FOR THE RADIO ENTHUSIAST ...

Practical Wireless

JUNE 1983

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Practical Wireless

FOR THE Radio ENTHUSIAST ...

JUNE 1983 VOL. 59 NO. 6 ISSUE 915

Our thanks to the CEGB for their assistance with the photo of Marchwood Power Station on our front cover

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four models from Trio

for the HF man, the **TS 430S**

£736.00 inc vat carriage £5.00

A new HF transceiver, taking into account the outstanding performance of the previous Trio rigs you could be forgiven for thinking that it would be impossible for them to improve on existing models and specifications. Alternatively of course, you might be of the opinion that engineers with the talents as displayed by the designers of such rigs as the TS830S, TS130V and TR2500 etc. would have no trouble in pushing forward the frontiers of transceiver technology s we know it today.

The new HF transceiver from Trio is the TS430S. Those who have seen it and the fortunate ones who have used it on the air are all agreed that here we have a major advance for the enthusiastic operator on todays busy bands. Not only does the transceiver have full amateur band coverage from 160 to 10 metres (including the three new bands) but it also incorporates a general coverage receiver (150 kHz to 30 MHz). The new transceivers features are many; USB, LSB, CW, and AM with FM available (optional FM430 board), compact size 270mm wide/96mm high/275mm deep, continuous tuning over the entire frequency range, two separate VFO's and an up/down scan mode using the optional MC42S microphone. Eight memories, each of which can be used as a separate VFO are provided and frequency scan is programable between the two frequencies held in memory channels six and seven. Not only does the memory remember frequency but also the mode of operation, thus short wave DX and Broadcast stations can be stored alongside a SSB net channel and complete sense made as the frequencies are scanned. The by now normal Trio features are all included, IF shift, notch filter, speech processor and narrow/wide filter selection on CW, SSB and AM modes.

The TS430S, Trio's rig for todays operator.

for the SWL who deserves the best, the **R 2000**

£398.82 inc vat carriage £5.00

Now from Trio, the R2000 general coverage receiver. By taking all the superb features of the R1000 and combining them with the latest in microprocessor control Trio have, in one step, completely revised the standard by which short wave receivers are judged. Among the many features provided for the discerning listener are programmable scan, memory scan, memory retention of the mode set for a particular frequency and last, but not least, Trio have included an FM mode – why FM after all this time and our repeated comment that for a shortwave broadcast receiver FM is not really necessary. Take a look at the rear panel of the R2000: a socket marked VHF converter. Wouldn't it be superb if Trio produced a VHF converter covering from 118 to 174 MHz – then you would require FM, you would also require AM. Study the features and I am sure you will agree the Trio R2000 is the receiver for you.

Continuous Coverage from 150 KHz to 30 MHz
Use of an innovative up conversion digitally controlled PLL circuit provides maximum ease of operation and superb receiver performance. Front panel up/down band switches allow easy selection within the full coverage of the receiver. The VFO is continually tunable throughout the full 150 KHz-30 MHz range.

Ten Memories Store Frequency, Band and Mode Data
Each of the ten memories can be tuned by the VFO, thus operating as ten built in digital VFO's. The original memory frequency can be recalled by simply pressing the appropriate memory channel key. All information on frequency, band, and **mode** is stored in the selected memory. The "auto M" switch allows two types of memory storage: when the "auto M" switch is off, data is memorized by pressing the "M in" switch; when the "auto M" switch is on the frequency being used at that time is automatically memorized.

Memory Scan
Scans all memory channels or may be user programmed to scan specific channels. Frequency, band and mode are automatically selected in accordance with the memory channel being scanned.

Programmable Band Scan
Scans automatically within the programmed bandwidth. Memory channels 9 and 0 establish the scan limit frequencies. The hold switch interrupts the scanning process. However, the frequency may be adjusted using the tuning knob whilst in the scan hold position.

Three Built In Filters with Narrow/Wide Selector
In the AM mode 6 KHz wide or 2.7 KHz narrow may be selected. In the SSB mode 2.7 KHz is automatically selected. In the CW mode 2.7 KHz is again chosen and if the optional YG455C filter is installed then 500 Hz in the narrow position. In the FM mode 15 KHz bandwidth is automatically selected.
Other important features are: squelch on all modes, noise blanker, a large 4 inch front mounted speaker, tone control, RF attenuator, AGC switch, high and low impedance antenna terminals, optional 13.8V DC operation, record jack and, of course, provision for a VHF converter.
All in all, a truly remarkable receiver.

and later in the year for the **R 2000** a 118 to 174 MHz internal vhf converter.

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for the VHF operator, the **TR7930** mobile transceiver

£305.21 inc vat carriage £5.00

Any amateur who has used or owns a Trio TR7800 has had the finest piece of 2 metre mobile technology at his fingertips. The TR7800 had simply everything that the keen mobile operator could ever want. Of course, there were a few points which customers said could be improved on and, I must admit, we, in the majority of cases, agreed. Trio, with the introduction of the new TR7930, have taken note of this feedback of information and the result, I am sure you will agree, is as close to perfection as you will find in a rig.

The improvements are, a green floodlit LCD readout which does not disappear in strong sunlight, additional memory channels, both timed and carrier scan hold on occupied channels, selectable memory channel for the priority frequency and automatically corrected mode selection (simplex or repeater) without having to instruct the rig. The most significant change is the liquid crystal frequency readout on a green illuminated background, but closely following this must be the ability to omit specific memory channels when scanning, and the programmable scan between user designated frequencies. This gives the rig the ability to scan simplex channels only, without holding on repeaters.

The Trio TR7930. The mobile 2 metre FM rig designed with ease of operation coupled to outstanding performance.

for the serious UHF and VHF operator, a DXing transceiver, the **TS780**.

With the arrival of the TS780, the dual bander rig has come of age, giving the two band multimode facilities of the original concept, plus a wealth of additional operating facilities. Taking a trip across the front panel of the rig we have the repeater facilities, a non-locking tone switch, ideal now that most repeaters are tone accessed and carrier maintained. The tone, of course, only works whilst the rig is in the FM mode. Below the tone switch is the TX offset switch giving plus or minus 600 KHz or 1.6 MHz, depending on whether 2 metres or 70 cm is selected and last, but certainly not least, reverse repeater – to my way of thinking proof that the TS780 was designed for amateurs by amateurs.

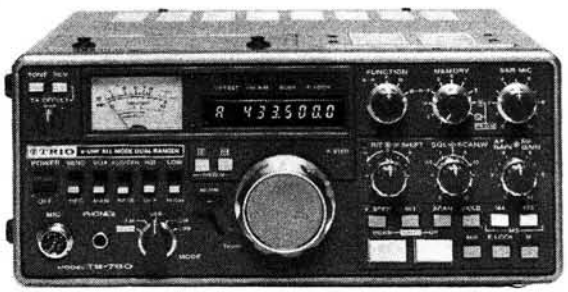
The meter functions on receive as S. meter, ALC meter or as a centre meter, the functions being controlled from a panel switch. On transmit the meter reads relative RF output. Immediately above the digital frequency and memory/VFO indicator are indicating leds: "a busy" led indicating in FM mode whether the squelch is open thereby, assuming the squelch level is correctly set, that the other station is transmitting. A "frequency lock" led tells that the F lock switch is pressed and the VFO knob inoperative. The "on air" led indicates the rig is transmitting and the "offset" led reminds you that the TX offset switch is set to repeater.

The memory operation has been updated: instead of having to progressively move through the memory content in sequence, by means of a rotary switch any of the ten memories (two more than the TS770's) can be selected at will. Entering frequencies into the memory is easier, as anyone who has a TS770 series will explain. Two priority frequencies are included: 9 and 10. Push buttons to the left of the VFO knob allow either of the two programmed frequencies to be quickly selected, immediately cancelling the previous instructions given to the rig. Just the thing for local net frequencies. SSB mic gain needs no explanation, as does the AF/RF gain control.

On the same control knob as the squelch level is a switch enabling the frequency width of scan to be determined. Briefly, when the rig is set to scan either in FM, FM step or SSB mode you can determine the amount of band to be covered.

The ranges are 0.5, 1, 3, 5 and 10 MHz, thus you can limit the rig to scan just the section of the band used by the mode you have selected.

Example: scan width 0.5 MHz, VFO set at 144,000, coverage – 144.000 to 144.5 mode side band – result: free scanning of the SSB portion of the band. On FM the scan locks if a signal is present. On SSB the scan does not stop but you are made aware that there is activity on the band.



Another new control on the TS780 is the IF shift. Available for some time on HF equipment to cope with crowded band conditions, obviously the Trio design engineers have recognised that the 2 metre SSB end of the band can become crowded during contests or when there is "a bit of a lift on". At these times a rig that has the "IF shift" facility will certainly "score points".

The send/receive Vox/Man, meter function, NB, low/high power switches are all well known and have been found on previous generations of Trio base station equipment and again require no explanation. I could say the same thing about the mode switch but here you will notice alongside the standard FM position another marked FM CH. Put the mode switch in this position and instead of a free-running VFO you have a mechanical "click" step feel, the frequency now moving in either 12.5 KHz or 5 KHz steps. Of course the rig will also scan in these steps, controlled either by the scan switch or the up/down shift microphone. Again the Trio amateurs who design the equipment have here a major triumph.

By now you may be seeing why I am so enthusiastic about the TS780 but there is still more to come. How about a memory scan system that will scan either the 2 metre frequencies stored in the memory or the 70 cm ones or, if you wish, both. Well that's another feature of the TS780. Add to this list variable VFO steps of either 20 Hz or 200 Hz, a selectable braked feel to the VFO knob, rapid up and down MHz switching and you have the most comprehensive rig ever seen.

Too complicated some may say. Rubbish say I. Trio thrive on rigs designed to be simple to operate. Do you remember what John wrote in Radcom about the TR7500 and its competitors? And, finally, how about a rig that without resorting to a MHz switch will, by use of the VFO knob, tune from 144 to 146 MHz and from 430 to 440 MHz – only one rig –

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★ FRV7700B; 118-130, 140-150, 50-59MHz.
★ FRV7700C; 140-150, 150-160, 160-170MHz.
★ FRV7700D; 118-130, 140-150, 70-80MHz.
★ FRV7700E; 118-130, 140-150, 150-160MHz.
★ FRV7700F; 118-130, 150-160, 160-170MHz.
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★ PLL digital VFO, stable (50Hz/hr AWU).
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★ SSB (USB/LSB), CW, AM, RTTY.
★ 6 and 2.4kHz, 600* and 300*Hz @ −6dB.
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★ Modular plug in design with mother board.
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*Option

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★ Switchable; AGC, CW bandwidth, dial lock.
★ Noise blanker, impulse interference tuned

		*option
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50T726	Six meter module	£170.00
SAT726	Full duplex unit	£90.00

★ 2M. 12V DC compact 2⅞" × 6⅞" × 7⅞" transceiver.
★ 25W (+ adjustable low power), 12½kHz steps.
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★ Single knob frequency selection, 20 steps revolution.
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★ Digital RIT 1kHz steps, adjusted from main tuning.
★ 2, 5 slot memories, simplex, cross or 600kHz split.
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★ NEW ★

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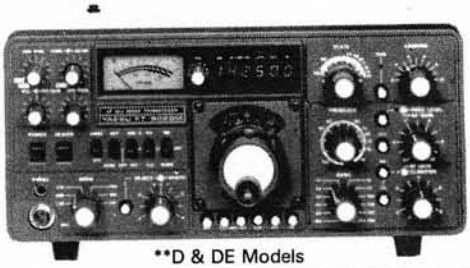
★ NOW WITH CW FILTER, AM FILTER, CURTIS KEYER‡ INCLUDED ★



**D & DE Models

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★ 1.8-3.5-7-10-14-18-21-24.5-28MHz.
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★ **FV102:**– VFO. 10Hz steps and readout, scanning, QSY.
★ **FC102:**– ATU, 1.2KW, 20/200/1200 W FSD PEP, wire.
★ **FAS-1-4R:**– 4 way remote waterproof antenna selector.

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★ CREDIT COVER ★

★ Rx 150kHz-30MHz.
★ Tx 160-10m. 9m bands × 3, × 500 kHz Aux bands.
★ All modes AM, CW, LSB, USB, AFSK & FM (inc.)
★ IF shift & variable bandwidth 2.6 kHz-300 Hz.
★ Inbuilt keyboard operation + scanning.
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IC-25E

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290H . 490E

The recently introduced IC-290H has proved so popular that we have decided to concentrate on this (25W) model 2m multimode. With its bright green display, 5 memories, scan facilities on either memories or the whole band, tone-call button on the microphone and instant listen input for repeaters, this little box really is a beauty. The 70cm version, the IC-490E has similar features (although the output is only 10W in this case). These two multimodes make an ideal pair.

IC-2E . IC-4E

A full range of accessories in stock.

Nearly everybody has an IC2E – the most popular amateur transceiver in the world – now there is the 70cm. version which is every bit as good and takes the same accessories.

Fully synthesized – Covering 144 – 145.995 in the 400 5KHz steps. (430-439.999 4E).
Power output – 1.5W with the 9v. rechargeable battery pack as supplied – but lower or higher output available with the optional 6v or 12v packs. Rapid slide-on charging facility.
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External microphone jack– If you do not wish to use the built-in electret condenser mic an optional microphone speaker with PTT control can be used. Useful for pocket operation.
External speaker jack – for speaker or earphone. This little beauty is supplied ready to go complete with nicad battery pack, charger, rubber duck

Than ICOM Than ICOM Than ICOM Than ICOM Than ICOM Than ICOM Than ICOM Than ICOM Than

CWR-610E

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Listed below are other sets available from Thanet Electronics a more detailed specification of these will appear in future advertisements. prices are inclusive of VAT IC-730, IC-720, IC-2KL + PSU, IC-PS15, IC-ML1, IC-505, IC-SP3, IC-AT500 IC490, IC-AT100, IC-551, IC-PS20.

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HB15M2SP	VP mini size 15m 3 ele.	102.30
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HB33SP	3 ele. tri band beam 10/15/20m	192.50
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MLA4	Loop antenna 10/15/40/80m	105.60
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SQY06	6 ele. quagi 2m	45.75
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FP77	Power Supply Unit	POA
FC77	Antenna Tuner Unit	POA
FRG7700	SSB/AM/FM recvr. dig. readout	POA
MEM7700	Memory unit for above	POA
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FRV7700B	60-60MHz & 118-150MHz	POA
FRV7700C	140-170MHz	POA
FRV7700D	70-80MHz & 118-150MHz	POA
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FF5	LF filter for above	POA
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QTR24D	World Ham clock	POA
YM34	600/50k ohm base mic 8 pin plug	POA
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MML 144/30LS	2m linear amp 3w in 30w out	69.95
MML 144/100LS	2m linear amp 10w in 100w out	139.95
MML 432/70	70cms linear amp 3w in 20w out	85.00
MML 432/100	70cms linear amp 10w in 100w out	228.65
ALINCO 230	2m linear amp 1-3w in 30w out	39.00
MIRAGE	2m linear amp 10w in 80-100w out	120.75
MIRAGE B 1016	2m linear amp 10w in 160w out	189.75
YAESU 2010	to match FT290R 10w out	54.00
YAESU 2050	to match FT 290R 50w out	115.00
YAESU 7010	to match FT 790 10w out	90.00
TOKYO HP HL32V	2m linear amp 1-3w in 30w out	53.50
TOKYO HP HL82V	2m linear amp with preamp and output meter 2 in 12 out 35 in 85 out	144.50
TOKYO HP HL160V	2m linear amp preamp output meter 10 in 160 out	242.00

The prices above include V.A.T. and delivery.

ROTATORS

KR 400RC	constant readout round meter 1½-2½ masts	114.90
KR 600RC	200Kg 1½-2½ masts	163.30
KR 500	180° elevation rotor 1½-2½ masts	112.10
AR 40	medium duty HF	90.85
CD 45	constant readout – armature breaks 8½sq.ft. ant	136.85
HAM IV	constant readout wedge solenoid breaks 15sq.ft.	258.70
T2X	THE BIG DADDY up to 30sq.ft. of ant.	327.75
RO 250	Light duty suitable most VHF/UHF	45.00
SKYKING SU 4000	medium duty HF constant readout	83.00

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YAESU HF MOBILE ANTENNAES

RSL 3.5	3.5Mhz resonator and whip	12.50
RSL 7.0	7.0Mhz resonator and whip	12.10
RSL 14.0	14.0Mhz resonator and whip	11.70
RSL 21.0	21.0Mhz resonator and whip	11.60
RSL 28.0	28.0Mhz resonator and whip	11.40
RSL 2A	Mast for above	5.25
RSM 2	Gutter mount-feeder and connector	11.50

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MORSE KEYS

HK 707	Straight Manual keyer	14.50
BK 100	Semi-automatic mechanical bug	22.99
MK 702	Manual keyer on marble base	26.99
MK 702	Manipulator	22.99
MK 705	Squeeze paddle on marble base	21.72
EKM 1A	Morse code practice oscillator	10.50

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SHURE 444D Dual Impedance	49.50
SHURE 526T Mk II Power Microphone	59.50
ADONIS AM502 Compression Mic 1 O/P	39.00
ADONIS AM601 Compression Mic + Meter 1 O/P	49.00
ADONIS AM802 Compression Mic + Meter 3 O/P	59.00

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INFORMATION FOR TRIO R1000 OWNERS

We don't have to tell you how good the receiver is – neither do we have to tell it is **missing** one essential feature – FM! No longer! Amcomm have specially designed a unit to complete your listening pleasure. It is small and will fit with minimal effort and time. It comes with really simple and concise instructions which can be read and used by the most non-technical users. The FM1000 is available now post free at **£15.99** inc. VAT from AMCOMM.

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Amtech 300B – To suit all coaxial and random wire antennas – 160-10 metres. 300w PEP. **£49.95** including VAT and carriage.

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Amtech FM 1000 – suitable for conversion of Trio R 1000, see details on lower part of page. **£15.99** including VAT and carriage.

ANTENNA PARTS AND KITS

Includes the world's finest traps – REYCO, which are guaranteed for five years no condenser used – no blow up possible. Precision moulded coil forms with stainless hardware – aluminium irridite finish – fully waterproofed and suitable for wire, vertical and beam antennas, rated at 2.5Kw and weigh only 4oz per trap – available for 7Mhz (KW40) 14 Mhz (KW20) 21 Mhz (KW15) and 28 Mhz (KW10). **£16.99** including VAT and carriage.

The BALUN – The Unadilla W2AU is famous because its the best, same rating as the traps and has a built-in lightning arrestor – available 1:1 and 4:1 – get it right first time with W2AU Balun – guaranteed for five years. **£16.99** including VAT and carriage.

THE KITS – AMCOMM 40 – 1 pair KW 40 Traps, 1 PL 259, 1 W2AU Balun, 1 pair insulators and of course 120ft soft drawn copper wire – coverage 80-10 metres (**includes** 10 Mhz). Full instructions included. **£41.50** including VAT and carriage.

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AMCOMM 3B – 1 pair KW 10 Traps, 1 pair KW 15 Traps, 1 PL 259, 1 W2AU Balun, 1 pair of insulators and 30ft soft drawn copper wire – coverage 20m, 15m and 10m. Full instructions included. **£47.50** including VAT and carriage.

New WARC Traps – KW 12, KW 17 and KW 30 now available from stock. **£16.99** including VAT and carriage.

ICOM HF EQUIPMENT

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IC 720A	Gen. Coverage Tcvr. with FM	
IC 730	Base/Mobile 8 band HF Tcvr.	
IC 740	WARC 9 Band HF Tcvr.	
IC PS 15	For above rigs	
IC 2KL	Linear Amp. inc PSU	
IC AT 500	Auto antenna coupler	
IC R70	Gen. Coverage Receiver	

ICOM VHF – UHF EQUIPMENT

IC 251E	2m base multimode	P.O.A.
IC 25E	2m 25w mobile	
IC 290E	2m multimode 10w	
IC 290H	2m multimode 25w	
IC 2E	2m handheld	
IC 4E	70cms handheld	
IC L1	soft cases	

Full range of accessories available from stock.

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HANSEN FS 5E 3.5 – 150Mhz 3 ranges to 1Kw (HF)	37.20
HANSEN SWR 50B 3.5 to 150Mhz 1Kw (HF)	26.45
YAESU YS 200 200w to 1Kw	52.90
YAESU YS 2000 PEP meter 2Kw	69.75
RF 2000 twin meter 3.5 – 150Mhz 2Kw	18.60
YM1X twin meter 3.5 – 150Mhz 12 and 120w	15.50

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TRIO R600 £257.50

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TRIO NEW R2000 £398.75

The R2000 is Trio's latest communications receiver covering the entire spectrum from 150KHz to 30MHz. It boasts a whole host of features that make it probably one of the best buys in radio communications receivers currently available today. Its uncompromising design provides facilities for AM, SSB, CW and FM reception with 3 separate filters automatically switched in. The factory fitted memory module provides for 10 separate frequencies to be programmed in any mode and for automatic scanning of all channels. In addition, pre-programmed segments of the band may also be scanned making it one of the most versatile designs available. As an added feature an internal battery with an estimated life of 5 years retains the memory even when the power is disconnected. The rate of tuning is controlled electronically and has 3 speeds to suit all types of operation. Another novel feature is the squelch control that is effective on all modes for suppressing background noise when no signal is present. Other features include noise blanker, dual AGC, clear digital display down to the nearest 100Hz, dimmer switch, 24 hour quartz clock, front mounted speaker, tone control, RF step attenuator, dual impedance aerial terminals, 230v AC or optional 12v DC operation, built-in timer etc, etc.

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YAESU FRG7700 £335

The FRG7700 is for the advanced listener or for the enthusiast who demands the best in short wave reception. The receiver covers the complete spectrum 200kHz to 30mHz with a highly accurate digital display. The receiver offers excellent sensitivity and selectivity and has separate detectors for AM, FM and SSB, plus switched bandwidth on AM. Other controls include automatic gain control, noise blanker, attenuator, squelch, rf gain control and clock with timer. There is also facilities for fitting an optional 12 channel memory unit. The receiver runs from 230v AC mains or 12v DC and there is an optional aerial tuner to go with it. And if you are interested in VHF, there is a complete range of specially designed converters to go with the receiver that covers the amateur, aircraft and marine bands, etc. Why not send today for our coloured brochure and get to know more about what the FRG7700 has to offer.

ICOM R70 £499

The R70 is possibly the ultimate in receivers designed for the amateur market. We've tested this thoroughly and are convinced that this receiver offers everything that the enthusiast could ever wish for. If anything can pull the signals in, this one will. Frequency coverage is 100kHz to 30mHz in 30 bands. A 3 stage rate of tuning enables easy tuning for all modes, AM, SSB, CW and FM (the latter requires the optional FM module). The dual VFO enables 2 separate frequencies to be used and the bright digital display gives precise frequency readout down to 100Hz with absolute stability. Great emphasis has been put on selectivity and in addition to independant filters for each mode, there is a separate selectivity control. This enables the bandwidth to be continuously varied down to 500Hz. Another control provides a variable notch filter to prevent hetrodyne interference – now you can really dig deep for those elusive DX signals. Another nice feature on this receiver is its excellent sensitivity even on very modest aerials. This is obtained by the use of a well designed front end incorporating switched pre-amplifier and attenuator. Other features include dual-mode noise blanker, dual AGC action, transmitter monitor, dimmer switch, dial lock, RIT control, squelch control, tone control, FM tuning indicator, forward facing speaker, 230v AC power requirements, etc, etc.

★ *HAVE YOU GOT YOUR COPY OF "BETTER SHORT WAVE RECEPTION"?*
THE NEW 5TH EDITION HAS JUST ARRIVED. 160 PAGES £3.95 + 75p p.&p.

AIRBAND MONITORS

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110-140 MHz 12V DC
5kHz steps. 1 watt audio output.
Excellent sensitivity.

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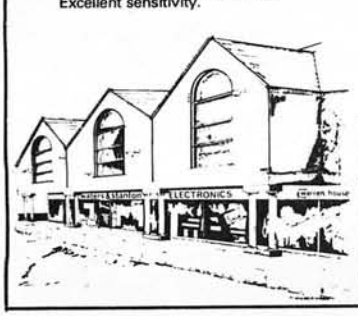

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230V AC & 12V DC.
60-89MHz; 140-179MHz;
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This amazing receiver covers the major portions of the VHF and UHF spectrum. Both AM and FM modes are catered for and the large digital display give clear indication of frequency being received, memories, locked out channels etc. It has excellent sensitivity and is one of the best scanners we have so far come across. Ideal for listening to amateurs, aircraft, marine and public service traffic it represents state of the art sophistication to wide band monitoring. First deliveries are expected at the beginning of May.

£259
Available early May

*on Trio Yaesu & ICOM BARCLAYCARD ACCESS AND INSTANT CREDIT E.&O.E.

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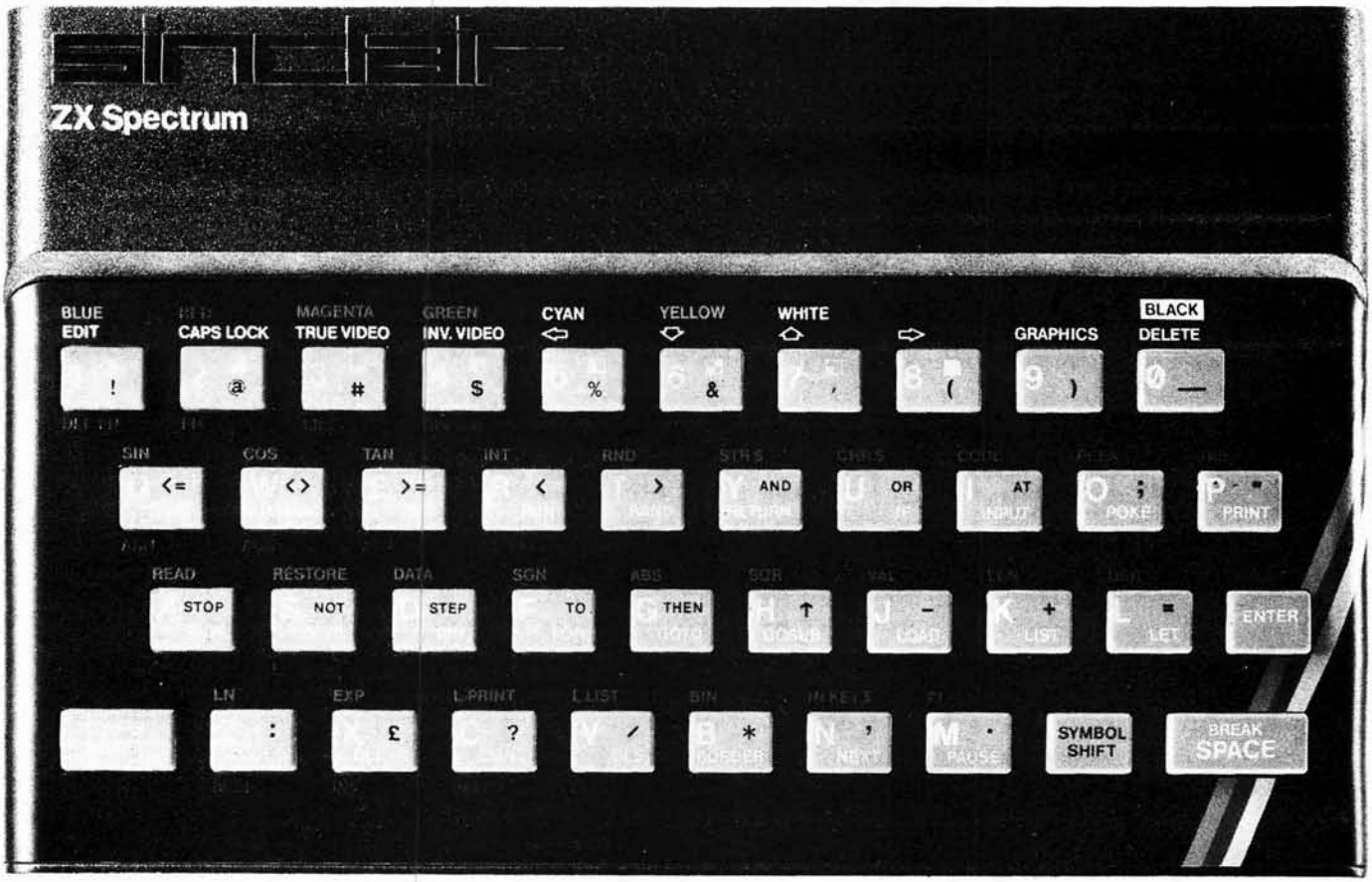

The growing range of Spectrum Software

You'll know already that the Spectrum has generated an enormous range of bolt-ons and independent software. Our own range is growing very fast. You'll see some cassettes here. The rest are detailed in the Sinclair Software Catalogue – *free* with every ZX Spectrum.

'um-news!

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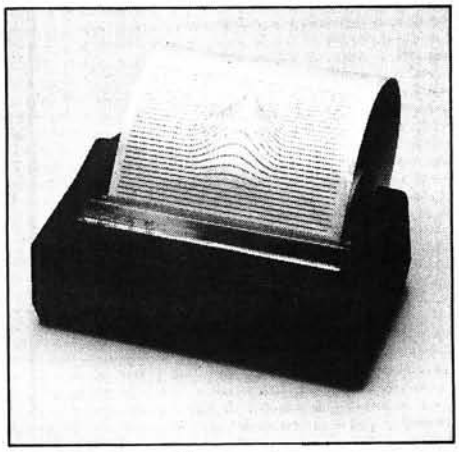

ZX Printer now £39.95

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PRW 906

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A Busy Month

DURING MARCH, we have had three major amateur radio events in the UK, including two "firsts". The RSGB's traditional Ally Pally exhibition moved to the Birmingham National Exhibition Centre to become the first National Amateur Radio Convention, and despite many people's misgivings over the new venue, it was a great success. Over 10000 visitors came, 4000 of them in the first hour of the first day, and the dealers generally seemed to have happy faces at the end of the show! The HF Convention was combined with the show, but though I'd have liked to listen to some of the lectures, we were so busy on the *PW* stand that I couldn't get away. I think that the only real complaint among visitors was the overloaded catering facilities in Hall 6. Hopefully the planned move to another hall next year will overcome this problem.

Second on the calendar was the NARSA annual exhibition, which had moved from Belle Vue, Manchester to Pontins Holiday Village at Southport, and turned itself into a radio and electronics weekend. Around 4500 visitors attended, not bad considering it came only a fortnight after the Birmingham weekend. Our *Broadcast Bands* contributor Charles Molloy was our guest on the *PW* stand.

The final Saturday in March saw the RSGB's VHF Convention at Sandown Park. We weren't exhibiting there, just visiting, which gave us a chance to look round the stands and listen to the lectures.

One of the problems of the lectures, apart from making up your mind between the three streams, is knowing whether a particular lecture will be "beginners" standard or "state-of-the-art". Some sort of grading system would be a great help in judging whether a lecture might be too basic or too advanced for your level of knowledge of that topic. I've been caught both ways myself over the years.

In his Convention Address at Sandown Park, RSGB President Don Baptiste spoke out very strongly against the tendency among some holders of Amateur Licence "A" to treat "B" Licence-holders as some sort of second-class citizens. The "B" licensees were now in the majority as RSGB members, he said, and their considerable contribution to the progress of amateur radio should be acknowledged. Don Baptiste also pledged his whole-hearted support for the idea of "B" Licence-holders being allowed to use Morse code on bands at 144MHz and above, currently under negotiation between the RSGB and the Home Office.

Geoff Arnold

QUERIES
While we will always try to assist readers in difficulties with a *Practical Wireless* project, we cannot offer advice on modifications to our designs, nor on commercial radio, TV or electronic equipment. Please address your letters to the **Editor, "Practical Wireless", Westover House, West Quay Road, Poole, Dorset BH15 1JG,** giving a clear description of the problem and enclosing a stamped self-addressed envelope. Only one project per letter please.

Components for our projects are usually available from advertisers. For more difficult items, a source will be suggested in the "Buying Guide" box included in each constructional article.

PROJECT COST
The approximate cost quoted in each constructional article includes the box or case used for the prototype. For some projects the type of case may be critical; if so this will be mentioned in the Buying Guide.

INSURANCE
Turn to the following page for details of the PW Radio Users Insurance Scheme, exclusive to our readers.

CONSTRUCTION RATING
Each constructional project will in future be given a rating, to guide readers as to its complexity:

Beginner
A project that can be tackled by a beginner who is able to identify components and handle a soldering iron fairly competently. Generally this category will be used for simple projects, but sometimes for more complicated ones of wide appeal. In this case, construction and wiring will be dealt with in some detail.

Intermediate
A project likely to appeal to a wide range of constructors, and requiring only basic test equipment to complete any tests and adjustments. A fair degree of experience in building electronic or radio projects is assumed.

Advanced
A project likely to appeal to an experienced constructor, and often requiring access to workshop facilities and test equipment for construction, testing and alignment. Constructional information will generally be limited to the more critical aspects of the project. Definitely not recommended for a beginner to tackle on his own.

SUBSCRIPTIONS
Subscriptions are available to both home and overseas addresses at £13 per annum, from **"Practical Wireless" Subscription Department, Room 2816, King's Reach Tower, Stamford Street, London SE1 9LS.** Airmail rates for overseas subscriptions can be quoted on request.

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	Manufacturer's Name	Model	Serial No.	Description of equipment to be insured e.g. Base station; Mobile; CB; etc.	VALUE £
1					
2					
3	Antennas (Aerials), s.w.r. meters, etc.				

Please continue list of equipment on a separate sheet if necessary

TOTAL SUM TO INSURE £

DECLARATION: I/We hereby declare that: 1. The sums insured represent the full replacement value of the equipment. 2. I/We have not* had insurance cancelled, declined, restricted, or other terms imposed in any way other than the normal Policy terms. 3. This proposal shall be the basis of the contract and that the contract will be on the Underwriters normal terms and conditions for All Risks and Legal Costs/Expenses cover unless otherwise agreed. 4. I/We have not* sustained any loss or damage to any radio communications equipment or been involved in litigation relating to use of radio equipment during the past three years, whether insured or not. 5. All the above statements made in connection with this proposal are true and no material information has been withheld. 6. I/We understand no liability shall attach until this proposal shall have been accepted by Laymond's and the premium paid in full and a Certificate issued.

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Morse Code for Class B?

During members' question time in the House of Commons, on 18 February 1983, Mr. Charles Irving asked the Secretary of State for the Home Department why Her Majesty's Government prohibit the use by Class B amateurs as part of their self-training of Morse code on the wavebands they are allowed to use.

Mr. Mellor replied: "The purpose of the Class B radio amateur licence is to allow the use of telephony only and the transmission of Morse code is confined to those qualified to hold a Class A licence. However, we are reviewing the position in respect of self-training in Morse and the subject is to be discussed with the Radio Society of Great Britain at a meeting to be held in March."

That meeting did take place, and David Evans G3OUF, General Manager/Secretary, of the RSGB stated: "Following the meeting during March between the Home Office and the RSGB, the Home Office has confirmed that they have no objection in principle to the scheme put forward by the RSGB for Class B licensees to use Morse above 144MHz on an experimental basis for one year.

"The question yet to be resolved is whether this dispensation should be limited to the primary amateur bands above 144MHz or whether it can be extended to those bands where amateurs have a secondary allocation.

"Further consultation both with the primary user and the Radio Interference Services will now follow, before discussions will be resumed with the RSGB."

It is estimated that the consultations will take a couple of months and then final resolution of the matter a further few months. So, don't go wiring that key up yet.

The Telecommunications Bill

The Bill has been considered through sittings of Standing Committee H, and an Amended Bill ISBN 0 10 310283 3 (£7.60 from HMSO) has now been published.

The "Provisions Relating to Wireless Telegraphy" form a very small section of the Bill. So far as we can see, the only change in this section is the addition of a clause to cover the different legal situation in Scotland.

UK Novice Licence

We have recently received details, from Ian Abel G3ZHI, of a campaign that aims "To obtain an amateur radio novice licence for operators not yet possessing the qualifications for a full amateur licence."

Campaign literature states that the RSGB has failed in its negotiations with the Home Office, dating back to 1947, despite a promise made in Parliament by the Postmaster General on the 11th March 1968 to introduce such a licence "later in the year".

The present position of the HO is quoted as being that no objections in principle exist, but the HO are not convinced that sufficient interest exists for such a licence.

The UK would certainly not be creating a precedent if such a scheme were to be introduced — the USA, for instance, has had a novice class licence for many years which requires the applicant to pass a basic theory examination and have the ability to receive Morse code at the rate of five words per minute. In return, the novice licence holder is permitted to operate on 28, 21, 7 and 3·5MHz (10, 15, 40 and 80m) using c.w. only (within defined segments of each band), also they are **only** allowed a maximum power input of 250 watts. The licence is valid for two years.

If you are interested in supporting the Amateur Radio Novice Licence Campaign (ARNLC) or require further details of the proposals, contact: *Ian Abel, 52 Hollytree Avenue, Maltby, Rotherham, South Yorks. tel: (0709) 814911* (please enclose an sae).

This is your opportunity to demonstrate to the HO that sufficient interest in this form of licence does exist.

Rallies and Events in May

This month I have quite a number of rallies and events to mention, so I have published essential information only.

RATEC 83 a new radio rally, organised by the Radio Amateurs Technical Engineering Club, to be held at Woodford in Cheshire on Sunday 22 May. Details from: *Dave Kirby G3VFP, 17 Laleham Green, Bramhall, Cheshire. Tel: 061-485 2377.*

East Suffolk Wireless Revival 1983 organised jointly by Ipswich Radio Club and Martlesham Radio Society, to be held at the Civil Service Sportsground, The Hollies, Straight Road, Ipswich on Sunday 29 May, starting at 10am. Details from: *Jack Tootill G4IFF, 76 Fircroft Road, Ipswich IP1 6PX. Tel: (0473) 44047.*

The 6th Plymouth Radio Club Rally at the Main Hall, Tamar High School, Paradise Road, Stoke, Plymouth on Sunday 29 May, starting at 10am. Details from: *The Rally Organiser, G6EQM, QTHR. Tel: (0752) 20224.*

For Your Diaries

Don't forget to make a note of these later events. We plan to be there—why don't you come along too?

Vintage Wireless Day at the Chalkpits Museum, Houghton Bridge, Amberley, West Sussex on Sunday 5 June from 11am to 5pm.

RNARS Mobile Rally at HMS Mercury, Leydene, near Petersfield, Hants. on Sunday 12 June from 10am to 5.30pm.

26th Longleat Mobile Radio Rally at Longleat Park, near Warminster, Wilts. on Sunday 26 June from 10am.

Scottish Amateur Radio Convention at Cardonald College, Mosspark, Glasgow on Saturday 27 August, organised by the West of Scotland ARS.

Telford Amateur Radio Rally and Exhibition at Town Centre Malls, Telford, Shropshire on Sunday 11 September from 11am (10.45 for disabled visitors).

Readers will be interested to know that at these events we will have, on our stand, recent copies of *PW, Out of Thin Air* and *Passport to Amateur Radio;* also on sale will be *PW Radio Programs – 1* cassette tapes and parabolic dishes.

Parabolic Dishes

Ever since we sold-out of parabolic dishes, originally supplied for the *PW Exe* microwave transceiver project, we have had a steady trickle of requests for them. Consequently, we were encouraged to place another bulk order with the manufacturers — these are now in our possession.

The dishes will cost £10 each, which includes VAT, and will be available to callers at our offices or from our stand at the rallies and events we will be attending throughout the year — see the diary notes under Rallies and Events.

Unfortunately, we are unable to supply the dishes by mail order.

Repeater News

Of the 22 repeater licences released by the Home Office under v.h.f. phase 5 and u.h.f. phase 6—five v.h.f. units—GB3AM, GB3BX, GB3ES, GB3EV and GB3LM are operational together with GB3FN, GB3UL, GB3WU and GB3XX on 432MHz.

432MHz: A recent meeting between the RSGB and the HO has confirmed the continuing and permanent secondary user status of amateur radio within the 430 to 440MHz (70cm) band. It has been suggested that the hoped-for joint primary user status, believed to have been coming as a result of WARC 79, was due to an omission in the footnotes relating to the discretionary powers of individual administrations.

If nothing else has been achieved since WARC 79, a new spirit of "general awareness" and the availability of preliminary vetting of amateur service proposals for 432MHz is now the order of the day at the HO/MOD.

A proposal has been submitted to the Repeater Working Group for a 432MHz repeater covering the Wisbech, March and Chatteris area of North Cambridgeshire.

Site Changes: The ex-Brighton 144MHz repeater GB3SR on R3, has had approval for a site change which will allow a considerable improvement in its service coverage towards the Portsmouth area. The new site will be close to Worthing and will consolidate the 144MHz repeater coverage along the South Coast, without a potential large overlap with the recently introduced Hastings repeater GB3ES on R7.

The Humberside 432MHz repeater GB3HU on RB10, is to be co-sited with its 144MHz counterpart GB3HS. The group's site change is conditional on low levels of interference to other repeaters on the same channel.

GB3ANG, the Angus beacon, currently operating on 432.990MHz is to QSY to 432.980MHz to avoid interference to users of the local 432MHz repeater, the output of which is on RB0 (433.000MHz).

The future: On a more sobering note for the serious repeater user, the RSGB are currently striving to obtain from the HO, a ruling on future repeater projects on the 144 and 432MHz bands. It has been suggested, but not confirmed, that the next submissions for either band could well be the last—nationwide coverage having been, in the eyes of the HO, achieved and the original experiment fulfilled.

This being the case all current proposals, before the RWG, are being held until the HO states whether the end has or has not been reached and that any remaining groups seeking to establish repeaters in areas not currently being served have had their chance to lodge a proposal.

Innovative uses for existing units and microwave/h.f. systems will still be considered. Who's going to be the first to propose a 29MHz f.m. repeater for the UK? Do we need one? I've just been overtaken by a case of déjà vu.

Vintage Stock

We regularly receive in our postbag requests for information or service data etc. for old radios and many other types of aged electronic equipment.

The Vintage Wireless Company specialises in this area of the electronics market and can supply complete equipment, service sheets, books, valves and components.

To market their goods the Company publish a newsletter approximately 12 times a year, and the subscription rate for 12 issues, to the UK and Eire, is £3.00.

For further details, contact: *The Vintage Wireless Company, 64 Broad Street, Staple Hill, Bristol BS16 5NL. Tel: (0272) 565472.*

ATV Exhibition

The British Amateur Television Club will be holding an Exhibition of Amateur Television at the Post House, Leicester on 22 May. The doors will open at 10am and admission is free.

Attractions at the exhibition will include the BATC outside broadcast unit, demonstrations of both fast and slow scan television along with narrow band television using the 432MHz, 1·3 and 10GHz bands. There will be the usual trade stands also a comprehensive supply of club books and p.c.b.s, in particular a full range of p.c.b.s covering all the projects in the *Amateur Television Handbook 2.*

The Post House is well suited to the family with a very reasonably priced Sunday lunch and special half-priced rooms for people attending the exhibition and requiring accommodation.

Further details are available from: *Trevor Brown G8CJS, 25 Gainsbro Drive, Adel, Leeds LS16 7PF. Tel: (0532) 670115.*

A Golden Jubilee at Marconi

On 11 February, 1983, Marconi Communication Systems celebrated the fiftieth anniversary of the inauguration of the world's first commercial microwave link, installed between the Vatican and the Pope's summer residence at Castel Gandolfo.

During the late 1920s and the early 1930s a great deal of money and effort was invested by Marconi in the investigation of wavelengths of less than one metre, much of the work being carried out by the Propagation Section at Chelmsford, and by Marconi himself at his private laboratories in Italy.

