.f. these sometimes cause problems.

Solid State Circuits for Single Sideband, F. H. Belt. Discusses a number of circuits which are used by the manufacturers of commercial equipment.

MOSFET Converter for 220 Mc., WB2EGZ. The author favours the R.C.A. types 3N159, 3N140 and 3N141 in the amplifier/mixer with 2N3478 and 2N3478 in the oscillator mixer chain.

Stub-Switched Stub-Matched Antennas, by W2EEY. The author shows how transmission line sections can be used to match antennas at one frequency and switch at another. Some practical systems are described.

Solid State Current Controlled Tuning, by K2ZSQ. Inductors which are varied by varying the current through a control coil. Very interesting technique: maybe the prices have fallen to "Amateur level" or they are available in disposals.

Some Notes on Cubical Quad Measurements, W4YM. Handy tips for those who may be contemplating the construction or adjustment of a quad.

Novel Linear for Two Metres, W4KAE. For those whose transmitters are of low output, a linear with an input power of 30 watts will

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give those extra miles. Uses inductive divider input and toroidal output circuits.

"The Repair Bench." Larry Allen takes the beginner and any old-timer who feels he may learn something new, through trouble shooting routines on popular circuits.

Antenna and Rotator Preventive Maintenance, WA1ABP. Most of us fit 'em and forget 'em, perhaps working on the assumption that it is better to leave well alone. Ted Woolner suggests that the beam owner can increase the life of his beloved signal squirter by some simple maintenance.

The DXer is catered for by such features as propagation predictions for the month. There is also a New Products section.

February 1969—

High Power Grounded Grid Linear, W6SAI. Two 3-500Zs in a high power linear.

Signal Detection in the Presence of Noise, WB6IOM. Some methods of reading those signals you can hear but cannot resolve are given.

Converting a Vacuum Tube Receiver to Solid State, W1OOP. Some of the older receivers, which are very good mechanically, can be converted to solid state to achieve more performance from less power. BC348—old chassis —new motor!

Power Supplies for S.S.B., F. H. Belt. The author discusses the required characteristics for the various modes of operation.

Miniature Keying Paddle, K6RIL. VK1AU, in the October issue of "A.R.," said "if you cannot obtain or make a paddle, give it away!" This article is the answer to that problem.

Sloping Inverted Vee Dipole Antenna, W6NIF. A vee with a difference.

V.T.V.M. Modifications, W6HPH. Describes how to build in that ohmmeter supply, etc.

Analysing Incorrect D.C. Voltages, Larry Allen. Meter readings cannot always be taken for granted. This article tells why.

Universal Transistor Preamplifier, W2EEY. John describes a pre-amp. to improve receiver S/N ratio from 80 to 6 metres.

March 1969—

Design Data for a High Power V.H.F. Linear, W6UOY. 2 kw. g.g. linear for two metres. Maybe the "Moonbouncers" could get permission for one of these!

High-Stability Solid State V.F.O., W8YFB. If you already have a variable capacitor from a Command set this may interest you.

IC Frequency Calibrator, K6KA. Using a uL914, this calibrator uses an existing 100 Kc. crystal and voltage obtained from the filament line.

The Real Meaning of Noise Figure, K6MIO. Fully explained; if I stopped to read every word of every article I'd never get this column written, more's the pity.

Miniature Monitorscope, WA3FIY. A 902A and a handful of solid state components and you are on your way.

Novel Two Metre Ground Plane Antenna, W3WZA. Some Australian Amateurs have been using five-eighths on 144 Mc. This author makes a case for seven-tenths.

Safety in the Ham Shack. Jack Darr and Alan James take it upon themselves to show the uninitiated where they can go wrong before they wind up on the wrong end of a pair of conductors carrying high voltage.

Integrated Circuit VOX, W2EEY. Using uL914s, John says it is a big improvement on older circuits. No clacking relays either.

Propagation Predictions for March, WB6KAP. Continues his monthly feature.

Computers in Ham Radio, W5TOM. The author suggests that there is a need for such a device to take the drudgery out of it. I thought Amateur Radio was a hobby!

Repairing High Voltage Transformers. W6NIF suggests that the one you thought was a throw-away job may be capable of reclamation.

Ham Notebook. One of the features. This month D.C. Crystal Switching, S.B.E. Linear Amp. tips and Co-axial Cable Connectors, etc., in good measure.

"QST"

September 1969—

A Direct Conversion S.S.B. Receiver, W1DAX. A recent "QST" article has revived an interest in the direct conversion technique for radio reception. Simplicity with good performance are the advantages. This article describes an experimental receiver using a novel approach to the use of direct conversion for true single-sideband reception.

A Three Element Delta Loop Beam for Six Metres, W1ICP and K1QQX. Each side of the delta is about seven feet long and it seems that this type of antenna is a practical device for the 10 and 6 metre bands; it does not appear to be nearly so practical for 20 metres where the elements become rather unwieldy.

Squelch Circuits, WA5SKM. A review of principles and practical circuits.

Transistor Switching for the Micro-To, by W1JE. Modification to a popular c.w. keyer described in "QST" August 1967 and in the A.R.R.L. Handbook. Here the relay goes solid state.

Grinding Technique for Surplus Crystals, W9PBI. Using the technique described here, the author has been able to make large changes in frequency without loss of activity.

Receiver Sensitivity. What it means. How it is measured. W7IV. Does a sensitivity figure of so many microvolts for such-and-such signal-to-noise ratio tell you anything?

Microcircuit Electronic Key, K2ERI. Combined keyer and audio monitor, all built on to a "bug" type base.

Strays. "QST" gives Cliff Tait, ZL1AKI, "the Flying Kiwi" a mention on p. 35. Cliff is touring the world in an Airtourer 115 (nee Victa) aircraft which was built in N.Z. He operates from the plane on 80 metres.

A Simple Two-Transistor A.F.S.K. Generator, WB2RHM. This a.f.s.k. generator for r.t.t.y. can be built for less than $10. Its low cost should not be used as a measure of its performance. The author's generator was given some gruelling tests in the A.R.R.L. lab. regarding output frequencies and it was found that after adjustment was made as described, it was necessary to use a frequency counter which would count in tenths of a cycle to measure the drift. Also handy as a test generator for your f.s.k. demodulator.

