WORLD WIDE COMMUNICATION
High power SSB Transceiver
Extremely good audio (crystal filters fitted)
Mobile and fixed station
Operation on all amateur bands from 10 to 80 metres

Write for full technical specification

Write for illustrated detailed specifications on other KW Equipment including the KW 2000B; KW Vespa Mark II; KW 201; KW 1000 and our list of KW Tested Trade-ins.

K. W. ELECTRONICS LIMITED
1 HEATH STREET, DARTFORD, KENT
TEL.: DARTFORD 25574. CABLES: KAYDUBLEW DARTFORD
Your local Eddystone dealer is:

CHESHIRE
The Transistor Centre (Wilmslow) Ltd
Green Lane
Wilmslow 24766

CORNWALL
S.S.B Products
7 Little Castle Street
Truro
Feseok 575

DERBYSHIRE
J. & A. Tweedy (Electronic Supplies) Ltd
64 Lordsmill Street
Chesterfield
Chesterfield 4982

DEVON
Graham Newbery
(Reg Ward G2 J5W) Axminster
Axminster 3163

ESSEX
F. E. Smith
184 Moulsham Street
Chelmsford
Chelmsford 3977

HAMPSHIRE
Wireless Supplies Unlimited
264-266 Old Christchurch Road
Bournemouth
Bournemouth 24567

ISLE OF WIGHT
Sherratt & Son
81-82-93 High Street
Newport
Newport 359-9

KENT
G. T. & R. Wilson
12-14-16 Queen Street
Gravesend
Gravesend 653278

MIDDLESEX
Gurney's Radio Ltd
91 The Broadway, Southall
01-574 2115

SUSSEX
Cosh and Hammond
29 Beach Road, Littlehampton
Littlehampton 4477 or 4478

NORTHUMBERLAND
Aitken Bros. & Company
30 High Bridge
Newcastle upon Tyne NE1 1BW
Newcastle upon Tyne 26729

NOTTINGHAMSHIRE
George Francis
93 Balderton Street
Newark
Newark 4733

SCOTLAND
L. Hardie
542 George Street
Aberdeen
Aberdeen 20113

SURREY
Home Radio (Components) Ltd
240 London Road
Mitcham CR4 3HD
648-8422

“DX ZONE MAP”
In four colours, on durable paper for wall mounting, 35in.
wide by 25in. deep. Giving essential DX information—bearing
and distance of all parts of the world relative to the U.K., the
40 Zone areas into which the world is divided for Amateur
Radio purposes, with major prefixes listed separately. Distance
scale in miles and kilometres. Time scale in GMT. Marking
of Lat./Long. close enough for accurate plotting. Hundreds of
place names, mainly the unusual ones, and most of the rare
islands.

Immediate delivery from stock
Price 14s. 9d.
Including postage and special packing in
postal tube to avoid damage in transit.

Publications Dept.,
Short Wave Magazine Ltd., 55 Victoria Street,
London, S.W.1. (01-222 5341/2.)

RADIO COMMUNICATION HANDBOOK
New Fourth Edition of the
Original RSGB "Amateur Radio Handbook"
Price 69s.
(Includes 6s. post and packing)
(Counter Price: 63s.)
Available from stock

Order from:
PUBLICATIONS DEPT.
SHORT WAVE MAGAZINE LTD.,
55 VICTORIA STREET, LONDON, S.W.1
WE ARE THE ANTENNA PEOPLE

WHY BUY IMPORTED EXPENSIVE TYPES—BACK BRITAIN—BUY ANTENNA'S
MANUFACTURED 100% IN ENGLAND

ELAN
Provides outstanding performance on 10 and 15 metres, coupled with light weight (17 lb.). All alloy and stainless steel construction, exceptional broad band tuning, exclusive trap design, single coax feed point. Power rating 300 watts AM/CW, 600 watts p.e.p. SSB input to final. Forward gain up to 8 dB. Maximum element length 20 ft. Boom length 12 ft.

Send for HANDBOOK/CATALOGUE containing full details and prices of Antenna and technical information, 2/6 refundable on purchase of an Antenna.

Regret increase in Antennae prices from November 1969. New price list on request.

Carriage and Insurance Extra
Telephone: Costessey 2861, orders only

V-3 Jr.

E M S A C

2 METRE CONVERTER

CN1 Low noise 2 metre converter with IF (output) of 23-30MHz for 144-146MHz input. Two 6CW4 Nuvistors in a cascode circuit provide the RF amplification. 12A77 triode mixer and cathode follower for low impedance output. 12A77 crystal oscillator/multiplier. Measured noise factor better than 3dB. Band width minus 4dB or better over band. The converter is complete with crystal (38-66MHz) and all plugs and sockets. The overall dimensions 6" x 4" x 4". (Other IF's available; please state requirements.)