An 18km link near Genoa in October 1931 provided the first practical demonstration, attended by senior Italian Government officials, a duplex telephony link of some 35km following in April 1932. Pope Pius XI, a practical man with an interest in maintaining reliable communications, had the Vatican link, spanning 24km, installed during the autumn and winter of 1932/3, and attended the inauguration on 11 February at which the Marchese Marconi demonstrated the system to him.

Special Event Station — GB2WEC

The Bournemouth and District RAIBC group will be operating a special event station on Saturday 14 May, between 1000 and 1700hrs, to celebrate the second anniversary of the opening of the Wedgwood Electrical Collection located at the former Christchurch Power Station, Bargates, Christchurch, Dorset.

The collection of exhibits display the progress of the electricity supply industry from its primitive and precarious inception up to modern times, and will be open for inspection between the previously mentioned times.

Talk-in will be available on S22 and also during the day the station will be active on 144MHz (2m) f.m. plus 28, 21, 14 and 3·5MHz (10, 15, 20 and 80m) s.s.b. or c.w.

A special QSL card has been prepared and will be sent to all stations worked via RSGB QSL Bureau or direct on receipt of an s.a.e. and card to G6DUN.

Further details available from: *Bob Burrows G6DUN, 40 Fairmile Road, Christchurch, Dorset. Tel: (0202) 762828.*

432MHz—Mutual Interference

With the large increase in both f.m. repeater and ATV activity on the 432MHz band, the RSGB VHF Committee has issued an operating code of practice to assist both groups. It is considered that by following these recommendations problems due to mutual interference will be greatly reduced.

ATV Operators: Always operate as high in the band as possible, using the minimum bandwidth necessary. Particular attention should be given to the bandwidth of digitally generated signals.

Operators should at all times be aware that "long overs" may be keeping several repeaters open for long periods. Transmitting equipment should be provided with a means of fine frequency adjustment, to enable sidebands of the ATV signal to be offset from repeater input channels. Polarisation of ATV antennas should always be horizontal.

Repeater Users: Antenna polarisation should always be vertical (this applies to all non-TV terrestrial transmissions above 433MHz), all u.h.f. repeaters are installed with vertically polarised antennas.

Repeater groups should ensure that periodic identification callsigns are kept to a maximum of one every five minutes, when the device is not being used. Timeout facilities should be provided to prevent the repeater from being "locked up" for long periods when not used for f.m. traffic.

It should be appreciated that the UK u.h.f. repeater channels are deliberately non-standard in an attempt to avoid interference to ATV operations. The IARU system provides repeater inputs that occur much higher within the band.

There appears to be no reason why individual repeaters cannot be switched off during ATV contests, provided prior arrangements have been made with the individual repeater group and RSGB HQ.

Stolen Equipment

A considerable amount of amateur radio equipment was stolen in a burglary at *Poole Logic, 49 Kingston Road, Poole, Dorset, tel: (0202) 683093,* in February.

The following rigs formed part of the haul:

Yaesu
- FT-902DM ... Ser. No. 1M 240441
- FT-707 ..... 2G 250139
- FT-230 ..... 2I 070087
- FT-290 ..... 2J 170422

Icom
- IC-290E 142 02927
- IC-2E 119 25915
- IC-720 ..... 131 09442

If you are offered, or have any information concerning these items, please contact either the owners or Poole Police, Tel: (0202) 22099.

Company Name Change

Dau (UK) Ltd. and its associate, Church House Components Ltd., have combined their activities. The management of Dau (suppliers of foil dielectric variable capacitors, hardware and heatsinks) felt that their associate's activity as a stocking representative for other specialised components was becoming so close to their own that the most sensible thing to do was to combine the two organisations (which has now taken place), resulting in the new company being called Dau Components Ltd.

For full details of the new company's product range, please contact: *Dau Components Ltd., 70-74 Barnham Road, Barnham, Bognor Regis, West Sussex PO22 0ES. Tel: (0243) 553031.*

Please Note!

A number of our advertisers have asked us to advise readers that the price of imported products are likely to change from month to month.

The reason behind these changes is fluctuating international exchange rates. So, readers are therefore advised that they would do well to check prices with suppliers prior to sending off orders.

New Catalogue

Ambit's new Spring catalogue is now available. As usual, there are a number of new stock components listed—including a stock range from the huge Ritel collet/pushfit knob range, solenoid cassette mechanisms, multi-colour micrographic printer/plotters, coils, filters and all the more general components that they can supply.

The new catalogue is available at many newsagents throughout the UK priced 75p, or alternatively, for the same price, direct from: *Ambit International, 200 North Service Road, Brentwood, Essex CM14 4SG. Tel: (0277) 230909.*

ZX Success

Sinclair Research, manufacturers of the personal home computer range ZX80, ZX81 and ZX Spectrum, announce that they have extended the number of retail outlets for their ZX Spectrum.

Joining branches of W. H. Smith, currently selling several thousand ZX Spectrums each week, are selected branches of Boots, Currys, Greens—Debenhams' in-store subsidiary—and John Menzies.

At the same time John Lewis, House of Fraser, Rank Xerox and many smaller retailers and computer stores will be supplied by Sinclair's UK distributor, Prism Microproducts.

Together, sales of the ZX80 and ZX81 now exceed the million mark and the ZX Spectrum sales seem to be following the same path to success with over 200 000 units sold so far.

Sinclair Research, which was founded by Clive Sinclair in July 1979, has beaten off competition from both Japan and the USA, and is now the world's largest manufacturer of personal home computers. Current monthly production of the ZX Spectrum is running at over 50 000 units, and rising sharply, whilst they are also producing 60 000 ZX81s per month.

Sinclair Research Ltd., 25 Willis Road, Cambridge CB1 2AQ. Tel: (0223) 353204.

Can I Help You!

Are you the secretary, organiser or general dog's body of your local radio club or any other group whose functions may interest readers of *PW*? If so, let me know and I will endeavour to publicise your rally, get-together whatever, through this column.

AIMING HIGH SAFELY

Rob Mannion G3XFD

There is no doubt that for most radio enthusiasts, getting antennas up and down safely and easily for maintenance and alterations is the most difficult problem of all. Sometimes it can be fun, sometimes risky, sometimes downright dangerous! When you are young, lithe and fit it can be a very enjoyable part of the hobby. However, when you are getting a bit long in the tooth like some of us and not so able, it is not so easy.

Unless you are good at climbing trees, and that's assuming you have a tree to use, or something high to mount the wire ends to, you will have to use your head (not literally of course) and think of a practical way out of it.

The ideas I have condensed here are taken from nearly thirty years of radio antenna erecting experience, and one or two near disasters in the process. It is hoped that at least some of my ideas will be of use to you, and suitably modified to your requirements provide you with a reliable and "easily-get-at-able" system.

Once you have a system that is easy to adjust, the tendency to "leave well alone", or "it's up there now I'll leave it!" will go. You will be much more tempted to adjust your antenna to give the best results that you can possibly get.

The first thing to consider for ease of antenna erection are the various high quality masts that are available—albeit at a price. It is a tragic reality that the people who could really benefit from such a mast system cannot afford them, as living on a Pension or Disability Allowance does not stretch far enough for such luxuries.

These kind of towers are so well known that they do not need anything more than a passing mention, other than to say that not only can you mount your h.f., v.h.f. and other rotatable antennas on them, they can be radiators themselves, or be the centre support for your h.f. band antenna too. It is surprising how many amateurs that I have seen using these towers, with just one or two antennas up top—wasting the very expensive potential of the tower.

Before passing onto other methods, it must be mentioned that even with one of these beautifully made towers, you still have quite a lot of hard work to do even with the electric winches that are now made to help with erection. It really does pay to have friends to help you with this job.

Although steel towers are relatively common in amateur radio usage another form of telescopic tower that is in use professionally all over the world is hardly known in our hobby at all. The "pneumatic mast" is used by all the Broadcasting Authorities within Britain: both the IBA and the BBC use examples of this most useful kind of mast. Local radio stations (again both IBA and BBC) make extensive use of this most flexible of masts (if you'll forgive the deliberate pun).

Pneumatic masts come in many different sizes, and would suit the radio amateur's requirements (purse permitting of course). One of the most useful is the standard 10 metre mast, which with a low pressure air supply of around 100–170kPa (15–25lb/in^2), will erect the mast to full height within a minute or so. Within broadcasting these masts find their biggest use in field strength surveys for Television and Radio Stations. Another use is for outside broadcasting, especially in local radio.

This sort of mast is quite suitable for intermittent use, for fast and frequent erection and for permanent erection such as holding a wire antenna in position. They are available in many different forms, vehicular and post mounting types being supplied. Types are made that can be pumped up as easily as a car tyre, and locked into position. These are the most likely to be found in amateur radio circles and they can be very useful indeed. The mast shown in Fig. 1 is a 10 metre model from Clark Masts Ltd. on the Isle of Wight, and is very useful, even being able to rotate v.h.f. and u.h.f. beam antennas.

All these wonderful professionally-built masts and towers are really marvellous but most of us, despite the availability of the manufactured jobs, have usually to turn to our own devices—that's what amateur radio is all about, is it not! It is surprising how cheaply and easily we can make a mast to our requirements and pocket.

Wood used to be the best and cheapest material to employ, but nowadays the cost of a really decent piece of wood to use as a light mast can easily outreach that of a length of lightweight aluminium scaffold pole. However,

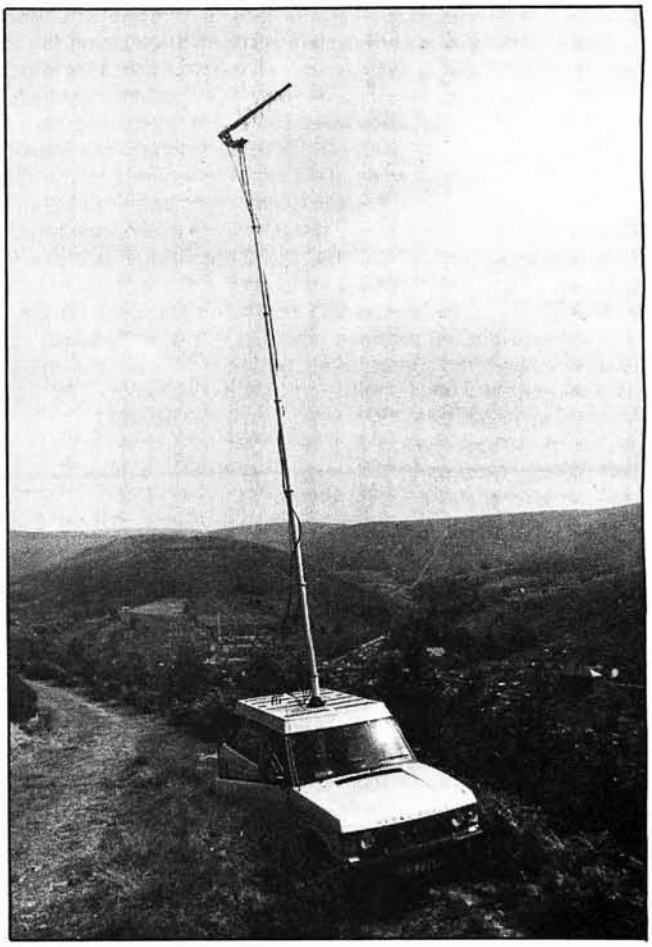

Fig. 1: The Clark Masts Ltd. 10 metre mast being used during field strength tests

by far the biggest advantage of a lightweight wooden mast is that it can easily be erected by one man and lowered again very easily for repairs. The disadvantages are that they rarely can take much weight at the top, and that timber rots very quickly indeed, being exposed to everything our delightful climate can throw at them.

An example of a very simple mast that the author used for many years is shown in Fig. 2. It is in itself unobtrusive and able to support an end-fed wire up to a height of approximately 7·5 metres. The total cost should not be more than £8, even if you have to buy all the wood (2 × 2 or similar). Plenty of creosote is required though.

You need to drill a standard fence or gate post to take the fixing bolts for the pole, Fig. 2(a). For the centre or "cheek type" joiner the bolts should pass through both the joiner and pole. Four bolts should be used, only two are illustrated in the diagram. A small gap should be left between the wooden poles to allow air to pass through, avoiding the possibility of rot setting in too quickly at this vulnerable spot.

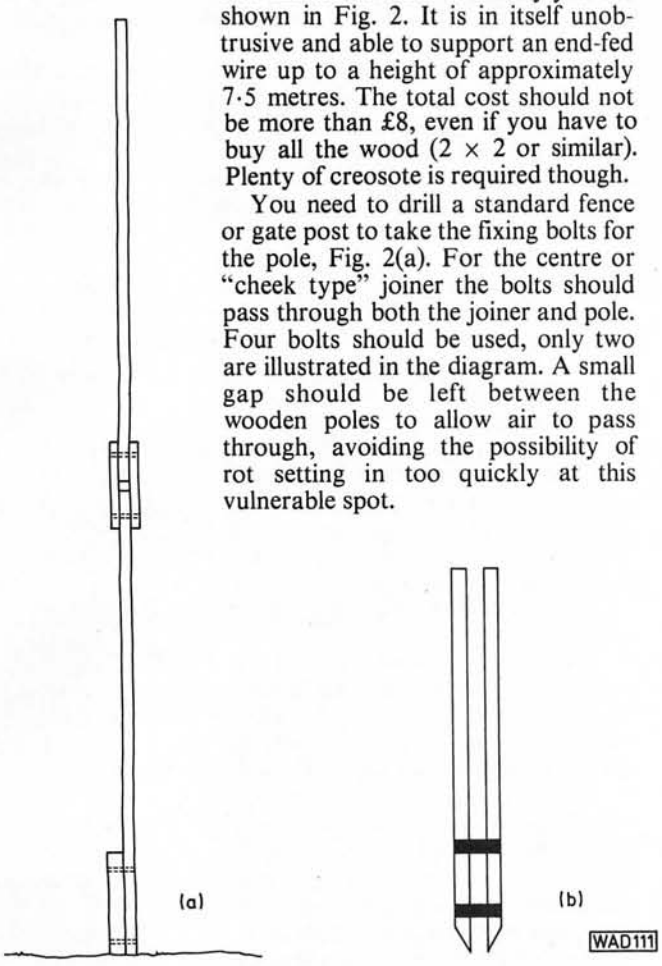

Fig. 2: Simple wooden mast and base

If you are going to use scaffold poles you will also need two 2 metre lengths of angle iron welded or bolted together, spaced to accept the pole, as in Fig. 2(b). The base should be set in concrete in the ground and drilled just above ground level to take the bottom pin/hinge. The pole should then be drilled to take both the bottom and top pins.

Telegraph poles are one of the biggest gifts to radio amateurs, when you can get hold of them that is! Not many people realise that the Telecom people (I really cannot get used to that name) in your area will sell you a pole and deliver it to you, for a modest charge. There is a snag though, you have to wait until there are some poles to be taken down in your area which, knowing the long life of poles, can be a long time. Despite this, a pole is really an ideal foundation for an antenna mast system and as Fig. 4 shows, a simple idea can be used to get the most out of a little.

The design was used by the author for over 10 years and the pole, which was over 30 years old, is still being used by another amateur (Fig. 3). With a bit of care and patience, this mast will support all your h.f. beams, not to mention the v.h.f. ones and also your dipoles etc. At one time the author even had a stiff copper wire running up the pole, to act as a vertical antenna.

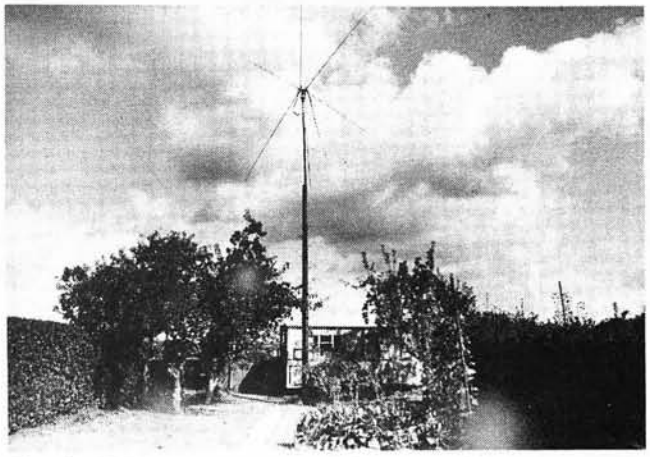

Fig. 3: This mast was used for over 10 years by the author

The ingredients for this mast are as follows: one telegraph pole, one or two alloy scaffold poles—depending on your pocket, planning permission and whatever you intend to put on top. You could try the local British Rail telephone department if the Telecom people can't help. Although most main lines do not have pole mounted telephone cables anymore, some minor railways do, and they often have to be replaced—it is worth a try.

The alloy poles will unfortunately cost you around £25 for a 6 metre length, but although the cost is much higher than for an equivalent steel one the difference can be felt in the weight, it can make or break your ideas. If, for instance, you are only going to use this mast for supporting an end-fed wire, having a steel pole rather than an alloy one would mean you having to invest either in a set of pulleys or a small winch to pull the mast upright via the simple derrick-effect built into the mast design. The pulley and cables shown with the dotted line in Fig. 4(b) enable the extra pulley to ride up as the angle changes. It really does help, but experimentation is needed, the length of the loose strop also will require experiments.

As can be seen, there are possibly only two things in the design that may necessitate a bit of outside help. The bottom bracket could be made without welding, as can the top bracket.

The height of the bottom bracket from the base of the telegraph pole depends on how high you want the mast, and how you intend pulling it into the working position.

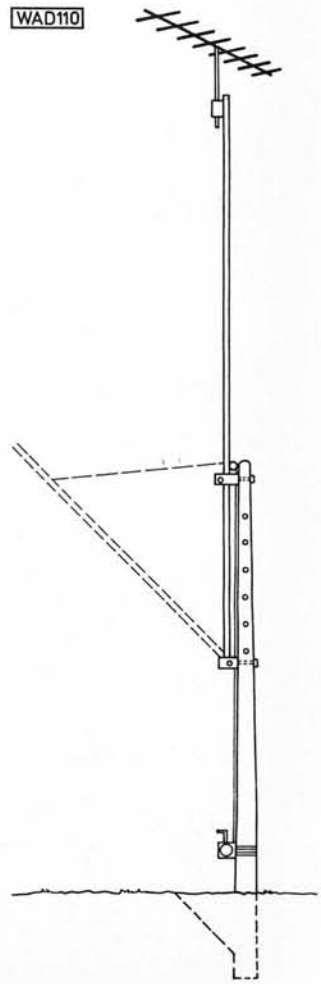

Fig. 4(a)

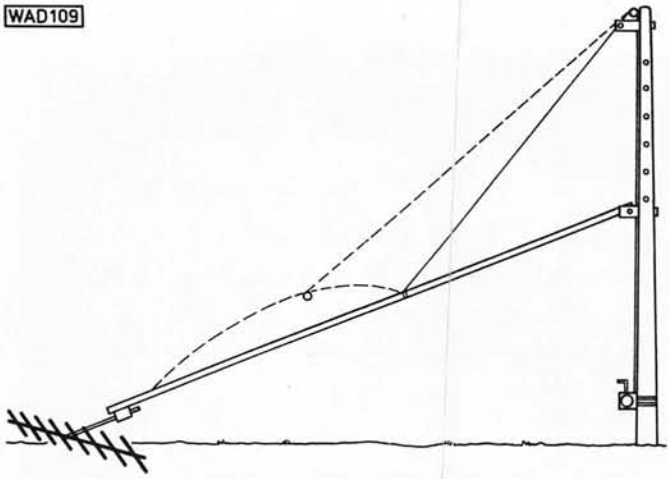

Fig. 4(b)

With the pole bottom bracket half-way up or more a winch is advisable, or at least three lots of pulley gearing. If the mast is only being used for wire antennas it can be pushed into position using long sticks with forked ends to help the man on the pulley rope.

Alternative designs for the brackets are shown in Fig. 5 to enable you to "have a go" yourself. The bracket shown in (a) is the bottom bracket with the end view showing the holes drilled for the fixing bolt and hinge pin. To secure the bracket to the pole the very coarse thread bolts that are used to secure the climbing rungs should be used. The pole should be drilled through so that a pin (a long coach bolt) passes through and acts as a pin to secure it and as a hinge.

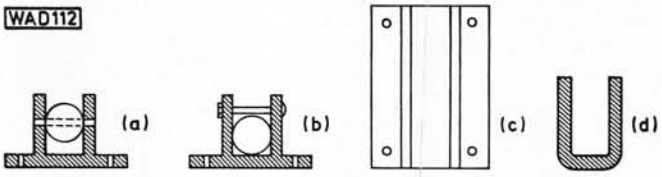

Fig. 5

In Fig. 5(b) the uprights are welded onto the base plate, but a local garage will probably weld this for you if necessary. For the top bracket the pole is held in behind the top pin. Fig. 5(d) shows the "B" type plate bent up into the bracket form using a bench vice, bricks (to bend the bracket over) and a large Calor gas torch. A wood fire blown with a vacuum cleaner—on blow of course—would work well, especially the 12V type. When the metal is a light yellow colour place it over the two bricks and force the pole down onto it, thus wrapping it around the pole. Before the metal cools make sure the pole is not too tight a fit. Be warned though, at worst, it could mean you actually have to build a little "forge-fire" in your garden so as to heat the metal up to "bending" heat. When building the fire don't forget to set the bricks far enough apart to allow for the thickness of the pole. A blacksmith will do the whole job for you though.

You will be able to see from the diagram (Fig. 4) that the pole is hinged at its bottom end and is located half to three quarters of the way up the telegraph pole, the pin securing the pole also acts as the hinge. The top bracket into which the pole locks has a locating pin through it, and above this can be mounted a pulley or pulleys as needed. The erecting pulley can be bolted or stropped as necessary. The cable is fixed to a lug on the pole, do not drill through the pole at this point. The whole idea of this design is that getting the mast up and down will not be a big problem, for as you can see the whole thing looks like a derrick assembly.

The pole (bole end) should be buried to a depth of about 2 metres for an 8·5 metre pole. The dotted lines in Fig. 4(a) show how to dig a hole the professional way! You need to dig a slot trench a fraction more than the width of the pole, and with an angle of around 45 degrees. With four or five helpers the pole can be "walked" upright into the hole.

Careful preparation of the hole can save a lot of trouble, so make sure the sides of the hole are packed tight so loose earth will not fall into the hole. Once the pole's weight has taken it into the hole, you and your helpers can fill the hole in. Levelling it will not be difficult if the straight far side of the hole is dug carefully. It can be done with two men but the author and G3NML **do not recommend it,** from practical experience!

A later modification to this was a counter-weight running down one side of the mast, independently of the pulley system, and with this incorporated, one man can erect the whole assembly unaided with a complete v.h.f. and u.h.f. beam antenna system on top. The author has only one arm and if he can do it anyone can! Cheap winches can be obtained from dealers selling boat trailer kits, but avoid boatyards—they cater for heavy purses!

Recent costings on this mast assembly have put it up around the £45 mark, and that is allowing around £5 for the welding by your friendly local garage—if you decide to go for that particular version. A word of warning though regarding planning permission, it can be a problem.

Since the advent of legalised CB radio, literally thousands of rather odd and sometimes gigantic CB antennas have sprung up, the vast majority without planning permission it seems. One only has to read the columns of the local weekly paper to see that it is a problem worrying the Local Government Authorities. From what you read it seems painfully obvious from the comments printed you should be prepared for problems. "Councillor Higginbottom drew the attention of the Council to the hundreds of 'Ham' antennas now to be seen around the Borough . . ."

It does not help us one little bit that Cllr. Higginbottom cannot tell the difference between an illegal length CB vertical and a legitimate amateur installation. It is just one more unneeded obstacle for us to face.

Perhaps now you have seen some simple and practical schemes you will have a go, and as a result will get more out of your radio hobby—safely and much more easily! ●

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Sunday 19 June 1983
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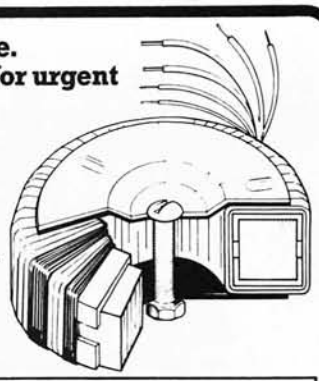

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	0x012	12+12	0.63	**£5.12**
	0x013	15+15	0.50	+ p & p £0.78
	0x014	18+18	0.42	+ VAT £0.89
	0x015	22+22	0.34	TOTAL £6.79
	0x016	25+25	0.30	
	0x017	30+30	0.25	
(encased in ABS plastic)				
30 VA 70 x 30mm 0.45Kg Regulation 18%	1x010	6+6	2.50	
	1x011	9+9	1.66	**£5.49**
	1x012	12+12	1.25	+ p & p £1.10
	1x013	15+15	1.00	+ VAT £0.99
	1x014	18+18	0.83	TOTAL £7.58
	1x015	22+22	0.68	
	1x016	25+25	0.60	
	1x017	30+30	0.50	
50 VA 80 x 35mm 0.9Kg Regulation 13%	2x010	6+6	4.16	
	2x011	9+9	2.77	
	2x012	12+12	2.08	
	2x013	15+15	1.66	**£6.13**
	2x014	18+18	1.38	+ p & p £1.35
	2x015	22+22	1.13	+ VAT £1.12
	2x016	25+25	1.00	TOTAL £8.60
	2x017	30+30	0.83	
	2x028	110	0.45	
	2x029	220	0.22	
	2x030	240	0.20	
80 VA 90 x 30mm 1Kg Regulation 12%	3x010	6+6	6.64	
	3x011	9+9	4.44	
	3x012	12+12	3.33	**£6.66**
	3x013	15+15	2.66	+ p & p £1.72
	3x014	18+18	2.22	+ VAT £1.26
	3x015	22+22	1.81	TOTAL £9.64
	3x016	25+25	1.60	
	3x017	30+30	1.33	
	3x028	110	0.72	
	3x029	220	0.36	
	3x030	240	0.33	

TYPE	SERIES No	SECONDARY Volts	RMS Current	PRICE
120 VA 90 x 40mm 1.2Kg Regulation 11%	4x010	6+6	10.00	
	4x011	9+9	6.66	
	4x012	12+12	5.00	
	4x013	15+15	4.00	**£7.42**
	4x014	18+18	3.33	+ p & p £1.72
	4x015	22+22	2.72	+ VAT £1.37
	4x016	25+25	2.40	TOTAL £10.51
	4x017	30+30	2.00	
	4x018	35+35	1.71	
	4x028	110	1.09	
	4x029	220	0.54	
	4x030	240	0.50	
160 VA 110 x 40mm 1.8Kg Regulation 8%	5x011	9+9	8.89	
	5x012	12+12	6.66	
	5x013	15+15	5.33	
	5x014	18+18	4.44	**£8.43**
	5x015	22+22	3.63	+ p & p £1.72
	5x016	25+25	3.20	+ VAT £1.52
	5x017	30+30	2.66	TOTAL £11.67
	5x018	35+35	2.28	
	5x026	40+40	2.00	
	5x028	110	1.45	
	5x029	220	0.72	
	5x030	240	0.66	
225 VA 110 x 45mm 2.2Kg Regulation 7%	6x012	12+12	9.38	
	6x013	15+15	7.50	
	6x014	18+18	6.25	
	6x015	22+22	5.11	**£9.81**
	6x016	25+25	4.50	+ p & p £2.05
	6x017	30+30	3.75	+ VAT £1.78
	6x018	35+35	3.21	TOTAL £13.64
	6x026	40+40	2.81	
	6x025	45+45	2.50	
	6x033	50+50	2.25	
	6x028	110	2.04	
	6x029	220	1.02	
	6x030	240	0.93	

TYPE	SERIES No	SECONDARY Volts	RMS Current	PRICE
300 VA 110 x 50mm 2.6Kg Regulation 6%	7x013	15+15	10.00	
	7x014	18+18	8.33	
	7x015	22+22	6.82	
	7x016	25+25	6.00	**£10.88**
	7x017	30+30	5.00	+ p & p £2.05
	7x018	35+35	4.28	+ VAT £1.94
	7x026	40+40	3.75	TOTAL £14.87
	7x025	45+45	3.33	
	7x033	50+50	3.00	
	7x028	110	2.72	
	7x029	220	1.36	
	7x030	240	1.25	
500 VA 140 x 60mm 4Kg Regulation 4%	8x016	25+25	10.00	
	8x017	30+30	8.33	
	8x018	35+35	7.14	**£14.38**
	8x026	40+40	6.25	+ p & p £2.40
	8x025	45+45	5.55	+ VAT £2.52
	8x033	50+50	5.00	TOTAL £19.30
	8x042	55+55	4.54	
	8x028	110	4.54	
	8x029	220	2.27	
	8x030	240	2.08	
625 VA 140 x 75mm 5Kg Regulation 4%	9x017	30+30	10.41	
	9x018	35+35	8.92	
	9x026	40+40	7.81	**£17.12**
	9x025	45+45	6.94	+ p & p £2.55
	9x033	50+50	6.25	+ VAT £2.95
	9x042	55+55	5.68	TOTAL £22.62
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	9x029	220	2.84	
	9x030	240	2.60	

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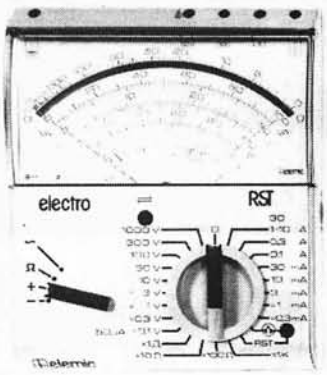

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QRP 7MHz Transceiver

PART 2

Rev. G.C. DOBBS G3RJV

Construction

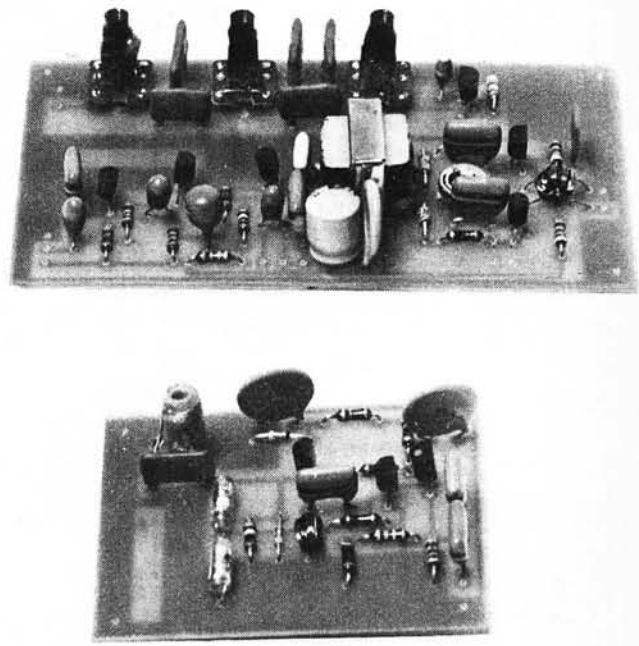
The receiver is built on two printed circuit boards, one for the v.f.o. housed in a screened box and the other for the rest of the circuitry. The v.f.o. Board, shown in Fig. 2.1, is probably best built first and tested in its own right. A few of the components are worthy of mention. The capacitors associated with the frequency determining tuned circuit need to be of good quality. These are C13–17. C14 is the tuning control and should be a good quality, air-spaced variable capacitor with a maximum capacitance of 10 or 15pF.

These can be very expensive and are the sort of component that a seasoned constructor will seek out at junk sales and radio rallies. The thrifty can even saw off a few back vanes of a larger variable capacitor to produce the value which gives an appropriate frequency coverage. C14 is mounted on the front of the box which houses the v.f.o.

The remaining fixed capacitors should either be silver mica or polystyrene types to aid frequency stability. Ideally, some of the circuit padding should be done with NPO type capacitors, but these are often difficult to obtain. In this circuit, as in many others, I have used a mixture of silver mica and polystyrene types. The former usually drift up and the latter down, so a mixture often works out well in practice . . . I hope no one technical reads this magazine!

The Radio Frequency Choke (L5) is home-made from 10 turns of 32 s.w.g. enamelled wire wound onto a ferrite bead. The coil, L4, is wound on a 4·8mm former. These are readily available as surplus items, as practically every piece of r.f. gear built in the '60s and '70s seemed to use this size former. They can also be bought by mail order from Maplin. L4 is cemented into a hole drilled in the printed circuit board. The coil uses an iron dust core (4mm × 10mm) for setting up the correct frequency. There can be a risk of thermal effects in such cores causing drift, but in practice this does not seem to happen if only a small portion of the core is inserted into the winding. With the number of turns advised here that is the case. The windings are best secured by polystyrene cement "borrowed" from your son's modelling kit.

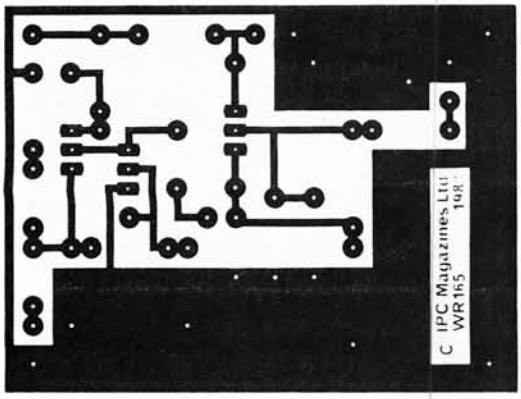
Building and mounting the v.f.o. is critical. Rigidity is the keyword; imagine it being passed along a row of All Black forwards or being a GPO Christmas parcel. It should be mounted in a strong metal box (102 × 64 × 38mm in the prototype) using 6BA bolts on standoffs. The power line enters the box through a 1000pF capacitive feedthrough and the outputs leave via non-capacitive leadthroughs. The tuning control, C14, requires a reduction drive to facilitate ease of tuning. The ideal, and cheapest, solution is to use one of the small in-line epicyclic drives which usually have a reduction of some 6 or 8 to 1. This may be mounted onto the outside of the front of the screened box using standoffs and 6BA bolts. A method of adding a dial will be described later.



The two boards described in this part. Top is the receiver and audio board while below it is the v.f.o. board

When the v.f.o. is completed it can be tested. Those fortunate enough to have access to a digital frequency counter can measure the frequency directly. Another, quite adequate, way is to pick up the output on a receiver. Set C14 fully meshed and adjust the core of L4 to just below 7MHz. A complete 180 degree rotation of C14 should take the v.f.o. just past the top end of the band (7·1MHz). If the desired frequency coverage is not obtained, C13 may be changed in value or turns can be added or removed from L4. However, with the suggested number of turns no such problem should arise. The final adjustment of the frequency is best done with the lid on the screened box, a hole being drilled so that a non-metallic trimming tool can reach the core of L4. Slight drifting when the supply is connected is usual, and is due to the junction of Tr7 reaching a stable operating temperature.

The rest of the receiver is built onto the board shown in Fig. 2.2. The audio amplifier may be built first and tested by injecting a small signal or putting a finger on the input of C8. The audio gain control, R6, is front panel mounted with screened leads between it and the board. Transformer T2 is a transistor audio driver transformer of the type used in push-pull circuits in domestic radios. One suitable type is the LT44 transformer, although it is much cheaper to cull a suitable component from an old transistor radio.



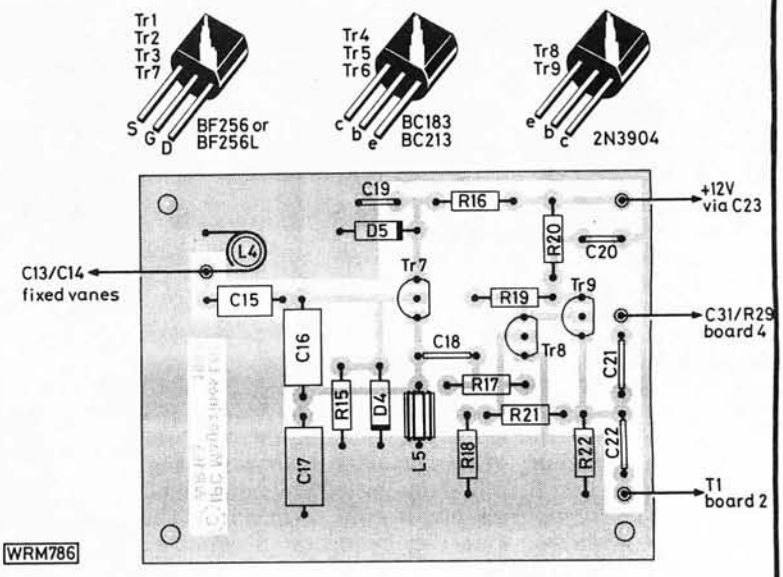
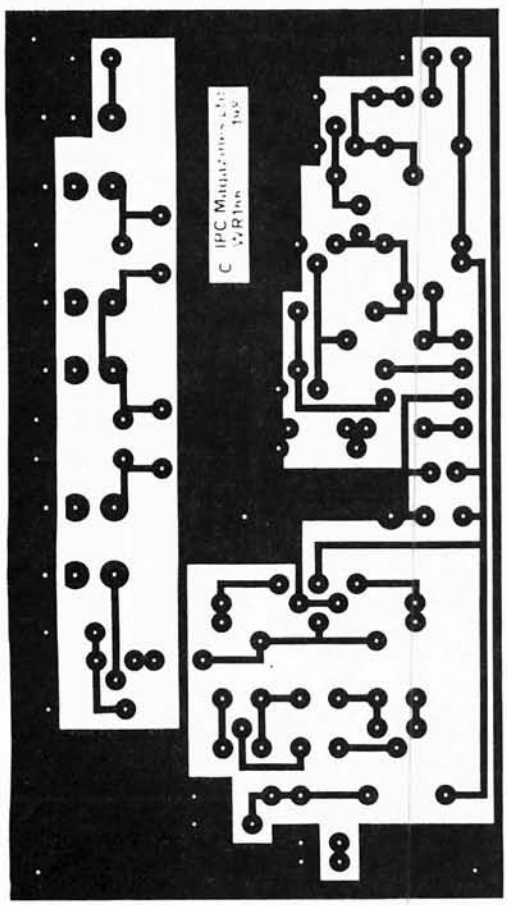


Fig. 2.1: Copper track pattern and component layout for the v.f.o. board shown full size



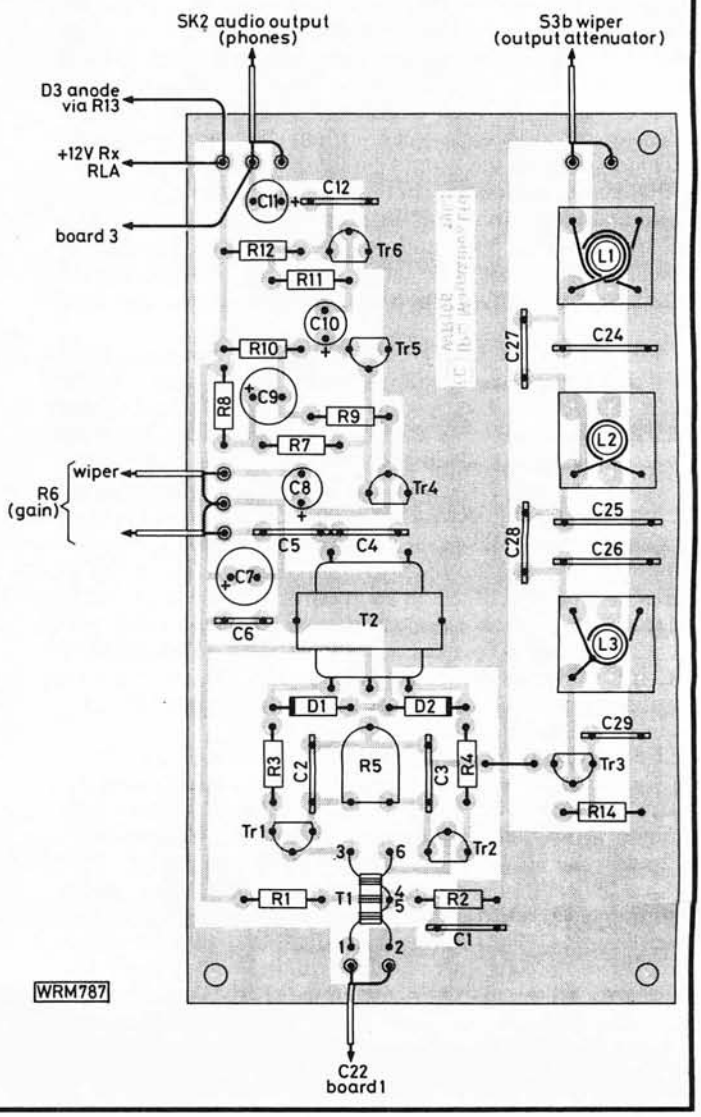


Fig. 2.2: Copper track pattern and component layout for the main receiver and audio board shown full size

Usually the ones built in the '60s with the OC family of *pnp* transistors yield a suitable driver transformer. These transformers are commonly a few thousand ohms, centre tapped, into about ten thousand ohms. Three different surplus transformers were tried in the prototype and all worked well.

The trifilar wound transformer, T1, providing a balanced input to the mixer, from the v.f.o., deserves mention. It may look complex, in the diagram, but is very simple to wind. The former is a ferrite toroid (Neosid 28-502-27). For this application, almost any of the smaller ferrite toroids which pile up in the surplus market would do the job. They are like red Polo Mints. The prototype worked with several different types, including a very nice little toroid of outer diameter 7·6mm and unknown origin. A standard Amidon T37–6 RF Toroid, although dust iron rather than ferrite, also worked well in the circuit. Amidon toroids are available from Ambit and TMP Electronics.

Coil winding details

Coil	Turns	Wire (s.w.g.)	Former (mm)	Core
L1	22,3	26	4·8	Iron dust
L2	22	26	4·8	Iron dust
L3	17 + 5	26	4·8	Iron dust
L4	17	26	4·8	Iron dust
L5	10	32	On ferrite bead	
T1	12,12,12	32	Trifilar wound on toroid	

The coil T1 has three windings marked as shown, which are twisted together and wound around the core. The dot markings on the diagram, Fig. 1.2, indicate the start of each winding and Fig. 2.2 drawing shows how these three windings are connected together in the circuit. Begin by taking three lengths of wire long enough to make the required 12 turns. These wires are then twisted together, one twist every 3mm is enough, along their whole length, to form one thick wire. Ask your wife what three-ply wool looks like. The turns are wound on the toroid, each pass through the hole representing one turn. Separate the wires and scrape some enamel off the ends of each one. The individual windings can now be identified using a multimeter on the ohms range for a continuity check. The appropriate ends are connected as per the p.c.b. drawing. The winding should be spaced to occupy most of the core.

The input tuned circuit coils L1, 2 and 3 are wound on the 4·8mm diameter coil formers with dust iron cores. The printed circuit layout shows them mounted onto the s.r.b.p. base plates that are common for such formers. Stiff copper wires rise vertically from the base pins and act as solder points for the windings. If the base plates are not available, the formers may be mounted as in the v.f.o. Note that the input tuned circuits are fixed tuned, which is acceptable over the 100kHz excursion of the 7MHz amateur band. L1, 2 and 3 require to be tuned somewhere in the centre of the required coverage. As the transceiver is for c.w. operation only, around 7025kHz is ideal. The prototype was peaked on 7030kHz, the QRP calling channel for Europe. Although the coils may be peaked, using the cores, by listening to signals on the completed receiver, it is an asset to set up the tuned circuits before the receiver is tested. This can be done in a variety of ways, with a g.d.o., a signal generator and some form of output measurement or even by trying the input filter ahead of an existing receiver on the 7MHz band and peaking the signals.