An Inexpensive Ten-Minute Timer, W2HZZ. Another of those solid state devices built into a 3 x 4 x 5 inch mini-box. Designed essentially to warn the Amateur when to identify his station.

Modern Filter Design for the Radio Amateur, W3NQN. For the filter fiend.

Australis Oscar 5. Progress report. With pictures of Owen Mace, Richard Tonkin and Paul Dunn.

The Outstretched Hand, W1UED. Help in Amateur Radio for the handicapped.

"THE INDIAN RADIO AMATEUR"

August 1969. This is a magazine which will have been seen by only a few VKs and it is not my normal practice to review it because most of the technical content is reprinted from other journals.

The Indian kindred society obviously has many handicaps. Although India has a very large population, the Amateur is relatively rare and they have difficulty in obtaining parts for constructional projects as well as other difficulties such as the number of languages spoken in the country. By publishing articles taken from overseas magazines and contributed by the local loyalists, the Amateur Radio Society of India do a great deal to advance the cause of Amateur Radio in India.

"73"

August 1969—

This issue is stated to contain over 40 feature articles. These articles, covering a very wide spectrum, should interest everyone.

Listening in on Two Metre Repeater, K0VQY. A monitor receiver using only two transistors.

An FET Regenerative Receiver for 3.5 Mc. and up, W6OSA. Two FETs will allow you to have a ball on the lower bands.

Multi Channel F.M. Operation, WA7EVX. Adding relay crystal switching to commercial f.m. gear.

The Case for the Five-Eighth Wavelength Vertical, W2EEY. This is the vertical with the low angle of radiation. Used for many years by thousands of broadcasting stations world-wide.

The Genesis of Radio Reception, W1USM. A history lesson.

An Introduction to Integrated Circuits, by WA1FHJ. Let's hope that an intimate relationship results.

R.T.T.Y. Tone Generator, W7FLC. Now you can mark and space up a storm.

General Purpose Good-Bad Transistor Tester, W0KKA. Useless if all your transistors are in excellent shape.

A Compact Two-Metre Transmitter, W4UOY. 2E26 output, phone.

Measuring Ft of Surplus Transistors, by WA1FRJ. There are some enormous bargains around.

Skylines for 160 Made Simpler, W1EZT. 160 metre antennas from A to exhaustion.

The Triac, K8TSQ. New gadget you should know about. What next!

430-470 Kc. Sweep Frequency Generator, WA5SWD. That's Kc. not Mc. This is for aligning i.f. strips.

What Do You Think? K1OXK. A special "73" metaphysical feature.

Leaky Lines, K2AGZ. Grumbles by Sam, err, Dave.

Magikey—for Automatic Didahs, W3SGV. Another automatic key and a good one. Only two transistors.

F.M.—Fun Maker, K2PTS. Are you missing out on the f.m. bandwagon?

The SB100 on Six Metres, WB4CXL. It's possible. (How many more will respond to similar treatment?)

Measuring the Frequency of Unmarked Crystals, K1EUJ. Different, simple ways of doing this.

Extra Class Study Course, Part VII., by the Staff. There is no excuse for failing the test if you read this.

Now You Too Can Have A Deviation Meter, K9STM. Don't deviate too much.

Two Transistor 1500-mile Transmitter, K0VQY. Quarter watt QRP rig for excitement.

Long Circular Quads, WA4KAE. For moonbounce work.

Measuring F.M. Receiver Noise Figure, by W8BBB. Taking the mystery out of this for f.m. receivers.

Would You like to be a Broadcast Engineer? K2ULR. No!

Distress: The Amateur and the Coastguard, WB6UKX. What happens when an Amateur passes along a distress call.

A Transistor Parameter Tracer, K3PUR. Useful, unless tubes come back again.

What Are We Here For? W8RHR. Sometimes, as we tune the bands, perhaps we wonder too.

Plus a number of other features. Comments are mostly from "73" which has a prepared review on page 1.

September 1969—

A DX Curtain for Fifteen Metres, VE1TG. Many Amateurs have heard of the "Sterba Curtain," not too many will own one. Gain 3-4 db. over a dipole.

Tunnel Diodes—Theory and Practical Applications, K8TSQ. Including a one transistor, solar powered transmitter.

The Magic Tee, by Thorpe. Methods of running r.f. transistors in parallel.

Uncle Will and News from Poudre Valley, K0VDI. In dialect yet.

Basic Soldering Outfit, W1EXT. Good Lord, another article on soldering.

Light Naturally Runs Down, K1CLI. A special scientific American type feature.

Cable Pick-up and Shielding, W2EEY/1. Keeping interference to a minimum.

WWV—Pioneer in Standards Broadcasting, WA1AAU. Perhaps you've heard the catchy tune they play.

Basic Theory and Applications of Transistors, WA1FHJ. Something you have always wanted to know.

Series Gate, Solid State, K6ZFV. Clipper.

Improving NC300 S.S.B. Reception, W1OOP. It was good, now it's better.

A.F.S.K. Generator, W1ESH. Crystal controlled, using digital ICs.

Transistor Transmitter Aspirin, K0VQY. How to keep from Westernising your transistors. (Dead one's tell no tales.—Ed.)

Improvement of Phone Intelligibility by Base Clipping, by Ives. Discussion of base clipping.

Measurement of Meter Resistance, WA6NIL. Making it possible to versatilise your meters.

Diode Stack Power Supplies—The Easy Way, K8KA. Instant operation of the Henry 2K and other rigs.

Transistor Testing Techniques, W9KXJ. Testing with a v.o.m. without destruction.

2½W. Transmitter, K0VQY. Work the world with this three-transistor rig.

Neutralising the HX10, W2PQG. Simple way to stabilise this rig.

More Taylor Modulation, DL5KS. Remember that a.m. is still on v.h.f.

An Audio Sinusoid Generator, W6FOO. Two ICs.

Capacitor Usage and Electron Flow, W0HMK. Where to use what capacitor and why?

What About FM? W9VZR. We'll have you on f.m. this year.

A Primer on Radio Propagation, WA1GEK. If signals really do bounce, this is how it works.

Measurement of Percentage of Modulation, by Granger. Of a.m. transmitter.

Extra Class Licence Course, Part VIII, Staff. Let's get cracking.

Big Signal—Good Looks, WA7AIA. 3-400Z k.w. linear.

A New Vidicon Camera for A.T.V., W8VCO. Isn't it time you tried a.t.v.?

Two More Transistor Testers, W9DJZ. Handy if you use bagsful.

The FET Compressor, WA0IOC. Audio compressor using two FETs.

DX

Sub-Editor: DON GRANTLEY
P.O. Box 222, Penrith, N.S.W., 2750
(All times in GMT)

The month of October has been a good one from a DX point of view, with some good openings occurring for the VK/ZL DX Contest. This event provided some very good openings on all bands, however a little more activity from VK and ZL would have helped. I spent about half the allotted time each week-end and was very surprised to note the conditions on 15 metres, also 10, in fact I hardly shifted from 15 over the c.w. week-end.

These good conditions are prevailing at the present time, and Mac Hilliard reports that 10 metres has been wide open to Europe on occasions at 1000z, with early morning conditions on 20 being comparable to those of the 1957 era. Sunspot count for June showed an average of 102, with wide variations from a daily low of 26, to a high of 186. Forecasts for November and December is 91 and 89 respectively.

George Studd, ZL2AFZ, comments that the use of the ZM prefix has given Amateur Radio in that country a much needed boost, he himself filled a log book in six days, working all continents in one hour. Similar conditions should prevail when we use the AX prefix next year.

Recently under the Awards heading I ran a short note on the Lincoln Award and the query has been raised as to whether or not Port Lincoln in S.A. would be eligible. Stew Foster assures me that it is, and counts for 20 points.

The following are active from the Svalbard Archipelago. JW8MI, JW6QL, JW7UH, JW2QK and JW9DL. The first three are there for almost a year, JW8MI being active on 14050 c.w. and 14190/195 s.s.b.

Stations active from Thailand at time of writing are HS1AF, HS2JR, HS3EP, HS3LJ and HS3ML, all are putting out good signals on 15 metres s.s.b. at around 1800z.

UA0NM continues to be active on Fridays from 1900 to 2100 on 14175 s.s.b. He is in Asiatic Russia, from Zone 19. Also from the same area is UA0IJ who is usually on 14025 on c.w.

CE9AT is heard regularly working CE3ZN on 14185 s.s.b. Fridays at 2115z. QTH is South Shetland Is.

Here are some more "nets". The Pacific Inter-Island net meets Mon., Wed. and Fri. at 0830 on 14330 with a KX6 as M.C. The South East Asia net meets daily at 1200 on 14320. World DX Round Table operates 14270 s.s.b. Wed. and Sat. at 0500 to 0800z with WA5UHR in the chair.

The VU0 prefix in use by Indian Amateurs for the month of October was in Commemoration of the late Mahatma Ghandi. QSLs for these stations to be sent to Box 6588, Bombay.

IT0ETN is good only for the prefix hunters, frequencies are 14190 and 21345 s.s.b. QSL to Box 366, Catalina, Sicily.

M1D is active daily 14100, 14150, 14180 s.s.b., and some 21 Mc. operation. No times are given, and Giovanni can speak French but very little English. However, if you do hook him and want a QSL, send to I1MKN with I.R.C.

The OG prefixes heard recently were special calls issued for the SAC contest by the OH authorities, they count for the prefix hunters only.

FR7ZP/E which has been active for the past month is at Europa. Op. is Maxime who will go QRT at the end of October. All QSLs to Box 4, St. Clotilde, Reunion Is., Indian Ocean.

KH6NR/Kure from Nov. 10 to Nov. 14, requests that all QSLs be sent to KH6NR, Kure DX-pedition, 530 Peltier Drive, Honolulu, Hawaii, 96818, U.S.A.

5B4ES, another for the prefix hunters, is active 21220, 28675 and 14250 from the English School Amateur Radio Club, Nicosia, Cyprus. His QSLs go to the International Short Wave League which is now located at 1 Grove Rd., Lynley Glos., England, GL15-5JE.

Did you work LT0ETN during the period Sept. 26 to 28? Then you are eligible for the ETNA award and medal, for which you apply to Sezione ARI, Box 366, 95100, Catania, Sicily, with 15 IRC's. Also awarded for working any two other stations.

4J9DX is another for the prefix hunters. He was UA9AN and operators from UA9KAI and UA9KAX operating from the South Ural Mountains during the "CQ" Contest.

Prefix hunters are really being catered for, here are a couple more: PZ0AA from Surinam Trade Fair recently, QSL to Box 566, Paramaribo, Surinan. WC4GSC from Ogeechee Exhibition, Statesbro Georgia. QSL to W4DQD. Also EI0RTS from RDS scientific exhibition in Dublin on Oct. 21 to 25.

YB1BC still very much active and putting a massive signal into VK2. Barry VK5BS has apparently worked him and states that his QSL return is very prompt if sent to Box 288, Bandung, Indonesia.

There has been little or no operation from Qatar lately, but OD5BZ has plans to go there late Nov. or early Dec.

ZD3JJ is active from South West Africa on 28610, and requests that QSLs be sent to him at Box 5639, Windhoek, U.S.A.

From the Long Is. DX Assn. bulletin comes an item which will be of interest mainly to S.w.l's. It concerns BY1C and BY1F, both are active, and both say QSL via Radio Peking. It states that after sending your QSL to Radio Peking, you will receive newspaper monthly. You certainly will, and I suggest that you ignore them and don't give them the opportunity to use Amateur Radio as a propaganda outlet.