The completed receiver is tested by making the interconnections between the boards. Screened lead, made from thin cable such as RG174 coaxial cable, must be used for all the signal paths. The coverage of the receiver will previously have been checked by measuring the range of the v.f.o. with another receiver or a frequency counter. The other minor adjustments may be done with a signal injected from a signal generator or with signals on the band. The latter approach may sound less technical, but "testing on the hoof" takes a lot of beating. The input coils might require a final peaking and the balance control R5 is adjusted for the optimum output with a weak signal. The prototype receiver proved surprisingly sensitive in use and the final adjustments were made using American c.w. signals on the band.

Simple Receiver Additions

The 7MHz band is taxing for even the best receiver with its confined space and intruding illegal broadcast stations. As was expected, the receiver suffered from some broadcast breakthrough during certain times of day. The two usual remedies for such problems in direct conversion receivers is input attenuation and audio filtering. A simple potentiometer circuit could be added to the input to provide attenuation, but for the little extra cost a switched attenuator with correct input and output impedance matching is preferable. Attenuating the input to a simple receiver may seem odd. Why reduce the signal when sensitivity is important? In practice, a degree of input attenuation will be survived by all but the weakest signals and greatly reduce cross modulation caused by adjacent spurious signals.

Fig. 2.3 shows a switched input attenuator circuit with steps of −6dB and −12dB; 6dB is usually taken as 1 'S' point on the RST signal coding scale. The circuit will allow, with combinations of switching, 0dB (direct path), −6dB, −12dB and −18dB attenuation. The whole circuit is wired onto the back of two miniature two-way changeover toggle switches. Slide switches can be used for economy but tend to be prone to poor contacts. The input from the antenna and the output to the receiver are routed through screened leads. Simply adding 6dB of attenuation made quite a difference in difficult conditions.

Audio filtering, even of the simplest type, can be a great aid in a direct conversion receiver. The simplest possible audio filter is shown in Fig. 2.4. It consists of a tuned circuit, L6 and C30, resonant at about 750Hz. This peaks audio signals at that frequency at the expense of other frequencies. The coil L6 is a surplus telephone loading inductor of the type usually imported from the USA and in common amateur radio usage. Several component dealers stock such coils which are toroid wound and made up of two 22mH windings which have to be connected together, series aided, to provide 88mH of inductance. The tuned circuit is added across the input of the audio amplifier between the top of R6 and ground. C5 isolates the circuit from T2 but it is damped a little by R6. In practice, this proved no problem and s.s.b. signals can be read very clearly through the filter. Constructors unhappy about the loading effects of R6 can add another 10nF capacitor between the switch (S1) and R6. Screened leads were used between the filter S1 and the circuit board. Closing the switch (S1) brings the filter into circuit. Naturally the constructor could add an active audio filter to the receiver. A variety of circuits and commercial active audio filters could be used either before the amplifier or on the output.

SPRAT is available quarterly to members of the G QRP Club, c/o G3RJV, 17 Aspen Drive, Chelmsley Wood, Birmingham B37 7QX.

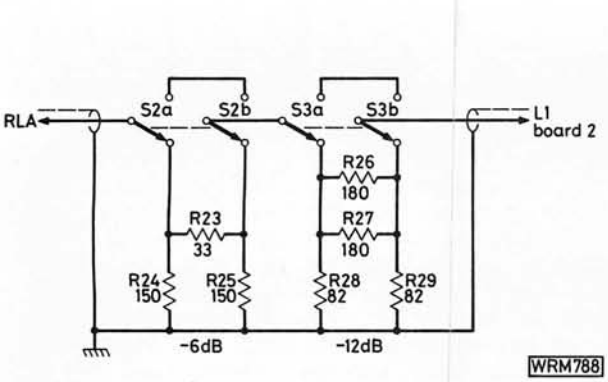


Fig. 2.3: The circuit and constructional details of the switched input attenuator

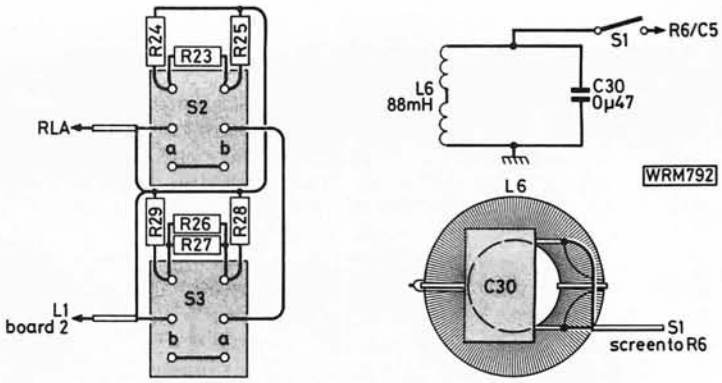


Fig. 2.4: The circuit and construction of a suitable audio filter

Quite a lot of the components used in the receiver can be obtained on the surplus market or at radio rallies. Alternative transistor types may be used if these are cheaper. The f.e.t.s used for Tr1, 2 and 3 should be of the specified type, as some surplus types may cause balancing problems in the mixer but Tr7 could be the cheap 2N3819. Tr8 and 9 could be BC108 transistors and a variety of complementary pairs can be used for Tr4, 5 and 6. These include BC318/BC321, BC171/BC251 and BC414/BC416. T2 can be culled from an old transistor radio and surplus ferrite toroids can be used for T1 with all the other coils wound on surplus 4·8mm diameter formers. The 88mH coil, L6, is also a surplus item. Part of the "QRP Philosophy" is about saving money in the hobby. So try to find the components from the cheapest sources. Why not join that exclusive group of radio amateurs who boast about how little their equipment cost rather than how much it costs.

★ components

Resistors

Carbon film ¼W 5%

10Ω	2	R3,4
33Ω	1	R23
47Ω	2	R14,20
82Ω	2	R28,29
100Ω	1	R16
150Ω	2	R24,25
180Ω	2	R26,27
330Ω	1	R22
560Ω	1	R13
1kΩ	2	R12,19
2·2kΩ	1	R8
2·7kΩ	1	R10
10kΩ	2	R17,18
33kΩ	1	R21
47kΩ	2	R1,2
82kΩ	1	R11
100kΩ	1	R15
220kΩ	1	R7
1MΩ	1	R9

Potentiometers

Min. horizontal preset

100Ω	1	R5

Carbon track ¼inch spindle

10kΩ (log)	1	R6

Semiconductors

Diodes

1N914	1	D4
Red l.e.d.	1	D3
BZX61C9V1	1	D5
BZX61C18V	2	D1,2

Transistors

BC183	2	Tr4,6
BC213	1	Tr5
BF256	4	Tr1,2,3,7
2N3904	2	Tr8,9

Capacitors

Disc ceramic

0·1µF	3	C6,19,20

Silver mica

8·2pF	2	C27,28
180pF	1	C13
200pF	3	C24,25,26

Polystyrene

390pF	1	C15
680pF	2	C16,17

Polyester

10nF	7	C2,3,5,12,18,21,22
20nF	1	C1
50nF	2	C4,29
0·47µF	1	C30

Tantalum bead

2µF 35V	1	C8
4·7µF 35V	2	C10,11
47µF 16V	1	C9

Electrolytic p.c.b. type

100µF 16V	1	C7

Lead-through

1nF	1	C23

Airspaced variable

0–10pF	1	C14

Miscellaneous

Min. toggle switch d.p.d.t. (2); Metal box (see text); Ferrite bead (1); 88mH telephone line loading coil (see text); Coil former 4·8mm dia (4); Ferrite toroid (see text); Transistor audio driver transformer (see text); Printed circuit boards (2).

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SX20	100	Assorted Polyester/Polystyrene Capacitors	£1
SX21	60	Mixed C280 type capacitors metal foil	£1
SX22	100	Electrolytics, all sorts	£1
SX23	50	Quality Electrolytics 50-1000mf	£1
SX24	20	Tantalum Beads, mixed	£1

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SX54 TO-66 size. 35mm x 30mm x 12mm. **35p**

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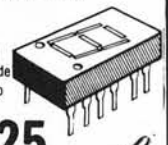

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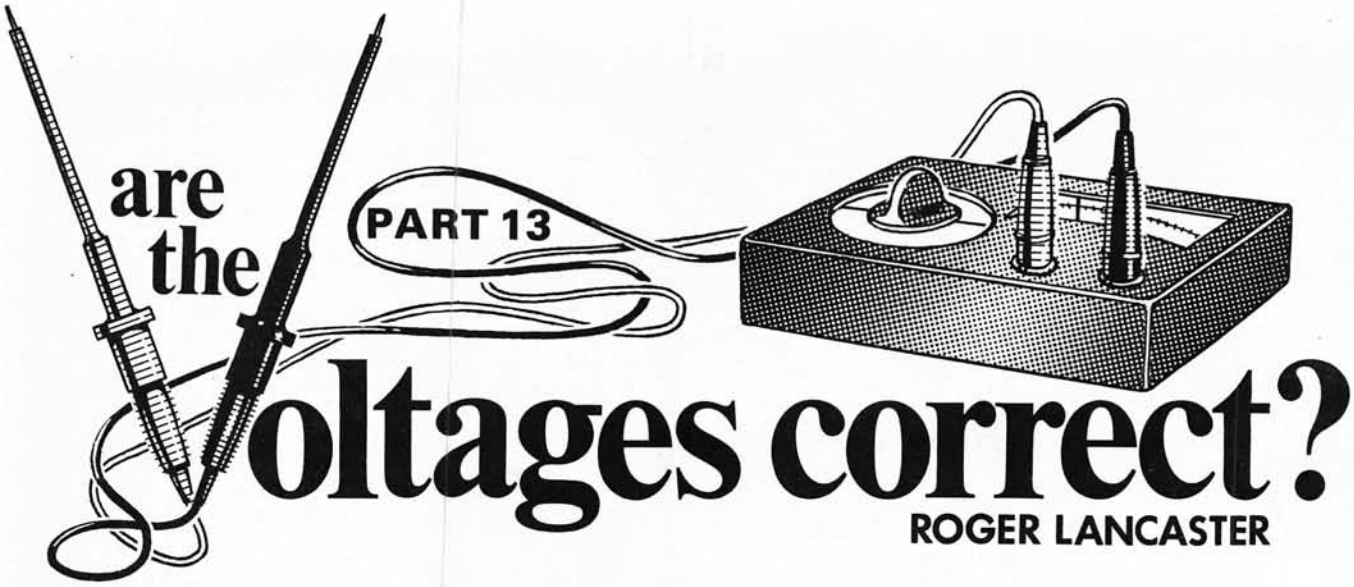

are the PART 13 Voltages correct?

ROGER LANCASTER

This month we start to look at the voltages around circuits which use thermionic valves—or vacuum tubes (or simply tubes) as the Americans call them.

Most valved equipment is in the vintage class now, of course, but valves may still be found in the transmitter output stages (and other high power applications) of quite recent units.

The first thing the newcomer to valve circuits must realise is that some of the voltages involved are **dangerously high.** Nowadays we are so used to poking our fingers into transistor and i.c. circuits with the power supply connected and switched on, secure in the knowledge that the few volts present can do us no harm, that we must be doubly careful when we approach valve circuits with their hundreds of volts' worth of **"high tension"** (h.t.) supplies.

Old hands will often laugh as they tell of severe shocks they have survived—"six hundred volts, old boy, threw me right across the room"—but behind the mask of mirth I suspect there lurks the memory of a traumatic and painful scare and the realisation that they are lucky to be alive to tell the tale.

So, whenever possible, switch off the equipment while you connect or disconnect your meter leads, and keep your hands well out of the way while the power is on. This will require patience, because you will have to wait up to thirty seconds for the equipment to "warm up" every time you switch on—the voltages will not settle down to steady values until this time has elapsed. Dampness, including perspiration, around either equipment or person adds considerably to the risk of electric shock.

Even after you've switched off, you may still not be safe! Large capacitors can remain charged to high voltages long after the equipment has been switched off. To remove this danger, when you have switched off and unplugged the equipment, connect your meter to the h.t. line and watch the voltage fall to a low level as the capacitors discharge through the meter, making sure that you hold only the insulated prods of the meter leads as you do this. The capacitors will discharge more quickly the lower the meter range selected, but remember the meter must always be on a range whose full-scale indication exceeds any voltage expected.

This raises another important aspect. The meter is also at risk from these high voltages unless it is always on a higher range than the voltage to be measured. If there is any doubt about the voltage you expect to measure, always switch the meter to its highest voltage range before switching on—you can always reduce the range afterwards if necessary. Do make sure your meter is not set to a current or ohms range by mistake, otherwise it could be irreparably damaged.

Initial Checks

If signal generating or signal tracing gear is available, this should be used to narrow the fault area down to one stage, or as few stages as possible, and to concentrate on this area with your meter—the same technique as with all equipment. The fault symptoms themselves may also restrict the fault to certain stages.

One of the electrodes in every valve has to be heated to a high temperature so that it can freely emit the electrons which will form the valve current. This is usually a cylindrical metal cathode, which is heated by a wire filament, rather like that in an electric lamp, in which case the valve is an "indirectly heated" valve. Other valves, notably those in battery operated equipment, are "directly heated"—that is, they have no cathode, the filament itself emits the electrons.

It is usually possible to tell whether the heater is doing its job, either by observing its red glow or by the hot feel of the valve. However, it is not always possible to see any glow, especially in the case of directly heated valves; also, not all valves become noticeably hot in operation. If these observation tests are inconclusive, the voltage on the heater pins of the valveholder must be measured and also ohmic continuity between the heater pins of the valve must be tested; if both these prove correct then there is no reason why the heater should not work, provided the valve base pins to valveholder socket connections are good.

The usual arrangement for the connection of valve heaters in a piece of equipment is in a parallel arrangement, as shown in Fig. 13.1. A common heater voltage is

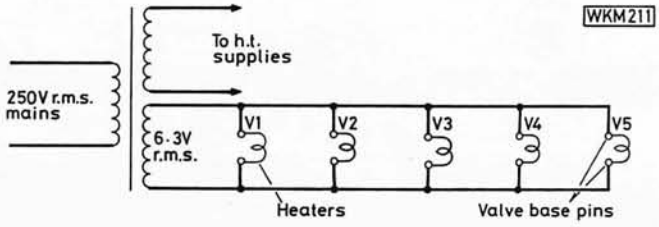

Fig. 13.1

6·3V r.m.s. a.c., and each heater should have its correct specified voltage across it and each will carry (typically) 0·3A. Total current drain on the winding of the transformer supplying these heaters is therefore $5 \times 0{\cdot}3 = 1{\cdot}5$A and the power consumed by the heaters is $1{\cdot}5 \times 6{\cdot}3 = 9{\cdot}45$W—quite a lot of power and we have only just started! In battery-operated equipment a separate 1·5V or 2V battery will usually supply the l.t. (**"low tension"**) for the heaters.

Correct heater voltages can range from 1·4V for small battery-operated portable receiver valves up to 25V or more for valves whose heaters are arranged in series, as in Fig. 13.2. A valve data book must be consulted in order to determine the correct voltage.

In the arrangement of Fig. 13.2, a single common **current** flows through all heaters, but the voltages across each heater could be different. Any excess voltage is developed across a high wattage resistor R.

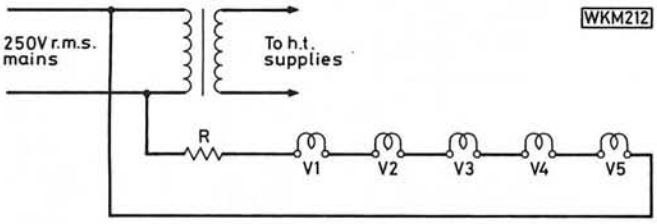

Fig. 13.2

If one valve heater became open-circuit in the parallel arrangement of Fig. 13.1, the other heaters would continue to work normally and the faulty one is easily spotted, but if one of the heaters of the circuit of Fig. 13.2 became open-circuit, the current would cease to flow and **none** of the heaters would function. The problem would then be to locate the faulty heater. One way would be to remove all valves and carry out an ohmmeter check on all heaters, but a quicker way is by voltage measurement. With no current flowing, **all** of the supply voltage (250V) will appear across the pins of the open-circuit heater and zero volts will appear across the pins of all good heaters, the resistor R being regarded as just another heater—R itself could be the component which has become open-circuit. Remember to switch to an a.c. volts meter range, if this is appropriate.

The first thing to check, then, if an item of valve equipment totally malfunctions, is the operation of the heaters of all the valves, if only because heater failure is a very common fault in valves. However, it is by no means the only fault that can occur in a valve and just because the heater glows it does not follow that the valve is working. Even when all heaters are glowing, a valve is still the type of component most likely to fail. Other common valve faults are loss of vacuum (air gets inside the glass envelope, the valve is said to become "soft" and low valve current results), loss of emission (the cathode loses its emissive properties which again leads to low valve current) and short-circuits between the various electrodes within the glass envelope.

In the days when valve television sets were predominant, there existed a form of first line servicing which American engineers scornfully dubbed "tube-jerking". The serviceman who visited the customer's home would merely change (in turn) all the valves which might possibly cause the fault for new ones, and if that didn't cure the trouble he would take the set back to the workshop for a more scientific investigation—rather like the p.c.b. swapping procedure of today.

The modern student tends to make a series of tests to **prove** a valve faulty before replacing it, just as he would for soldered-in semiconductors as advocated in this series. Yet the tube-jerker's approach made a lot of sense as a first test: valves have a high failure rate and it is simplicity itself to unplug a suspect one and plug in a new replacement. So if new valves are available, by all means adopt this approach, which could easily lead to the trouble being cured in a very short time.

Today, however, we do not tend to have large stocks of new valves on our shelves and it is an expensive business to buy a new valve just to try as a replacement, especially if it does not cure the fault. Some valved equipment may use the same type of valve in more than one stage, in which case the suspect valve could be tested in a stage which was known to be working with its original valve—if the stage continues to work when the suspect valve is used, the suspect valve is OK. Alternatively, the known good valve could be tried in place of the suspect valve and if the previously faulty stage then works properly the suspect valve is a dud.

It is quite likely these days, unfortunately, that we shall not be in a position to fault-find by valve replacement, in which case we must make voltage checks until we are as sure as possible that we know what the fault is.

Power Supply Rectifiers

The valve version of the semiconductor half-wave rectifier circuit described in Part 4 (Fig. 4.6) is shown in Fig. 13.3. There are several important differences:

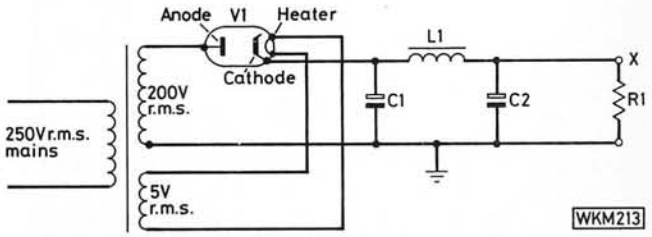

Fig. 13.3

A heater supply is required for V1, the rectifier valve, a common voltage being 5V r.m.s. (although 6·3V r.m.s. is common for valves other than the power rectifier).

The output voltage is much higher: capacitor C1 will charge to the peak voltage of T1 secondary less the voltage dropped across the valve (some tens of volts rather than 0·6V), e.g. $1{\cdot}414 \times 200 = 283$V peak voltage will exist at the anode and C1 will charge to (say) $283 - 33 = 250$V. So, neglecting any voltage dropped across L1, the potential at X will be +250V and this will be the "high tension" (h.t.) supply to the equipment.

The capacitance of C1 and that of C2 will be much lower than that of a modern semiconductor power supply smoothing capacitor. This is because, although the larger the capacitance the better for smoothing, the valve version has to withstand a higher voltage. While a 1000μF capacitor with a working voltage of 10V is a moderately-sized component, one of 1000μF and 500V working voltage would be unacceptably large. A typical value for C1 (and C2) would be 16μF/500V, which can be of moderate size. Coupling and decoupling capacitors in valved equipment are also of relatively low capacitance for the same reasons, usually 0·1μF maximum. The low value of C1 is partially offset by the use of the low-pass filter L1/C2 but the smoothing will not be as good as in low-voltage, high-capacitance circuits.

If V1 becomes low-emission the current through it will fall and the forward conducting voltage across it will rise, leaving a low h.t. voltage at X. Since the h.t. voltage will

supply all valves in the equipment, it follows that the performance of all stages will be below par. This is a very common fault and measurement of the h.t. voltage should be an early test in these circumstances. The h.t. voltage will almost certainly be quoted on circuit diagrams, if not it should be equal to 1·414 × (r.m.s. voltage at transformer secondary) – (a few tens of volts).

The rectifier valve is the one valve which can be replaced directly with a modern semiconductor diode (a BY127 is suitable for most applications), in which case the 5V heater supply will no longer be used. However, if the rectifier valve heater forms part of a **series** chain of heaters, as in Fig. 13.2, the valve must be left in place and the semiconductor diode soldered in parallel with the thermionic valve. A full-wave version of the valve power supply is shown in Fig. 13.4; it illustrates how semiconductor diodes can be connected in position as an alternative to replacing the low-emission valve with a new valve. The valve here consists of two diodes, sharing the same glass envelope, cathode and heater.

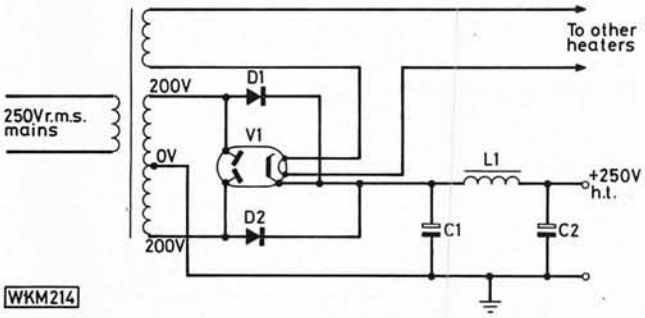

Fig. 13.4

There is one small disadvantage in replacing valve rectifiers with semiconductor ones: h.t. will appear immediately after switch-on and before the valves have had time to warm-up, and this could shorten the lives of the valves slightly. When a valve rectifier is used the h.t. does not appear until the rectifier itself has warmed up. So don't replace a valve rectifier with a semiconductor one until the valve **needs** replacing.

Valve pin connections can be obtained from a valve data book or from the circuit diagram. Alternatively, they can be determined quite simply by tracing the wiring.

In some old valved equipment, an obsolete form of semiconductor rectifier may still be found—the so-called "metal rectifier", recognisable by its metal cooling fins. These were often in bridge form as shown in Fig. 13.5, the

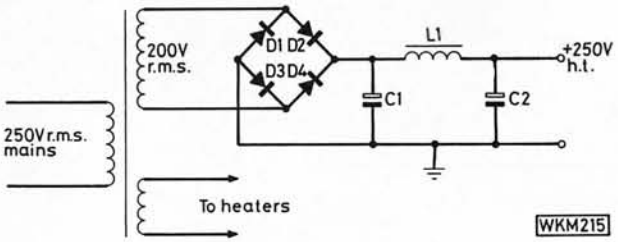

Fig. 13.5

four diodes being built as one unit with four connections. The diodes drop more forward voltage than modern *p-n* junction diodes and this voltage drop increases as the rectifier ages, leading to low h.t. as with a low emission valve rectifier. They can be replaced by modern *p-n* junction diodes, which are very much smaller for given voltage and current ratings.

Valve and metal rectifiers will still have to withstand the high peak inverse voltage as described in Part 4.

Next month we shall look at voltages to expect around the valves in the main part of the equipment, but if you cannot wait until then before rushing off to the attic to find that old valve set, do remember the safety warnings given at the beginning of this article.

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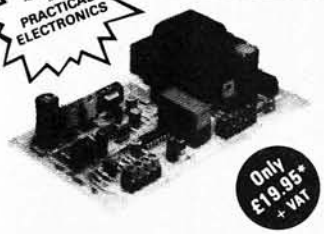

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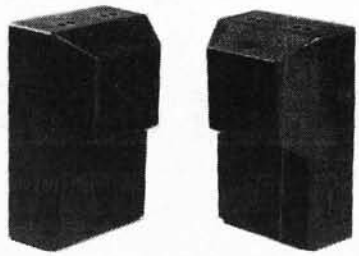

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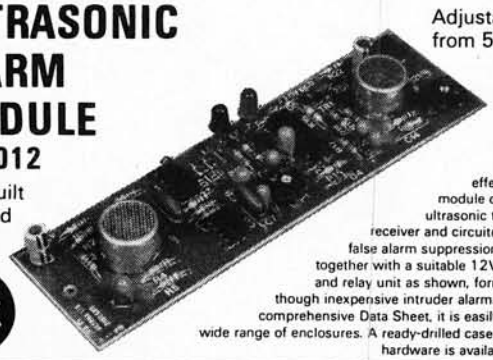

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AC141K	0.34	BC173B	0.10	BF258	0.28	TIP41C	0.45
AC176	0.22	BC182	0.10	BF259	0.28	TIP42C	0.47
AC176K	0.31	BC183	0.10	BF336	0.34	TIP47	0.65
AC187	0.25	BC184LA	0.09	BFX29	0.30	TIP2955	0.80
AC187K	0.28	BC212	0.09	BFX84	0.26	TIP3055	0.55
AC188	0.25	BC212L	0.09	BFX85	0.32	TIS91	0.20
AD149	0.70	BC213	0.09	BFX86	0.30	2N3054	0.59
AD161	0.39	BC213L	0.09	BFX88	0.25	2N3055	0.52
AD161/2	0.90	BC237	0.10	BFY50	0.21	2N3702	0.12
AD162	0.39	BC238	0.09	BFY51	0.21	2N3704	0.12
AF124	0.34	BC307	0.09	BFY52	0.25	2N3705	0.12
AF125	0.35	BC327	0.10	BFY90	0.77	2N3708	0.12
AF126	0.32	BC461	0.35	BT106	1.22	2N5294	0.42
AF127	0.32	BC478	0.20	BT108	1.22	2N5296	0.48
AF139	0.40	BC547	0.10	BT116	1.20	2N5496	0.65
AF239	0.42	BC548	0.10	BU105	1.22	2SA715	0.95
AU106	2.00	BC549A	0.08	BU108	1.69	2SC495	0.80
AU107	1.75	BC557	0.08	BU124	1.00	2SC496	0.80
AU110	2.00	BC558	0.10	BU126	1.60	2SC1096	0.80
AU113	2.95	BD131	0.32	BU205	1.30	2SC1173	1.15
BC107	0.10	BD132	0.35	BU208	1.39	2SC1306	1.00
BC108	0.10	BD133	0.40	BU208A	1.52	2SC1307	1.50
BC109B	0.12	BD135	0.30	BU326A	1.42	2SC1449	0.80
BC140	0.31	BD136	0.30	BU526	1.90	2SC1678	1.25
BC141	0.25	BD137	0.32	MRF450A	11.50	2SC1945	2.10
BC142	0.21	BD138	0.30	MRF453	15.50	2SC1953	0.95
BC143	0.24	BD139	0.32	MRF454	23.50	2SC1957	0.80
BC147	0.09	BD140	0.30	MRF475	2.50	2SC1969	1.95
BC148	0.09	BF179	0.34	MRF477	10.00	2SC2028	1.15
BC149	0.09	BF180	0.29	OC71	0.40	2SC2029	1.95
BC157	0.12	BF183	0.29	R2008B	1.70	2SC2078	1.45
BC158	0.09	BF194	0.11	R2010B	1.70	2SC2091	0.85
BC159	0.09	BF196	0.11	R2540	2.48	2SC2314	0.80
BC160	0.28	BF197	0.11	TIP29	0.40	3SD234	0.50
BC170B	0.15	BF198	0.16	TIP29C	0.42		
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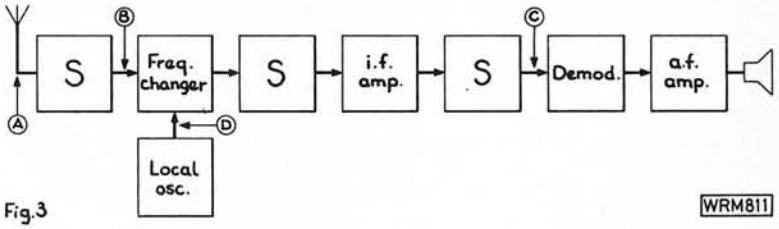


Fig.3

WRM811

FREQUENCY MEASUREMENT—2

Last month I tried to give you a basic idea of how a digital frequency meter works. We saw how it counts events—how many cycles of the signal to be measured pass through a gate in a known period of time—to calculate the rate at which those cycles come. We call that rate frequency.

There are two requirements for the signal being measured. First, it must be big enough to trigger the counting circuit reliably each cycle, and that usually means some sort of r.f. pre-amplifier at the input. Secondly, the signal must be reasonably free of interference, otherwise the counter may start adding in the cycles of the interfering signal. Incidentally, that "interference" includes the sidebands generated by any modulation on the signal being measured. Modern digital frequency meters seem to be able to stand far more modulation without giving a wrong reading, though I'm not sure why that is. When in doubt, turn off the modulation to leave plain carrier.

If you're checking a J3E transmitter (single sideband, suppressed carrier) then you can't turn the modulation off, of course, because there would be virtually no carrier left to measure. The answer is to apply a single tone of known frequency as modulation. If the tone was 1kHz, and the frequency meter said that the output of the transmitter operating on upper sideband was 14 201kHz, the carrier frequency must be 14 201 − 1 = 14 200kHz. You will see that it's no good trying to measure the frequency of the actual r.f. output of an s.s.b. transmitter with voice modulation, and we have to adopt another approach which I'll come back to later.

Now, what I've just said should have set you thinking that there are likely to be some problems in checking the frequency of a received signal. Look at Fig. 3, which shows the block diagram of a simple "conventional" superhet receiver for a.m. signals (your average medium-wave "tranny"). Each box marked "S" is a selectivity block, tuned circuits which are trying to pick out the wanted signal and get rid of all the others.

If we connect our digital frequency meter at point "A", it's going to be presented with a whole host of signals at levels from a few microvolts to a few millivolts with, as like as not, interference that is stronger than the wanted signal. Moving to point "B", interfering signals at frequencies some way off the wanted signal will have been reduced in strength, but close-in ones will be more or less as before, because of the low selectivity (*Q*) of the tuned circuits. We can add more tuned circuits and stick in some r.f. amplifiers to increase the signal level (d.f.m.s as a rule like at least 10mV input) but no way are you going to get the clean, single signal that the counter wants.

By now, you're probably saying that the main selectivity in a superhet is in the i.f. stages, so why not connect the d.f.m. to point "C". Alright, you've got a hefty signal there, with no interference if you're lucky, though it will have modulation on it most of the time. Unfortunately, though, it's always at the same frequency, 455kHz or some such, because we made it that way by mixing the incoming signal with the local oscillator (l.o.) in the frequency changer. Where do we go from here then?

The arrow labelled "D" in Fig. 3 should have given you a clue. The output of the local oscillator is quite large, it's a single signal with very little interference on it in the way of modulation or noise (at least it should be), and it varies frequency in step with the tuning of the receiver and therefore with the frequency of the wanted signal. The difference between the l.o. frequency and the wanted frequency equals the intermediate frequency (i.f.). When our medium-wave "tranny" is tuned to 600kHz, the l.o. will be on 600 + 455 = 1055kHz. When it's tuned to 1500kHz, the l.o. will be on 1500 + 455 = 1955kHz.

It would be a bit tedious, and you'd very likely make lots of mistakes, if you had to subtract 455 from the display reading each time you retuned the receiver. A much simpler way would be to modify the electronics of the counter so that it does the subtraction for you and displays the right answer. For our "tranny", it would be arranged that the counter is pre-loaded with the number −455 before the start of each count, so that it would go from −455 to 000 and then up to +600, when the receiver was tuned to 600kHz with the l.o. on 1055kHz.

The frequency difference is referred to as the i.f. offset, or sometimes just the offset of the d.f.m. You can design d.f.m.s using t.t.l. or some other logic family to cope with any i.f. offset that's likely to be found in a receiver, though as I said last month, some receiver frequency conversion systems make life very difficult. And often the unit would be too big to build into the receiver itself. But you don't have to design your own, providing the receiver uses one of the "broadcast standard" offsets of around 450–470kHz for the long, medium and short wave bands (oscillator always higher than signal frequency), or around 10·6–10·8MHz for v.h.f. (oscillator high or low). Such d.f.m.s come ready-made in a single i.c. package to cover the long and medium wave broadcast bands, or with the addition of a pre-scaler i.c. which divides the input signal frequency by 10 or 100, to cover the h.f. bands up to 30MHz and v.h.f. to Band II and beyond.

I leave you this month with the question: what does dividing the input signal frequency by 10 or 100 do to the offset?

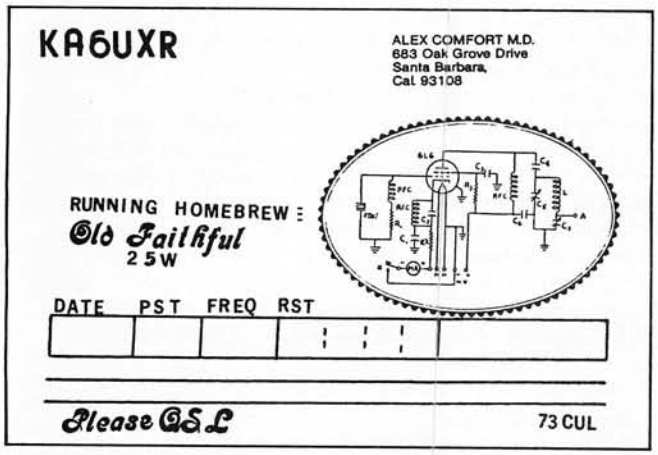
Letters

Running Homebrew

Sir: Having spent several months waiting for an ordered transmitter which didn't come (the subcontractor making the cases has read the blueprint in reverse, it appeared) I looked round for the cheapest, simplest and most rapid-to-construct source of 25W on 7MHz (40m) which the junkbox could provide—as a standby.

I settled on the 6L6 one-tube (one-*valve*) keyed oscillator which appeard in the 1946 *ARRL Handbook*. One mentions tube transmitters under one's breath here, for fear of being put in a museum: the determining factor was that I had no powerpack for a 25W power f.e.t., but I did have a 440V pack from an old tube scaler, bought in the local scrapyard for five dollars.

The original "Old Faithful", which put innumerable American novice hams on the air, was a breadboard job: I built it in an upgraded form, on a chassis (there are objections to 440V connections draped across a board) and added a 5-pole Chebyshev filter, a crystal select switch and a built-in dummy load. The original circuit, which now figures on my QSL card, matches a long wire by using the parallel-fed plate tank as a pi-network: I fed my long wire antennas through a separate commercial Transmatch.



I have been astonished by the performance of this antique. Whoever designed the circuit certainly knew his job. The signal is stable and chirp-free and the oscillator extremely well-behaved. The coil-stock inductance used in the plate tank happens to be very broad-tuned, giving no sharp dip at resonance, but at the same time needing no retuning over the 7MHz novice band. With a 10m long wire from the shack window to a tree, aligned in an E–W axis, my furthest DXs have so far been N5DAM in Gulfport, Mississippi, KA1ASD in Northford, Connecticut, KA7LEO in Mercer Island, Washington, and several stations in Detroit and Akron. At first I was intimidated by the antiquity of the circuit in a high-technology country, and would send simply "rig is h.b.", but so many QSL cards, since I owned up, have included a resolution to "build one themselves" that I am thinking of starting a Dinosaur's Club in celebration of this remarkable little rig, which is the DC-3 of home-built c.w. transmitters. From the DX data I have given, one can calculate that if I bring it with me when I return home to Kent, I should be copied in Baku and Archangel when the band is in.

The most expensive parts of the thing are the crystals (I know where to get a 6L6 cheap). If one drove it off a solid-state v.f.o., as a power amplifier, it would be fully respectable (see *QST* January 1983 for a similar use of an old 75W 1625 tube transmitter of rather more recent vintage). Eat your heart out, Yaesu!

Alex Comfort M.B., B.Ch., D.Sc. KA6UXR
Santa Barbara, California.

Band I

Sir: It will be a great shame if a small portion of Band I isn't allocated to Radio Amateurs when it becomes available. This is a unique and valuable section of the spectrum for experimentation.

I propose the section 48–48·6MHz giving 48 × 12·5kHz channels with the third harmonics falling in the amateur 144MHz band, making them easily policed and identifiable. Any fourth harmonics would fall on the IBA's Ch. 9 only. (As a TV technician in North Devon, I know only of one customer using this channel.)

With careful avoidance of specific local radio frequencies the 2nd harmonics shouldn't be any problem either.

These are my personal views and I welcome comment or letters of support.

John Stacey G8BXO
South Molton, Devon

Repeaters

Sir: I would like to report an interesting phenomenon observed recently on the 144MHz (2m) band:

For some time now the local 144MHz band repeater and its nearest neighbour have been off the air for a variety of reasons, technical and otherwise. Bad news, one would think, for the average 144MHz f.m. operator but tuning through the top half of the band reveals quite the opposite to be true. What were once lifeless simplex channels are now buzzing with activity, operating standards have improved dramatically, the need for increased simplex range has prompted many amateurs to improve both their antenna systems and equipment performance and the misbehaviour often heard on repeaters has disappeared from the band. While never doubting the technical splendour of our repeater network I cannot help asking myself: what do repeaters really contribute to Amateur Radio?

Paul Russell G4BWQ
Brighton

YL Phraseology

Sir: Reference Anja Simpson-Frazer's comments on a suitable parallel for "Old Man" for lady amateurs, I would have thought the most obvious answer was "Young Lady", since it's there already and since it's well known that all ladies are young; but linguistically speaking it would be quite acceptable to hang onto "Old Man", since the hippies (Hey Man) and the Americans (Hey You Guys) have already set the precedent (Man: person of either sex, etc.). If neither of those fit the bill, how about "Old Thing", nicely unisex and noncommittal, already with a long history as a term of mild endearment/abuse, or if we want to be really formal we could go all medieval with "antique friend"! And for those really special moments when nothing seems to go right and you need to let a bit of steam out of your valves, how about "Old Moo"?

Helen Armstrong
RAE 1979, 1980 (Failed)

Letters

Why SOS?

Sir: Endeavouring to trace the origin of some practice can be a fascinating hobby in itself—especially where this concerns wireless!

How about that well-known emergency signal "SOS" for example? Every schoolboy believes this stands for "Save our Souls" or "Save our Ship" . . . but is this really so, and when did the signal come into general use?

Way back in 1903, at a Wireless Conference held in Berlin, it was proposed by the Italian delegates that a special combination of letters should be used by a ship in need of assistance.

The letters proposed were "SSSDDD", and instructions were to be given to all ships that, in the event of such a signal being received, all c.w. traffic should be stopped immediately.

Although generally agreed, the matter was left to a special conference at a later date, and the Marconi Company, recognising the necessity for the immediate adoption of some special signal, gave instructions on 1 February 1904, that the letters "CQD" should be used in an emergency. This was a combination of the general call "CQ" followed by "D" for danger.

A couple of years later, at another Wireless Conference held at Berlin, the German Government made the suggestion that ships in distress should use the letters "SOS", and this was immediately accepted. But why SOS? These letters were chosen because of the ease with which they could be transmitted and the simplicity of the signal, presenting the least possibility of errors!

What about CQ? That goes back much, much further, to the days of rail telegraphy a century or more ago. One suggestion which I suppose is as good as any other, is that it stood for "seek you".

See?—CQ—Seek you.

Alright, I know—but has anybody any better idea?

Douglas Byrne G3KPO
Ryde IOW

New Books

POPULAR ELECTRONIC CIRCUITS BOOK 2
by R. A. Penfold
Published by Bernard Babani (publishing) Ltd.
146 pages, 178 × 111mm. Price £2.25

The circuits (over 70 of them) are for those with some experience in electronic construction. The circuits need to be constructed from just a circuit diagram, without the aid of detailed constructional information and board layouts. Circuits in the book cover a wide range of subjects—audio, test gear, radio, house and car etc.

BEGINNER'S GUIDE TO VIDEO
by David K. Matthewson
Published by Newnes Technical Books
192 pages, 182 × 118mm. Price £3.95

This book attempts to fill-in the lack of information available to the intelligent "man in the street" on domestic video. It covers not only understanding how a video camera or recorder functions, but also how to get the best out of various items of video equipment. If you haven't already bought your equipment this book is helpful in deciding what to buy. If you already possess equipment then you can gain a fuller understanding of its potential and thus increase your enjoyment.

HOW TO USE OP AMPS
by E. A. Parr
Published by Bernard Babani (publishing) Ltd.
154 pages, 177 × 111mm. Price £2.25

With the op. amp. as possibly the most versatile i.c. it is a basic building block for many applications. This book is a designer's guide which acts as both a reference book and a source book of circuits. The text is divided into the following main chapters: Meet the op. amp., Basic circuits, Oscillators, Audio circuits, Filters, Miscellaneous circuits, Common op. amps., Power supplies, Constructional notes and Fault finding.

INTERFERENCE HANDBOOK
by William R. Nelson WA6FQG
Published by Radio Publications Inc.
247 pages, 140 × 207mm. Price $10.45 including surface mail to the UK. Available from Ham Radio's Bookstore, Greenville, New Hampshire 03048, USA. (Credit card orders accepted)

If you have ever experienced problems with r.f.i. (radio frequency interference) this book will probably contain the details of how you should have cured it.

This recently published work contains a wealth of both theoretical and practical information on the vast subject of interference, covering all manner of domestic and industrial equipment, the ways they can create and suffer from r.f.i.

Although primarily written for the US market, the bulk of the information is equally valid to the UK only the description of the various r.f.i. case histories require slight translation e.g. *"The Case of the Musical Trash Chute."*

The book is not limited to common sources of r.f.i.; sections elaborate upon e.m.p. (electromagnetic pulse generation—the ultimate r.f.i. problem), St. Elmo's Fire and lightning discharge, non-linear device effects and self-inflicted r.f.i. are also dealt with. For those who don't know what a Snivet or Barkhausen is, this is the book for you. Earthing techniques and vehicle suppression are also amongst the topics covered within the 13 chapters, which feature many diagrams and photographs, and are written in a style that is both informative and entertaining to read.

CB PROJECTS
by R. A. Penfold
Published by Bernard Babani (publishing) Ltd.
83 pages, 179 × 109mm. Price £1.95

All the designs included in this book are suitable for enthusiasts with limited constructional experience. Where necessary setting-up procedures are described in detail and special test equipment is not needed to get the projects to function properly. The book includes such things as a speech processor, interference filters and even a simple radio receiver for 27MHz f.m. reception.

Products

Combined Audio Notch—CW Filter

This latest addition to the excellent range of r.f. equipment produced by Datong Electronics Ltd. is designed to improve the performance of existing receiver systems without resort to extensive "internal surgery".

The Model ANF automatic audio notch filter, when interfaced in series with a receiver's loudspeaker, will function as a highly efficient notch filter which may be set to operate automatically, or manually, to reduce offending "in-band" tune up whistles and heterodyned effects by up to 40dB. In the manual-mode, in-built a.f.c. circuitry automatically acts to lock the notch onto the best position when within 100Hz of the interfering signal.

In auto-mode, Model ANF continuously scans the audio range from 270Hz to 3·5kHz, automatically locking onto and notching-out interfering signals.

A further very valuable function of the unit when used in the "Manual Peak" position, is as a c.w. filter. As with the notch filter mode, an in-built l.e.d. bargraph display indicates to the operator precisely where the peak (or notch) is located in relation to the audio passband. The filter width in "Peak" mode is typically 60Hz and 500Hz at 3dB down.

The Model ANF incorporates its own 2W audio amplifier and only requires a single connection to the receiver, plus a 12V d.c. power line to operate.

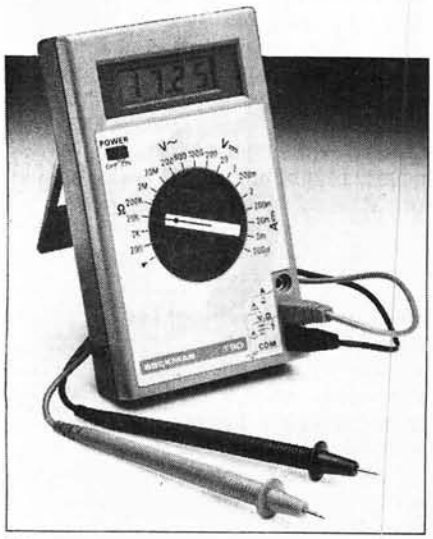
Currently priced at £67.85, which includes VAT and p&p, it is available direct from Datong or any of their many dealers.

Datong Electronics Ltd., Spence Mills, Mill Lane, Bramley, Leeds LS13 3HE. Tel: (0532) 552461.

Low-cost DMM

Beckman Instruments Ltd. introduce a new low-cost version of their successful T-series of digital multimeters. Designed specifically for technicians, electricians, engineers and hobbyists, the new Beckman T90 costs £43.45 plus VAT.

The choice of functions and ranges has been determined by market research to permit little-used functions, by the majority of buyers, to be omitted. As a result the T90 offers a diode test function, six resistance ranges to 20MΩ, two a.c. voltage ranges of up to 200V and 600V (1·5% accuracy), five d.c. voltage ranges to 1000V (0·8% accuracy), and five d.c. current ranges up to 2 amps. There is no a.c. current range, but the other ranges are well protected against overloads and the instrument is covered by a one year, comprehensive world-wide guarantee.



All functions and ranges are selected by a single rotary switch and the $3\frac{1}{2}$-digit liquid crystal display features automatic decimal point plus polarity, overload and low battery indication.

The T90 will operate continuously for 200 hours from a standard 9V battery and is housed in a high shock resistant case measuring 150 x 90 x 30mm, and weighs only 285g, including the battery.

A comprehensive selection of accessories is available, which includes current clamps, high voltage probe, r.f. probe, temperature probes and a durable vinyl carrying case.

For further details, contact: *Beckman Instruments Ltd., Electronic Components UK Sales and Marketing Organisation, Mylen House, 11 Wagon Lane, Sheldon, Birmingham B26 3DU. Tel: 021-742 7761.*

New Range for DMMs

Anyone who owns or has access to a digital multimeter can now add wide range temperature measurement to the instrument's range of capabilities, by utilising standard type K thermocouples and the DVM/TC Interface Unit from Graham Bell Instrumentation.

This new device, at considerably lower cost than a dedicated instrument, will operate in the temperature range −50°C to +1100°C and incorporates automatic cold junction compensation. Thermocouples are connected via a miniature compensated socket and a basic type K thermocouple and mating plug are supplied as standard with the instrument.

The output from the interface unit, of 1mV per degree centigrade, is fed through a 0·75 metre coiled lead, fitted with 4mm plugs, to the multimeter. Long term stability is excellent and the low battery drain allows the unit to be used for continuous monitoring, if necessary.

Additionally, since the accuracy is not affected by the output loading, it may also be used to interface instruments such as chart recorders.

The DVM/TC Interface Unit costs £36.00 plus VAT and 70p p&p, and is available, as are further details, from the manufacturers: *Graham Bell Instrumentation, PO Box 230, 39 Derbyshire Lane, Sheffield S8 0TH. Tel: (0742) 582370.*

934MHz CB Transverter

With manufacturers of equipment for the 934MHz CB service seemingly "running on the spot", in terms of releasing their equipment onto the market, I have received information of a product that could enable operators to get on the air.

BeeWare Ltd., of Harrogate, introduce the LA83, a 934MHz transverter, designed to allow owners of 27MHz CB transceivers to convert their rigs to 934MHz. This is achieved by inserting an interconnecting coaxial lead between the transceiver's antenna socket and the input of the transverter. Then the transverter is connected, via "N" type terminations, to a 934MHz antenna and the 27MHz rig set to channel 1, the system is then ready to go on 934MHz.

The LA83 transverter, which conforms to the specifications of MPT1320, provides 20 channel operation (selected on the transverter) at a maximum of 8W r.f. out. Other indicators on the transverter are ON AIR l.e.d., r.f. power meter and there is, of course, a POWER ON/OFF switch.

Use of the LA83 in conjunction with a 27MHz transceiver produces what is effectively a triple conversion receive system with the 27MHz rig acting as a fixed i.f.

The photograph shows the LA83 transverter below, with a Bluebird 27MHz f.m. transceiver mounted above

In order to comply fully with the MPT1320 specification, a phase-locked-loop system within the transverter automatically inhibits the output if any channel other than channel 1 is selected.

The LA83 should be available shortly after this issue of *PW* is published, and will be priced in the region of £200. Alternatively, BeeWare recommend a complete mobile set-up which includes the LA83, a Bluebird 27MHz transceiver and a suitable antenna for approximately £250. Suitable feeders and connectors will be available as optional extras.

Further details from: *BeeWare Ltd., Ripon Way, Ripon Road, Harrogate, North Yorkshire, HG1 2AU. Tel; (0423) 501151/6.*

Because of a large number of enquiries from the public about the Telecommunications Bill, the Radio Regulatory Department of the Home Office has issued a new information sheet explaining in simple language what the Wireless Telegraphy provisions of the Bill mean. This explanation is of interest to all radio users, and we reproduce it here in full.

THE TELECOMMUNICATIONS BILL EXPLAINED

CITIZENS' BAND RADIO INFORMATION SHEET
No 8
TELECOMMUNICATIONS BILL — WIRELESS TELEGRAPHY PROVISIONS

Existing Law

1. Under section 1(1) of the Wireless Telegraphy Act 1949 it is an offence to install or use any wireless telegraphy apparatus except under and in accordance with a licence issued by the Secretary of State. The Secretary of State also has power, under section 7 of the Wireless Telegraphy Act 1967, to make an order specifying apparatus for the purpose of restricting or prohibiting its manufacture and importation. Contravention of such an order is an offence.

Need for new powers

2. Experience has shown that the existing powers to enforce the wireless telegraphy laws are inadequate to deal with all the many areas of unlawful use of equipment. Whilst the proposed changes are not aimed specifically at CB radio, there is no doubt that the most pressing need for increased enforcement powers arises from the steep rise over recent years in the use of illicit AM CB radio. Such equipment—which it has never been legal to use in this country—is causing widespread interference, not only to domestic radio and TV reception but also to the radio communications of the emergency services—police, fire and ambulance—with all the serious consequences that may entail.

Provisions of Telecommunications Bill

3. Against that background, the following new powers are being sought in the Telecommunications Bill:

(a) Control of sale and possession

4. Power is being taken in the Bill to enable controls to be imposed on the sale and possession, without reasonable excuse, of certain equipment. This is being done by extending the existing power of the Secretary of State under Section 7 of the Wireless Telegraphy Act 1967 to make orders prohibiting unauthorised manufacture and importation. Contravention of any restriction or prohibition imposed by order will be an offence punishable on summary conviction by a fine not exceeding level 5 on the standard scale as laid down in the Criminal Justice Act 1982 (currently £1000). The offence will not be imprisonable. As at present, the Secretary of State will be required, before making any order under Section 7, to satisfy himself that the proposed order is compatible with the international obligations of the United Kingdom.

5. Although it is impossible at this stage to be specific about the precise scope of any orders which may be made if the new enabling power is enacted, it is most likely to be invoked in the case of illicit AM CB. It is already illegal to manufacture, import or use such equipment and in such circumstances there can be little justification, particularly where a ban on sale is also imposed, for objecting to a prohibition on having the equipment in one's possession without reasonable excuse.

(b) Seizure of equipment

6. In order to ensure that effective action can be taken against offenders, the Bill will also create new powers for the police and investigating officers of the Radio Interference Service to seize equipment which is involved in or evidence of the commission of certain wireless telegraphy offences, for the purpose of legal proceedings. Seizure of equipment will be lawful in the case of an indictable offence under the Wireless Telegraphy Act 1949 (that is, one involving hoax calls or deliberate interference) or an offence under Section 1(1) of that Act involving the installation or use of transmitting apparatus or an offence under Section 7 of the 1967 Act involving the contravention of restrictions on the manufacture, importation, sale or possession of specified apparatus.

(c) Forfeiture of equipment

7. Where equipment has been seized, it will be open to a person authorised by the Secretary of State or a constable, as an alternative to initiating criminal proceedings, to apply to a magistrates' court for an order that it should be forfeited. A forfeiture order will not be made under this new procedure unless the apparent owner and any other interested party has first been given the opportunity of appearing before the court to show cause why an order should not be made, and there will be a right of appeal to the Crown Court. The intention of this provision is to enable illegal equipment to be removed from circulation where little purpose would be served by seeking a criminal conviction.

(d) Arrest

8. Finally, it is also intended that the police should have power to arrest persons reasonably suspected of certain offences involving transmitting apparatus where their name and address cannot be satisfactorily established or where they are unlikely to remain at the address given long

enough to enable a summons to be served. This power which will only, under the Bill, be available in the case of indictable offences under the 1949 Act and offences under Section 1(1) of that Act involving the installation or use (but not the possession) of transmitting apparatus is intended simply to ensure that offenders cannot, as they do at present, escape prosecution simply by witholding their identity or giving a false name and address. It is likely that this provision will, in the event, be overtaken by a similar one in the Police & Criminal Evidence Bill which applies to all offences.

Penalties

9. With the exception of offences involving hoax distress calls and deliberate interference which are to be made triable either way, the Telecommunications Bill will not increase penalties for wireless telegraphy offences. Penalties for certain offences are, however, being increased, as part of a general up-rating of fines, by the Criminal Justice Act 1982, the relevant sections of which come into force on 11 April.

Entry & Search of Premises

10. The Bill will not create any new powers to enter and search premises. As at present, entry of premises without the occupier's consent will only be lawful under a warrant issued for that purpose under section 15(1) of the Wireless Telegraphy Act 1949.

the things people say

"OK on you living at Fareham, can you give me a break on your QTH?"

. . . heard by G8RYP

". . . at 40ft, and above that a 9-element 2 metre vertical Yagi, just to keep in touch with the locals".

. . . heard by G30ZT

1st op: "Are you interested in QRP at all?"
2nd op: "Not a hope! I've always been a Spurs man."

. . . heard by G6GOY on the night of the FA Cup Final

"There was an old owl who sat in an oak, The more he heard the less he spoke, The less he spoke the more he heard, Amateurs, please copy that wise old bird!"

. . . heard by G. Curtis

Whilst a G2 was whistling up a repeater, his xyl was heard to say in the background "must be the old grey whistle test"!

. . . heard by G2DRT

"I gave up with the 7/8 whip, at high speed on the motorway the angle of radiation was better for satellite working than repeater."

. . . heard on GB3FF by GM6HGW

ANTENNAS

PART 5

F.C. JUDD G2BCX

Part 5 of this series deals with the general principle and performance of long wire antennas.

Many have found that an open-wire antenna that is long in terms of the number of wavelengths relative to the frequency of operation, often has some advantage over multi-band directive antennas.

A long wire antenna is not difficult to set up providing the space for length is available, moreover dimensions and adjustments are not normally critical. A long wire will accept power and radiate it very efficiently and indeed some power gain can be obtained from the main lobes of long wires, but only when the length is equal to a relatively large number of half or full wavelengths at the frequency of operation.

For example, a long wire antenna is not really long even when the physical length is equal to four whole wavelengths (eight half-wavelengths). Yet, even at this length it will provide useful gain in the main lobes, as well as radiation from the secondary lobes, about equal to that from a single λ/2 antenna.

Radiation Fields from Long Wire Antennas

With long wire antennas the radiation from each elementary resonant length does not combine at a distance, as would the radiation from a number of separate λ/2 radiators driven in phase. To put this another way, the field strength at a distance is always less than would be obtained if the total length of wire was cut and reassembled into a number of individually phased and driven λ/2 sections i.e., a colinear array.

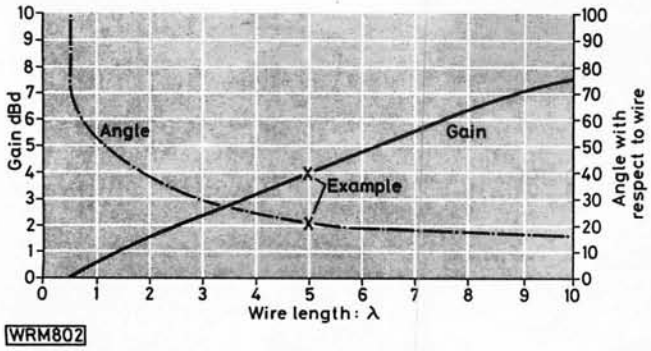


Fig. 5.1: Gain in main lobes relative to length of wire in wavelengths. Example gives gain in main lobes of 4dBd for wire 5λ long. The angle of main lobes to wire is approximately 20 degrees

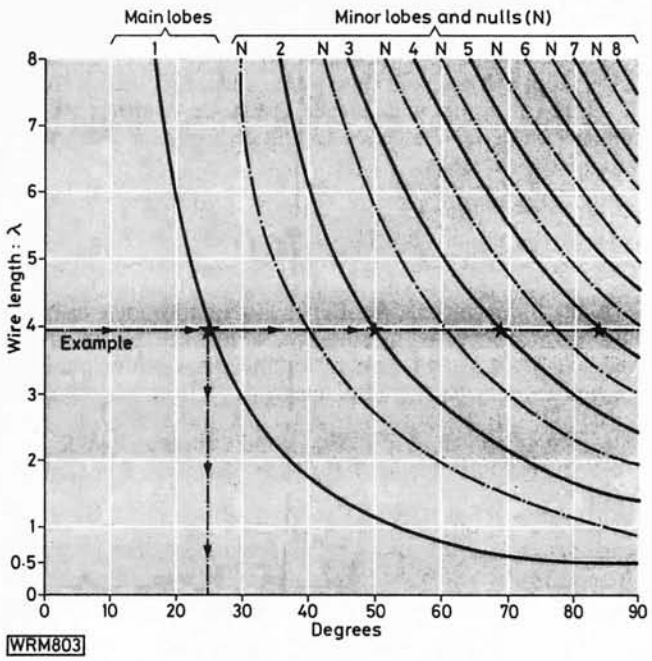


Fig. 5.2: Main lobe and secondary lobe angles relative to length of wire in wavelengths (see text and Fig. 5.3)

As the open wire is made longer however, the radiated fields combine to provide greater radiation from the main lobes. This is illustrated by Fig. 5.1 which shows the gain from the main lobes with reference to a single λ/2 dipole as a function of the length of the wire, in wavelengths, for any specific frequency of operation. The dotted line indicates the angle to the wire at which the main lobe intensity is maximum. The example X-X in Fig. 5.1 shows that with an antenna five wavelengths long at operational frequency, the gain from the main lobes is 4dBd and the angle of these lobes to the wire is approximately 20 degrees.

Radiation Patterns of Long Wire Antennas

There are always four main lobes but as the number of wavelengths in a single long wire antenna is increased so the number of secondary lobes increases. This can be verified with the aid of Fig. 5.2 from which the angle of the main lobes and the number of secondary lobes can be determined for open wires up to eight wavelengths long (solid line curves). The angles of nulls between the lobes are found from the dotted line curves. **It must be appreciated that the chart only provides the angle of the main and secondary lobes for each quadrant about the wire.** The example included in Fig. 5.2 is for an open wire four wavelengths long. Following the arrows, we reach the main lobe (large star) which lays along the centre dotted line. The small stars show three minor lobes in the quadrant at 50, 68 and 82 degrees. The **nulls** (N-dotted curves) fall between these at 40, 60, 76 and 90 degrees. The formation of a long wire radiation pattern is illustrated in Fig. 5.3 which, if fully completed, would have four main lobes, one in each quadrant and twelve secondary or

minor lobes, three in each quadrant. The gain in each main lobe is a fraction over 3dBd and the amplitude of radiation from each of the minor lobes would be at least equal to that from a single λ/2 antenna.

Harmonic Operation

Few radio amateurs have the required space/length for multiple wavelength long wires for the lower frequency and harmonically related h.f. bands viz: 1·8MHz (160m), 3·5MHz (80m), 7MHz (40m). For instance, a four wavelength wire for 3·5MHz would be 320 metres long but this would function as eight wavelengths on 7MHz, 16 wavelengths on 14MHz and 32 wavelengths on 28MHz! Wishful thinking no doubt and anyone who has the space, even for a λ/2 for 1·8MHz is indeed fortunate. However, some are and this could be considered as a more realistic starting point for a harmonic long wire which would function as a full-wave on 3·5MHz, two wavelengths on 7MHz, four on 14MHz and eight on 28MHz.

On the other hand few have the space, even for an 80 metre wire. The most commonly used length of wire is **half** this, at 40 metres, which provides resonance for a λ/2 on 3·5MHz, full-wave on 7MHz, two wavelengths on 14MHz and four on 28MHz. This length of wire can also be tuned against ground as a quite effective λ/4 for 1·8MHz. Assuming **the whole length of wire is horizontal and "end fed",** the radiation patterns for 3·5MHz and 7MHz will be similar to those shown in Fig. 5.4 as (a) and (b) and for 28MHz as in Fig. 5.3. Operation on 14MHz will produce the four main lobes, each at an angle of approximately 36 degrees to the wire with a total of four secondary lobes, two each side.

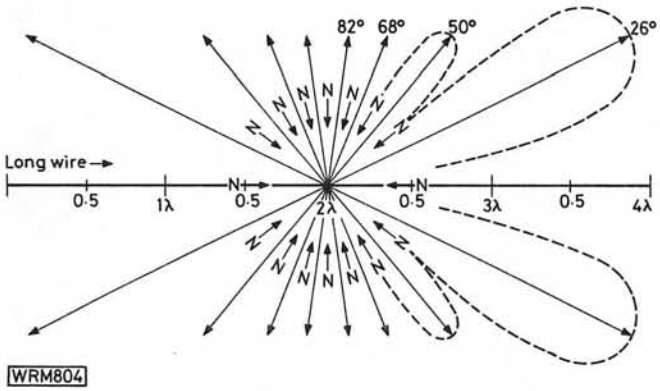


Fig. 5.3: Formation of radiation pattern of a wire 4λ long at operational frequency. Gain in main lobes approximately 3dBd

It should be noted that a long wire antenna may consist of **an odd number of half-waves** as for example $1\frac{1}{2}$ wavelengths long (three half-waves) and which would have a radiation pattern as in Fig. 5.4(c). The remaining pattern, Fig. 5.4(d), is that produced by a single wire eight wavelengths long at the frequency of operation. It would have a gain of a little over 6dBd in each main lobe.

General Coverage for Local and DX Operation

Some idea of the coverage provided by the λ/2 on 3·5MHz and/or tuned for harmonic operation on either 7, 14 or 28MHz can be seen from the circle chart, Fig. 5.5. Although the long wire is based on the approximate centre of the British Isles, the DX coverage for 14 and 28MHz as shown around the periphery, would remain virtually the same with the antenna in any part of the country. Orientated this way on an East/West line, quite good coverage is maintained over the British Isles on 3·5 and 7MHz. On the higher h.f. bands the secondary lobes have significant radiation power which may prove effective when propagation conditions are good. Long wire antennas of this nature also produce some radiation off the end of the wire and this too may be found useful.

Vertical Wave Angles and Antenna Length

The vertical angles at which maximum radiation takes place from a long wire antenna depends largely on its height above ground. Low angle radiation is desirable for DX on 14 and 28MHz (or 21MHz), whereas high angle radiation is more useful for 3·5MHz and 7MHz local working (the UK and European countries). For more or

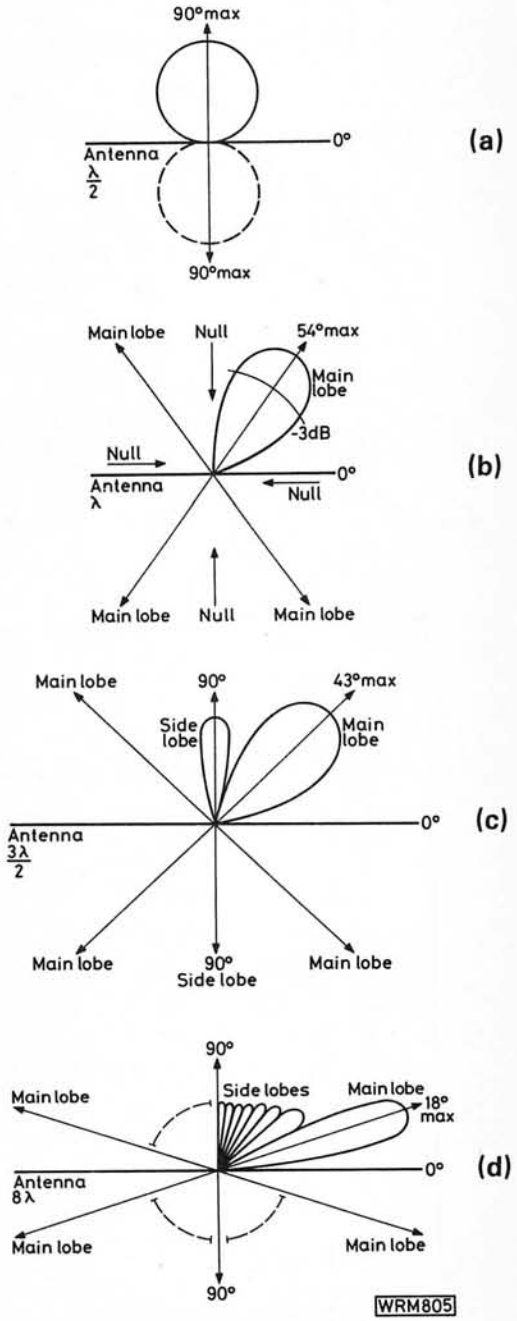


Fig. 5.4: Radiation patterns related to long wire antennas of (a) λ/2, (b) λ, (c) 3λ/2 and (d) 8λ

less optimum results in both cases the height of a long wire antenna should be about 10 metres. It certainly need not be much more.

Antenna length has been given mainly in terms of "wavelength". There is nothing particularly critical about wire length for an antenna to operate over a number of harmonically related amateur bands. The general formula for the length of a long wire in metres is:

$$\frac{299{\cdot}91\ (N - 0{\cdot}025)}{\text{Frequency in MHz}}$$

in which N is the number of full wavelengths required in the antenna.

Feeding Long Wires

A long wire will only operate efficiently and harmonically and with no distortion of the radiation patterns when it is fed at one end via a tuned 600Ω line as in Fig. 5.6. It is possible to directly feed the antenna from a tuner unit near the transmitter but this means that part of the wire will be semi-vertical and cause some distortion of the otherwise symmetrical radiation patterns. The tuning and matching unit should have sufficient flexibility to cater for impedance matching to both resonant and non-resonant long wire antennas. The former method, with a tuned feed

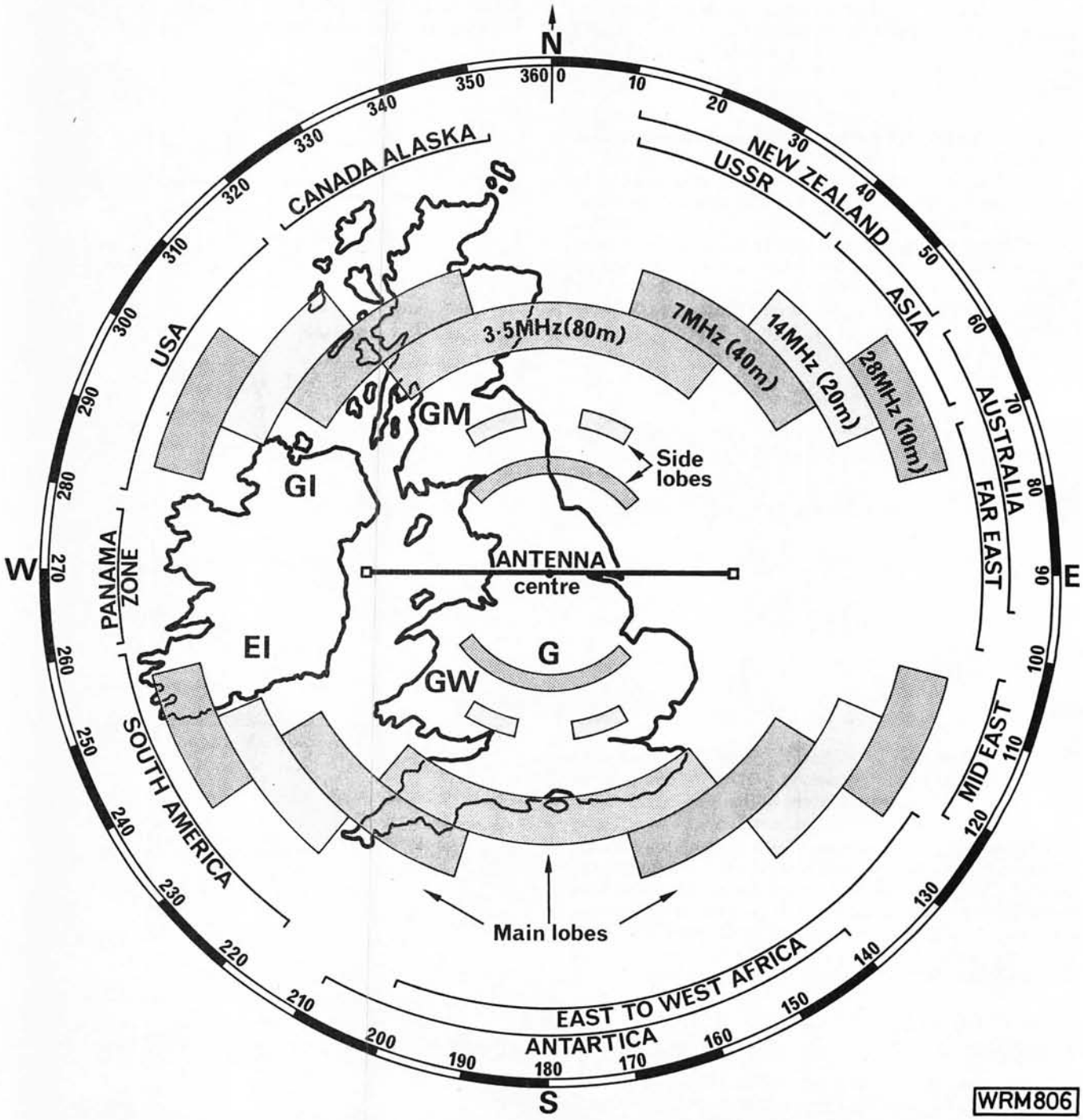


Fig. 5.5: Circle diagram showing approximate coverage with a 40·25m (132 feet) long wire antenna operating as a λ/2 on 3·5MHz and for harmonic operation on 7MHz, 14MHz and 28MHz

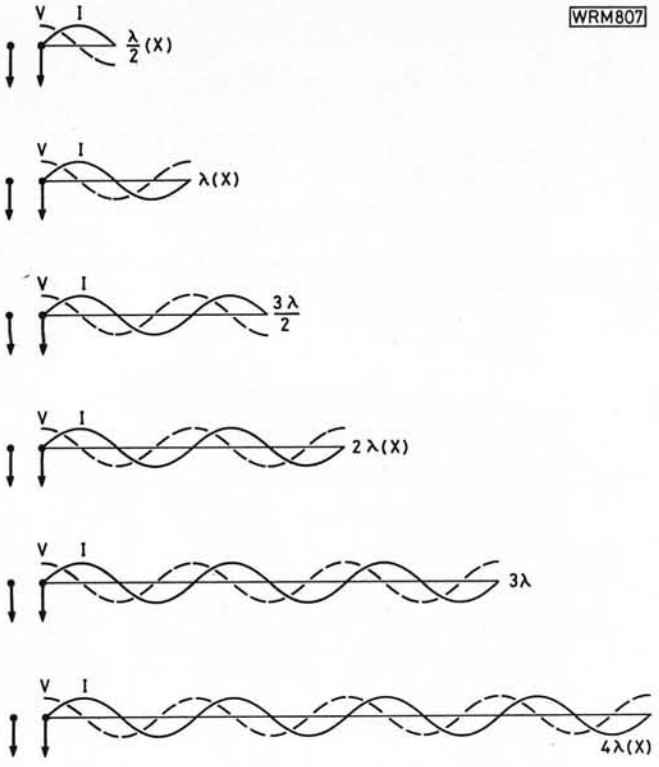


Fig. 5.6: Current and voltage distribution on long wire antennas of "N" number of half or full wavelengths when wire is end fed via a tuned feeder system (see text). Those marked X are directly harmonically related

system, permits a voltage maximum drive to the wire (current maximum at the centre of each λ/2). This also applies to feeding and matching direct from a tuner unit but this brings high r.f. voltage into the shack which is not an ideal situation unless special precautions are taken to keep the start of the wire as far from walls and/or conducting objects as possible.

Other Forms of Long Wire Antennas

There are numerous other ways in which a long wire, or combination of long wires, may be operated and two well known systems are the horizontal "V" and the rhombic. Long wires may be folded in various ways when space is restricted but again radiation patterns will be distorted. Since it is impossible to deal with the many different systems in one article references are given which will provide much more detailed information concerned with long wire antennas.

References

The ARRL Antenna Handbook (chapter 3) American Radio Relay League. Available from the RSGB book dept.

HF Antennas for all Locations. L. A. Moxon RSGB. Available from the RSGB book dept.

Out of Thin Air. Antennas for 160 metres and antenna tuner. IPC Magazines. *Practical Wireless* Publication.

Next Month

The next part of this series will investigate the effects of environment on antenna performance together with recommendations for the best use of available space.

PW 'MARCHWOOD' 30A POWER SUPPLY UNIT part 1

by Nick Allen-Rowlandson BSc G4JET

One of the most useful pieces of equipment needed by anyone pursuing radio or electronics as a hobby is a good power supply. It needs to be reliable and able to give years of hard service without needing attention and if it is to be built at home it must be simple to construct and set-up.

The *PW* Marchwood was designed as an all-purpose supply capable of powering several transceivers and other 12V equipment. The output voltage is adjustable over a small range to allow for powering mobile transceivers which are rated to produce maximum power output at 13·8V. The maximum current available from the *PW* Marchwood is 30A on a continuous basis provided that the heat-sinking arrangements are adequate.

To achieve the required reliability the supply is protected against short circuits, thermal runaway, overvoltage and even operator impatience. A soft-start facility is incorporated to prevent the large charging currents associated with the reservoir capacitors causing problems.

The main problems to be overcome in presenting high current power supplies for home construction are the mains transformer and the case. In the design of the *PW* Marchwood both of these have been overcome and arrangements have been made with suitable suppliers. The design of the transformer is also detailed to allow constructors to arrange with a local transformer maker for one to be made.

Circuit Design

The *PW* Marchwood is designed around the ubiquitous LM723 regulator chip. This contains a buffered reference voltage and a low current (100mA) regulator stage. It is worth taking a look at how the fault circuitry is configured in the LM723 to understand the operation of the overcurrent and overtemperature protection circuitry of the power supply. Referring to Fig. 1.1, when the voltage

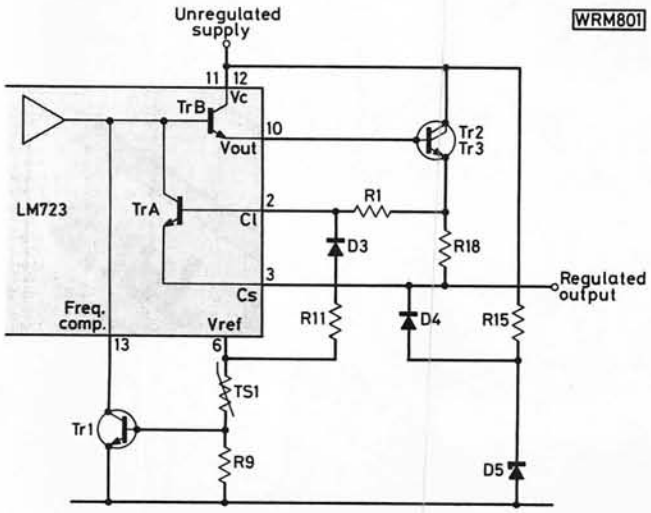


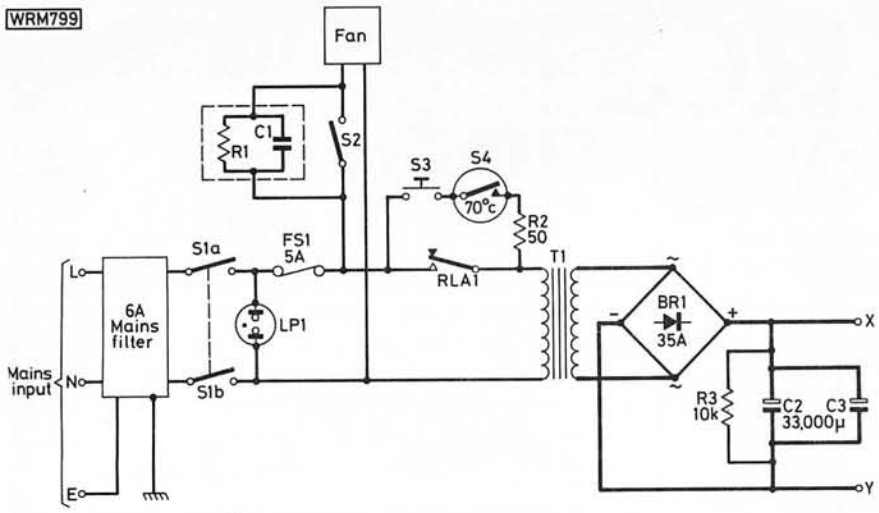
Fig. 1.1: Outline of the protection circuits

across the current sensing resistor R18 is large enough to turn on TrA, TrB is progressively turned off, preventing the output current from rising to a higher value. This results in the output voltage being reduced. If the load is such that the output voltage falls to less than about 7V, diode D3 starts to conduct and takes over the job of turning on TrA, shutting off the regulator completely. In this condition the regulator is latched in the off state.

One way to reset the regulator is to turn TrA off. When this is done it must be done in such a way that if the fault is still present at the output, the regulator is still able to protect itself. If the external load is removed R15 is able to raise the output voltage to a high enough value to make D4 conduct and reverse bias the emitter-base junction of TrA. It is only able to do this if the load is either removed completely or reduced to a few milliamps. If the load draws more current then the output voltage is held low enough to prevent TrA from being turned off. Zener diode D5 prevents the output voltage rising above 10V when no load is applied to the regulator since R15 could provide enough current to allow this to happen.

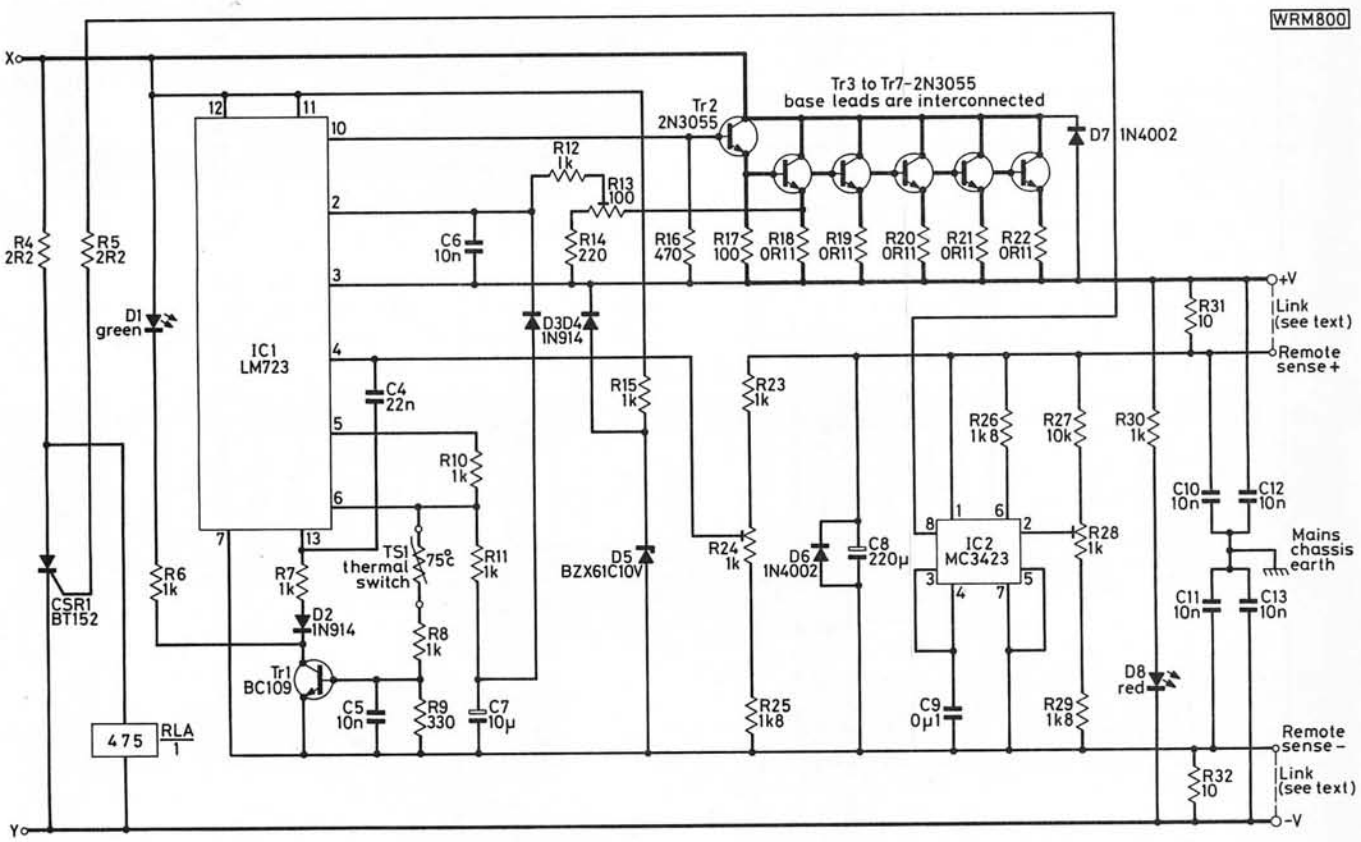
Thermal protection is provided by TS1 which, upon reaching 75°C, reduces its resistance from a high value to around 100Ω. This turns on Tr1 which turns the regulator off in the same manner as TrA and also gives an indication of a temperature fault via the l.e.d. D1 (Fig. 1.3). When Tr1 is turned on, the regulator turns off as before and latches off in the same way until the temperature reduces and the load is removed.

When designing the output stage it must be realised that for reliable operation the junction temperature of the transistors must be kept to reasonable levels even in the case of short circuits. The power dissipated in the output stage when regulating 30A will be about 180W (assuming 12V output and 18V unregulated input to the regulator). The final design of the output stage consists of five 2N3055 transistors connected in parallel each with its own 0·11Ω emitter resistor to ensure current sharing. One of these resistors is used to monitor load current. The pre-driver transistor Tr2 ensures that there is enough current gain as the LM723 is only capable of supplying 100mA. The complete circuit is shown in Figs. 1.2 and 1.3.



◀ **Fig. 1.2: Circuit diagram of the unregulated section showing the soft-start and fan supply. The indicator lamp LP1 is built into the mains switch S1**

Fig. 1.3: Circuit diagram of the regulator and protection circuits. The high-current feeds are indicated by heavier lines. Resistors R31 and R32 are included to prevent the remote sense lines becoming unrelated to the main output terminals if the links are inadvertently left out ▼



Protection Circuits

The most difficult aspect of designing a heavy current p.s.u. such as the *PW* Marchwood is the provision of reliable protection circuitry. The current limit and over-temperature circuits have already been explained. This leaves the overvoltage and main fusing circuits.

It is important to be able to shut down the supply in the event of the voltage at the output terminals rising above the safe level for the load. In the case of a transceiver this is usually about 15V. The usual cause of overvolting is total failure of the pass transistors. Failure resulting in these going open circuit is harmless but failure with them going short-circuit puts the full unregulated output from the capacitor bank across the load terminals. Various means of ensuring that the output voltage cannot rise above, say, 15V have been suggested but most do not even work satisfactorily for low-current supplies let alone a 30A p.s.u. such as the *PW* Marchwood.

Any system which relies on taking out a fuse in the low-voltage circuits will not work reliably and safely.

A study of fuses in general will show that a fuse which will carry 30A continuously requires a current of around 500A to rupture in 4ms, 200A in 500ms and 100A to go in 10s. The energy available to rupture the fuse is stored in the capacitor bank and, assuming a short-circuit condition, is all that is available since it cannot be replaced during the next mains half-cycle. Even with the 66 000µF capacitor bank used in this design it is very doubtful that enough energy can be obtained in the 10ms available to rupture a fuse in the low-voltage circuits. Added to this problem is the very high cost of reliable and safe fuses and holders capable of carrying 30A and containing the explosive forces released when the fuse blows.

The system used in the *PW* Marchwood is a form of circuit-breaker which removes the mains supply when a

fault occurs. The overvoltage circuitry uses a 3423 overvoltage protector chip which continuously monitors the output voltage. To prevent tripping by noise spikes the circuit has a delay built in. Capacitor C9 charges up when the output voltage rises above the reference level set by R28 and if the overvoltage remains long enough to allow C9 to charge up to the same value as the reference level the output is activated, firing the thyristor CSR1.

The thyristor effectively shorts out the relay RLA which switches the mains supply off. At the same time the thyristor discharges the capacitor bank through the 2·2Ω resistor R4. This prevents the capacitor bank from being discharged too rapidly with possibly messy results, and also limits the thyristor current.

With no voltage on the capacitor bank the relay RLA is de-energised and hence the mains supply is switched off. This prevents the supply being turned on simply by operating the mains switch S1. To start the supply it is necessary to bypass the contacts of RLA and this is performed by the PUSH TO START switch S3. The low value resistor R2 in series with S3 limits the mains current to a level which allows the mains fuse FS1 to be of the quick-blow type rather than having to withstand a high surge current. To protect the p.s.u. from impatient operators who might try to start the supply either on load or with a fault condition existing, a thermal switch is used which operates when R2 gets too hot. This switch opens at 70°C and does not close again until it cools to 55°C.

This approach to protection, whilst appearing complicated, is in fact the most cost-effective way.

CONSTRUCTION RATING Advanced

BUYING GUIDE

The construction of this project is not inherently difficult but requires care and attention to detail if the resulting power supply is to be successful.

Components are readily available from several advertisers while the mains transformer will be made available to order as will the specially designed case. Details will be given in Part 2.

APPROXIMATE COST £95

Part 2

In the second part we will deal with the construction and setting-up of the *PW* Marchwood power supply including details of where to obtain the case and other critical components.