Still a few more nets. The YL-SSB net covering Oceania meets 14332 on Sat. from 0300z. Marine Corps net 21380 daily from 1900. Marianas net 14240 Tues. and Thurs. 0930. CHC/FHC net on 14340 daily from 1800, and on 7070 Sun. 1000z. Royal Navy ARS 3720 on Wed. from 1800. Finally, the British Commonwealth net meets daily on 21354 or 14285 from 1430 with 9V1PA as net control, and usually consists of service personnel.

LA2PH/MM is often heard coming in 5 by 9 into VK2. QSL address for him is to his home address, Knut Gjertsen, Lailavold 2, Loftcrod, Sandefjord, Norway.

I mentioned at the start of these notes that there has been much increased activity on 10 metres. Some of the calls logged, heard, or worked in VK and ZL over the past few weeks are DU1FH, UG6GM, UL7OA, VS9MB, VU2DK, 5N2AAF, 9Q5DG, EA8DV, HV3SJ, KG6AQY, KP4DCR, KV4FZ, LA0AD, MP4BHR, MP4TDA, TR8DG, UD6APO, VK9BB, VP8HZ, YN2JS, 8P6AH, XW8CS, UA3SU, 4S7WA, 9M2DQ.

To go lower in the spectrum, down on 80 metres there has been quite an upsurge in activity. In the interests of space, I will quote some of the prefixes which have been either logged or worked on both modes in VK and ZL over the past month. TI2, DJ8, DJ7, I1, HB9, PA0, ON4, DK3, DL5, CP1, CT2, FG7, VO1, 4U1, 4X4, OA4, OD5, 5Z4, OH0, 9G1, 9M2, TF5, 9Y4, JA, WA6, W1, W2, F5, F2, W9, GI3, LU2, G8, OH1, OH3, G2, F9, LU4, VE7 and many other W call areas.

Despite the good conditions, there is not a great amount of DX news this month. However, I would once again remind those interested, that the Pacific DX net broadcast a very fine bulletin of DX news at the start of their Friday evening session at 0630z on 14270. Look for net control KH6GLU.

Some time ago I mentioned the use of the Z following the numeral in certain DU calls. Here is a list of stations together with their QSL managers: DU1ZAA/K2IRT, DU1ZAB/W7UXP, DU1ZAC/K3MOV, DU1ZAE/W4JNR, DU1ZAF/9G1TV, DU1ZAG/WB6GFJ, DU1ZAH/W4SUS, DU1ZAI/KG6APJ, DU1ZAJ/W7UUO, DU1ZAN/W1GL, DU1ZAW/W3EIV, DU8ZAD/W3MOV.

QTH SECTION

(By courtesy of the ISWL)

A2CAU—J. Large, Box 200, Francistown, Botswana, Africa.
CP1GN—U.S. Embassy, La Paz, Bolivia.
C21JW—R. J. Wirth, C/o. OTC, Nauru Is., Central Pacific.
CE0AE—Op. John, Det 517, APO, New York, N.Y. 09877, U.S.A.
DK1YK—E. Stammerberger, 5 Sauerbruchstr, 8630 Coburg, West Germany.
F5PE—E. Ermiz, Ferme Boulouch, 32 Lectoure, France.
FM7WO—B.P. 287, Fort de France, Martinique, French W.I.
FG7XL—B.O. 109, Pointe-a-Pitre, Guadeloupe, F.W.I.
HB0AFM—Box 293, 8040 Zurich, Switzerland.
JT1AK—Box 639, Ulan Bator, Mongolia, Asia.
KC6AT—Box 94, Ponape, East Caroline Is., 96941, Pacific.
KC6ES—E. Sugiyama, Koror, Palau Is., West Carolines, 96940.
LA5KG—Postfack 150, Slependen, Norway.
LU4VL—Apto 121, Allen, Rio Negro, Argentina.
MP4BHH—Box 155, Manama, Bahrian, Arabian Gulf.
MP4BHL—Box 144, Bahrian.
OH2AM—Box 40015, Helsinki 40, Finland.
PJ9BG—C/o. Trans World Radio, Bonaire, Netherlands Ant.
PJ9VL—Box 692, Curacao, Netherlands Ant.
PY4AP—CP 484, Belo Horizonte, Minas Gerais, Brazil.
TR8DC—Guy Delas, Box 356, Libreville, Gabon Rep.
VE2AFC—BP 382, Quebec 4, PQ, Canada.
VS6AA—C/o. HKARTS, Box 541, Hong Kong.
VR2FT—L. Higginbotham, Box 3722, Samabula, Fiji.
W3AWU/YB6—3030 Marshall Rd., Pittsburg, Penn. 15214, U.S.A.
YJ8BM—J. MacIntyre, Dept. of Telecom, Santo, New Hebrides.
YJ8RG—R. Graham, C/o. P.O. Vila, New Hebrides.
ZE1CY—Bob Furzer, Box 738, Gwelo, Rhodesia.
ZS6LW—Box 838, Germiston, Rep. of South Africa.
5Z4LS—Nick Henwood, Box 448, Nyeri, Kenya.
5V4DB—BP 123, Lome, Togo Republic, Africa.

The prefixes C3A-C3Z have been allocated by the I.T.U. to the Principality of Andorra. Formerly PX1, that prefix was unofficial and in reality belonged to Brazil.

Unfortunately, I will have to close these notes here this month. However, I will have a full screed for the next issue. My thanks this month to George ZL2AFZ, Mac Hilliard, Maurie Cox, Geoff Watts DX News Sheet, L1DXA, Barry VK5BS, ISWL, Jack VK3AXQ, Ernie Luff, Bernard Hughes and Stewart Foster of England. Until the next time, 73, Don L2022.

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VHF

Sub-Editor: ERIC JAMIESON, VK5LP
Forreston, South Australia, 5233.

I take on the preparation of notes for this page still with a degree of hesitancy, wondering if I can do what is expected of me. There is no doubt that the degree of v.h.f. operation on all bands has declined during the past three or four years. I believe there are two very important reasons for this. Firstly, the operation of Channel 0 has had a widespread effect. Not only has it made it more difficult for operators within the service area of these stations to be active, but in removing their operation from the 52 Mc. band there are, as a consequence, less stations for others to work during a DX opening, and in periods of non-DX many will not risk coming on the air anyway, although it does appear some station operators have been able to overcome their problems to a certain degree.