ZX SPECTRUM COMPETITION

RESULTS

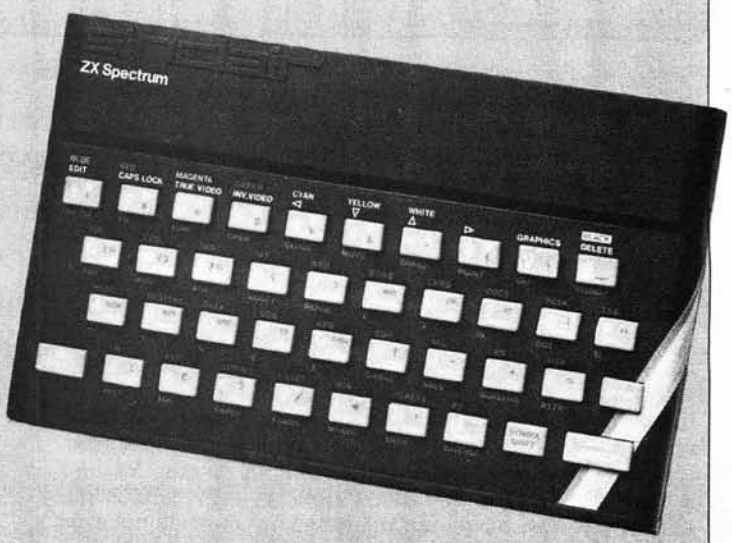
1ST PRIZE

In our ZX Spectrum Competition, readers were invited to study the profile of an amateur radio enthusiast and to decide which eight programs, of a given 16, would be of most use to him in pursuing his hobby. Having considered all entries, the judges chose the following selection as being the best received:

Spurious (sprog) finder; ATV Test Card; ATV Text Generator; Bearings & Distance; RTTY Terminal; Technical Article Index; Resonant Circuits; High Speed Morse Terminal.

A large number of readers submitted this selection and so took part in a postal eliminating contest. The first prizewinner emerged as Mr. D. Eaton, of St. Andrews, Guernsey, CI, who wins the first prize of a Sinclair 16K ZX Spectrum computer.

There were also five runners-up who each win a year's free subscription to *Practical Wireless.* These winners are: Mr. N. Gerdes, Blandford Forum, Dorset; Mr. J. Hewitt, Ashford, Kent; Mr. A. Markham, Ilford, Essex; Mr. W. Turnbull, Crook, Co. Durham; Mr. P. Wilton, Worthing, Sussex.



IC of the month

Brian DANCE M Sc

Plessey Semiconductors SL6700

The SL6700C i.c. has been designed for use in single or double conversion a.m. radio applications and incorporates the i.f. amplifier and demodulator stages.

A particular feature of this device is its low power consumption, which is less than 60mW, together with its ability to operate from low-voltage supplies of between 4V to 7V, with optimum performance at 4·5V. This makes the device ideal for use in portable a.m. receivers which can be operated from small battery supplies, such as those employed in hand-held equipment.

Applications of this highly versatile device include its use as the i.f. stages of a double conversion receiver, single conversion a.m. broadcast receiver, i.f. unit for use in a combined a.m., s.s.b. and c.w. receiver and in circuits for the remote control of models. The SL6700C can also be employed as a generator of s.s.b. signals.

Connections

The connections of the 18 pin d.i.l. encapsulated SL6700C are shown in Fig. 1; the internal circuit, shown in block form, contains two i.f. amplifiers, AMP 1 and AMP 2, whose response extends to 25MHz and thus allows the user a wide choice of intermediate frequency. The double balanced mixer block connected to pins 7, 8 and 9 has been included on the chip for use as a second converter in double conversion circuits. When used in this way, a local oscillator signal must be fed to pin 9 of the device.

Signal demodulation occurs between pins 13 and 15 and the device includes an on-chip noise blanking circuit as well as an a.g.c. generator which controls the gain of AMP 1 and AMP 2. A delay system is incorporated in the a.g.c. so that gain reduction does not occur until the signal input amplitude exceeds a certain threshold value.

It should be noted that the absolute maximum voltage supply for this device between pins 10 (positive) and 17 (ground) is only 7·5V. The application of any higher voltage may permanently damage the device, so it is wise to regard the upper limit as 6·5 to 7V to allow a margin of safety in the case of supply voltage fluctuations, measurement errors, etc.

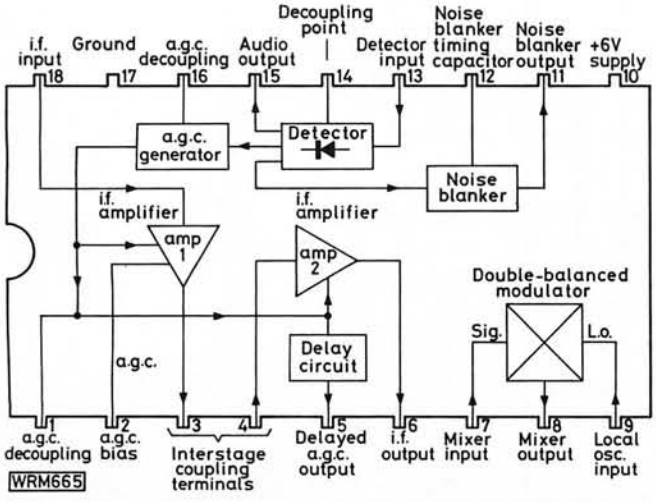


Fig. 1: The connections and internal block diagram of the SL6700C

Double Conversion Circuit

The circuit of a double conversion receiver using the SL6700C as the first and second i.f. units and demodulator is shown in Fig. 2. The input, first i.f. frequency, is normally 10·7MHz, but can be 21·4MHz. The input signal to pin 18 is amplified by the first i.f. amplifier block, which produces its output at pin 3. This output is coupled by C8 to pin 4 and further gain is provided by the second i.f. amplifier whose output appears at pin 6.

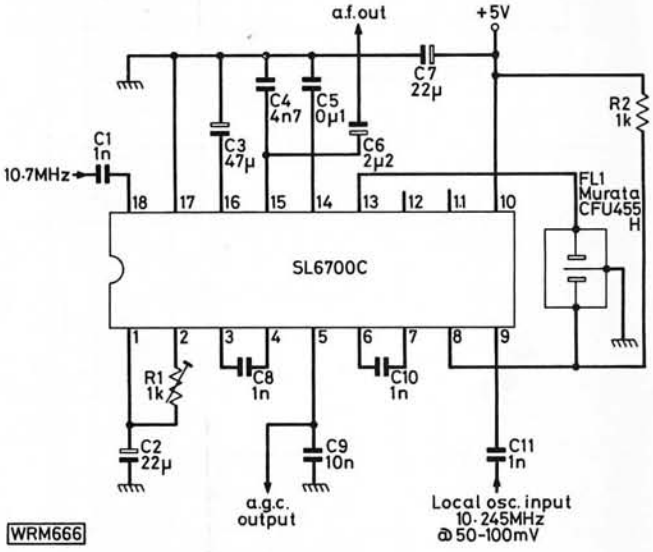


Fig. 2: A double conversion i.f. strip

Signals from pin 6 are coupled into the input of the balanced modulator at pin 7, whilst a local oscillator signal is applied to pin 9 at a level of approximately 50 to 100mV. If the frequency of the l.o. signal is 10·245MHz, and the first i.f. is 10·7MHz, the second i.f. will be a frequency of 10·7 −10·245MHz or 455kHz. Alternatively, the oscillator frequency may be above the input frequency; for example, it may be 11·155MHz with a 10·7MHz input to provide the same standard second i.f. at pin 8 of 455kHz.

In either case, the 455kHz output from pin 8 is filtered by the Murata CFU455H filter FL1. This is an economic ceramic type, similar types being available from other manufacturers. The output from this filter is applied to the demodulator input at pin 13.

Variable resistor R1 sets the threshold level at which the a.g.c. commences to operate; this delayed a.g.c. provides a positive going output with increasing signal strength from pin 5. The output reaches a sufficient voltage to control the Plessey Semiconductors SL600 and SL1600 series amplifier services.

The circuit shown in Fig. 2 has a sensitivity such that a 5μV r.m.s. signal at pin 18 modulated at the 30 per cent level can produce a typical 10dB signal-to-noise ratio in the audio signal. High signal levels of up to 100mV r.m.s. can be handled by the circuit and even if modulated at a level as high as 80 per cent will result in a distortion level of under 5 per cent. The demodulator circuit is extremely linear, as demonstrated by the fact that an increase in the audio output as the modulation level rises from 30 to 80 per cent is 8dB—which may be compared with the theoretical rise of 8·52dB.

AM/SSB/CW Circuit

The versatile circuit of Fig. 3 can be used for the reception of a.m., s.s.b. or c.w. (Morse) signals at input i.f. frequencies of up to approximately 1·6MHz. The circuit is not recommended for use at higher frequencies, since the frequency response of the demodulator circuit is limited.

The a.m. and s.s.b. signal outputs should be kept quite separate and should be selected by switching according to the type of input signal. A beat frequency oscillator (b.f.o.) signal must be applied through a capacitor of about 10nF to pin 9 during s.s.b. and c.w. reception. This oscillator must be switched off during a.m. reception to avoid heterodyne interference and the production of audio-derived a.g.c.

Input signals fed to pin 18 are amplified by the two internal cascaded i.f. amplifiers. The input signal is normally at a frequency of about 455kHz, so the output from pin 6 can be fed through a 455kHz ceramic filter to the demodulator input at pin 13. This signal is also coupled through a capacitor to the input of the balanced modulator at pin 7 which is used as a product detector. It is possible to employ an *LC* tuned circuit instead of the filter FL1, provided that the inductor is tapped at a suitable point for providing the signal input and output without degrading the quality factor, *Q*, of the tuned circuit. However, the use of a miniature ceramic filter is generally more convenient and provides a better performance.

In the s.s.b. and c.w. modes of operation, an audio output is provided from pin 8 of the internal product detector circuit. This audio output is coupled by C14 to the base of the 2N3904 transistor Tr1 which amplifies the signal and applies its output to the input on the SL1621 a.g.c. generator circuit. The output from this device is applied to the base of the 2N3904 transistor Tr2 whose output is in turn used to control the internal a.g.c. circuitry of the SL6700C.

During a.m. operation the b.f.o. is switched off and this results in the output from the product detector being negligibly small, so the SL1621 provides no output and the a.m. detector and its internal a.g.c. circuit operate in the normal mode. However, in the s.s.b. and c.w. mode of operation, the product detector activates the SL1621 and the a.g.c. is "taken over" by this stage. Nevertheless, the a.g.c. derived from the input signal is still applied in the event of strong signals occurring at zero beat. The resistor values have been selected so that the outputs on a.m. and s.s.b. are approximately of equal amplitude for an 80 per cent modulated a.m. and s.s.b. signal.

For c.w. reception a narrower pass-band than that obtainable with the single ceramic filter FL1 of Fig. 3 is desirable, although a multi-element crystal filter may not be an economical proposition. In this case the capacitor connected between pins 3 and 4 of the SL6700C device can be replaced with the quartz crystal network shown in Fig. 4. However, this produces a very narrow peak to the pass-band and for some work the user may prefer to use

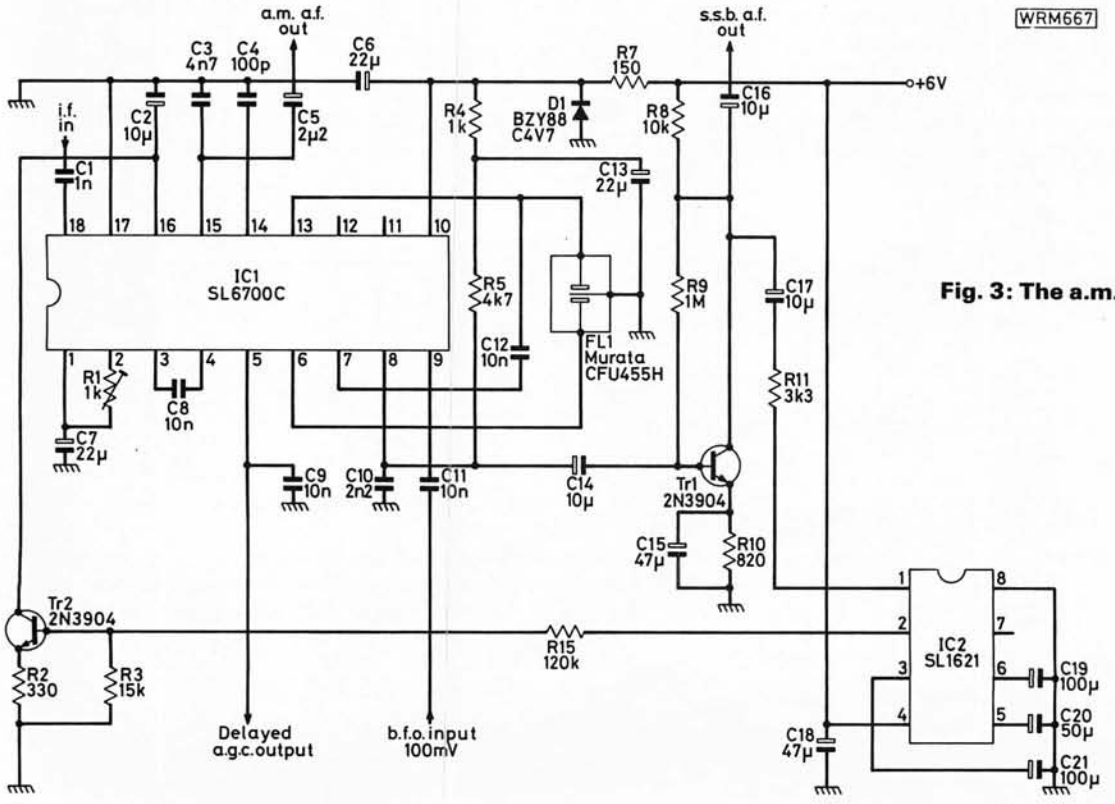


Fig. 3: The a.m./s.s.b./c.w. i.f. strip

the single ceramic filter shown in Fig. 3. If the circuit is to operate at a higher frequency, usually at 1·4MHz or 1·6MHz, the 2·2nF capacitor of Fig. 4 should be reduced to approximately 470pF; the response will then be less sharp at 455kHz, but will still be adequately narrow for almost all purposes.

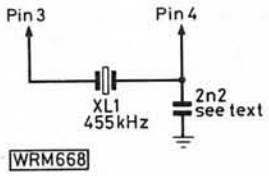


Fig. 4: This circuit may be used in Fig. 4 to obtain a sharply peaked selectivity characteristic

The SL1621 used in the Fig. 3 circuit is designed as a fast attack s.s.b. a.g.c. generator and can draw a large transient current owing to the large value capacitors employed. This large transient current can flow only when an s.s.b. signal is first applied, but to avoid instability the positive supply pin (4) of the device should be decoupled with a 47µF capacitor having short connecting leads. The use of long leads can increase the equivalent series resistance of the capacitor to transients.

Performance figures of the a.m./s.s.b./c.w. circuit of Fig. 3 are tabulated in Table 1. The ultimate signal-to-noise ratio on s.s.b. reception is not as great as may be desired, but is adequate for most purposes other than that of the higher grade of point-to-point communications. The intermodulation products quoted by Plessey Semiconductors are typically −30dB (representing some 3 per cent distortion) and this is less than most of the received transmissions. The relatively low power requirement (about 90mW) of this circuit, together with its small size, makes it attractive for hand-held and other portable equipment.

TABLE 1

Parameter	AM Mode	SSB Mode	Notes
Sensitivity	7dB $\frac{S+N+D}{N+D}$	15dB $\frac{S+N+D}{N+D}$	5µV r.m.s. input m = 0·3
	15dB $\frac{S+N+D}{N+D}$		5µV r.m.s. input m = 0·8
A.F. output	42mV r.m.s.	—	5µV r.m.s. input m = 0·8 fm = 1kHz
	—	43mV r.m.s.	f audio 1kHz
A.G.C.	4dB	5dB	Change in a.f. output from 5µV to 100mV r.m.s. input
Distortion	2·8%	—	V_{IN} 100mV r.m.s. m = 0·8 at 1kHz
		4·2%	V_{IN} 100mV r.m.s. f_{OUT} 1kHz
Signal to Noise Ratio at higher inputs	28dB	—	V_{IN} 50µV m = 0·3
	36dB	—	V_{IN} 50µV m = 0·8
	—	35dB	V_{IN} 50µV f_{OUT} 1kHz
Ultimate Signal to Noise Ratio	50dB	40dB	V_{IN} 100mV r.m.s.

Next month we will continue with part 2 of the Plessey Semiconductors SL6700

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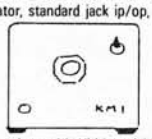

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QV03-12	4.20	1S5	0.45	6BE6	0.60	6SG7	1.15	20D1	0.80
SP61	1.80	1T4	0.45	6BG6G	1.60	6SJ7	1.05	20F2	0.85
TT21	23.00	1U4	0.80	6BJ6	1.30	6SK7	0.95	20E1	1.30
TT22	18.50	1X2B	1.40	6BQ7A	0.85	6SL7GT	0.85	20P1	0.65
U25	1.15	2D21	1.10	6BR7	4.80	6SN7GT	0.80	20P3	0.75
U26	1.15		1.85*	6BW6	6.20	6SR7	1.10	20P4	1.25
U27	1.15	2K25	16.95	6BW7	1.80	6SQ7	0.95	20P5	1.35
U191	0.85		24.50*	6C4	0.50	6V6G	1.50	25L6GT	0.95
U281	0.70	2X2	1.15	6C6	0.55	6V6GT	0.95	25Z4G	0.75
U301	0.65	3A4	0.70	6CH6	8.20	6X4	0.95	30C15	0.50
U600	11.50	3AT2	2.40	6CL6	2.75	6X4WA	2.10	30C17	0.50
U801	0.90	3D6	0.50	6CW4	8.50	6X5GT	0.65	30C18	2.45
UBC41	1.20	3D22	23.00	6CX8	3.80	6Y6G	0.90	30F5	1.15
UABC80	0.75	3E29	19.00	6D6	0.70	6Z4	0.70	30FL2	1.40
UAF42	1.20	3S4	0.60	6F6	1.60	7B7	1.75	30FL12	1.25
UBF80	0.70	4B32	18.25	6F6GB	1.10	8BN8	2.95	30FL14	2.15
UBF89	0.70	5B/254M	16.90	6F7	2.80	9D2	0.70	30L15	1.10
UCC84	0.85	5B/255M	14.50	6CY5	1.15	9D6	2.90	30L17	1.10
UCC85	0.70	5B/258M	12.50	6F8G	0.85	10C2	0.85	30P12	1.15
UCF80	1.30	5C22	29.90	6F12	1.50	10F18	0.70	30PL13	1.25
UCH42	1.65	5R4GY	1.20	6F14	1.15	10P13	1.50	30PL14	2.45
UCH81	0.75	5U4G	0.75	6F15	1.30	11E2	19.50	35L6GT	1.40
UCL82	0.95	5V4G	0.75	6F17	3.20	12A6	0.70	35W4	0.80
UF41	1.35	5Y3GT	0.95	6F23	0.75	12AT6	0.70	35Z4GT	0.80
UF80	0.95	5Z3	1.50	6F24	1.75	12AT7	0.65	50C5	1.15
UF85	0.95	5Z4G	0.75	6F33	10.50	12AU7	0.60	50CD6G	1.35
UL84	0.95	5Z4GT	1.05	6FH8	4.20	12AV6	0.95	75B1	1.25
UM80	0.90	6/30L2	0.90	6GA8	1.95	12AX7	0.65	75C1	1.70
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		6AS6	1.15	6L6G	2.50	12SQ7GT	0.85	954	0.60
		6AT6	0.90	6L6GC	2.65	12Y4	0.70	955	1.20
		6AU6	0.60	6L6GT	1.25	13D3	0.70	956	0.60
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SPARK TO SPACE

by Ron Ham

"We would particularly like to congratulate Messrs Stratton and Co. Ltd., upon their *Eddystone Short Wave Manual,* which was available in time for Olympia and sold by the Society upon their stand", said a report in the RSGB's journal, the *T & R Bulletin* in September 1932. This manual was published for many years and is well worth adding to any collector's library. Gerry Brownlow, Brighton, gave me a copy which he had just before WW-II. He pointed out that the transmitter which they designed for the home constructor was suitable for use on the frequencies allocated for training with the Royal Navy Wireless Auxiliary Reserve and the Royal Air Force Civilian Wireless Reserve (Fig. 1), both mentioned

Fig. 1: Eddystone transmitter about 1939

in previous issues. The general components and cabinet to build this single-valve transmitter, covering the 14, 7, 3·5 and 1·8MHz bands (20, 40, 80 and 160m), with plug-in coils, cost around £5.50 plus a 5Z4 rectifier and a 6L6 valve. Stratton and Co. Ltd., of Birmingham manufactured, under the name of Eddystone with its lighthouse trademark, a wide range of components for the short-wave enthusiast as well as a number of communications receivers, many of which are now collectors' items.

Home Constructors

"It was in 1921 as a kid of 13 that I built my first crystal set, from some instructions in *Answers,* a popular weekly magazine in those days", writes Frank Templeton, Moulton, Northants. At that time he lived in Wallington and received strong signals on 334kHz from the control tower of Croydon Aerodrome, a couple of miles away.

"Before you could legally 'listen in' in 1921, one had to apply for a *Wireless Experimenters Licence,* giving details of the experiments one wished to carry out" says Frank. He remembers Arthur Burrows, a 2MT announcer closing down the first night's transmissions by reading a verse of poetry which finished with, "Shall fold their tents like Arabs and silently steal away" and then beat out some sort of tune on a set of tubular gongs in the studio.

The first valved receiver Robin Addie built was a Cossor kit called the Skyscraper Two which covered the long, medium and short wavebands. Incidentally, the matchbox crystal set built by Robin's father in 1921 is now in the South Kensington Science Museum.

Griffith Rockwood and his brother Gabriel, then 4S7GS and 4S7GR, built a 30-line scanning disc television receiver in the mid-1930s. They were delighted to receive transmissions in the medium wave band in Ceylon from Baird's station in the UK. Griffith, now G3JGR, said that the receiver was synchronised by a rheostat in the motor circuit driving the disc and remembers carefully drilling the holes in the disc at 12 degree intervals. Griffith also won first prize at a radio exhibition in Ceylon for building an all mains, short-wave, superheterodyne receiver, and his efforts were reported in the *Ceylon Radio Times,* November 1938.

Collectors

"I recently picked up an old wreck of a radio from a jumble sale for a quid" writes Brian Renforth, Chippenham, who added this GEC BC402 to his existing collection of a HMV 1131 and a Ferguson 3180. The latter, made in 1974 and all transistor, will do for "portable Band II DXing", said Brian.

One of our New Zealand readers, Arthur Williams ZL4TIS, has included military sets in his collection and recently obtained a NZ WS ZC1, a British WS21, a WS-48, an ex-RAF R1132A and a radar set, the 13AP, made in the USA. Another collector of WW-II sets is Ralph Barrett G2FQS, seen in Fig. 2 at the Chalk Pits Museum, Amberley, Sussex, on Wireless Day June 6, operating a WS-18 transmitter and receiver which is remote controlling a New Zealand ZC1 situated about a hundred metres away.

While visiting a country house recently, I couldn't help noticing copies of *The Mathematics of Wireless* by Ralph Stranger and Newnes *Television and Short-Wave Handbook* among many others on a book shelf. It was another of Ralph Stranger's books, *The Outline of Wireless,* that started Robin Addie G8LT, Towcester, in radio and he well remembers how the author described, in simple terms, the workings of a thermionic valve. Robin also has copies of *Short-wave Wireless Communication* by Ladner and Stoner and *Wireless Direction Finding* by R Keen. Coincidentally Brian Renforth tells me that he has just purchased a copy of that same Ladner and Stoner book for twenty pence, so keep your eyes open readers, there is still some good stuff about.

Tail Piece

Fifty years ago on September 25 the first 56MHz field day took place and the stations concerned were G6UT located near Loughton, Essex, G6CL in Hertfordshire, G6YK on the roof of the GEC works at Hammersmith and G2NH at New Malden, Surrey.

Fig. 2: Ralph Barrett using a WS-18

Getting Into SSTV

JAØBZC/ZL1LH Converter

by Nick Foot G8MCQ

The basic principles of Slow Scan TV operation were detailed in the *PW* series *Introduction to SSTV* August–December 1981. The following article is a review of a low cost self-build SSTV receive converter.

With the increase in SSTV activity over the last few years, particularly on the h.f. bands, brought about by the availability of digital scan converters (over 14 000 stations worldwide are estimated to have SSTV capability), the author started looking for suitable constructional designs for a receive unit. Traditional circuits to be found in the current RSGB handbooks using long persistence c.r.t.s were dismissed as being outdated, so a suitable design for a digital slow-to-fast scan converter was sought after.

Digital Converters

One popular solution for the would-be SSTV enthusiast has been to buy a blank Robot 400 p.c.b. [1] and build a scan converter to this design, using parts bought as and when they could be afforded. This has now become an expensive solution with the bare p.c.b. alone costing approximately £70 and the memory a further £30. This must, however, be weighed against the cost of a ready-built Robot 400 which is currently over £600 [2].

A further design found was based on a 6800 microprocessor system and published in the American *Ham Radio* magazine. This looked interesting but was intended to be an add-on for a home computer system and would have been complicated to build up from scratch.

The last receive-only design to be examined was originated by JA0BZC and was published in the March 1980 issue of *A5 Magazine*, an American Amateur TV publication. This design looked promising as it used four 4116 dynamic RAMs for memory—with a price of approximately 70p each. This made the memory cost for a digital scan converter less than £3·00, or £9·00 for an expanded colour version. In addition to this the design used readily available t.t.l. integrated circuits and operational amplifiers together with some Toshiba l.e.d. VU meter driver chips for the analogue-to-digital (A to D) converter.

The only problem remaining was that the original copy of the circuit diagram was a poor photocopy of a photostat of the magazine and the pin numbers of the chips on the diagram were mostly illegible! This made it difficult but not impossible to build, so the search for a better copy of the drawings continued.

During last year's BATC convention at Leicester the author spoke to Grant Dixon G8CGK. He passed on the address of Dave Cowie ZL1LH[3], who has redesigned some of the p.c.b.s from the original JA0BZC circuit and made them available. A bank draft valid in New Zealand dollars was despatched to Dave Cowie and two weeks later an airmail package containing two p.c.b.s and a well-written set of instructions was received.

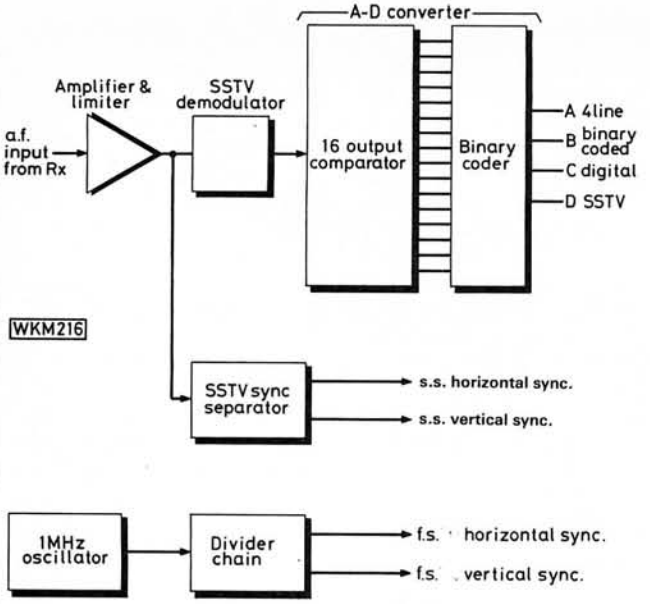
JA0BZC/ZL1LH Scan Converter

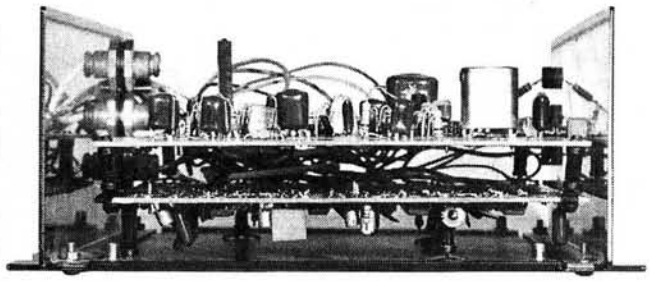
The p.c.b.s were 165 × 230mm single-sided and designed for plugging into edge connectors, both being good quality glass fibre boards. Included in the package were the two special Toshiba chips needed for the A to D converter which saved any problems that may have been encountered in obtaining them in the UK. All remaining components needed were obtained without any problems from several sources such as Maplin, Ambit and Midwich, and the boards assembled according to the detailed instructions supplied, without any further problems.

The block diagrams of the two boards are shown on the opposite page, together with a photograph of the assembled boards mounted back-to-back on pillars in the case. The total cost to build the unit, including the p.c.b.s but excluding the case and p.s.u., was less than £70.

Both boards were tested and problems encountered with the clock crystal oscillator where a 74LS00 i.c. had been used instead of a normal 7400. This sub-circuit worked normally as soon as a 7400 was fitted. After going through both boards and replacing other 74LS series chips with normal t.t.l. devices where any analogue timing functions were involved, a picture was obtained by playing in a pre-recorded tape of SSTV signals.

The author's assembled SSTV receive terminal displaying an off-tape frame





Two component value changes were made to achieve slightly better results—these involved changing R126 for a 12kΩ resistor in series with a 5kΩ preset, to null out audio breakthrough onto the SSTV video and changing R137 to 100kΩ to improve the SSTV signal pulses. All component numbers refer to the ZL1LH circuit diagrams.

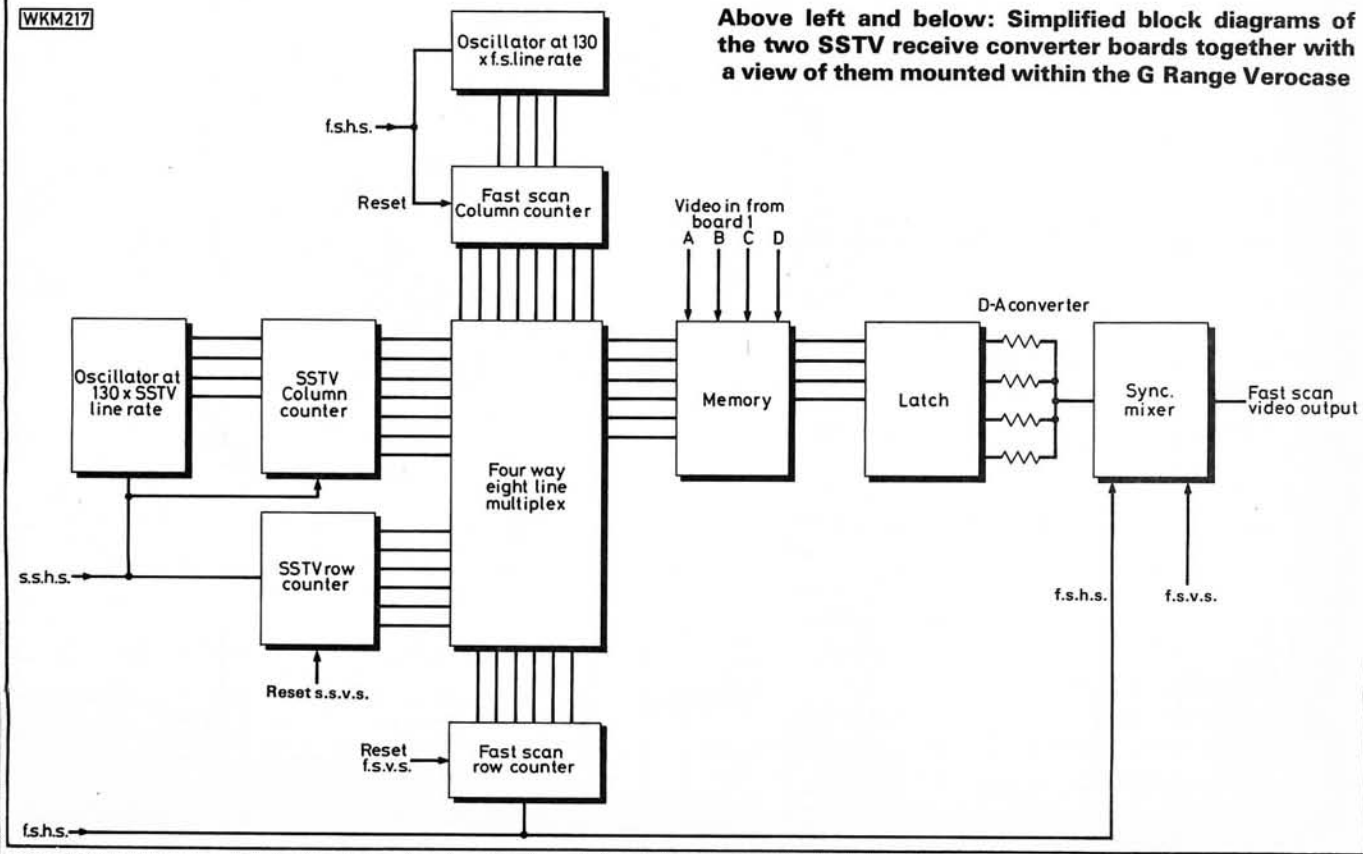
The next problem was to fit the unit into a case and screen it well enough to be able to hear any stations on the h.f. bands over the enormous QRM produced by the fast t.t.l. logic!

The boards were fitted into a Vero G Range case which had had the paint removed from the contact faces between the front and rear panels and the bottom plate. This proved essential to obtain efficient screening. A dedicated p.s.u. providing +12, +5, −5, and −12V d.c. outputs was built into a separate case and connected via a 5-pin DIN locking pin connector. A 47nF decoupling capacitor was fitted from each of the five wires to chassis, directly onto the rear of the connector.

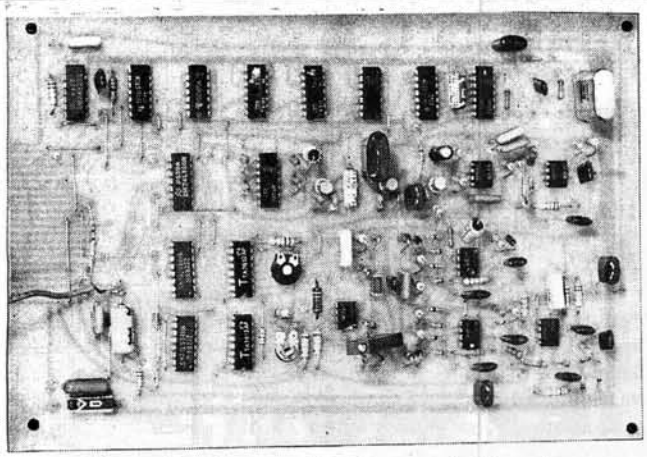
Audio from the receiver was fed in via a phono connector with its body bonded directly to the back panel and a further 47nF capacitor from its centre pin to chassis inside the case to prevent r.f. leaving via the audio cable. The video output was routed via a BNC connector which again was directly bonded to the back panel. The screen of the video cable inside the box was used as the only connection between the 0V rail of the unit and chassis. Adopting these measures reduced the previously high r.f. emissions from the unit to insignificant levels.

Performance of the Unit

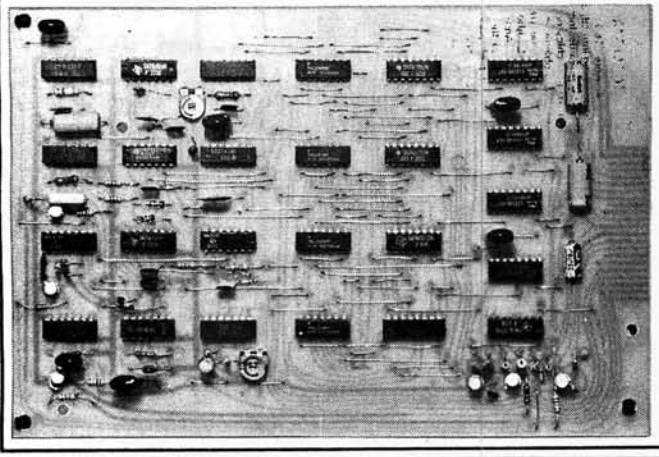
Since its construction the performance of the unit in resolving pictures from the SSTV signals received on the 14MHz (20m) band (around 14·230MHz) has been very satisfactory, and it is intended to expand the unit to enable the display of three-frame sequential colour SSTV pictures that several stations are now sending.



Above left and below: Simplified block diagrams of the two SSTV receive converter boards together with a view of them mounted within the G Range Verocase



The author's assembled converter boards



The unit can be thoroughly recommended to anyone who wants to be able to resolve SSTV cheaply, provided that they are reasonably experienced in electronic construction. Access to an oscilloscope is very useful for setting the unit up and is invaluable in fault finding if any problems occur with the unit. If you do not possess one this need not be a problem as your local Radio Club will often reveal someone willing to help and who has suitable equipment available.

The author's converter was displayed on the *PW* stand at the 1982 Electronic Hobbies Fair, held at the Alexandra Pavilion. Remember that SSTV frames can be stored indefinitely on ordinary audio cassette tapes.

A few suggested frequencies to look around for off-air SSTV are: 3·726MHz (80m); 14·230MHz (20m); 21·340MHz (15m); 28·680MHz (10m); 144·500MHz (2m). The best quality pictures can be obtained on 144MHz from local stations and from 28MHz when the band is open. It can at times be very difficult to find a clear frequency on the other bands. ●

References

(1) Robot 400 p.c.b. available from: P. Burnett, 7 Rydings Avenue, Brighouse, West Yorkshire, MD6 2NJ.

(2) Robot Model 400 SSTV scan converter built and boxed available from: Aero and General Supplies, Building 33, East Midlands Airport, Castle Donington, Derby, DE7 2SA.

(3) PCB & Toshiba chips for JA0BZC converter from: Dave Cowie, 52 Prince Regent Drive, Bucklands Beach, Auckland, New Zealand.

Price for p.c.b.s for monochrome converter together with Toshiba chips: NZ$41—including airmail. Specify whether 625-line 50Hz or 525-line 60Hz output required. Boards for colour are also available.

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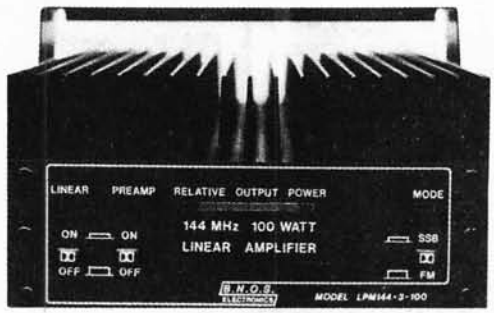

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RTTY with the ZX81

by Dick Ganderton G8VFH

Part 1

With the minimum of additional components and a suitable machine code program the 16K ZX81, and the ZX Spectrum, can be used to receive and transmit RTTY signals. The main considerations taken into account when designing this project were that it should be easy to build and set-up with no difficulty in obtaining components and that the cost should be kept to a minimum.

The project is split into two parts—the first dealing with the construction of a simple yet effective terminal unit with the second part covering the construction of the necessary interface board, the software and some hints on reducing the interference created by the computer itself.

Essential Basics

I do not intend to describe the way in which RTTY works and readers are recommended to read the excellent series by Jeff Maynard G4EJA which started in the September 1980 issue of *PW*. This series covered all the theory behind RTTY together with helpful operating hints.

To receive or transmit RTTY using a computer the system shown in block form in Fig. 1.1 is required. The receiver audio output—in the form of RTTY five-element, two-tone coded signals, is fed into a unit which converts the two tones (Mark and Space) into corresponding TTL logic levels.

This string of logic levels is then converted by the interface into a form which the ZX81 can understand and process. The ZX81 is used to perform the decoding of the signals and this it does by comparing the signals with a look-up table contained in the program and deciding whether a valid RTTY character is present or not. If it has detected a valid character this is printed on the screen and the next set of five-elements operated on.

In transmit mode the ZX81 generates the five-element codes corresponding to the characters to be transmitted and the interface converts these into a serial form ready for feeding into the audio frequency shift keying (a.f.s.k.) generator. This circuit produces the two audio tones corresponding to Mark and Space depending on whether the interface has output a logic *0* or logic *1*. The output of the a.f.s.k. generator is then fed into the microphone socket of the transmitter.

The circuit of the terminal unit is shown in Fig. 1.2 and can be broken down into three areas. The receive chain is made up of IC1,2,3,4 together with their associated components.

The input—in the form of Mark and Space tones (1445Hz and 1275Hz respectively)—is processed by a 741 op. amp. (IC1) to provide a high level drive for the two phase locked loop i.c.s. Diodes D1,2,3 and 4 provide input protection for the 741 and 567 i.c.s.

Both the p.l.l. chips are driven with high level inputs to ensure that their bandwidths are constant and do not vary with changing input levels. This is important to obtain consistent results. IC3 has its bandwidth set by C11 and its centre frequency can be adjusted by R14 to 1445Hz. The second 567 p.l.l. i.c. (IC2) has its centre frequency set to 1275Hz.

The output level of a 567 changes from logic *1* (+5V) with no signal input to logic *0* (0V) when an input within its bandwidth is present.

As only a Mark or Space frequency (but not both) should be present at the inputs of the p.l.l.s one output has to be inverted before being combined by a NAND gate (IC4d). Tr2 performs this inversion. By using two NAND gates (IC4 contains four 2-input NAND gates) it is very simple to obtain a NORMAL or REVERSE sense t.t.l. output ready to be input into the interface board. Switch S2 provides this facility by selecting either the output from the first NAND gate or the output from the second NAND gate (IC4c) which is wired as an inverter.

With the two p.l.l. chips tuned for 1445Hz and 1275Hz, only signals with shifts of 170Hz can be processed. Other shifts can be catered for by switching one p.l.l. out of circuit and S1 does this, simultaneously connecting the first NAND gate (IC4d) as an inverter. In this configuration only the Mark signal is operated on and the receiver is offset to tune the Mark frequency to 1445Hz. If you want to save the last penny, IC2 and its associated components together with S1 can be omitted from the p.c.b.

The a.f.s.k. generator is another p.l.l. chip, this time a 566 type used to generate a stable audio tone. Since two tones are required some means of changing the frequency generated is needed and this is performed by Tr1, effectively shorting out R19—one of the two preset potentiometers used to set the output frequency of the p.l.l. The

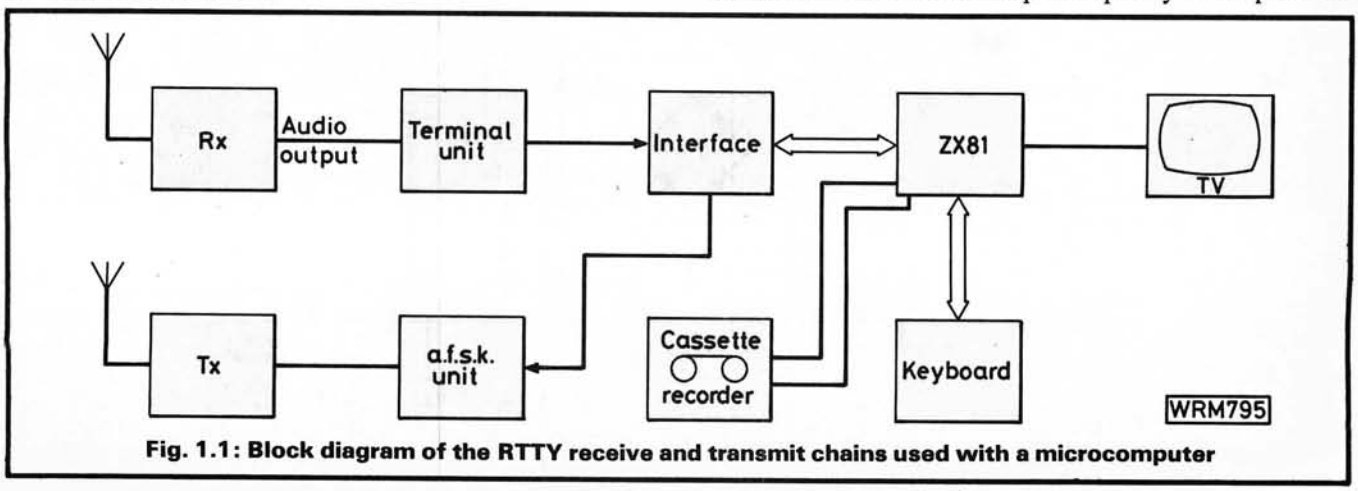


Fig. 1.1: Block diagram of the RTTY receive and transmit chains used with a microcomputer

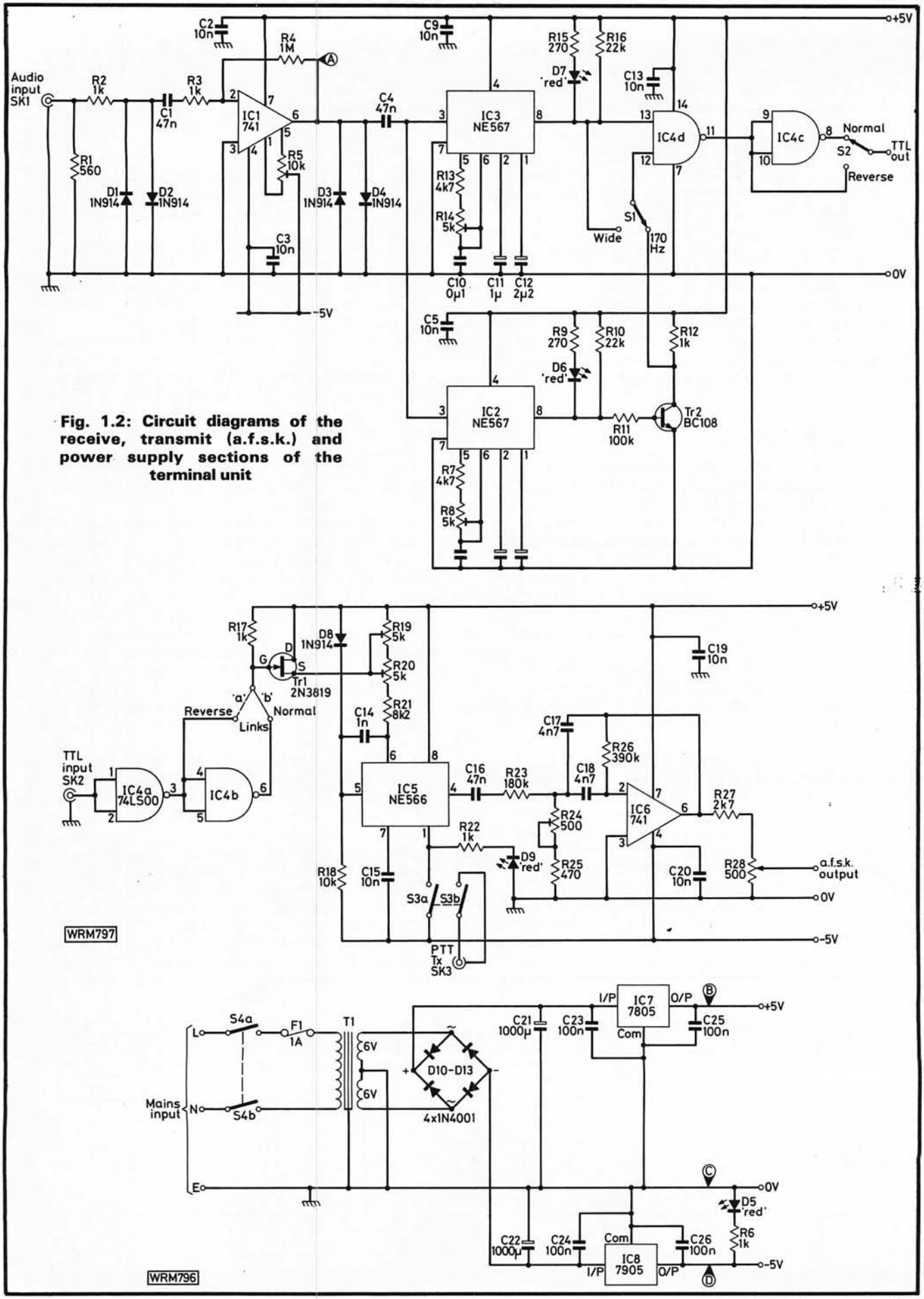


Fig. 1.2: Circuit diagrams of the receive, transmit (a.f.s.k.) and power supply sections of the terminal unit

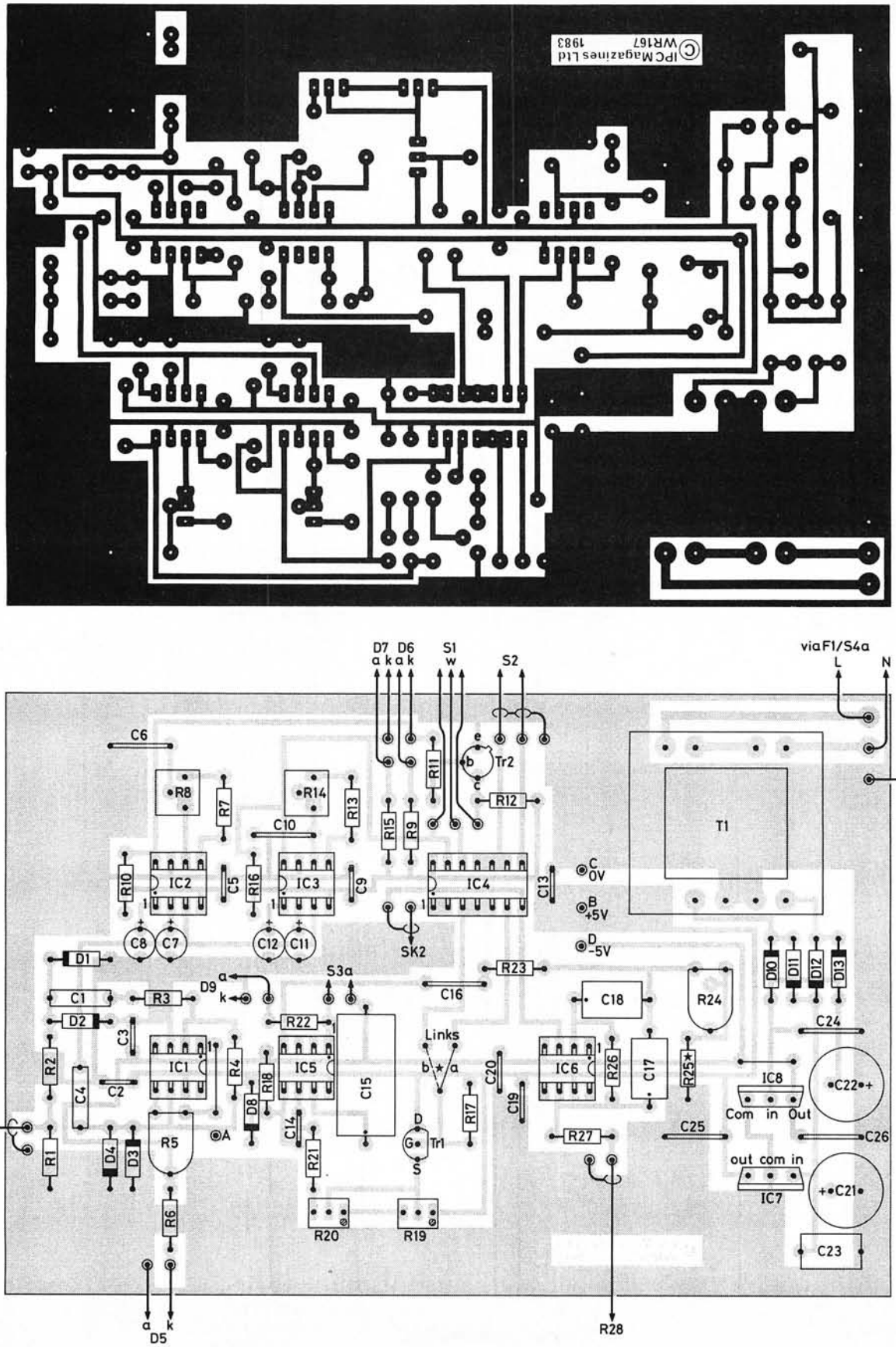


Fig. 1.3: The full-size copper track pattern for the p.c.b. together with the component placement drawing

RTTY with the ZX81

gate of Tr1 is either at logic *1* or *0* dependent on the output state of the NAND gate IC4b. By taking the gate to the output of IC4a instead the a.f.s.k. output sense can be reversed and this is done by changing over the link on the p.c.b. since this is not normally changed once set-up.

The 566 p.l.l. has two outputs, a square wave and triangular wave, and the latter is used here to feed an active filter built around a 741 op. amp. (IC6). Preset potentiometer R24 is used to set the bandwidth of the filter to give equal output levels of the Mark and Space tones at the wiper of R28.

During receive S3a switches IC5 off so preventing any possibility of stray pick-up affecting the receive side of the unit. D9 indicates that S3 is switched to TRANSMIT, while S3b operates the p.t.t. of the transmitter.

Power requirements are simple and only ±5V stabilised are needed. The p.s.u. is conventional with IC7 and 8 as stabilisers capable of providing ±5V at up to 120mA if needed. The mains transformer is mounted on the p.c.b. For driving a tuning unit such as the popular Toni-Tuna described in *Radio Communications* August 1982 stabilised supply rails can be taken from TPB, C and D.

Construction

All components with the exception of the l.e.d.s, switches and a.f.s.k. pot are mounted on the p.c.b. making construction simple. It should be noted that R19 and 20 must be multi-turn preset potentiometers otherwise it will be impossible to set-up the tones accurately. Also R8 and 14 must be good quality cermet types and preferably multi-turn as well although this is not so vital as with the a.f.s.k. generator pots. The p.c.b. accommodates both.

Internal wiring between the p.c.b. and the various

★ components

Resistors

Carbon Film ¼W 5%

270Ω	2	R9, 15
470Ω	1	R25
560Ω	1	R1
1kΩ	6	R2, 3, 6, 12, 17, 22
2·7kΩ	1	R27
4·7kΩ	2	R7, 13
8·2kΩ	1	R21
10kΩ	1	R18
22kΩ	2	R10, 16
100kΩ	1	R11
180kΩ	1	R23
390kΩ	1	R26
1MΩ	1	R4

Capacitors

Disc Ceramic

1nF	1	C14
10nF	8	C2, 3, 5, 9, 13, 15, 19, 20

Polystyrene 160V 2%

4·7nF	2	C17, 18

Polyester Min. Dipped 250V

47nF	3	C1, 4, 16
0·1µF	6	C6, 10, 23, 24, 25, 26

Tantalum Bead

1µF 35V	2	C7, 11
2·2µF 35V	2	C8, 12

Electrolytic p.c.b. Type

1000µF 16V	2	C21, 22

Switches

Min. Toggle

s.p.d.t.	2	S1, 2
d.p.d.t.	2	S3, 4

Potentiometers

Min. Horiz. Preset

500Ω	1	R24
10kΩ	1	R5

Cermet Multiturn Top-adjust Preset

5kΩ	2	R19, 20

Cermet Top-adjust Preset

5kΩ	2	R8, 14

¼inch Spindle

500Ω	1	R28

Semiconductors

Diodes

1N914	5	D1, 2, 3, 4, 8
1N4001	4	D10, 11, 12, 13
Red l.e.d.	4	D5, 6, 7, 9

Transistors

BC108	1	Tr2
2N3819	1	Tr1

Integrated Circuits

NE566	1	IC5
NE567	2	IC2, 3
741	2	IC1, 6
74LS00	1	IC4
7805	1	IC7
7905	1	IC8

Miscellaneous

Mains transformer 6 + 6V 3VA p.c.b. mounting (RS207–829); 1A fuse and holder; Sockets (see text) (5); Metal case 200 x 125 x 75mm; Printed circuit board; Knob; Integrated circuit d.i.l. sockets 8pin (5), 14pin (1).

switches and sockets should be in lightweight screened cable and the type of sockets used can be either phono, miniature jacks or DIN to suit your tastes.

The prototype unit was housed in a metal case 200 × 125 × 75mm (Maplin BlueCase 222) but any similar metal case could be used.

Alignment

As no toroids or other wound components are used, setting-up is simply a matter of adjustment of the preset potentiometers. A minimum of test gear is required, this being a multimeter and a digital frequency counter capable of operating at between 1kHz and 2kHz. (The Soar FC-845 or similar is ideal.) A simple oscilloscope and an audio signal generator are useful but not essential.

The a.f.s.k. generator is set-up first to provide a pair of accurate signals for use in aligning the receive side.

Short the input to IC4a (SK2) to 0V and adjust R20 to give 1445Hz at the wiper of R28. Remove the short and set the output to 1275Hz using R19. Repeat the process until you achieve the two tones, accurately set, at the output. If you have a 'scope then the levels of the two tones can be balanced using R24. Note that R25 may need to be changed to achieve balance. If no 'scope is available then the output can be balanced by using the transmitter into a dummy load and adjusting R24 for equal power output with each tone.

Before setting up the p.l.l.s IC1 should be nulled. Short SK1 and adjust R5 so that the voltage at TPA is as near 0V as possible. A simple multimeter is suitable for this.

The two tones can be used to set-up the receiver p.l.l.s by connecting the a.f.s.k. output to the audio input (SK1) and adjusting R14 so that the red l.e.d. D7 comes on for 1445Hz. Repeat the process with the a.f.s.k. generator set for 1275Hz adjusting R8 until l.e.d. D6 comes on. Check that when D6 is on D7 is off and vice versa.

This terminal unit can be used with any interface and microcomputer requiring a 5V t.t.l. compatible drive. In the second part we will look at the interface board for the ZX81 and discuss the software. The program and interface board have been designed by Scarab Systems who also produce a version for the ZX Spectrum.

Part 2 will also provide some ideas for reducing the QRM produced by the computer.

CONSTRUCTION RATING Intermediate

BUYING GUIDE

The only unusual components used in this project are the multiturn top-adjust cermet preset potentiometers. The p.c.b. is designed to accept RS Components 186–514 types. The costing is for the simplest version and does not include the case, software or interface board.

APPROXIMATE COST £15

Swap Spot

Have Bearcat 220FB scanner switched f.m. or a.m. with Datong PC1 general coverage converter. Would exchange for FRG-7 or Trio R-1000, or similar type s.w. receiver. J. B. Curry, 26 Knockwood Crescent, Belfast BT5 6GE. Tel: Belfast 671646. *R395*

Have Clarion PE-754 Mk III car stereo radio/cassette, auto reverse, loudness etc. Mint condition in box, complete with Pioneer full-range door speakers, superb sound, cost £170. Would exchange for TR2300 or synthesised 144MHz mobile. Tel: Farnworth, nr. Bolton, 706038 after 6p.m. *R396*

Have Uniden Uniace 100 f.m. CB, p.s.u., s.w.r. meter, mag mount antenna. Would exchange for best AR88, CR100 or similar receiver offered. Tel: 095 65 7700 (Co. Durham). *R397*

Have Casiotone 401 electronic music keyboard, 18 months old, cost £330. Would exchange for Micro, BBC, Tandy, ZX etc., or 144MHz mobile or base station. Tel: David 0525 714591, evenings (Flitwick). *R426*

Have home-brewed organ, 2 x 5 octave manuals, 28 pedals, built-in string ensemble and effects. Would exchange for decent s.w. receiver, or anything interesting in electronics or musical, w.h.y. T. Richardson, 45 Park Crescent, North Shields NE30 2WR. Tel: 0632 595852. *R427*

Have Sanyo C3 portable music system, new and boxed, also Lloytron 12 band receiver, b.f.o. requires a little attention. Would exchange both for SX200N scanner. Tel: 0226 83320 (Barnsley). *R444*

Have brand new boxed CB radio. Would exchange or part exchange for 144MHz (2m) transverter for use on 28MHz (10m) rig or scanner, w.h.y. Tel: 049083 355 evenings and Sundays (Clwyd). *R469*

Have Sensory chess computer, seven levels of game, new—never used. Would exchange for CB radio or w.h.y. radio equipment. Tel: 073529 3373 (Berks). *R473*

Have Bearcat 250FB scanner and Realistic DX300 communications receiver. Would part exchange for Drake DR-7 receiver 0-30MHz, or receiver for listening to whistlers and spherics. Tel: John 01-688 8502 evenings or write 41 Oakfield Road, West Croydon, Surrey. *R474*

Have Pye stereo cassette M2272, Pye car stereo cassette/radio, Pye auto-reverse car stereo cassette, Philips car radio/cassette, Philips auto radio, all unused. Would exchange for Hallicrafters SX28 or Eddystone 888 or Hammarlund SP600. Tel: Millington 0754 73329. *R496*

Have CF-550A Sony f.m./a.m. stereo cassette-corder. Would exchange for R208, R210, S20R, S36A or any 50MHz receiver. Barlow, "The Pippins", Lake Lane, Liskeard, Cornwall. Tel: 46049. *R497*

Have Sony CF950S 5-band global radio cassette, absolutely mint. Would exchange for similar radio ICF5900W plus stereo adaptor STA60. D. Starr, 54 Rickley Lane, Bletchley, Milton Keynes, MK3 6BT. Tel: 77139. *R498*

Have Avo Electronic multimeter model EA 113 value £200. Would exchange for 144MHz (2m) multi-mode or hand-held transceiver. Tel: 0530 31395 (Leicester). *R499*

Have Heathkit SWL717 receiver. Would exchange for multiband antenna or Partridge Joyframe a.t.u. Tel: 54496 (Farnborough, Kent). *R511*

Have Oxford oil-filled welder with cables etc. Would exchange for chess challenger or DB801 dip meter. Tel: Warrington 59946. *R512*

Have Cosina s.l.r. through lens metering and with electronic flash gun, all in mint condition. Would exchange for 144MHz (2m) transceiver. Belfield G6NNZ. Tel: Hull 859445. *R523*

Have Microwave Modules 2000 RTTY to television converter. Would exchange for 144MHz (2m) synthesised hand portable. Nigel G4PJJ, Tudor Cottage, Minsterworth, Gloucestershire. Tel: 75376. *R524*

Have Chinon CE4 35mm auto camera, computer flash, power winder, 70–162mm tele and macro lens and carrying case. Would exchange for FRG-7, R600 or similar in good condition. Tel: Shoreham-by-Sea 64623 any time. *R536*

Have Solartron 1442 double beam 'scope, excellent condition, also two Realistic Minimus II speakers, as new. Would exchange for good general coverage receiver and 144MHz converter or h.f. transceiver plus balance or w.h.y. Goodenough, 8 Glencraig Terrace, Fenwick, Ayrshire KA3 6DE. Tel: Fenwick 725. *R545*

Have Olympus OM10 35mm s.l.r. with case, manual adaptor, gadget bag in very good condition. Would exchange for Yaesu FRV-7700B/A in good condition with antenna. D. J. Dauris, 38 Manor Road, Swinton, Mexborough, South Yorkshire S64 8PY. *R547*

Have new IC-251E boxed. Would exchange for good h.f. rig with any accessories, e.g. a.t.u., or take TR-2500 etc., in part exchange. Waters, 42 Tregundy Road, Perranporth, Cornwall TR6 0FF. *R548*

Have copies *PW*, Jan–March, June, Sept–Nov 1980, Feb, March, May, June, Aug, Sept, Dec 1981, Jan, Mar and Dec 1982. Would exchange for Government surplus wireless equipment, handbook or w.h.y. A. Clark, 77 Edge Ave, Scartho Road, Grimsby, South Humberside. *R561*

Have Binatone 5-star f.m. CB, antenna and accessories. Would exchange for ZX81 plus 16K RAM and power supply etc. J. G. Bolland G6OEM, 23 Kingsley Street, Claughton, Birkenhead, Merseyside. Tel: 051 653 4853. *R562*

Have Astro telescope (new), all extras, value over £100. Would exchange for Hallicrafters or Eddystone amateur set in good condition. Bovingdon. Tel: 024 07 5237 (Chalfont St. Peter, Bucks.), after 6p.m. *R610*

Have Kimball Super Swinger Organ with stool, in very good condition; paid £1400 three years ago. Would exchange for Yaesu FT-707 and FC-707. E. Price. Tel: 01-309 1248 after 8p.m., or 01-859 5017 day (Sidcup). *R618*

Have Roland TR 606 "Drumatix" microprocessor controlled, user programmable rhythm machine, hardly used, complete with case and p.s.u. Would exchange for Yaesu FRG-7 plus a.t.u. Also have AR88D, would exchange for Datong active antenna. Tel: Eddie 01-257 5032 (office hours). *R637*

Have Realistic PRO-2008 scanner 68–512MHz, complete with outdoor antenna. Would exchange for Minolta X-700 or X-D camera. Would consider Canon AE-1 program. Mark Cargill. Tel: 0333 310630 (Anstruther). *R654*

Have Philips N1700 video recorder and one blank tape. Would exchange for receiver FRG-7700 or similar. T. Moore. Tel: 051 426 6938 (after 6 p.m.). *R699*

Have OM1 camera with 50mm and 135mm Zuiko lenses, 2X teleplus; Hardy Graphite 2·7m fly rod; Cobra 19X CB set; Fidelity 2000 CB set. Would exchange for 144MHz (2m) transceiver, ZX81 etc. Sandy, 31 Craigie Crescent, Kirkwall, Orkney. *R712*

Swap Spot

Have Zenith camera plus 135 x 50mm lens, enlarger for b/w, two flash guns and holdall. Would exchange all this for good marine band v.h.f. receiver or transceiver. N. Beadsworth, 2 Lapwing Way, Clooney Estate, Waterside, Londonderry, N. Ireland. Tel: 46871. *R722*

Have Cosina c.s.r. 35mm camera, mint condition. Would exchange for a short wave set. A. Barley. 46a Carlyle Road, Aston Fields, Bromsgrove, B60 2PJ. *R723*

Have Realistic DX200 (150kHz–30MHz) general coverage receiver, v.g.c. plus headset. Would exchange for Adana 8 x 5 printing press, type chases, furniture or goldblocking machine, type foil, furniture. Or w.h.y. (varied interests). D. Ford, 67 Stuart Road, Welling, Kent, DA16 1RD. Tel: 01 301 2691 (evenings and weekends). *R724*

Have FT-480R 144MHz (2m) multimode transceiver and 40W Sota linear amplifier v.g.c. Would exchange plus cash difference for good MkIII FT101ZDFM or TS830S h.f. transceiver. G4OXD. Tel: 0462 35248 (Hitchin). *R746*

Have Heathkit RA-1 amateur band receiver. Would exchange for legal homebase CB 934MHz if possible with antenna, or a scanner. J. Hargreaves, 148 Heather Road, Fawley, Southampton, S04 1EU. *R761*

Have Trio 130S, 12 months old. Would exchange for 144MHz (2m) multimode home base or w.h.y. Tel: Leabrooks 604965. *R762*

Have Durst B30 enlarger and Jobo CPE2 colour processor. Would exchange for RTTY equipment (mechanical or electronic), 144MHz linear (r.f. switched) or w.h.y. Tel: Chris G6LAW, 0494 449255 after 6 p.m. (High Wycombe). *R772*

Have Harvard 410T 40 channel hand held CB with "rubber duck" antenna, one month old. Would exchange for any receiver. I. Sear, 11 Margaret Close, Bicester, Oxon. Tel: 43269. *R779*

Have HW12A s.s.b. 3·5MHz band (80m) 200W p.e.p. rig and p.s.u., Icom ICB1050 CB with p.s.u., mic and s.w.r. meter, and DX-40U with v.f.o. (may need attention). Would exchange/part exchange either way for HW8 or HW7. Lucien. Tel: 01-958 9868. *R780*

Have UK101 8K computer with software and literature. Also Beta 1000CB with antenna. Would exchange for almost anything such as rotator, BBC disks, 144MHz linear, 144MHz s.s.b. or 432MHz transceiver or w.h.y. Tel: Richard G6RZL Potters Bar 51449. *R781*

Have Tasco 6T reflector telescope, brand new, 150X magnification, tripod, viewfinder, 2in mirror, boxed with maps and 10 year guarantee. Would exchange for 144MHz transceiver. Andy, 6 Sedgefield Close, Salford 5, M5 4JL. *R782*

Have North Star Horizon (S100) computer/software, Lear Siegler 15in v.d.u., Epson MX82F/T printer, all mint condition. Would exchange for 144MHz/432MHz multimodes, RTTY or w.h.y. Tel: 0293 515201 (Crawley). *R783*

Have Polmar SS120 28MHz (10m) mobile, 5A p.s.u., 200W; mains linear amplifier; Minimitter 3·5MHz–28MHz (80m–10m) transmitter, a.m., c.w., f.m. 350W out; B40 receiver, s.w.r./power meter. Would exchange the lot for good FT101 or similar. Dave. Havant 453169. *R799*

Have Sailor (Danish) 26D marine transmitter, 2MHz 11 channel, hybrid, QE05/40s output, good condition. Would exchange for w.h.y. L.A. Wilkinson, 2 Cragside, Lower Contour Road, Kingswear, Devon, TQ6 OAL. *R803*

Have Heath of London ships grid compass, fluid filled, with rotating bezel. Gimbal mounted, 152mm across bezel, as new (value £150). Would exchange for FRG-7, R300, R600 or similar modern receiver (0·5–30MHz). Brian Stracey, 31 Westfield Road, Garlinge, Margate, Kent. *R806*

Have Unimat 3 lathe with drill, mill attachment, 3/4 jaw chucks, dividing head, all plates, milling table, face plate, rev centre, top slide, cutting tools etc. Would exchange for 144MHz (2m) synthesised portable or base station (f.m. or multimode). Tel: Accrington 391243. *R807*

Have Harvard 40 channel f.m. hand-held CB with rubber antenna. Would exchange/part exchange for Daiwa Search 9 or other form of 144MHz (2m) receiver. Andrew, 17 Gosport Road, Lee-on-Solent, Hants. Tel: 551729. *R808*

Have Flatacraft Force Four rigid hull g.r.p. inflatable, 50h.p. Mercury outboard. Four seater, very fast, suitable for diving, skiing, fishing. Trailer and extras—worth £1000. Would exchange for h.f. transceiver line-up, Yaesu/Icom/Trio, any modern outfit considered. Also wanted 'scope, d.f.m. or w.h.y. G4RYF. Tel: 0642 553726 (Billingham). *R809*

Have Icom IC-255A 25W f.m. dual v.f.o. plus memory as new, Hameg HM307 'scope, new. Would exchange for BBC Micro "B". G4OYV. Tel: 0274 592407 (Shipley). *R824*

Have FRG-7, good condition. Would exchange for AMR217B Belcom, marine version or any good marine receiver. Tel: 0970 615446. *R825*

Have TR2300 144MHz transceiver as new, boxed, NiCads, mag mount. Would exchange for Armstrong 625 or 626 hi-fi receiver. P. Higgins. Tel: 886021 (Wimborne, Dorset). *R826*

Have 144MHz Electronic Developments linear 640 p.a. Would exchange for Z-match a.t.u., electronic keyer or w.h.y. G. Hayes, 3 Manor Avenue, Higher Marston, Nr. Northwich, Cheshire. *R827*

Have complete darkroom outfit including Durst enlarger, Durst analyser, Jobo temp unit, Jobo processor, Schneider lens and much more. Would exchange for FC902 a.t.u. or h.f. multiband linear or any useful h.f. gear. Martin. Tel: 0525 220174. *R843*

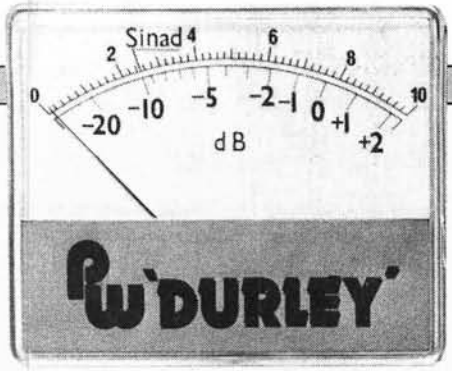
Have Cybernet Beta 3000 and Audioline 341 with K40 processor mic and K40 mobile antenna. Would exchange for Trio TR2300 or similar 144MHz portable. Brian. Tel: 051 677 4189. *R844*

Have Harvard H407 f.m. CB home base rig, excellent condition, cost £100. Would exchange for Sinclair ZX81 with 16K RAM, or good v.h.f. scanner receiver. A. S. Williams. Tel: Bloxwich 406411. *R846*

Have black and white TV with built-in two-band radio, 5in screen, runs on mains or batteries. Would exchange for any h.f. transceiver or maybe FC102, FT902DM a.t.u. in good condition. Tel: Malvern 64327. *R847*

Have MuTek 144MHz mobile Halo as new. Would exchange for good discone e.g. Revco, Norcone etc. Also have Pye Cambridge, working TX on 145MHz, RX faulty. Would exchange for 4CX250 or 2C39 valves, w.h.y. Dave G8PQG. Tel: Oxford 67165. *R848*

Have Rega Planar 3 (Ortofon cartridge), Sony TCK81 cassette, A60 15W + 15W stereo amplifier, Rotel R1010 ten-band stereo graphic equaliser and KEF Concord speakers. Would exchange for NRD (or similar quality) receiver or Telereader/Tono RTTY c.w. computer or Trio TS870 transceiver, or any weather satellite decoding gear. GI4NKF, QTHR. Tel: 0232 795128 or 743507 (Belfast). *R859*



by E.A.RULE
Part 4

Distortion and SINAD Meter

Final parts of the construction and setting-up details formed Part 3 of this article. This concluding part examines distortion and sensitivity measurements of both audio amplifiers and receivers.

Distortion Measurements

As an example, the method for measuring distortion from an amplifier will be given but the method can be applied to most types of equipment.

First, decide at what level of signal and frequency you want to measure distortion. Using the voltmeter section, adjust the amplifier under test to give the required output across a suitable dummy load. Let us assume that this is 25W across 8Ω. We will be measuring in this case a voltage level of approximately 14V (14·142 to be precise!). Assuming a frequency of 1kHz in our example, set the frequency range switch to the 500–2000Hz range and the selector switch to SET. Adjust the SET level control until the meter reads 100 per cent. Select "%" and adjust FREQUENCY and PHASE controls C for the best possible null, reducing the "%" range switch as required. When the best possible null has been obtained, adjust the F controls for any improvement and then, finally, the VF controls. Depending on the amount of actual distortion present, these controls may or may not have an effect on the reading. The final reading obtained is the amount of harmonic distortion in the signal being fed into the *PW* Durley, i.e. from the amplifier under test.

Remember that the signal generator will have some distortion present and the level of this could be checked by feeding directly into the meter. To avoid errors, the generator should have a distortion content at least ten times lower than that expected from the amplifier under test. With distortion you do not add the amounts to obtain the final possible error but take the square root of the sum of the squares, i.e. if our generator has 0·2 per cent and our amplifier measures 0·4 per cent the possible distortion is:

$\sqrt{0{\cdot}2^2 + 0{\cdot}4^2} = 0{\cdot}4472$ per cent, depending on the phase relationship between the various components of the signal. Again, if you are after real accuracy you must also take into account the accuracy of the load resistor and the voltage reading. Sorry if we seem to labour this accuracy point, but it is important to know it exists. Sitting with a calculator and taking into account all known possible errors will show just how great the practical error can be, it's much larger than you may imagine! The age of digital meter read-outs has lulled us into a sense of accuracy that is often misleading.

SINAD and IHFM Measurements

The terms SINAD (Signal to Noise and Distortion) and IHFM (Institute of High Fidelity Manufacturers) refer to methods of measuring the performance of receivers, they do **not** provide a minimum standard of performance. In other words they show the way these measurements should be carried out, not the figures that should be obtained. SINAD is concerned with the measurement of receiver sensitivity only, whereas IHFM is a method of evaluating the complete performance of hi-fi stereo receivers. We shall take a look at both systems but with the emphasis on sensitivity measurements.

Measuring the sensitivity of a receiver would seem at first to be fairly simple but in fact it is prone to very large errors and it is important to understand how these can arise, before going into the actual method of measurement.

Sensitivity is normally expressed in microvolts input at the antenna terminal for a given signal to noise ratio at the output. Arriving at the figure of actual microvolts present produces our first difficulty. There can be an error (intended or otherwise) in the quoted figures in the ratio of two to one. This is because the figure quoted may be in microvolts e.m.f. or microvolts p.d. The e.m.f. figure is the voltage present at the signal generator output when it is "open circuit", i.e. with no load connected. The p.d. figure is the actual voltage present when a load (normally the receiver) is connected. As the load, represented by the receiver's input impedance, may be uncertain this puts a third variable into the calculations.

Assuming that the receiver has an input impedance of 50Ω and that 2μV p.d. is required for a signal to noise ratio of 20dB, it can be measured as shown in Fig. 4.1. The signal generator output is divided between the generator's internal impedance and that of the receiver as shown. Assuming that both the generator and receiver are of 50Ω impedance the sensitivity will be 2μV p.d. or 4μV e.m.f.; either figure could be given in a specification and

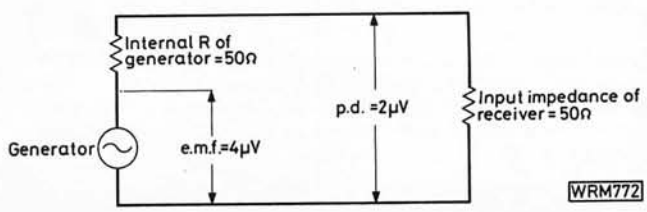


Fig. 4.1: The generator output is divided between the internal resistance and the external load

both would be correct. As 2 is lower than 4, the p.d. figure of 2μV may be given (as it implies better sensitivity) without reference to either e.m.f. or p.d. or impedance, but without these references the figure is meaningless, as will now be shown.

Referring to Fig. 4.2, we can see that to get our p.d. figure of 2μV with a receiver which has an input impedance of 200Ω we only need an actual e.m.f. of 2·5μV. As the generator e.m.f. is equal to the voltage produced by an antenna and this e.m.f. is now less it would seem that

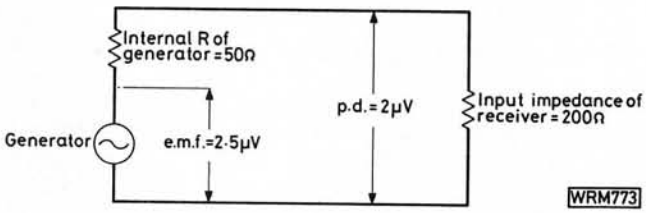


Fig. 4.2: When the impedances are not equal the ratio between e.m.f. and p.d. will vary depending on the value of the load impedance

raising the input impedance of a receiver makes it more sensitive! This would be true **if** the receiver only depended on the actual voltage present but in fact it is the **power** produced in the receiver input impedance that determines its sensitivity and if we now consider the power produced we get a completely different picture. The power produced by 2μV across 50Ω is **four** times the power produced by 2μV across 200Ω and maximum power is only transferred between two circuits when they are "matched", i.e. their impedances are the same. This is why both in receiving and transmitting correct matching is so important.

If we assume that our two receivers require the same power at their inputs for a signal to noise ratio of 20dB, then receiver A will need 2μV p.d. and receiver B 4μV p.d. Taking e.m.f. instead we obtain A requiring 4μV and B requiring 6μV. From this one can see how important it is to state exactly what figures are used **and** the impedances. When you also take into account the possible error in the generator's output level and the measuring equipment's accuracy, you can begin to see just how difficult it is to arrive at a meaningful figure for something as simple (*sic*) as a receiver sensitivity measurement. The IHFM system does in fact use available power for its sensitivity measurements and this aspect will be dealt with later.

SINAD Sensitivity

One conventional method of connecting up equipment for SINAD sensitivity measurements is shown in Fig. 4.3. In practice the signal generator output is adjusted until the required SINAD ratio is reached. Now the actual SINAD ratio required will depend on the standard applied to the equipment. For domestic sets (CB etc.) it may be 12dB (25 per cent distortion), whereas for commercial equipment it may be 20dB (10 per cent) or more. The method used for measurement is the same in each case, it is only the final figures achieved which will vary, depending on the standard required.

Let us assume that we are working to the 12dB figure. The generator is set up so that it is modulated to 100 per cent, with a 1kHz tone. Both the generator and receiver are tuned to the same frequency. The generator output at this point is adjusted for a suitable level so that the receiver produces an output of high enough level to feed into the SINAD meter. The SINAD meter is set to read distortion and its set level control adjusted so that the meter reads 100 per cent. The meter is then switched to read "%" and the 1kHz tone nulled out by using the FREQUENCY and PHASE controls.

Depending on the signal input level it should be possible at this stage to obtain a good null, i.e. to reject the signal to well below the standard required. Now without touching the SINAD meter controls reduce the signal generator input until the distortion and noise is reading 12dB (by approximation between the scale markings). Now switch the SINAD meter to SET LEVEL and reset the level to 100 per cent, if this has changed. Switch back to "%" and readjust the generator for a 12dB reading; repeat this procedure until no further changes in the readings are taking place. Note, it may also be necessary to readjust the frequency and phase controls to obtain optimum null. The rated sensitivity is the generator output in microvolts e.m.f. at 100 per cent modulation for 12dB SINAD. The sensitivity may also be measured at say 30 per cent modulation. Whatever figure is used must be clearly stated. For example: 1·5μV e.m.f., 30 per cent modulation for 12dB SINAD. The modulating frequency should also be mentioned, in our case 1kHz.

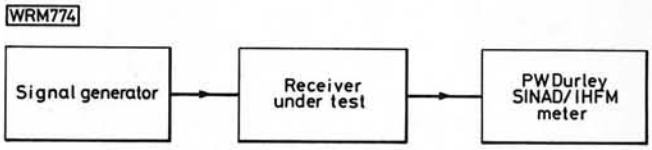


Fig. 4.3: Basic set-up for SINAD and IHFM sensitivity measurements

All this assumes of course that the receiver input impedance is known and stated (see the previous section) but if it is not, the *PW* r.f. impedance bridge which was published in the January 1982 issue will be found helpful.

There are a number of other errors that can cause misleading results, losses in connecting cables between generator and receiver, s.w.r. due to mismatching, inaccurate modulation percentage, leakages of r.f. from the generator when trying to measure very low signal levels etc. A very useful application note is published by Marconi Instruments Ltd. which covers this subject, called *MEASURETEST, Receiver Sensitivity Measurements, How Accurate Are They?*, note number 36. This is a reprint of the Marconi Instrumentation Volume 15 number 6 Autumn 1977, which can be obtained from Marconi Instruments Ltd., St. Albans, Herts, AL4 0JN.

IHFM Sensitivity

The basic IHFM method used is similar to that for SINAD but to a much higher standard. It is not generally realised that the modern domestic hi-fi receiver is tested to a much higher standard than many commercial receivers and in fact puts demands on the quality of test equipment that would make most manufacturers shudder!

For example, how many signal generators are there that can be modulated to 100 per cent with a total harmonic distortion of less than 0·01 per cent, yet this is the standard required by the top hi-fi receivers. Generators with distortion even at a 1 per cent level are expensive enough. The author remembers that in 1976 the company he was working for paid £4500 for a generator suitable for measuring to the distortion limits of 0·1 per cent. However, as the actual IHFM sensitivity measurements are made at a distortion level of 30dB (3 per cent) unless you are doing a full specification you can get away with a lower quality generator.

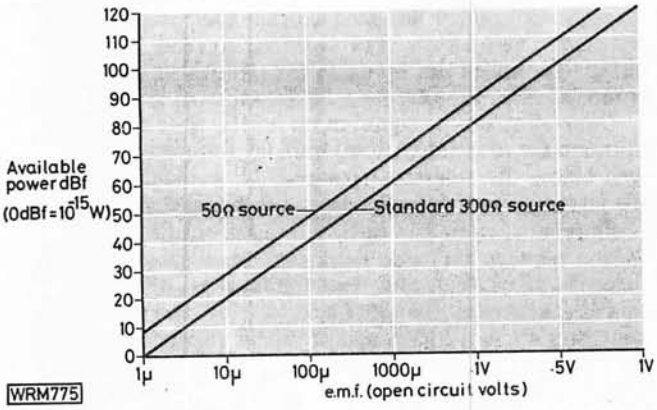


Fig. 4.4: The relationship between e.m.f. and available power in dBf into a 300Ω standard impedance, with 50Ω plot shown for comparison. Note that for a given e.m.f. the power into a 50Ω impedance is 7·78dB (×6) more than for 300Ω. 1μV into 50Ω = 6·99dBf or −0·79dBf into 300Ω

The IHFM sensitivity measurement is based on the **power** required to produce the 30dB distortion figure. This is an attempt to remove the ambiguity between microvolts e.m.f. and p.d. The method has been standardised with the femtowatt (10^{-15} watts) equal to 0dBf. The standard impedance used is 300Ω and 0dBf = 1·1μV e.m.f.; 120dBf = 1·1V e.m.f. By stating the receiver's sensitivity in dBf (available power) all ambiguity is removed and one receiver can be directly compared with another. The relationship in dBf for 300Ω and 50Ω impedances is shown in Fig. 4.4.

The test set-up shown in Fig. 4.3 can also be used for the IHFM tests and the method is similar. The rated sensitivity of the receiver is the available power in dBf which will produce a 30dB distortion figure. Of course in this case our generator is set up for ±75kHz deviation (100 per cent modulation) and the sensitivity will be measured both with the system in mono and then repeated with it in stereo. Sensitivity may also be quoted for other modulation levels.

The full IHFM tests are given in *Standard Methods of Testing Frequency Modulated Broadcast Receivers* published by the Institute of Electrical and Electronic Engineers, Inc. 345 East Street, New York, NY10017. The number of the standard is IHT-T-200 1975.

To measure the actual distortion present in a hi-fi receiver (and assuming that the generator is of high enough quality) the signal from the generator is increased until full limiting of the f.m. receiver takes place; the standard IHFM input for this test is 65dBf. The output of the receiver is fed into the *PW* Durley SINAD/IHFM meter, which is switched to measure distortion. First the SET level is adjusted for 100 per cent and then the meter is switched to read "%" and the FREQUENCY and PHASE controls adjusted for maximum null. The "%" range switch will need switching down to lower ranges as the rejection (null) increases. The tuning of the receiver may need slight adjustment for optimum rejection, but this should only be a very small adjustment, away from the correct tuning point. The final rejection obtained is the distortion present at the particular deviation level used and includes any distortion from the generator. This test is carried out both in the mono and stereo modes. The full test will include figures for mono, stereo A + B, A − B, A only and B only (A and B are left and right channels). For more details of these tests refer to the relevant standard.

The foregoing information has been only a general guide to sensitivity measurements and there are many, many more uses for the *PW* Durley SINAD/IHFM meter; however, space is limited and for further details one of the many books available on the subject should be consulted. Recommended books by Gordon King and John Earl are *The Audio Handbook* and *Audio Technician's Bench Manual* respectively. ●

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In May a new design for a 50W h.f. transceiver will appear in Radio Communications. While it is a departure from our normal policy of marketing only our own designs we were so impressed by George Fare's (G30GQ) write up that we have offered to back the project with component kits. This will include PCB's and all components per our normal policy. Full price details are not yet available but a full kit should market for approximately £250 inc. VAT. Some provisional technical details are available, please ask.