The second very important reason is the reduction to 10 w.p.m. in the c.w. requirements to achieve a full call. Many prominent v.h.f. men of a few years ago now have a full call sign, and therefore share their operating time between v.h.f. and h.f. Previously with no other bands to use, they would stay around and look for and work the DX, particularly on 2 metres, as it appeared, often spending hours doing it. Now, if a few calls on v.h.f. fails to provide a wanted QSO, it is so easy to fire up on h.f. and work someone. These two factors added together have made it very difficult for the keen v.h.f. operator to remain as enthusiastic as previously, with the result he goes and builds some fresh equipment, perhaps for a u.h.f. band which are largely for local operation anyway.

The purpose of this page in the future will be to try and foster more interest in v.h.f./u.h.f. particularly with a view to promoting contacts with neighbouring and other States. I am a keen advocate of portable operation, and if our measure of activity in this direction were to match that keenness which exists in ZL, I would be satisfied. Today with the advent of transistors, and the greater knowledge of their use, particularly by the younger members of our fraternity who have grown up with semiconductors around them, portable equipment need not be either expensive or elaborate. Providing a few basic rules are kept in mind, the results can be very happy.

High power is not necessary, 15 watts on 144 Mc. from a QQE03/12, coupled to a 10 element yagi from any reasonable sized hill, plenty of modulation (though you will need a high level clipper and filter if you are going to thrash this), a good transistor or FET converter feeding into a car radio or other reasonably good receiver, will give you contacts from 200 or 400 miles without a lot of trouble, and in excess of 400 miles when conditions are good. Early morning is often the best time, but many long hauls have been made during evening hours as well. And when there is a field day or contest, there is a great thrill in working some 20 or 30 different stations on 2 metres in a couple of hours or so. As this is one of my chief platforms here in VK5, I will be pleased to answer any queries on portable operation from anyone interested.

BEACONS

The advantages to be gained from these are so great it is hard to understand why they are not operating in all States on 52, 144 and 432 Mc. We can pardon VK3 and VK4 on 52 Mc. as their Channel 0 t.v. is generally a reasonable guide as to band conditions. Many openings to VK2 must be missed however because of lack of indication from there.

I note the long awaited 144 Mc. beacon in VK3 will soon be a reality, but we could certainly do with one on that band in VK4 and VK2, and you chaps in N.S.W. cannot really shelter behind Channel 5A on 143.750 at Wollongong. It might help the ZLs, but in the direction of the Western States it could well be too far removed from the centre of 144 activity to be much use on most occasions.

VK5 is experimenting with a 432 Mc. beacon, and VK6 has one which can be turned on by request.

The following is a list of beacons and pseudo-beacons, and it is hoped the Editor will grant space for this list regularly—one never knows into whose hands a copy of "A.R." may fall, and they may be unaware of the operating beacons if not published regularly.

VK2	51.740 Mc.	Western N.S.W.
	143.750 Mc.	Channel 5A Wollongong.
VK3	51.760 Mc.	Channel 0 Melbourne.
	144.700 Mc.	Under construction.
VK4	51.750 Mc.	Channel 0 Brisbane.
VK5	53.000 Mc.	VK5VF, Mount Lofty.
	144.800 Mc.	VK5VF, Mount Lofty.
VK6	52.006 Mc.	VK6VF, Tuart Hill.
	144.500 Mc.	Mt. Barker, near Albany.
	145.000 Mc.	VK6VF, Tuart Hill.
	435.000 Mc.	VK6VF (on by request).
VK7	144.900 Mc.	VK7VF, Devonport.

CONTESTS

Two contests of note for v.h.f. operators are the Ross Hull Memorial V.h.f./U.h.f. Contest commencing 6/12/69 and the John Moyle Memorial National Field Day commencing Saturday 7/2/70. The first is a very worthwhile contributor to band occupancy during the summer DX season, and some excellent scores have been attained over the years. There has been a suggestion made that the contest should be abandoned because of the small number entering logs. It would be a pity for this to happen, so I can only appeal for a greater log entry. Perhaps there is a way of overcoming the rather tedious job of writing up the Contest Log to obtain scores and to assure the Contest Committee of your honesty. Any suggestions?

The John Moyle Field Day provides an excellent opportunity to go out portable, and being in the warmer part of the year is generally ideal for camping out overnight. It is hoped the 1970 Field Day will see a greater participation by VK5 v.h.f. stations seeking to work interstate, rumours of equipment being constructed tends to confirm this.

The VK2 Division V.h.f. and T.v. Group are lending support for the 1970 John Moyle Field Day by holding their summer V.h.f./U.h.f. Field Day over the same week-end instead of the New Year period. It appears in the past some operators have gone out mountain-topping for one or the other event, not both, so it now appears there will be a rush to get to the favourite mountain site. The rules are at present in the drafting stage, and will be mailed to those interested, all Divisional V.h.f. Groups, Divisional Stations, etc., as well as the VK2 "Bulletin".

In abridged form, the rules allow one contact every clock hour on each band 52 Mc. upwards, with an "incentive factor" increasing as the band frequency goes higher. The system also favours portable/mobile operation. The VK2 event commences 1400 EST on Saturday, 7th Feb., until 2200 EST, then re-commences the next day at 0400 continuing to 1600 EST. 18 of the 20 hours of operation are common with the N.F.D. Scoring for a given QSO is the product of the distance factor and the multiplier. The distance factor is 1 for every 10 miles, and the multiplier is the sum of the transmitting incentive factors of the two stations in contact. (Out with the slide rules chaps!)

The VK2 V.h.f. and T.v. Group are really keen. They are considering a special 24-hour "AX" V.h.f./U.h.f. Contest from midnight on 31/12/69 to midnight 1/1/70 to launch with a big splash the new Cook Bi-Centenary Year "AX" prefix. All bands 52 Mc. and up, all modes, nets, etc. Certificates for highest scorers on each band and so on. How about the other States doing something along similar lines? Summer DX will be with us and 52 Mc. contacts across the continent may well be possible. Too late for much to be said in "A.R." before the event, but State V.h.f. Groups could take up the matter locally. Go to it.