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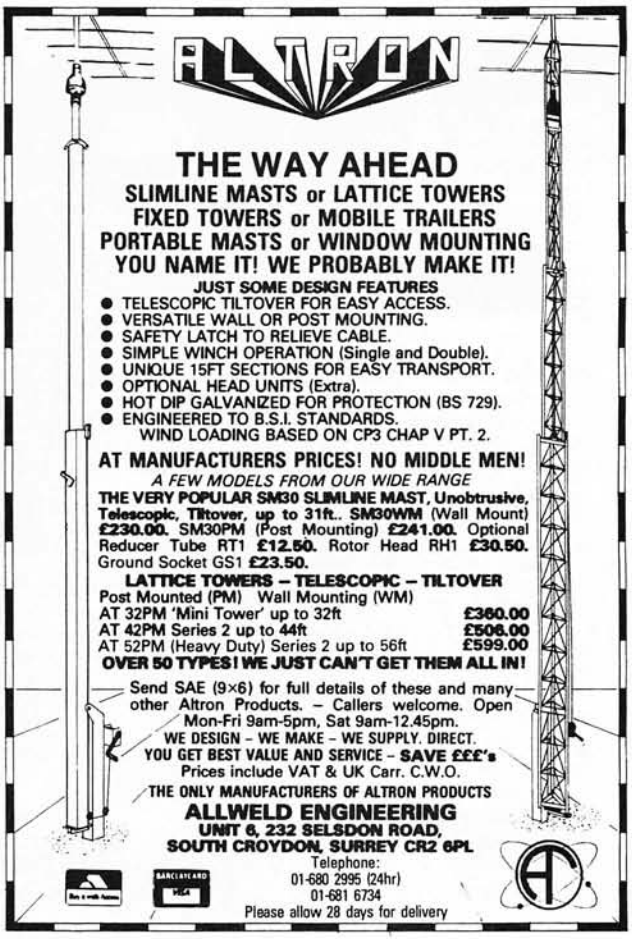

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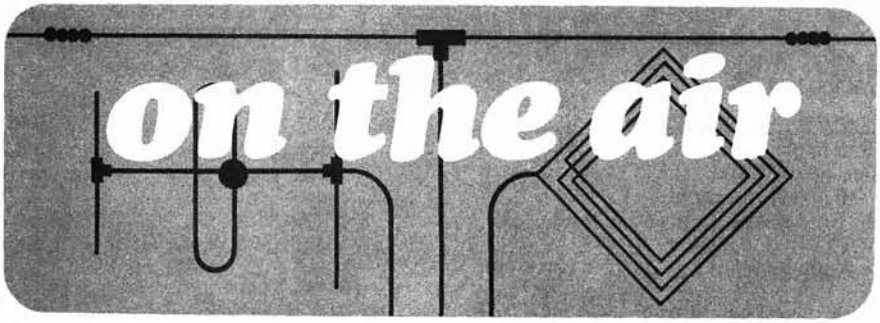

Amateur Bands

by Eric Dowdeswell G4AR

Reports to: Eric Dowdeswell G4AR
Silver Firs, Leatherhead Road,
Ashtead, Surrey KT21 2TW.
Logs by bands in alphabetical order.

I am afraid that one or two readers misconstrued my remarks concerning the RAE in the March issue. Let me make it quite clear that I have nothing but admiration for anyone that goes to the trouble of studying and passing the exam, especially if it is a solo effort, and more so if they have not had any previous experience of electronics.

My criticism is aimed at the system that allows such candidates to then go on the air, possibly on both the v.h.f./u.h.f. and h.f. bands, on any mode, when, in some cases, they have had no practical operating experience whatsoever. This has happened and continues to happen, and it just cannot be right. A great deal of the secondhand amateur radio equipment we see advertised in our various journals belongs to newcomers to AR who have got the RAE and then bought commercial gear, often by doting parents, but have been quite unable to cope with problems of TVI and the like which have arisen when they have gone on the air.

Yet again I suggest that experienced and licensed amateurs in the hundreds of clubs up and down the country be approved by the Home Office to certify that a prospective licensee has had instruction on the correct operation of transmitting equipment. It would not be difficult to make suitable arrangements for those who could not, for one reason or another, attend a club for this purpose. Amateur radio would gain by the improved standards of operating and the clubs would gain in membership although membership of a club would not necessarily be a requirement of the instruction.

Again, anyone able to show proof of previous experience of transmitting would not need such a certificate.

For those who are really restricted when it comes to space for antennas, G2DYM Aerials has come up with the trapped Uni-Pole antenna for multiband use. Basically one half of a conventional trapped dipole, it works against earth, the "missing" half of the antenna being formed by the mirror image in the ground. If the recommended radials are not possible then G2DYM suggests an earth rod. This can take the form of a length of copper tubing of the microbore type as used in central heating systems, and it is quite cheap for these days, and can be four or five feet long.

The Uni-Pole is fed with 50Ω coaxial cable, the outer shield of which should be connected to the earth rod at the antenna location, and, of course, to the earth system in the shack. The antenna itself with its single trap can then be fitted in as suits the location but it can be a vertical, sloping or in an L-shape. Various permutations of bands and traps are available, such as one trap for four or five bands or three or four traps that enable the same radiation pattern to be maintained on several bands. All Uni-Poles are supplied with 12m of coaxial cable, although longer lengths can be supplied.

In some cases the coaxial cable can be dispensed with and the antenna fed straight into an a.t.u., but the good earth connection should not be neglected.

Versions of these antennas for the s.w.l. are available. There is also a three-band Uni-Pole for the new WARC bands at 10, 18 and 24MHz.

On the Bands

A Yaesu FRG-7 receiver and a 20m-long dipole helped **David Price** of Wellington, Somerset, to monitor several bands, finding such as TL8TX using 10W to a vertical antenna, 7Z2AP in Saudi Arabia and FR0FLO on Reunion, all on the 28MHz (10m) band. On 14MHz (20m), J5HL of Guinea Bissau showed up, with 6Y5RV and DU6BOB. On 7MHz (40m) the sole entry was 6W8DY, with LX0RL, a club station, on Top Band s.s.b. That dipole may be OK for the 7MHz band but other than 21MHz (15m) it is a pretty bad mis-match. David might try adding quarter wave arms to it for the other bands, all connected in parallel.

In Callington, Cornwall, **Viv Doidge** now has a 40m-long wire, plus a.t.u., hopefully intending to put up another one soon to form a formidable V-beam, especially as he is using an FRG-7700 on the end of it. Anyway, on 21MHz he caught C53DF, CP6OK, KP2AJ in the Virgin Islands, V2AC, 5H3JR, 5X5FS and 9Y4LL, adding on 14MHz C53EY, N8DCJ/8P6 (QSL to home QTH), S83H, V2AN (QSL WB8SSR), VP2KT (QSL WB2TSL), YI1BGD for a goodie, ZD8FX (QSL G3VBY) and 6Y5AM. HP3FL, 6W8DY, ON6BC/C9 and 4X4MS/5N0 were logged on 7MHz, and on 3·5MHz ending with FM7WS, J6LCV, VP5ARX, ZL4AP, 6W8AR and 6Y5IC.

D. B. Shapiro lives in Prestwich, Manchester, with his DX200 and a 20m-long wire, logging stuff from 28–3·5MHz, like HI3PGJ, 7X2BK, PJ9EE and LA2EX/P/3X1 for a strange one on 3·5MHz. On 7MHz it was just FM7CD and OD5KN, but better things on 14MHz such as 9N1MM, 9V1VP, VP2VA (QSL VE3MJ), C31YF, that YI1BGD again, and VE7CZH/P/4U on the Golan Heights and cards to VE7DCM, then CR4OF for a rare one indeed. HL0B turned up from Seoul, Korea, on 21MHz, with C53DF on 28MHz and QSL to G3LQP. Ah, yes, D.B.S. is now BRS53844. Forget that CR4, just realised it is just another CT now!

Jim Willett did send in a photo of his shack which I trust will be good enough to grace these pages. In Grimsby he has an FRG-7700 and a.t.u. with a "random length wire", so have suggested that he try and make it into a multiple of 9·75m for even better results. He has been pretty busy so it's just TG9NR and ZS2RJ on 21MHz, I'm afraid, this month. However, I'm wondering if that ZS2 on Prince Edward Island counts, as did ZS2MI, for a separate country, although MI was on Marion Island.

Paul Martin of Dartford, Kent, has a Lafayette HA700 with a 16m-long wire with an a.t.u. in the process of being constructed, with the pennies being saved for something else. He's had his first QSL card back which is always a great encouragement. I can still see my first card on the hall floor, from G6SR as he was then, later becoming GM6SR when we started to get individual prefixes, but that is more than 48 years ago! Back to Paul and his DU1TDY, HK6ALV, HK2BEF,

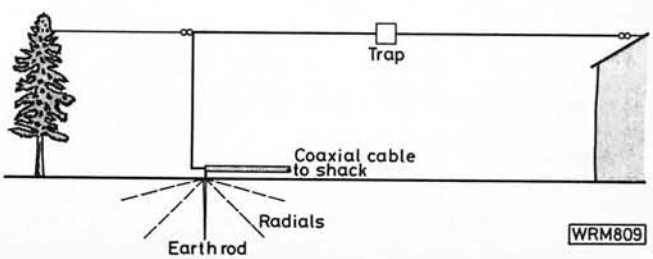

Fig. 1: One of the many possible arrangements for the G2DYM Uni-Pole half-size trapped dipole for several bands. The vertical portion should be as long as possible as it is carrying maximum current and contributes most to the radiation. It is placed here to be as far as possible from both house and tree. The radials are not essential but highly desirable

During the Girl Guides special weekend, February 19/20, the Nene Valley club ran this neat special event station GB2WGG, with club chairman Harry Williams G4MOP at the left and secretary Lionel Parker G4PLJ on the right

PZ1AN, S79LA and 9X5SL (QSL DL8DF) all on 21MHz s.s.b. Only cop on 7MHz was 6W8DY in Dakar.

The 28MHz band quad of **Dave Coggins** in Knutsford, Cheshire, got clobbered in the winter winds so the log is a bit thin this time. A rotator is envisaged soon to replace the present tiresome "Armstrong" method of rotating the quad. So, on the FRG-7700 and FRT-7700 a.t.u. and a long wire it was FY7KRU, TI2MEF, TL8DC, VP8AQQ, YS1ECB, 7P8AF (Lesotho) and WA7SIC/M in his car in Arizona!

In Stowmarket, Suffolk, **David Palmer** concentrated on the 14 and 21MHz bands with his Drake 2C and long wire antenna, with S79WHW in the Seychelles, S83H, VP8SB (QSL G4DMA), VU2YK, 3B8FG, 5V7HL (?), 8Q7WY and 9V1VR all on 14MHz. Found on 21MHz were CR9AC for a nice one, HL1AI, YC2HV with QSLs to POB 017, Semarang, YI1BGD (QSL POB 5864, Baghdad), and lastly 7Q7LW.

Andy Durrant was another correspondent who was very pleased to copy VP8SB on his AR88, in Colchester, Essex. He also logged KA2PFV/SV9, 8P6IB, 5N6NKB, 5N3ECA, 6Y5AM and V2AN, all on 14MHz s.s.b.

In General

A note from **Dave Brooks** G4IAR says the sponsored WAB weekend raised around £300 for the RAIBC and leukaemia research which is much appreciated. For those who want to go for the various Worked All Britain awards, and that includes s.w.l.s, the record book is obtainable from Brian Morris G4KSQ, 22 Burdell Avenue, Sanhills Estate, Headington, Oxford, for £3 plus £1 postage and packing. It seems that in future the donations to the RAIBC will be in the form of equipment for its members.

A first letter from **Bob Stone** in Keyham, Plymouth, says he has a B40 receiver and a 17m wire plus homebrew a.t.u. plus several dipoles. So far he has concentrated on 3·5MHz where he has logged many Europeans and the odd DX station including ZL2BT. Bob wonders if it is possible to put a signal strength meter in an a.t.u. I'm afraid that the signal strength levels are far too low at that point, often less than a microvolt (millionth of a volt). They are amplified many times in the receiver before activating the "S" meter.

Because of the varying sensitivity of a receiver from range to range, the "S" meter reading is purely a comparative one, from one signal to another, and does not measure actual signal strength unless one is lucky enough to get the set accurately calibrated from range to range.

Jim Willett with his gear in Grimsby, the FRG7700 main receiver being dwarfed by some of the older equipment. Hopefully, the CB Jim is using will be replaced by an amateur bands rig before long

Around the Clubs

Once again I must ask club correspondents to give the full QTH and possibly the telephone number of the secretary or PRO and NOT just "QTHR". Frequently the sec has a recently-issued call which will not appear in a callbook for quite a while. In any case, it is not everyone by any means who has the latest callbooks, including myself! Please remember also that about six weeks' notice is required if club events are to appear in this feature.

Abergavenny & Nevill Hall ARC Notice of three special event stations to be run by the club, GB2NHF on Saturday June 4 at the Nevill Hall Fete, GB4AC Abergavenny Castle on Sunday July 24, and GB2ABC on Saturday July 30 at the Abergavenny and Border Counties Show. Normal club nights every Thursday at 7.30 at Pen-y-fal Hospital, above male ward 2, but a new computer section meets on the fourth Tuesdays of the month with any ZX81 programs welcome, and if anyone can give a chat on the subject they will be doubly welcome. It's D. Jones GW3SSY, 2 Dalwyn Houses, Llanover Road, Blaenavon, Gwent, or try ringing (0495) 791617.

Acton, Brentford & Chiswick ARC G3IIU It's Going Mobile by G3IGM on Tuesday May 17, starting at 7.30 at the Chiswick Town Hall, High Road, Chiswick, London W4, with a special welcome for visitors and prospective members. So says sec W. G. Dyer G3GEH, 188 Gunnersbury Avenue, Acton W3.

Atherstone ARC G4LCQ G6ARC (nice one!). Meets at the Tudor Centre, Coleshill Road, Atherstone, Warks, at 7.30 on the second and third Thursdays. Advance notice of G8SYE on RTTY techniques on June 9 and old-timer G5UM describing the v.h.f. awards system and comparing v.h.f. "then and now" on July 14. From sec Mike Wooding G6IQM, 16 Hill Top, New Arley, near Coventry, also (0676) 40946.

Aylesbury Vale RS A new twist, Tuesday, every four weeks at the Stone Village Hall, Stone, at 8. Last meet I know of was April 19, so next looks like May 17, but Cathy Clarke, 9 Conigre, Chinnor, Oxon, will know what's going on then, also (0844) 51461.

Bangor & District ARS GI3XRQ First Friday at the Sands Hotel, Bangor, with the club's mobile rally tentatively on June 18. Newcomers and visitors most welcome says newsletter editor Stewart Mackay GI4OCK, 11 Dellmount Park, Bangor, Co. Down, N. Ireland, quoting club sec as Harry Squance GI4JTF "QTHR", ugh!

Braintree & District ARS The B'tree Community Centre, Victoria Road and near to the bus station, at 7.30, and the AGM is on Monday May 16. It's Mick Jones G6DFZ, 26 Anson Road, B'tree, or B'tree 44168.

Bury RS G3BRS Mosses Community Centre, Cecil Street, Bury, every Tuesday at 8, although the second one is normally reserved for main meetings, the others being more informal. Excellent club newsletter *Feedback* has topical article by G3VNQ on converting a CB rig for use on 29MHz f.m., in particular the Icom1050, complete with corrections on the February *SWM* article on the same subject. Club info from Brian Tyldsley G6OKE, 4 Colne Road, Burnley, or B'ley 24254.

Bury St Edmunds ARS Third Tuesday at the Guildhall, Guildhall Street, B-St-E at 7.30, with John Munro G3GBB at 29 Angel Hill, B-St-E, around to welcome you.

Cambridge & District ARC G2XV Every Friday during term time in the Visual Aids Room of the Coleridge Community College, Radegund Road, off Coleridge Road in the southern part of the great city. Usual AR interests catered for include SSTV and computers. On May 6 it's awards night for the club's constructors, May 13 for code class and on-the-air with club station G2XV, May 20 talk by Martin Cranage G8OFA on Happy Homodynes, otherwise direct conversion receivers. May 27 is G2XV operation and generally informal. PRO is Dave Wilcock G2FKS on (0954) 50597, or sec Dave Leary G8JKV, 9 Priory Avenue, Swavesey, C'bridge (Swavesey 31120).

Chesham & District ARS Briefly, it's every Wednesday at 8 at The Stable Loft, Bury Farm, Pednor Road, Chesham, Bucks, with a big welcome promised for prospective members and visitors, says sec John Alldridge G6LKS, 15 Whichcote Gardens, Chesham, or ring C'ham 786935.

Cheshunt & District ARC G4ECT G6CRC Every Wednesday at 8, the Church Room, Church Lane, Wormley, Herts, according to Roger Frisby G4OAA, 2 Westfield Road, Hoddesdon, Herts. To come is natter nite on May 11, an equipment evening on the 18th, while the 25th sees 144MHz portable operation on Baas Hill Common, Broxbourne.

Colchester RC Looks like first and third Thursdays at 7.30, Colchester Institute, Sheepen Road, Colchester, info from G3FIJ, 29 Kingswood Road, C'chester (0206) 70189.

Cornish RC From club mag *Cornish Link* I can say that the main club meets on the first Thursday at 7.30 at the SWEB Clubroom, Pool, Redruth, while the computer section goes into action on the third Mons, same place, same time. May be in time to tell you of May 5 when all are invited to bring along their v.h.f. rigs while G3OCB, G3VWK and G3XFL show how test equipment ought to be used. Make a note of the June 2 meet when G3NPB investigates the different operating modes of our repeaters. You should also put a tick in your diary for July 17, a Sunday, when it's mobile rally time at the Cornwall Technical College. PRO is S. Rodda G4PEM, Cliff Hotel, Penrose Terrace, Penzance, or try P'z 3948.

Derby & District RS Professor Chaddock talks on computer arithmetic on May 11, while on the 18th it's Gordon Anderson of BR chatting on batteries (I suppose they have to start those big diesels with something!). I am informed that wetsuits will not be required for a talk by G8TSQ of Loughborough University on Underwater Acoustic Imaging on May 25, with a down-to-earth junk sale, for members only, and quite rightly so, on June 1. Wednesdays, 7.30, top floor of the Oddfellows Hall, 119 Green Lane, Derby, is on the spot with light refreshments on the go. Ring Jenny Shardlow G4EYM on D'by 556875 but, please, at a reasonable hour!

Edgware & District RS G3ASR By this time the Straight Key Evening on 3·5MHz will have been pronounced a great success judging by the first effort so that looks like being a regular fixture of the club which meets on the second and fourth Thursdays at 8pm at 145 Orange Hill Road, Burnt Oak, Edgware, Middx, with the club net on 1875kHz Mondays at 10pm. More from Howard Drury G4HMD, 11 Batchworth Lane, Northwood, Middx, otherwise Northwood 22776.

Fareham & District ARC The Portchester Community Centre, Westlands Grove, Portchester, every Wednesday at 7.30 with new members most welcome to join the 30 or so already enjoying club life. The cub has h.f. and v.h.f. stations with projected activity in various contests. On May 11 it's on-the-air time, while on the 18th it's G4CJO holding forth on AMTOR with more station activity on the 25th. Brian Davey G4ITG, 31 Somervell Drive, Fareham, Hants, is sec, or F'ham 234904.

Farnborough & District RS Second and fourth Wednesdays at the Railway Enthusiasts Club, Access Road, off Hawley Lane, F'boro, and near to the M3 bridge, says hon sec Ivor Ireland G4BJQ, 118 Mytchett Road, Mytchett, near Camberley, Surrey (F'boro 543036). On May 18 it will be NFD preview time to discuss the club's participation in this annual event, as no doubt it will be for many clubs around the country. Big event for the club will be the attendance of G5RV of antenna fame to talk about that very subject on June 6.

Felixstowe ARC Goings-on at the Felixstowe Ferry Golf Club at 8, with J. E. Hobin G3XIX at 14 St Martin's Green, Nightingale Park, Trinley St Martin, also available on F'stowe 75676.

Flight Refuelling ARS G4RFR G6SFR The spring calendar for this expanding club includes the following highlights. May 1 "Early days of 144MHz and TVI"—G8CEZ. May 8 "Bleep in the night"—G8JMB (all about paging systems and selective calling). May 15 "How to win VHF NFD '83?"—G8MCP & Co (all ideas welcome). May 22 G8MCQs rambles including constructors forum. May 29 "Commercial v Amateur propagation paths"—G8BCC. Further details from the club sec Mike Owen on Wimborne 882271.

Gloucester ARS Every amateur has friends who express interest in AR from time to time, so May 18 will be the time to invite them along to a Beginners' Evening at 8, at St Barnabas Church Hall, Stroud Road, Gloucester, with members on hand to give advice and show off the equipment, demonstrating the many facets of AR. Informality will be the order of the day, says sec Tony Martin G4HBV, 12 Redwood Close, Podsmead, Gloucester. Otherwise it's Wednesdays at the same spot at 7.30.

Guildford & District RS Sad news for the club was the death of Ken Taylor G4EEC in February. Meetings continue to be held at the Club House of the Guildford Model Engineering Society in Stoke Park, G'ford at 7.30. Looks like second and fourth Fridays from past events. Sec Helen Mullinger G4OJO can be QSO'd on Aldershot 20384.

Hastings Electronics & RC G6HH Another club where it is all go! Now there are two venues, Ashdown Farm Community Centre and West Hill Community Centre, so it's first, second, fourth and any other Wed at AF for micro night at 8pm, except the third which is main meeting at WH, like May 18 when Chris Page G???? talks on QRP operation. Tuesdays RAE course, Morse classes at AF and a chat nite on Fridays. Phew, frightening, isn't it? All from lively mag *Vital Spark*, which says sec is George North G2LL, 7 Fontwell Avenue, Little Common, Bexhill-on-Sea, or Cooden 4645.

Haverhill & District ARC Dave Hickford G6BPS, on H'hill 61207, has more details of the club which meets at Copse Hall Farm, Steeple Bumpstead Road, H'hill.

Ipswich RC G4IRC Big month for the club with the annual East Suffolk Wireless Revival event at the Civil Service Sports Ground, Straight Road, Bucklesham, Ipswich, on May 29, a Sunday. Attractions include national and local traders, car boot sale, antenna testing range, RAYNET display, RSGB bookstall. You name it, it'll be there! Licensed bar and refreshments and everything for the family. Talk-in on GB3PO (144MHz) and GB3IH (432MHz), so you just can't get lost. Back to the normal routine to tell you meetings are held on the second and last Wednesdays at 8, in the Club Room of the Rose and Crown, 77 Norwich Road, Ipswich, and it is pointed out that the club room is detached from the public bars so juniors need not worry and are especially welcome. As for meetings, there is a DF hunt organised for May 11 with final planning session for the ESWR on the 25th. Club mag *QUA*, more like a book, carries a remarkable amount of info on other local clubs which I have nicked and give elsewhere. When he has recovered from the ESWR, Jack Tootill G4IFF, hon sec, will be glad to answer queries, at 76 Fircroft Road, Ipswich, or buzz him on (0473) 44047.

Leighton Linslade RC Meets at the Vandyke Community College, Room A64, Vandyke Road, Leighton Buzzard, Beds, at 7pm and you should be on your way home at 10. On Monday May 9 it's an away quiz feature with the Milton Keynes mob, but back home on May 23 for guest lecturer G3ZPA chatting on a.t.u.s. Note that on Sunday May 29 it's a DF hunt, but for more info on this and other club matters contact Peter Brazier G6JFN, Kingsway Farm, Miletree Road, Leighton Buzzard, Beds, or ring Heath and Reach 270.

Leiston ARC. Sec A. Martindale G3MYA, 1 Dinsdale Road, Leiston, Suffolk, with meetings on the first Tuesday at the Sizewell Sports and Social Club, King George's Avenue, Leiston, preceded by RAE classes. G3MYA is on Leiston 83074.

Lincoln SW Club G5FZ G6COL Don't forget the Hamfest '83 on Sunday May 8 from 11 to 5.30 at the Lincolnshire Showground, four miles north of the city on the A15 Scunthorpe Road. A day out for the family with model aircraft demos, trade stands a'plenty, raffles and bring-and-buy stalls. Win an FT-290R 144MHz transceiver with a lucky number programme. Talk-in on S22 and SU8. More on this and the club from Pam Rose G8VRJ, c/o City Engineers Club, Central Depot, Waterside South, Lincoln.

Lowestoft & District ARC North Suffolk Teachers' Centre, Lovewell Road, L'toft, at 7.30 fortnightly on Fridays; more from Paul Godfrey G8JBD on L'toft 60420.

Midlands ARS It does really seem to be a round-the-clock job at the club located at 294a Broad Street, Birmingham B1, with Monday a working party night, second Tuesdays devoted to computer sessions, third Tuesdays are regular club meetings with lectures and the like, Wednesdays are code classes and general natter nites. Thursdays are h.f. bands on-the-air time with emphasis on good operating procedures, especially for those new to the game. What a lovely idea, could be copied by many other clubs if they have the interests of their members in mind. Where are we? Ah, Fridays, RAE classes! Sats and Suns are put aside for contests, where applicable, with H & C available, a water urn for tea or coffee and an electric cooker. They really do spoil them at MARS! That lot from "Post boy and current President" Tom Brady G8GAZ, 57 Green Lane, Great Barr, B'ham B43, also 021-357 1924.

Mid-Warwickshire ARS It's 61 Emscote Road, Warwick, at 8, first and third Tuesdays with a 144MHz foxhunt planned for May 17, while on June 7 G8MWR will be discussing

antennas and feeder systems. Anyone with an interest in AR most welcome says sec Carol Finnis G6LKP, 37 Stowe Drive, Southam, Warks, which is also the abode of (092681) 4765.

Milton Keynes & District RS Gathers on the second Monday of the month at 8pm, Lovett Hall, Silver Street, Newport Pagnell, Bucks, plus a chat night every fourth Monday at the Bowls Club, Stony Stratford. More on the club's activities from Dave White G3ZPA, Rose Cottage, Shenley, Brook End, Bucks, or try buzzing Milton Keynes 501310.

Nene Valley RC G4NWZ G6GWZ Reminder of the club's new meeting spot, the Dolben Arms, Finedon, for lectures, natter nites and films, with constructional and h.f./v.h.f. stations located at nearby St Mary's Scout Hall, the permanent location. May 8 is a trip to the Lincoln Hamfest '83, mentioned earlier, with a natter nite on the 11th at the Dolben Arms. Two RSGB films are a feature of the May 25 gathering, also in the Dolben Arms. Around 8pm is fine. In between, on May 18, G4PZR speaks on the RNARS—An alternative approach—but to what, I know not, but no doubt Lionel Parker G4PLJ, 128 Northampton Road, Wellington, Northants, can fill you in. I ought to tell you of the meeting on June 1 which appears to be films (?) on the ARRL's Orlando Hamfest, and RSGB news, presented by G3DOT, with an on-the-air cum natter nite on the 8th.

Norfolk ARC Meets at the Crome Community Centre, Telegraph Lane East, Norwich. Contact Paul Gunther G8XBT on Norwich 610247.

North Bristol ARC G4GCT The trip to the RSGB "do" at the NEC was marred by having nowhere to sit once they got there! No, they didn't run there! Club meetings every Friday from about 7pm at the Self-Help Enterprise place at 7 Braemar Crescent, Northville, Bristol. All the usual activities' including RAE and code classes and, as always, visitors most welcome. Write to Ted Bidmead G4EUV, 4 Pine Grove, Northville, Bristol 7, for the latest gen on meetings.

North Devon RC Gets together fourth Wednesday in the month, at 7.30, at the Pilton Community College, Chaddiford Lane, Barnstaple, on even months, and at the Bideford Community College, Abbotsham Road, Bideford, on odd months. How very odd altogether! As always with our clubs, potential members and visitors to the area will be assured of a warm welcome. Sec is George Hughes G4CG, Crinnis, Highwall, Sticklepath, Barnstaple, who can also be QSO'd on 3635kHz from 0845 onwards any weekday.

Oxford & District ARS When someone on the air asked G6FOK if there was a club in Oxford he thought we ought to be in on the secret, too. It's second and fourth Wednesdays at 7.30 at the DHSS club room, Marston Road, Oxford; all visitors welcome, and bring your YLs and XYLs. So says Terry Vale G6FOK, 15 Bateman Street, Headington, Oxford.

Radio Amateur Invalid and Blind Club (RAIBC) Some interesting statistics from the club's newsletter, *Radial*. Of 876 eligible members, 456 are licensed and 420 are s.w.l.s: 331 are blind, 513 are invalids and there are 32 blind invalids. There are 149 local representatives with 69 clubs lending a helping hand. Is yours one of these? In addition, 186 supporters show their interest with financial help. Newsletter *Radial* every couple of months has a print run of over 1200 copies with 169 audio cassette versions also distributed. A. Herridge G3IDG went to the trouble of compiling these very interesting figures, which I personally find quite amazing. I hope Frances Woolley G3LWY won't mind if I call her the "interface" between the AR movement and the club! Secretary/editor, she can be contacted at 9 Rannoch Court, Adelaide Road, Surbiton, Surrey.

Radio Club of Thanet G2IC Good news from this group with a change of venue to the Grosvenor Club, Grosvenor Place, Margate, where meetings will take place on the second and fourth Tuesdays in future. On May 10 it's a talk on the Spectrum computer by G4KEJ, while on the 20th G3BHW deals with high gain antennas. It's Ian Gane G4NEF, 17 Penshurst Road, Ramsgate, Kent, ready to fill you in on the details.

Radio Society of Harrow G3EFX A surplus equipment sale takes place on May 13 with fault-finding without tears the subject of a talk on the 27th. The other Fridays are more of an informal nature, so it's Fridays at 8pm at the Harrow Arts Centre, High Road, Harrow Weald, Middx, with talk-in if you so wish on GB3HR RB14. If you've come straight from the salt mine there are coffee and biscuits and a licensed bar. Present membership stands at a very healthy 150, but new blood is always welcome. Do contact Chris Friel G4AUF, 17 Clitheroe Avenue, Rayners Lane, Harrow, Middx, which also responds to 01-868 5002.

St Neots & District ARS Alternate Mondays in the lounge bar of the Horseshoe Inn, Offord Darcy, near Huntingdon, which seems to make it May 16 for beer and skittles at the Plough Inn, Abbotsley, for a change, with wives and girlfriends more than welcome. Sandwiches promised but you'll have to buy a raffle ticket or three to pay for them! On Bank Holiday, May 30 it's an informal meeting at the Horseshoe Inn. Steve Foote G4FOH, Whiteknights, 10 Old Farm Close, Needingworth, Huntingdon, Cambs, is the sec, and your contact for further details.

Sefton ARC New sec Mike Webb G6ICR, 33 Belle Vue Road, Gateacre, Liverpool (051-487 0756) introduces himself saying that the club meets on alternate Wednesdays, which is not much use to you until I have worked out that the next one I can tell you about is on May 18, at the Liverpool Prison Officers' Social Club, Hornby Place, off Hornby Road, Walton, Liverpool 4.

Southdown ARS First Monday at Chaseley Homes, South Cliff, Eastbourne, with a talk on RTTY by BARTG editor G5CRD Marvin Wallis. He will also be addressing the club on June 6 concerning AR licences and privileges in the US. PRO Peter Henley G8IQO, 45 Springfield Close, Westham, near Pevensey, Sussex on 763123 (E'bourne, I think) or club sec Tom Rawlance G4MVN, 18 Royal Sussex Crescent, E'bourne.

Spalding & District ARS G4DSP Next event of any moment for the club is the visit of Martin Shardlow G3SZJ, RSGB rep for Region 4, on Saturday May 14 at the White Hart, Market Place, Spalding at 7.45. The mobile rally is on Sunday June 5 at Springfields, Spalding, with 25 acres of lovely gardens, trade stands, bars and all the fun of the fair. Talk-in S22 and SU8. On July 8 it's 144MHz DF night, leaving the White Hart (ahhhh!) at 7.45, roughly. Your contact for all this fun is Ian Buffham G3TMA, 45 Grange Drive, Spalding, Lincs.

Stourbridge & District ARS G6OI G6SRS Bob Egan G6DIH is pleased to announce a new meeting spot for the club, at the Garibaldi, Cross Street, Stourbridge, gathering on the first and third Mondays to begin proceedings by around 8pm. First Mondays will tend to be informal with main meetings on the third. Bob says "QTHR", which is not likely to be very helpful, so on to sec Malcolm Davies G8JTL, 25 Walker Avenue, Quarry Bank, Brierley Hill (NOT QTHR, I'm told!), or, much more easily, call Malcolm on (038482) 4019.

Stowmarket & District ARS It's the Red Cross Hall, Stowmarket, railway station, on the first Monday at 7.30. More from Jim Lowe G8SCB, 22 Bluebell Grove, Needham Market, or N'market 721296.

Sutton & Cheam RS Two possibilities, the Sutton College of Liberal Arts or the Carshalton Sea Cadets HQ at TS Puma, Church Path, Beddington, which is near to the Carew Manor School, so be at SCOLA on Friday May 13, and at Beddington on the 27th, making it the second and fourth Fridays of the month. But I can't tell you what will be going on but I'm sure G. Brind G4CMU, 26 Grange Meadow, Banstead, Surrey, will be glad to supply all the details.

Torbay ARS G3NJA Every Friday at 7.30 and the last Saturday with HQ at Bath Lane, accessible from the rear of 94 Belgrave Road, Torquay. Have you made a note of the club's rally on August 28? In May, a junk sale is promised, while in June G4FCN is scheduled to talk on computers, but contact Les Mays G2CWR, Atlantis, Clennon Avenue, Paignton, for the details.

Tynedale ARC The Club is mourning the loss of Fred Signey MBE, G4DOB, a hard worker for the club and many other civil activities in the area. Club interests include all the bands, plus amateur TV, computers, so anyone with any interest in amateur radio will find a niche in this club. It's first Tuesdays at 7, at the Falcon Hotel, Prudhoe-on-Tyne, Northumberland, where a large car park is available plus meals or snacks and drinks to suit. Ken Hatton G4IZW it is, living at 8 Alnwick Street, Newburn, Newcastle, or (0632) 678828.

Wimbledon & District RS Sec Geoff Mellett G4MVS says that the club meets second and fourth Fridays at the St John Ambulance HQ at 124 Kingston Road, London SW19, which means May 13 for a natter nite and Morse code classes. On the 27th it will be on-the-air time, probably on 3·5MHz but 1·8MHz is also being considered. Contact Geoff at 26 Paget Avenue, Sutton, Surrey.

Worthing & District ARC G3WOR G8GCP On May 10 Peter Fanning will talk of the place of plastics in amateur radio, unusual subject but could be fascinating, with a DF contest on the 17th with G3LQI in charge. A famous tape lecture on May 24 is Dud G6CJ on the "Aerial Circus", with, on the last day of the month, p.c.b. techniques by G8MSQ.

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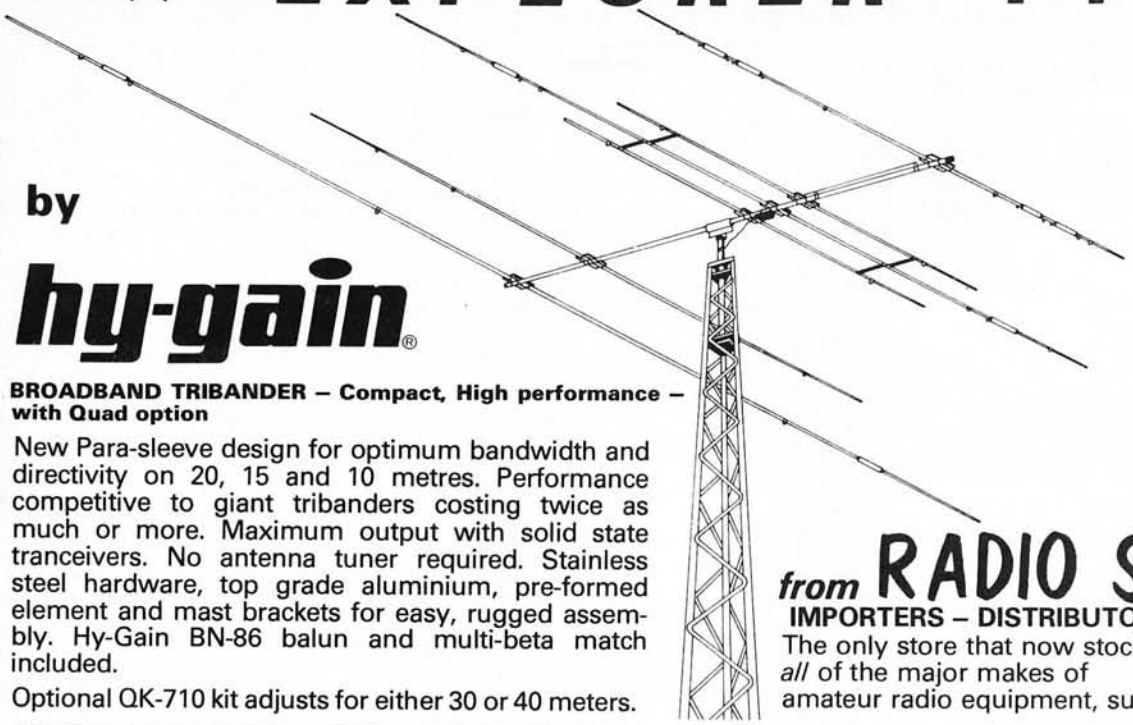

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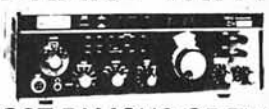

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EF80	1.75	PCL82	2.00	2D21	3.25	6F6	3.00	572B	30.00
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EL95	2.00	PL509	6.00	6AN5	4.75	6L6GC	2.50	6146B	8.25
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EM81	2.50	PL802	6.00			6LQ6	7.50	6973	4.00
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From which you may deduce that the club meets every Tuesday, at 8 at the Amenity Centre, Pond Lane, Worthing, W. Sx. Interesting club mag, *Ragchew*, reveals that a member has parted with his h.f. bands linear amplifier—his neighbours bought it! One way of curing TVI! Joyce Lillywhite, 41 Brendon Road, Worthing, will assist if I have missed anything.

Yeovil ARC G3CMH G8YEO Every Thursday at 7.30 at the Milford Recreation Centre, Milford, Yeovil, Somerset, with May 5 AGM time although this may be just too late, but on the 12th G3MYM will outline a 144MHz propagation experiment he has in mind. He has had the club listening for typical chordal hop signals and one was positively identified by BRS10663 on 14MHz. More such tests are being planned. Back to May 19 and G8MZI revealing the secrets of working DX on v.h.f., with the 26th a natter nite. Temp sec is Adrian Denning G4JBH, 19 The Park, Yeovil, otherwise (0935) 23873.

Well, that is a pretty comprehensive coverage of the clubs, but what has happened to GM? Has it sunk 'neath the waves of the NE gales? Very thin from GW, too. If you think that your club ought to be mentioned in this column, but isn't, you know who to kick, don't you? After all, he/she did volunteer for the job I suppose! Keep the info coming, to me, not *PW* HQ, by the 15th of the month.

Medium Wave Broadcast Band DX

by Charles Molloy G8BUS

Reports to: Charles Molloy G8BUS
132 Segars Lane, Southport PR8 3JG.

"I am particularly interested in medium wave DXing, yet I'm getting nowhere," is the message from **M. Holden** of Harlow who goes on to say that his two radios have ferrite antennas. He wonders if this would limit his success or "do you think it is simply a lack of technique on my part?" A bit of both I would think, but there is quite a lot that can be done with a portable on the medium waves.

The standard set-up for medium wave DXing is a communications receiver and a m.w. loop antenna. Of the two, the loop is by far the more important. Its pick up, when peaked, will equal that of a short outdoor antenna and of course you have the additional advantage of its directional properties. The loop can be rotated to null out interference or noise. The ferrite rod antenna is a mini-loop which is peaked by the receiver's tuning control, the limitation being that the signal pick up is quite a bit down on the DXers 1 metre square loop.

Some DXers have had success using a full size loop along with a semi-vintage valve receiver of the type that has an "A" and "E" socket at the rear and no internal antenna. This type of set was intended for use with an outdoor antenna but performs very well with a loop. Selectivity is not so good as with a communications receiver but adequate for many DX signals. Sensitivity, too, will be down but this is not such a disadvantage as might at first appear. DX on the medium waves usually suffers from slow cyclic fading and a sensitive receiver will pick up a station over a greater part of that cycle. Surprisingly, most DX on the medium waves comes up to reasonable strength on peaks of this fading cycle.

DXing with a Portable

The first thing to do is to get the feel of the directional effects of the internal ferrite antenna. Tune round the band until you come to a channel that has two or more stations on it. Pick up the portable by its handle if it has one, or hold the set in a horizontal position if it hasn't. Now rotate the receiver slowly. You will find, if the stations lie in different directions, that you can suppress each in turn. From my QTH 585kHz is a good frequency to demonstrate the effect. The powerful Spanish station can be heard on its own or it can be nulled out simply by rotating the receiver. A very useful tool for the DXer.

Local Radio DXing

This is the field for the newcomer who can learn the technique of DXing on the medium waves and have a lot of fun at the same time. Lower power local radio stations, operated by the BBC or IBA, are spread across the country with quite a lot of frequency sharing. Look for a channel that is not dominated by a strong local. Rotate the receiver and see if you can pick out a station by this method. On 1458kHz I can select Manchester or Carlisle quite easily, simply by picking up the set and turning it around.


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QSL

we herewith acknowledge due receipt of your report, dated 1.8. 1982
concerning our radio/television transmitter Lopik 3
on a frequency of 675 kHz
on channel
which you received on 1.8. 1982
from 1630 till 1815 hours GMT
at Beckenham, KENT
we thank you for your remarks and we assure you that these are always helpful for us
wishing you happy listening.
nos, the technical department
C.Th. Hagen

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p.o. box 10, 1200 JB hilversum, the netherlands

QSL card from Lopik in Holland
(Mark Slater)

QSL card from the DDR on 178kHz
(Mark Slater)

During the daytime m.w. signals travel along the ground for a comparatively short distance. After dark they are reflected from the ionosphere as well (sky wave), so the range is then increased and distant stations appear. All sorts of interesting things can happen around sunset and sunrise with locals fading out and long distance signals peaking up. Get out the portable at the end of a summer's evening and tune round the local radio channels, you never know what you may pick up.

Local Radio Literature

There are two free booklets that should be in the hands of every local radio DXer. These are *Transmitting Stations, A Pocket Guide* from the IBA Engineering Information Service, Crawley Court, Winchester, Hampshire, SO21 2QA and *BBC Television and Radio Stations,* Engineering Information Dept., BBC Broadcasting House, London, W1A 1AA.

The British DX Club issues a ten page A4 size list with station addresses, transmitting times, QSL policies and background information called *Radio Stations in the UK* which can be had for 30p in stamps (UK) or 2 IRCs (abroad). there is also the 48 page booklet *Radio in the UK* produced by the Norwegian DXer Bernt Erfjord whose address is N-4480 Kvinesdal, Norway. It costs 7 IRCs and contains an alphabetical list of stations with addresses and some programme details. *Dial-Search,* which is a frequency check list covering medium and longwave stations in Europe and the UK, has a map which enables the DXer to fix the bearing of any station from his own QTH. It costs £1 or 7 IRCs and is available from 9 Thurrock Close, Eastbourne, BN20 9NF. For the benefit of newcomers, International Reply Coupons (IRCs) are available from main post offices for 30p each and can be exchanged throughout the world for the amount required for return postage.

Absent Friends

My recent comments on stations one time more conspicuous brought an interesting reply from **John D. Heys** (G3BDQ). He mentions a discussion he had a long time ago on this subject with the late G6BQ who recalled the start of broadcasting in the 1920s. When stations such as Newcastle or Manchester opened

up there were huge signals in the south of England, but as time went on they seemed to go down in strength in spite of an increase in transmitting power.

There are all sorts of reasons why a station might decline in strength. Alterations at the transmitting site to the antenna or the earth system, interference from new stations, the effect of the new Band Plan, a change in transmitting times, but even then an element of doubt remains. A perusal of old log books reveals that in the 1960s Bermuda was being heard regularly. Not only on the then easy "split" frequency of 1235kHz but on 960 and 1340 as well, both being North American channels. These stations are still on the air, 1230kHz being used now instead of 1235 but this country, on its own to the north of the Caribbean, is now a rarity.

Audio Notch Filter

Reader **F. L. Crook** asks for information about this useful receiver accessory. In particular, he wants to know how to connect one to his set and if it will suppress whistles and heterodynes.

The notch filter I use, which was obtained from Cambridge Kits some time ago, is powered by a 6-F22 (PP3) battery and consumes 4mA. It is inserted between the headphone jack and the phones. Plug the phones into the filter and the filter into the receiver. The current model can also be placed between the set and its loudspeaker.

The notch is a very sharp null that can be tuned across the audio spectrum by means of a tuning control. The effect is quite startling. Rotate the tuning control slowly and the offending whistle suddenly disappears. Since the notch is so narrow, any degradation in audio quality is slight and passes unnoticed. There is only one notch so only a single heterodyne can be suppressed.

There is an article called A DXers' Notch Filter in the July 1982 edition of *Practical Wireless* which describes this device in some detail. It continues with constructional details of a filter built round a twin-gang potentiometer and switch so that it can be panel mounted on existing sets.

QSL certificate from Deutschlandfunk 155kHz which has recently increased power to 500kW

White's Radio Log

Further to the note in the January issue, **Don L. Gabree,** who has acquired the publication Rights of White's radio Logs informs me that the new edition of the log will be available by mid-April. It will be sold primarily by mail order for $3·95 plus $1·00 for postage and handling (US currency). The correct address is Worldwide Publications Inc, PO Box 5206, North Branch, N.J. 08876, USA. The WRL which used to appear as part of Communications World and before that of Science and Mechanics, was well known for its excellent coverage of US and Canadian medium wave stations which were listed by frequency, by location and by call letters.

Short Wave Broadcast Bands

by Charles Molloy GBBUS

Reports: as for medium wave DX, but please keep separate.

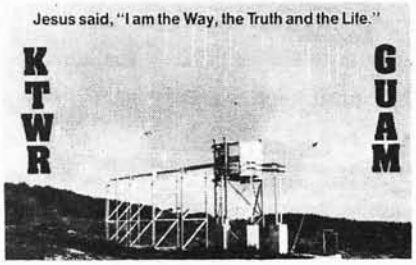
"I received Radio Australia on 9·570MHz. When I heard it, it was as loud as Radio 1 and this seems to be no challenge as a long distance station," writes reader **Paul Martin** from Dartford who, although he does not mention the time, was probably listening between 0700 and 0900 when the transmission is beamed to Europe. Radio Australia is a good signal in the evening as well, on 6·035MHz in the 6MHz (49m) band.

There is some similarity from the DXing point of view between the short wave broadcast bands and the medium waves. Both are full of signals at entertainment value. Those on the medium waves are mainly of local origin, while those on the short waves can come from any part of the world. Using a modern portable receiver with whip antenna one can listen to the world and with the aid of a publication like the *International Listening Guide* (see January issue) it is possible to select an evening's entertainment. This is the field for the short wave programme listener. Although reception is not as reliable as on the medium waves, high power transmitter and directional antennas help to compensate for it.

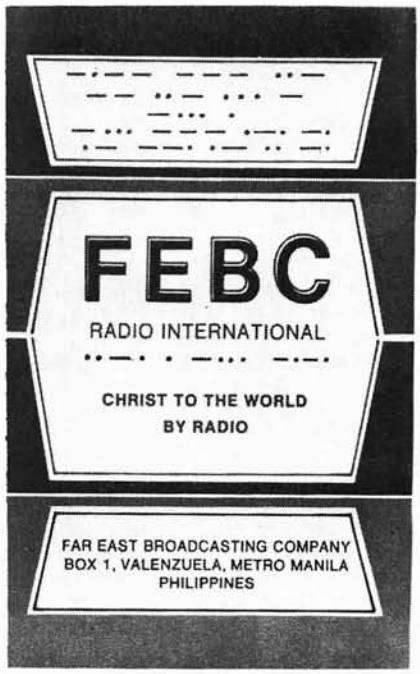
I listen regularly to programmes from Canada, Holland, Switzerland, Ecuador and Austria and to a number of others such as Turkey, Egypt, Australia, Sweden and Finland as the mood takes me. All this has little to do with DXing. Unfortunately many newcomers start off as a s.w.l. and fail to realise that there is DX to be heard as well.

DXing on the Short Waves

Where is this DX to be found? Let's go back to Australia. While the international service (Radio Australia) can be picked up with the proverbial piece of wet string, the domestic service of the ABC (Australian Broadcasting Commission) is another matter. When the R. Australia transmission on 9·570MHz goes off at 0900, move to 9·610MHz and listen for Perth. It is on the air until the late afternoon and is heard occasionally in the UK, reception usually being at its best in the middle of the day. The station does



QSL card from KTWR Guam *(Philip Hodgson)*



QSL card from FEBC *(Philip Hodgson)*

QSL if you enclose an international reply coupon, the address being ABC, PO Box 190D, GPO 6001, Perth, W. Australia. Another one to hunt for is Brisbane on 9·660. Although only 10kW it can be picked up in this country during the day. The station address is ABC, PO Box 293, GPO 4001, Brisbane, Queensland, Australia.

You have to be persistent to hear these stations but that is what DXing is all about. Although the term DX was originally an abbreviation for Distance it is better thought of as Difficulty in the context of our hobby. Do not be put off by interference from other stations. If you hear nothing at all when the channel is clear then try again later in the day or on another occasion. Look for weak signals in the spaces between the strong ones. The 9MHz (31m) band is a good hunting ground at any time. During the day listen for Radio Nepal on 9·590, Tashkent 9·600, Philippines 9·670, Indonesia 9·680, Radio Sana in Yemen 9·780. In the evening search for Angola on 9·535, Mozambique on 9·620 and Tanzania on 9·750, while at night look for Taipei on 9·510, Chile 9·550, Brasil 9·645 and 9·675, and Argentina on 9·690MHz.

DX Clubs

Reader **R. McDonald** wonders if there is a list of stations that verify. Yes, this sort of information is published in the bulletins of DX clubs along with the latest frequency changes, logs of catches recently made plus a lot of information about DXers and their activities. Anyone really interested in the hobby ought to join a club otherwise they will be working in isolation and will miss a lot. The following clubs are located in the UK. The North of England Radio Club International, 15 Francis Avenue, Birkenhead, L43 4XL. The British DX Club, 55 Boundary Road, Worthing, Sussex, BN11 4LL. The World DX Club, 17 Motspur Drive, Northampton, NN2 6LY. A stamped addressed envelope should bring details of membership and a sample of the club bulletin. If I have omitted a club then please let me know and I will include details in a future issue.

QSL card from Deutsche Welle
(Adrian Butcher)

Language Recognition

"Are there any key words to listen out for, e.g. Govarit in Russian," asks **Peter Hodgson** of Stamford, who is finding it difficult to identify some of his catches. Language recognition can be quite a problem for the DXer. It is possible, with some experience, to identify a language without being able to understand it but this does not necessarily help with the identification of an unknown station.

November, 1982

Dear Friend,

We would like to inform you that Radio Peking will be called Radio Beijing as of Jan. 1, 1983.

The spelling of "Peking" was changed to "Beijing" in 1979 when China's State Council decided to use the Chinese phonetic alphabet to Romanize Chinese names and places. But Radio Peking temporarily retained its old name so as to allow time for listeners abroad to get used to the new Romanization of Chinese names and places. We now consider that it's time for us to make the change too. We have decided to call our station Radio Beijing as of Jan. 1, 1983.

Wishing you happiness and progress in the coming year.

Sincerely yours,
English Department
Radio Peking

Letter from Radio Beijing

French, for example, is spoken in Canada and in some African countries as well as in France but many other countries broadcast programmes aimed at a French speaking audience. None-the-less, it is useful and interesting to be able to recognise at least a few of the many languages that can be heard on the short waves.

Several years ago Radio Canada ran a short wave club which produced a number of tapes relating to DXing. One of these called the *Foreign Language Recognition Course* aimed at giving the DXer a grounding in language recognition. The tape, which must be unique, gives examples of 55 different languages grouped into nine families. A commentary links the languages and gives tips on recognition including key words that are likely to be heard over the air.

RCI's DX club no longer exists but the tapes are still available from the Handicapped Aid Programme. Send a s.a.e. to HAP (UK), PO Box 4, St Ives, Huntingdon, PE17 4FE, for details of the tapes on DXing. They come direct from Canada which does cause some delay but the language tape is worth waiting for. It lasts for well over an hour and can be digested in small quantities.

QSL card from Radio Vatican
(Christopher Williams)

Radio Beijing

Reader **Cliff Keel** encloses a recent letter from China which says that from the 1 January 1983 Radio Peking will become Radio Beijing. Place names often create problems outside their own country. Either they are difficult to pronounce or the spelling, BRNO for example, creates problems. As a result changes occur such as in Vienna, Rome, Venice, Munich and even the River Danube, which are a long way different from the originals. Personally I rather like Beijing but it remains to be seen if it is universally adopted.

Readers' Letters

"I have only started DXing a little over nine months ago and have logged around 50 countries broadcasting in English," writes **Christopher Williams** from Northampton. He uses an Amstrad 6010 receiver along with an outside antenna which is attached to the end of the receiver's telescopic whip by means of a clip. "This helps with weak signals from distant countries but for some stations with stronger signals it can cause distortion."

If I connect even a short antenna to my Vega 204 by this method, image interference and heterodynes occur and there is some detuning on the highest frequency bands. The Vega is equipped with an external antenna socket so there is really no need to use this method but for a receiver that does not make provision for connecting an external antenna there may be no alternative. Rather than make a direct connection to the whip, wrap the external antenna lead round it several times. If overloading still occurs then retract the whip so that only the lowest section is extended. Alternatively, a low value fixed capacitor of 10pF or less may bring an improvement.

Receiver Shopping List

The 6th edition of the *Radio Netherland Receiver Shopping List* is now available. It classifies s.w. receivers under the headings Travelling Portables, Shortwave in the Car, Serious Shortwave Programme Listener, DX Hobby Receivers, Semi-Professional Monitoring

Receivers. There are some general hints which are worth reading carefully such as "Don't expect that buying an expensive receiver when first starting out in the hobby you will be able to tune in rare exotic countries with excellent reception", or "Don't buy a cheap receiver in the hope that you can buy components later to upgrade it to something double the price". The receiver list, which covers sets currently on the world market, can be had free of charge by writing to Receiver List (attn: Jonathan Marks), English Section, Radio Netherlands, PO Box 222, 12000JG Hilversum, Holland.

VHF Bands

by Ron Ham BRS15744

Reports to: Ron Ham BRS15744
Faraday, Greyfriars, Storrington,
Sussex RH20 4HE.

The summer months ahead should give everyone a chance of some first time and new v.h.f. DX, because not only is the propagation, sporadic-E and tropospheric, usually favourable but the many open air events such as contests, expeditions and rallies cause a great increase in the numbers of stations using the bands.

Solar

"On February 14, I recorded a spotless disc for the first time during the present decline in activity," writes **Ted Waring**, Bristol. During Ted's observations on February 22, he counted 3 sunspots increasing to 30 on March 4, including a string of medium sized sunspots near the central meridian, and back down to 14 on the 9th. As far as our routine radio observations were concerned the sun was quiet from February 9 to March 6, when **Cmdr Henry Hatfield**, Sevenoaks, using his spectrohelioscope, observed two small sunspot groups plus a long chain of at least 20 spots and an eruptive prominence. So, in view of this and Ted's report, neither of us were surprised when we recorded a solar noise storm at 136 and 143MHz respectively on March 7 and 9 and several small bursts of noise on the 8th and 10th.

The 50MHz (6m) Band

Up to March 10, from his QTH in Leicester, **David Newman** G4GLT, had worked 17 of the other 39, 50MHz band permit holders and his best DX was G5KW in Lands End. "Crossband activity is building," writes David who, so far, using 3·5MHz, 28MHz and 70MHz, has made crossband QSOs with 13 different stations who are not permit holders. During one of his late night listening sessions, **Dave Coggins**, Knutsford, heard c.w. and s.s.b. signals from GW3LDH in Wrexham on 50·1MHz.

The 28MHz (10m) Band

"The 28MHz band has been very variable and quite dead on some occassions," writes **Harold Brodribb**, St Leonards-on-Sea. He noted harmonics from the lower frequency broadcast station Alma ATA I and II around 29·3 and 29·8MHz on February 27. I think Harold's remarks sums up most of our feelings about the behaviour of the band between February 17 and March 18. One of my near neighbours, **Fred Pallant** G3RNM, has been keeping an ear on 28MHz and although he found the band generally quiet he did log Ws and WA2 at 1843 on February 25, KC2, WA2, W2 and W5 around 1930 on the 26th, LU1, PY2 and VU2 at 1540 on March 2, KA2 and VE3 at 1921 on the 8th and CX4, K6, PZ1, W4, W8 and YV5 around 1820 on the 10th. **Michael Hahn**, Rainham, is now using a Sommerkamp FT7B and a home-brew ground plane antenna on 28MHz and writes, "Conditions on 28MHz are not as good as last year. I think it won't be too long before it will be difficult even to have a QSO with a UB5 station." That's when regular watches on the beacons must be kept, Michael, to see just what propagation is like.

"I tuned the band around midnight on March 5 and heard 3 KH6 (Hawaii) and a VE8 (Yukon) . . . It pays, I think, to keep a watch on 28MHz between 2200 and 0100 because you never know what's coming through," writes Dave Coggins. He heard several G stations with fluttery type QSB on their signals around 2130 on February 20, logged a good opening to Africa with many stations on the band on the 26th, and an excellent path to South America, with most countries heard, on the 27th. Around 1320 on the 26th Dave logged VE3CUX and W1CEK on 28MHz f.m., and at 1846 listened to WA7SIC/M in QSO while driving his car in Arizona.

"On 28MHz there have been some very good days, but mostly pretty bad," comments **Peter Lincoln** BRS 42979, Aldershot, for the month prior to March 7. However, on one of the good days, March 2, he heard C53EY, LU3EZA, LU4IAD and PY4EU, and on the 3rd he added EA8ADY, UA9UEW, 3B8FK, 5B4LP and 9J2BL to the station log. Likewise, I found the band well below par but managed to find a few VEs and Ws at 1600 on February 25, VEs at 1716 on the 28th, a VK at 0910 on March 8, Ws at midday on the 10th and VS6 at 0950 on the 15th.

28MHz Satellites

"Conditions weren't very good on some days," writes **John Coulter**, Winchester, but this did not stop him sending an interesting log. On February 20, John heard telemetry on 29·502MHz from the Russian satellite RS00 and on the 24th, on 29·331MHz, heard signals from 4K1CR, 4K1KP and 4K1DCG, plus consecutive numbers. Listening again on 29·331MHz at 1400 on the 25th, John heard, "Tks for co-operation Antarctic Expedition we are QRT cuagn, 73, De 4K1CR, 4K1DCG, 4K1KP, AR." At 1640 on March 10 he heard a G working through a Russian satellite with a PA3 on 29·450MHz and at 1439 on March 13 he heard, "V de RS3A, 10 APR 830 to 24 UT Contest Costos 83 Uslowia Vurnai Radio Nr2 AR," on 29·331MHz being broadcast continuously. John thinks Costos could be Cosmos and that Vurnai may refer to the Russian town Vurnary. Whichever it is, John, no doubt you will be sending me a report about the event.

"With the help of *PW*, I've now identified telemetry from OSCAR 8 and the RS satellites," writes Ted Waring, so don't forget to send me reports, all you satellite buffs.

28MHz Beacons

"The 28MHz beacon log seems a bit thin this month," writes **Norman Hyde** G2AIH, Epsom Downs. However, along with the logs of John Coulter, Dave

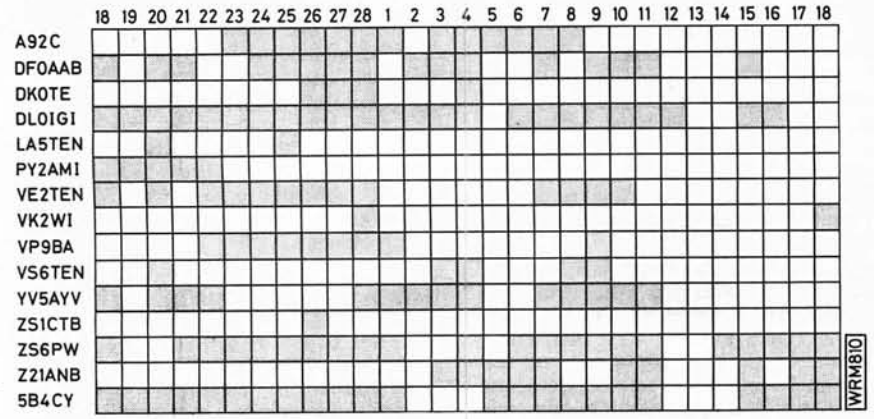


Fig. 1: Distribution of beacon signals. HG2BHA, VK5WI and ZD9GI were not heard during the month

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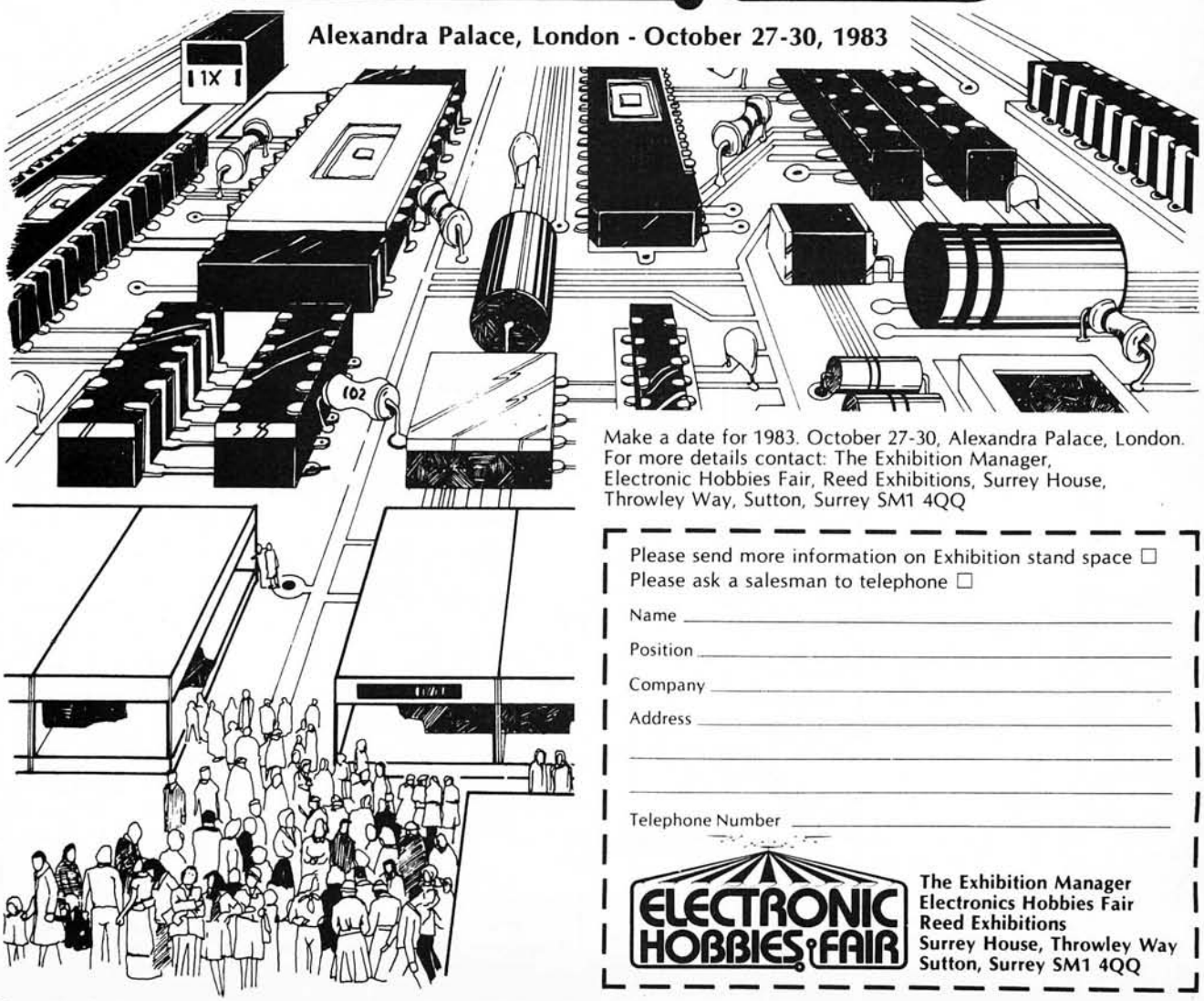

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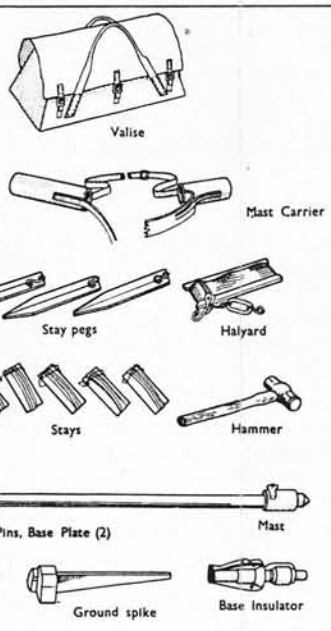

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Coggins, Henry Hatfield, Peter Lincoln, Ted Waring and myself, he made a good contribution to the monthly list of beacons heard, seen in Fig. 1. Norman also noticed the marked increase in strength of the South American beacon YV5AYV on March 2, 3, 9 and 10 and logged a new beacon, EA6AU, near Palma, on approximately 28·228MHz. John Coulter reports hearing a German World Communications Year beacon DK0WCY, on February 19 and 21 and March 3, 4, 6, 7 and 10. When he first heard it on the 19th it was giving a QTH of "Norden DN37G". David Newman added two new beacons, WA1IOB/B 28·210MHz at 1425 on January 28 and KA9NFE/B 28·241MHz at 1951 on March 8, to his log, bringing his beacon score to 48. Between John Coulter, Dave Coggins and Ted Waring, signals from the beacon KA1YE/B were heard on February 25, 26 and 28 and March 9 and 10. On February 27 Dave logged signals from the Argentine beacon LU1UG.

Tropospheric

Apart from about 36 hours on February 26 and 27 and about the same period on March 14 and 15, the atmospheric pressure, measured at my QTH was well above 30·0in (1015mb) from February 17 to March 18, peaking over 30·4 (1029) on days 17, 18, 19, 21 and 22 and days 4, 5 and 6. Conditions on the v.h.f. bands were favourable throughout the high pressure period with several short term lifts and a good tropospheric opening between March 6 and 9.

On February 27, **Bert Mills** GW3LJP and **Simon Hamer** went on a DXpedition to a site some 600m a.s.l., 6km south-west of Llangurig and while Bert worked or heard several stations through the 144MHz repeaters EI1DK R0, GB3-AR R4, BM R5, HH R4, MH R3, MP R6, WH R2 and WW R7, with his Icom 215. Simon, using a Grundig S1400 receiver, received strong signals in Band II from Radios Furness on 96·1MHz, Lancashire 96·4MHz, Merseyside 95·8MHz and Ireland RTE II on 94·9 and 95·3MHz. At 1730 Simon heard a programme on Merseyside called *What did you do in the war daddy?* introduced by Bob Azodiac.

Between March 6 and 8, **Peter Lewis** G6NSU, Ivybridge, had QSOs on 144MHz with EA1ED, EA1TA, G4PUB/P in Margate, G6LUA in Ware and G6LVN/P in Gatwick. Peter uses a Belcom Liner 2, FDK multimode 250 and 100W linear with a 5-element Jaybeam antenna at his QTH some 107 a.s.l. in Devon.

Band II

"Unpredictable events are what makes DXing such fun!" writes **Richard Hunt**, who received a QSL card, Fig. 2, from the German station Hessischer Rundfunk

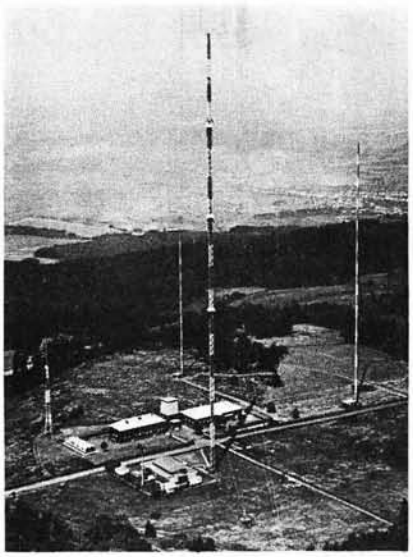

Fig. 2: QSL card from Hessischer Rundfunk received by Richard Hunt

for his reception report on January 23. He also received a sticker, Fig. 3, promoting their *hr 3* v.h.f. only programmes which carry traffic bulletins. Richard uses an Eagle receiver and a "T" shaped ribbon cable indoor antenna at his QTH, some 17m a.s.l., in Tadcaster. During the lift on February 18, **Michael Welch**, London, received signals from the British Forces Broadcasting Service on 96·5 and 101·5MHz, BRT Belgium from Genk on 97·9MHz and NOS Holland from Roermond on 90·9MHz. When Michael heard the BFBS station on 101·5MHz again during the opening on March 8, he made a few enquiries and learnt that the signal was coming from an 80kW experimental transmitter at Bielefeld. Over the period March 7, 8 and 9, Michael received strong signals from TDF France-Inter on 92·7MHz, which he presumes is from the new transmitter opened at Neufchatel WDR Germany on 100·4MHz from Langenberg with transmissions for foreign workers in Italian and Yugoslavian, WDR on 97MHz with an American comedy programme and several other German stations between 89·9 and 99·2MHz and BBC Radio Devon on 97·5MHz.

Fig. 3: Hessischer Rundfunk sticker received by Richard Hunt

At 2300 on the 7th, Simon Hamer received strong signals from Radios London, Solent and Sheffield and BRT-II from Egem and on the 8th, TDF Cultur from Vannes and TDF Inter from Caen. Also on the 8th, at 2150 he heard Tommy Steele's song Singing The Blues from ILR Essex and at 2220 he listened to a talk on conservation by Peter Jarvis, Chairman of the Bedfordshire Conservation Society on ILR Chiltern.

While **David Mahew**, Yapton, was on a site painting some houses in Bognor Regis, he heard the French station RBL, mentioned in my previous columns and while on another site near Worthing, using his Philips f.m. receiver, David logged several Belgian, Dutch and French broadcast stations between 100 and 102MHz. On the 9th, **Ian Kelly**, Reading, heard broadcast stations Frequence Nord from Boulogne and Lille, France Cultur, Lille, France Inter, Caen and Rouen, France Musique, Caen and Lille, and Belgium BRT Egem, RTBF 1 Wavre, RTBF 2 Anderlues and RTBF 3 Liege and Tournai, with some transmissions received in good stereo.

Back on the Sussex coast, Harold Brodribb counted 9 French stations in Band II on the 8th, 17 on the 9th and 10th, 11 on the 12th and 9 on the 13th, and enclosed the weather charts from his daily paper showing the movement of the high pressure system during the disturbance. On the 8th, I used the v.h.f. radio section of my TVR5D for a bit of DXing while on a trip to Bodiam Castle and with the receiver, relying on its own rod antenna, inside the car, I had a tune around at various sites en route and it appeared not to matter whether I was a few metres above sea level at Bodiam or around 200m at Heathfield; French and Dutch stations were very strong between 88 and 104MHz.

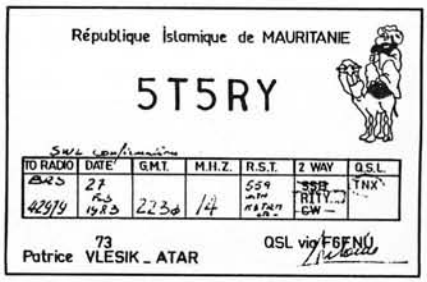

Fig. 4: Confirmation of RTTY report received by Peter Lincoln

During the lift, **Raymond O'Connor,** Dublin, using a Grundig portable, with its own telescopic rod antenna, heard TDF–Cultur, Brest, between 2200 and 2300 on the 7th and again on the 8th. At that time he also heard TDF–Inter, Niort and BBC Radio Devon. Raymond also logged local radio stations Cumbria, Lancashire, Merseyside and Red Rose at various times between March 8 and 11.

RTTY

Although Peter Lincoln found the h.f. RTTY bands relatively quiet during the month preceding March 7, he did copy one new country 5T5RY, Fig. 4, on 14MHz. He noted at the time that the h.f. bands were staying open quite late especially when he copied YV6BTM at 1545 on February 15, 5Z4DA at 2005 on the 20th and PW8ET at 2311 on the 24th on 14MHz and XT2AW at 1728 on the 19th and EA9JZ at 1716 on the 21st on 21MHz. Peter also logged a lot of stations from Italy and Spain during the period and received a QSL card acknowledgement from FR0GGL for his 21MHz RTTY report.

Between February 17 and March 18, I copied RTTY signals from stations in 19 countries, DL, EA, F, FC, FM, HA, HB9, I, IT9, LA, OE, OK, SM, UT, VE, VK, WA, YO and YU on 14MHz and 4 countries, EA, I, N and VE on 21MHz. Like Peter, I also found plenty of Italian stations and from the 64 stations I logged 9 were from Spain and 21 from Italy.

Peter tried a Datong AD-370 active dipole mounted on a rotator 9m a.g.l. and writes, "The results obtained seem very good and it out-performs my other antennas. The dipole does not overload and above 7MHz seems quite directional. Some of the signals I heard recently on 28MHz have been unreadable on other antennas." Good to know that, Peter, we are always pleased to hear from readers about their experiences with new bits of gear.

With the usual couple of dozen European signals plus regulars like TU2GA, XT2AU and 9K2KA safely in his monthly RTTY log, **Norman Jennings,** Rye, hunted in vain for a signal from the Isle-of-Man GD, but instead copied newcomers 5R8AL, 5T5RY, YC1CGB, and C53EE, a medical research station whose operator commented that they were the only RTTY station in Algeria. Like Peter,

Fig. 5: The 144MHz station, G6SFR/P, in the March Open Contest *(Bournemouth Evening Echo)*

Norman has installed a Datong AD-370 antenna and is "very, very" pleased with the results.

The March Contest

The 5/6 March RSGB 144/432MHz open contest proved once again to be a popular event with the weather favouring stations in Southern England. A large anti-cyclone was dominating conditions over northern G and allowed several brief openings into Europe for stations located around the edges of the system.

The Flight Refuelling ARS chose this event for their first attempt at /P contest operation using the callsigns G6SFR/P (144MHz) and G6TEA/P (432MHz), located at 200m a.s.l. on the Purbeck hills in Dorset (YK30c).

Equipment used for 144MHz included a Yaesu FT225-RD/muTek front-end transceiver driving a Tempo valve linear to 400W p.e.p. Antennas comprised a pair of 14-element Parabeams at 12m rotated by hand. The scene shown in Fig. 5 was that at 2.30 a.m. in the 144MHz tent: from top to bottom Roy G4RAM, and Mike G8VFY (on the pole), Don G8YCA (on the mic) and John G8MCP (logging). The best DX during the 24 hours was slightly over 900km into Germany with a total of over 650 contacts in

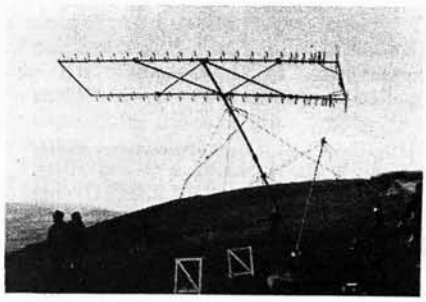

Fig. 6: The antenna system for 432MHz used by G6TEA/P in the March Open Contest

12 countries, not counting the LA/MA moored 3km away in Poole Harbour!

On 432MHz the station used an FT-790 driving a Microwave Modules 100W linear. The antenna system comprised a pair of vertically stacked 22-element quad loop Yagis at 12m fed with Andrew's LDF-4 Heliax, Fig. 6. The QRM on this band was incredible with 57 strengths measured from Syledis navigational systems and what was believed to be a defective marine radar installation. Nevertheless, the perseverance of Nick G8MCQ and Michelle G6TEA produced in excess of 100 contacts and a best DX of 810km to a station near Hamburg.

Other Events

Don't forget the RSGB have organised a 432/1296/2320MHz contest for May 7 and 8, plus a 144MHz low power event on the 8th, a 432MHz c.w. contest on the 22nd, a 70MHz event on June 12 and VHF NFD on July 2 and 3. I will be very pleased to hear from any stations taking part in these competitions.

We are holding another special Wireless Day at the Chalk Pits Museum, Amberley, Sussex, on June 5 when, in addition to the museum's own radio exhibition, we hope to have exhibits from most radio clubs in Sussex, RAYNET, ATV and members of the British Vintage Wireless Society. As usual I look forward to meeting many of our readers on that day.

On March 15, my XYL Joan and myself were guests of honour at the annual dinner of the Worthing and District Amateur Radio Club and we would like to thank the committee and members of the club for the invitation and giving us such an enjoyable evening.

TV

by Ron Ham BRS15744

Reports: as for VHF Bands, but please keep separate.

Once again the main story of the month is a tropospheric disturbance which, this time, took place between the 6th and 9th of March and kept readers, like **Harold Brodribb,** watching both their barometers and the weather chart in their daily newspaper and proving again, that the glory of a good tropo is the chance of DX conditions lasting for several days.

Band I

My thanks to **Richard Hunt,** Tadcaster, **Carey Taylor,** Glasgow, and **Simon Hamer,** New Radnor, for pointing out that the mystery picture, received by Roger Wallis (Fig. 6 TV Bands April *PW*), is a logo used by ORF, Austria, and would have appeared on Ch. E2 and not R1 as suggested.

At 1315 on February 20, Simon saw a motorcyclist on his machine outside of a wooden building during a long burst of picture on either Chs. E2 or R1. New readers may find this lack of frequency identification a bit confusing but do bear in mind that because Ch. E2 48·25MHz

and Ch. R1 49·75MHz are so close together it is often necessary to refer to the *World Radio TV Handbook* to see which country uses which channel. This is another reason why I recommend that new DXers should get a copy of this book as well as *Guide to World Wide Television Test Cards*, especially now that the sporadic-E season is upon us.

Although Band I, approximately between 40 and 70MHz, was generally quiet between February 19 and March 18, I received several bursts of test cards from ORF-FS1 Austria on Ch. E2 and Poland on Ch. R1 and a picture of a vintage car on one of these channels at 0900 on March 11.

Fig. 1: QSL received by Peter Lincoln for a 14MHz SSTV report

SSTV

"Slow scan television has been very quiet and I have only copied some German, Italian and Netherlands stations," writes **Peter Lincoln**, Aldershot, on March 7. During the preceding month he received a QSL card, Fig. 1, from DL7WCY, in reply to the 14MHz SSTV report which he sent to this special event station for World Communication Year.

Among the interesting SSTV pictures Peter received recently are two CQ captions from DJ0GF, Figs. 2 and 3, and a photograph of F3RT, Fig. 4.

Tropospheric

"I really enjoy TV DXing," writes 15-year-old **Philip Hodgson** from Stamford, who, while using his Sanyo receiver and 3-element portable u.h.f. antenna during the lift on February 18, received pictures from Tyne Tees TV on Ch. 29, saw the German version of *The Pyramid*

Fig. 2: SSTV caption *(Peter Lincoln)*

Fig. 3: SSTV caption *(Peter Lincoln)*

Fig. 4: SSTV picture from F3RT *(Peter Lincoln)*

Fig. 5: German Teletext *(David Girdlestone)*

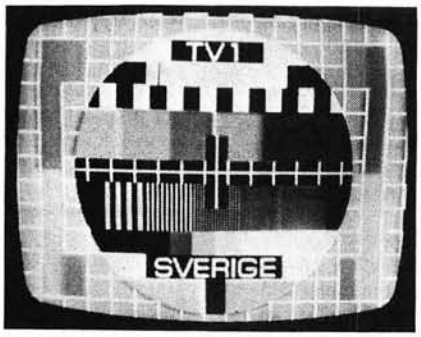

Fig. 6: Test card *(David Girdlestone)*

Fig. 7: Swedish programme caption *(David Girdlestone)*

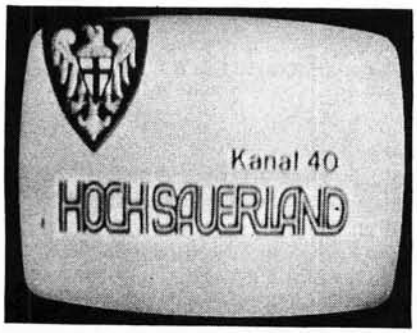

Fig. 8: German TV caption *(David Girdlestone)*

Fig. 9: East German News *(Ron Ham)*

Fig. 10: East German News *(Ron Ham)*

Game, Die Pyramide, from ZDF on Ch. 34, the sign-off of KRO-TV and Nos-Journal on Ch. 27, a medical programme from RTBF on Ch. 51 and a Belgian singer from BRT on Ch. 24. Well done, Philip, I hope to hear more from you.

During the opening on January 13, **David Girdlestone**, Norwich, received a teletext signal from the German station ARD/ZDF, Fig. 5, and on the 24th a fine colour test card from Sweden TV1, Fig. 6, and a programme caption, Fig. 7, on Ch. 30 and a German caption on Ch. 40, Fig. 8. On the 23rd, I logged an East German, DDR, news programme in which there were items about Karl Marx, Fig. 9, Paris, South America and Youth Employment, Fig. 10.

It seems that during the tropospheric disturbance on March 7, 8 and 9, u.h.f. pictures were jumping about all over the UK as well as those coming in from outside. "Good DX everywhere," says **Brian Renforth**, Torquay, who on the 8th, saw a local programme *Look North* in good colour from BBC North, Emley Moor, TV South from Hannington and Rowridge on u.h.f. 625 line and TVS South on Ch. 11 from Chillerton Down, South East on Ch. 10 from Dover and HTV Wales from Preseley Ch. 8, on 405 line v.h.f. Brian uses an indoor 5-element antenna for Band III while he plans his new system.

At 1330 on the 9th, **Ian Kelly**, Reading, received a weak test card from Belgium BRT TV2 on Ch. 35 and at 1835 noticed a newsreader in the background of *Crossroads* on Ch. 23. This is typical co-channel interference Ian, both the BBC and IBA stations were affected and were warning viewers not to adjust their sets. **Ken Smith** BRS20001, Horsham, noticed the criss-cross lines particularly on the London transmitter of the IBA. Just before midnight on the 9th, David Girdlestone watched *The News of Wales* programme and at 2100 on the 7th, Simon Hamer saw an advert for patio doors from IBA CH4, from Belmont on Ch. 32 and around 1915 on the 8th he logged BBC 1 and 2, ITV and IBA CH4 from Crystal Palace, Hannington and Rowridge on all their respective channels ranging from 23 to 66. At 2225, Simon identified the French station TF-1, Caen, fighting for predominance with BBC 1, Ridge Hill on Ch. 22 and at 2230 he received a very good signal from Tyne Tees, Bilsdale, on Ch. 29 and saw *North East News* and a logo of the Tyne Bridge.

During the early evening of the 8th, I saw adverts for Atari, Melita Coffee and Softlax on Ch. E10 and after a news bulletin a caption showing Bayerischer Rundfunk appeared. Later I received strong colour pictures from Radio Telefis Eireann, I think Ch. H in Band III, and saw adverts for Black and Decker, the Country Music Festival in Cork, Knorr Soup, Kraft Luxury Blend, Lombard and Ulster and New Ireland Assurance, followed by a programme called *Cross Country Quiz* between teams from Wexford and Cork. Early on the 9th, I received a strong test card from BRT TV1 on Ch. E10, RTBF-1, Wavre, on Ch. E9, a coloured test card from PTT-NED-1 on Ch. E4, followed at 0859 by the Nederland-1 clock showing 0959. Although the prevailing disturbance declined during the day, I did see part of *Man and Superman*, with Dutch subtitles, at 1936 on Ch. E10.

On the subject of QSLing, Philip Hodgson sent a report to London Weekend Television, Ch. 22, and received brochures, a QSL letter and a tie in reply. **George Garden**, Bracknell, received good flashes of colour from the Yorkshire TV transmitter at Belmont while he was watching a film *Deliver Us From Evil* at 1935 on February 22. George has also been testing out his VCR ready for taking to the high spots in his car for the summer DX.

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Have approximately 160 *PWs* 1966–1980, *Radio Constructor* May 75–Feb 81, *Everyday Electronics* Oct 73–78, 115 *Unexplained*, 48 *Joys of Knowledge*, some binders. Would exchange for BC46 Realistic PRO22 or w.h.y. R. Clarke, 20 Egerton Road, Wilmslow, Cheshire. Tel: 0625 524080. *R348*

Have ZX81 computer and 16K RAM, plus Datong D70 Morse Tutor. Would exchange for FRG-7 receiver. S. M. Keen, 30 Bath Road, Chiswick, London. Tel: 01-995 7339. *R372*

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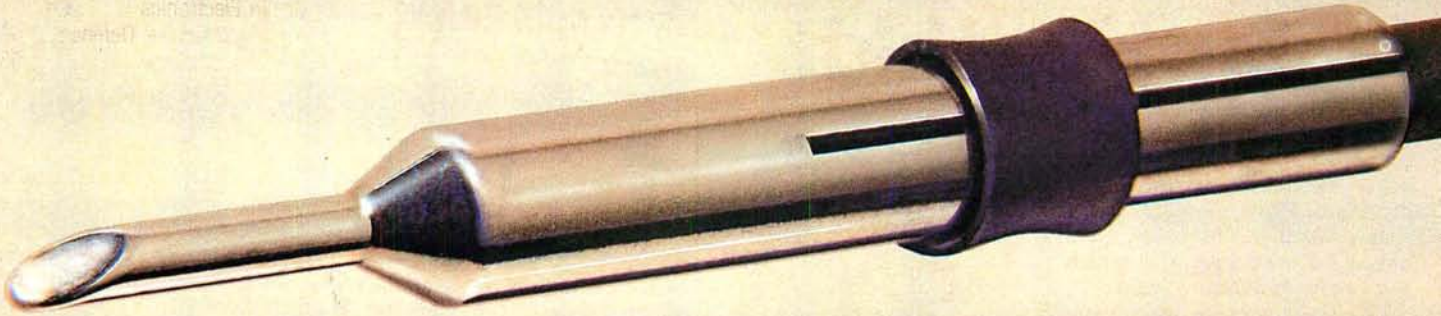

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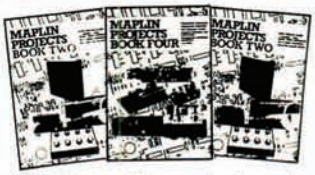

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