The 6th Annual Convention of the VK3 V.h.f. Group was held at Moondarra Reservoir in the Gippsland area on 11th and 12th October. About 60 Amateurs plus various families attended. Events included sniffer hunt, disposals sale, films on the Saturday. To the dismay of the scrub-battered sniffer contestants the event was re-run on the Sunday! Sunday's events included scrambles, mobile efficiency competition and a fox hunt. In this last event two transmitters were used, separated in frequency by 1 Kc. and positioned either side of a road cutting. The winner of the event, Kevin VK3ZYP, covered the 2-mile distance in 2 hours, while Dale VK5ZER took 60 miles to get there! The seven main events had a formidable prize list, which included such items as QQE06/40 base station, 1649 units, 6 mx mobile, QQE03/20, microphones, crystals. Unfortunately, the list supplied to me is too long for inclusion in "A.R." but prizes of this nature were given to the first three placings and sometimes the fourth, so you can gather that someone had been very busy twisting the arms of various distributors, who in turn were very generous indeed.

The VK3s enjoyed an end of October temperature inversion with DX stations up to 300 miles away very strong. Quite a few VK7s were worked, and VK7VF, the 144 Mc. beacon, gave the usual warning of the opening. The beacon was also heard in Mt. Gambier at about S7 for 30 hours. Some of the longest distance contacts were between Allan VK2ZEO in Deniliquin and Wilf VK7WF on 144 Mc., and Colin VK5ZKR in Mt. Gambier working Wilf on 432 Mc. No news of 1296 Mc. activity in VK3 this month. Would appreciate some information please.

In VK5 main interest has centred on the V.h.f. Field Day at the end of September. There was quite a good roll up of VK5 stations who were indeed grateful to the many VK3s in the Western Zone of Victoria for giving them QSOs. Band conditions were best the night before the Field Day started, but even on the declining conditions of the Sunday, 144 Mc. contacts were easy up to 300 miles, and 52 Mc. contacts good copy at 250 miles. Bob VK5ZDX burnt much midnight oil during the weeks previous to the Field Day while building a complete v.f.o. controlled 100w. 6 and 2 mx station, with all facilities. Joining up with Wally VK5ZWW, these two had a real "field day" and scored in excess of 11,000 points to win the Field Day. John VK5QZ and I teamed up and ran into second place with 7,574 points, also with specially built portable equipment. The Port Pirie Amateur Radio Club under the sign of VK5PP went into the field with a team of young operators to gain some experience. With my keenness for field days, I was very pleased to see the considerable number of operators who did actually go out portable.

Doug VK8KK is on his way to Adelaide from Darwin via the Eastern States on an extended leave holiday, arriving around 7th December. Just to keep his hand in at DX, Doug worked an HL9 on 52 Mc. prior to leaving Darwin. This indicates the 9 element Yagi he uses is working!

Much interest centres around the VK5QZ 432 Mc. converter which has been made a project by the VK5 V.h.f. Group. Initially 50 kitsets will be available at a most reasonable price, and the experimental beacon made by John VK5QZ will be a useful piece of apparatus when it comes to alignment and on-air tests. The appeal this converter has is its simplicity and that it is capable of very good results.

1296 Mc. RECORD

A South Australian record for a two-way contact on 1296 Mc. was set on the morning of 28th September about 0745 when Rod VK5ZSD at home at Eden Hills near Adelaide, contacted Alan VK3ZHU/5 located on South Hummocks. The distance was 75 miles, signals 5 x 8. Rod was running 25 watts to 3CX100A5 tripler, driven from 432 Mc. using a QQE06/40. Antenna 8 over 8 slot 25 feet high, receiver consisting of three cavity front end to a 1N21E diode mixer. Alan ran 20 watts to a 2C39 tripler from 432. A five-foot parabolic dish, focal length 27 inches slot fed reflector dipole, 6 feet high on the top of his car was the antenna. Alan's receiving set up was similar to that of Rod's. Congratulations gentlemen, now you will be after the Australian record. However, by the time you read this, Rod will be a resident of VK2, complete with his multitude of equipment, so further 1296 Mc. activity may be stimulated in that State.

MEET THE OTHER MAN

Mick VK5ZDR lives at Henley Beach, 7 miles west of Adelaide, at an elevation near enough to sea level. He is one who has done much to pioneer long distance contacts on 144 Mc., and was probably the first to realise the potential of using weather patterns to assist his DX operations, enabling him to call at the right time in the right direction. Mick has worked VK2, 3, 4, 5, 6 and 7 on 144 Mc., a most creditable performance, while on 432 Mc. holds the Australian record of 405 miles to Ian VK3ALZ in Melbourne, set on 28/5/66. His list of call areas worked on 52 Mc. is very impressive as it includes all VK areas 1 to 9 inclusive, ZL1, 2, 3 and 4, and all districts of Japan.

First licensed in 1959, Mick was not long in making his call sign known throughout Australia by winning the Ross Hull Contest in 1961/62, second in 1962/63 and again first in 1963/64. He also served a year as chairman of the VK5 V.h.f. Group, and is a regular member of the W.I.A.

Here are some brief details of the equipment used by Mick—52 Mc.: 100w. input to 829B, 6 element yagi 45 feet high, converter uses 6AM6 r.f. stage. 144 Mc.: 90w. input to QQE06/40, 10 element yagi 55 feet high, 7077 grounded grid r.f. amp. in converter. 432 Mc.: 60w. input to QQE06/40 to either 32 element

(Continued on Page 32)

INTRUDER WATCH NOTES

A. W. Chandler, VK3LC, has replaced M. P. Davis, VK3ANG, as Victorian State Intruder Watch Co-ordinator.

STATE INTRUDER WATCH CO-ORDINATORS

VK2—W. H. R. Treloar, VK2BPZ, 23/8 Fullerton St., Woollahara, N.S.W., 2025.
VK3—A. W. Chandler, VK3LC, 1534 High St., Glen Iris, Vic., 3146.
VK4—C. E. C. Kenny, 19 Lithgow St., Wynnum North, Qld., 4178.
VK5—John Bulling, VK5KX, 297 Goodwood St., Kings Park, South Aust., 5034.
VK6—G. Allen, 283 Amelia St., Balga, West. Aust., 6061.
VK7—D. H. Kelly, VK7DK, 56 Upper Brougham St., Launceston, Tas., 7250.

—·—

PROVISIONAL SUNSPOT NUMBERS

OCTOBER 1969

Dependent on observations at Zurich Observatory and its stations in Locarno and Arosa.

Day	R	Day	R
1	84	16	43
2	101	17	38
3	98	18	43
4	92	19	35
5	103	20	87
6	117	21	102
7	120	22	107
8	92	23	124
9	89	24	133
10	78	25	137
11	68	26	142
12	60	27	138
13	47	28	121
14	55	29	113
15	46	30	95
		31	80

Mean equals 89.9.

Smoothed Mean for April 1969: 103.0.

—Swiss Federal Observatory, Zurich.

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VHF NOTES

(Continued from Page 31)

extended phased array or 13 element yagi 50 ft. high, E88CC cascode front end in converter. The tunable i.f. range of 27 to 29.5 Mc. is utilised in his Yaesu Musen FR100B receiver which is used for all three bands. The modulator has Class B zero bias 807s with high level clipping and filtering. This latter Mick considers essential, both for oneself and others. Not long ago he spent 12 months at Tantanoola in the South East of S.A. and was keen enough to lug all his equipment down there with excellent results.

Plans for the future include working VK8 on 144 Mc., forward scatter experiments on 52 Mc., and possible operation on 576 or 1296 Mc. If the past is any guide, it is certain Mick will achieve all these things, and Amateur Radio will be the richer for it.

NEW ZEALAND

Our friends across the Tasman in New Zealand are holding their V.h.f. Field Day on Saturday and Sunday, 6th and 7th December. Amateurs in VK could well keep an ear on the bands for inter-country contacts. ZL1BFA and ZL1AJP have had another two-way contact on 5800 Mc., this time over a distance of 86.25 miles, contact was loud and clear using f.m. Further experiments are being undertaken to extend this distance.

John ZL1AZR continues his Moonbounce skeds with Kjell SM7BAE and Dick K0MQS. In a recent letter he says that he is replacing his present Earth-Moon-Earth aerial (eight 6/6 skeleton slots) with eight long yagis which feature high feed impedance driven elements. The new aerial will have about 22-23 db. gain compared with the 20 db. given by the slot array. John says that it is most necessary to use high impedance dipoles in stacked yagi arrays for it is almost impossible to drive low impedance units in large arrays.

The ZL3 144 Mc. beacon has received Post Office approval, and with every hope of being operational by the time these notes are read. No details of frequency as yet, perhaps by next issue.

This being my first issue of notes, and having very little idea what space a typewriter takes compared with the printed word, will wait and see if I have been too eloquent or not. I acknowledge with thanks information supplied by Peter VK2ZPC, Peter VK3ZYO, Mick VK-5ZDR, "Break-In" and "Spectrum", the latter two being New Zealand publications.

For future pages I am looking for information of national interest, something which can be read and appreciated in all States. Anyone may contribute, but all information will be re-edited, and acknowledgments given near the end of the v.h.f. page. Plenty of notice regarding contests, field days and other events will ensure some publicity will be given prior to the date of the event. Lengthy writing about any particular subject must of necessity risk fairly severe re-editing to keep it interesting to all, and save space.

I look forward to a happy period with you all. Traditionally, I always close my notes, wherever they are printed, with a thought for the month: "In a democracy, the votes of the vicious and stupid count. But under any other system they might be running the show." A Merry Christmas to all. 73, Eric VK5LP ("The Voice in the Hills").

—·—

W.I.A. V.H.F.C.C.

New Members

Cert. No.	Call	Confirmations 52 Mc.	144 Mc.
60	VK3ZOO	—	100
61	VK1VP	—	100
62	VK3ZOP	100	—
63	VK4ZKC	178	—
64	VK3ZKP	—	100
65	VK3ZBB	—	109
66	VK3RV	—	103
67	VK5ZKW	161	—

—·—

FEDERAL AWARDS

AUSTRALIAN D.X.C.C. COUNTRIES LIST AMENDMENT

Deletion: EA9 Ifni. Only contacts made prior to 13/5/69 will be credited. Contacts with stations located in the former Spanish territory of Ifni made after that date will be counted towards the Morocco listing.

All D.X.C.C. members who have claimed Ifni have had their scores amended as necessary.

—Geoff Wilson, VK3AMK,
Federal Awards Manager.

CONTEST CALENDAR

6th Dec. '69 to 11th Jan. '70: Ross A. Hull V.h.f. Memorial Contest.

6th/7th Dec.: CHC International DX Contest (c.w.).

13th/14th Dec.: CHC International WX Contest (s.s.b.).

7th/8th Feb.: John Moyle National Field Day Contest.

7th/8th Feb.: 36th A.R.R.L. International DX Competition (1st phone week-end).

21st/22nd Feb.: 36th A.R.R.L. International DX Competition (1st c.w. week-end).

7th/8th March: 36th A.R.R.L. International DX Competition (2nd phone week-end).

21st/22nd March: 36th A.R.R.L. International DX Competition (2nd c.w. week-end).

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Extra words, 3 cents each.

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DECEASED Amateur's Equipment: 1 Yaesu Musen FR50 Receiver, 1 Yaesu Musen FL50 Transmitter, 1 Yaesu Musen FV50 Transistorised V.F.O., 1 home constructed aerial tuning unit plus an indicator with 0-100 microammeter. 1 Aiwa Crystal push-to-talk Mike. This comprises a complete station having either independent or transceive operation plus the outboard V.F.O. for separate transmitting. The transmitter has VXO for plug-in crystals with between 6 to 7 Kc. shiftability. Firm offers please by mail, preference to a purchaser taking all. All offers will be replied to, your phone number an advantage. Write to Bob Thompson, 91 Lucan Ave., Aspley, Qld., 4034.

FOR SALE: Central Electronics 20A Exciter, 160 through 10, in excellent condition, will drive 813 or similar, manual, $100. BC458A especially modified for above exciter, $25. BC458 general purpose v.f.o., $20. TA33JR Triband Beam, weather proofed, $50. Type III, Trans./Rec. c/w. modulator and key, in-built power supply, 240v. a.c. or 6v. d.c., base or mobile, ant. spares, etc., instruction manual, $70. C.R.O. University 3 inch, mint condition, $50. H. Caldecott, VK2DA, 8 Seaview St., Balgowlah, N.S.W., 2093. Phone 94-1039.

FOR SALE: Geloso G222 Transmitter and G209 Receiver, Panda 10/15/20 mx Beam complete with prop. motor with transformer rotator in covered housing. Best offers to Ken Meallin, VK3NJ, 69 Caroline St., South Yarra, Vic., Phone 68-1032, home 26-5515.

FOR SALE: Hallicrafters five-band, s.s.b., c.w. Transceiver, Model SR150, complete with a.c. power supply, VOX, PTT, 125 watts p.e.p. input, instruction manual, $350 o.n.o. VK1AN, 37 Ingamells St., Garran, A.C.T., 2605. Phone (062) 81-5905.

FOR SALE: R.C.A. Beat Frequency Oscillator, ex P.M.G. Labs., $15. A. G. Pither, VK3VX, Phone 81-1853 (Melb.).

FOR SALE: Yaesu Musen FR-DX-400 Amateur Communications Receiver. In as new, immaculate condition. Only a few months old. $295. Lee Andrews, 49 Lord St., Roseville, N.S.W., 2069, or Phone 46-1022 after 6 p.m.

SELL: AVO Model 8 Multimeter, 20,000 ohm/volt, accurate calibration, good condition, $40. T75 Frequency Meter, 85 Mc. to 1000 Mc., Telemax u.h.f. version of Bendix 221, as new, $80. J. MacIver, 40 Beanga St., Greenslopes, Brisbane, 4120. Phone 97-8086.

S.W.L. Specials: BC453 with power supply, $25. Panoramic Adaptor, 3A-3/200, $70. Six Ham Band and General Coverage Receivers, $25 to $100. All gear in good going order. H. Roach, 28 Foster Avenue, Glenhuntly, Vic., Phone 58-3757.

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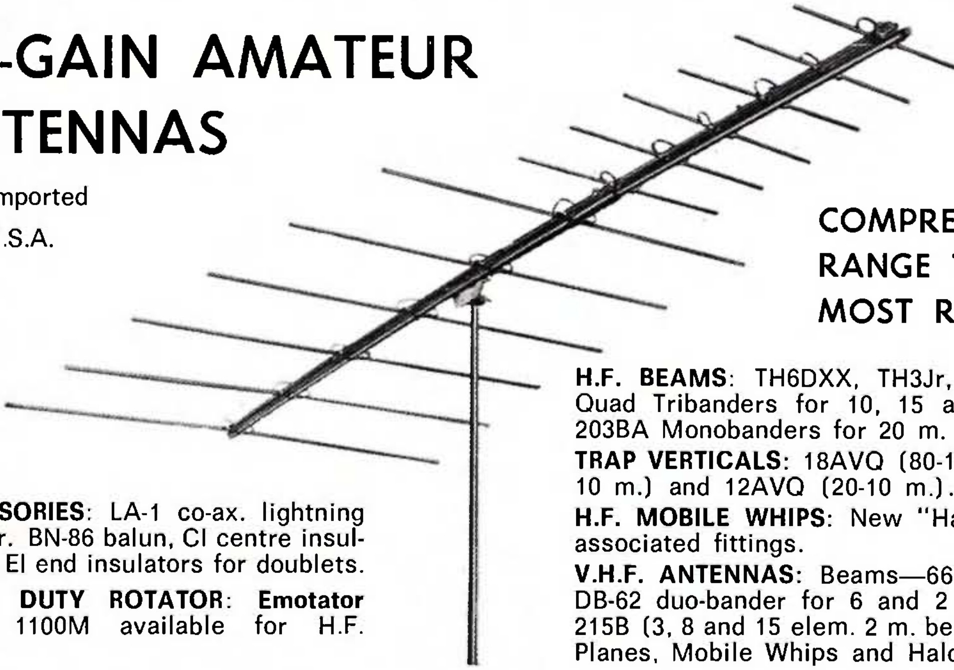

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- ★ Sidetone CW monitor.
- ★ Multi-scale panel meter, fully calibrated, provides direct reading of PA current, plus relative power output, ALC indication, Rx "S" units.
- ★ Offset tuning, plus or minus 5 Kc. is provided by clarifier control, which is selectable Off, Rx, Rx and Tx.
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- ★ VFO dial readout of 1 Kc.
- ★ Dial forward reading all bands.
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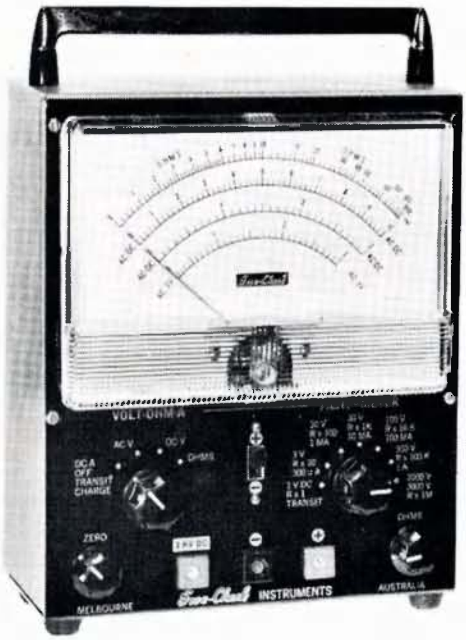

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