PS1 The matching power supply gives 25mA at 150v, and 1 amp at 6-3v. This is a separate item and may therefore be used with other equipment. It is connected to the CN1 by a three pin connector and lead (supplied)

CN2 2 metre converter as above with a power supply mounted in a cabinet, 8 1/2" x 7" x 4 3/4" (high), complete, immediate delivery.

TU2 Antenna tuning unit for receivers, 1-5-30MHz. Pie network. "In " Out " switch with position for " Cal " (or zero " S " meter) when output of tuner is earthed

TU4 Wide range transmatch, pie network. Full licensed power, 3.5-28MHz. Attractive cabinet

STANDING WAVE INDICATORS, etc.

Also in stock for immediate delivery, the following attractive items made by TTC—

C3042 Standing wave indicator, 52 ohms. SO399 input and output. Forward and reverse switch : sensitivity control. Calibrated directly in SWR. 12" square meter. Detachable telescopic column placed at the meter for use as field strength indicator. Frequency range 3-150MHz. Dimension of case 2 1/2" x 6" x 6 1/2"

C3005 Deluxe standing wave indicator. SO399 coaxial sockets and two 15" square meters enabling continuous and simultaneous monitoring of standing wave ratio and power. Impedance 52 ohms. Accuracy ±5%. Power loss negligible. Frequency range 3-150MHz. Indicators 100 DC microammeter. Dimensions of case 4 1/2" x 7" x 2

BASIC ANTENNA SYSTEMS

All lines previously advertised available, mostly immediate delivery. S.A.E. for list. We now stock TAVASU mobile antennas.

MISCELLANEOUS

Nuvistor 6CW4, 16/- each, post free.

Xtals. 2 metre converter crystals 38-66MHz, type 2MMW, 30/-, post free.

These are brand new, especially made by Cathodeon crystals, and are used in EMSAC 2 metre converter

The EMSAC range together with other stock lines are also available from—

G3IAR ELECTRONIC & MECHANICAL SUB-ASSEMBLY CO. LTD.
Highfield House, West Kingsdown, Kent. Telephone : West Kingsdown 2344
TRIO's TS-510 is the definitive instrument especially engineered for complete "SSB ERA" function. It's a high power, high stability product of imaginative design that fully lives up to the renowned "TRIO" name. Extremely stable VFO, a new development that is built around 2 FET's and 13 transistors, guarantees stable QSO's during entire use, an accurate double-gear tuning mechanism and a linear tuning capacitor produce a 1 kHz direct reading on all bands. There's easy tuning in of SSB signals because the TS-510's frequency coverage has been compressed to 25 kHz for one complete rotation of the dial. Sharp cutoff for both reception and transmission is achieved by a sharp factor frequency filter built just for this 510 series model. Combined with the TS-510's superb features are the distinctive, top quality PS-510 (Power supply and speaker) and VFO-5D (Variable frequency oscillator). With an AC power supply that operates a built-in 16 cm speaker, the PS-510 has been created as an exclusive companion instrument for the TS-510. It can be installed at any location with the PS-510 because the power supply is regulated on or off at the TS-510. The VFO-5D can match the TS-510 in performance and design. Its reading accuracy is unusually high since a double-gear dial covering 25 kHz per revolution is also used, as in the TS-510.
**LAFAYETTE HA.800 SOLID STATE AMATEUR COMMUNICATION RECEIVER SIX BANDS 3.5-4, 7-7.3, 14-14.35, 21-25.5, 28-25.7, 50-54 Mc/s.**

Dual conversion on all bands. 2 x 455 Kc/s. mechanical filters. Product detector. Variable F.C.O. 100-1000 Kc/s. crystal calibrator. 15Mc/s. high sensitive dial. Power consumption 15watts. Size: 7 x 7 x 7 x 5.5 x 14". Full range of accessories. SAE. Macros 99.6. P.A. 10/-.

**TRIO TS 510 AMATEUR TRANSCEIVER with speaker and mains P.S.U. CR.12.**

TRIO JR310 AMATEUR BAND 10-80 Metre Receiver, £77/10/-. R 289 RL II COMMUNICATION RECEIVER

4 band covering 550 Kc/s. to 30 Mc/s. continuous and electrical bandwidths. 15, 20, 40, and 80 metres. 8 bands plus 7 diode circuits. 48 ohm output and phone jack. 550-CW - ANL. Variable BFO. 15 meter. Sep. bandspread dial. IF frequency 455 Kc/s. audio output 1-5w., Variable RF and AF gain controls. 15 Mc/s. A.C. Size: 7 x 7 x 5-5 x 10" with instruction manual. £13/11/-. Carr. paid.

**TRIO COMMUNICATION TYPE HEADPHONES.**

Normally £5/19/-, our price £3/19/- if purchased with receiver.

**NEW LAFAYETTE SOLID STATE HA.600 RECEIVER 5 Band AM/SSB/CW receiver and short wave 500-400 Kc/s. and 550 Kc/s.-30 Mc/s.**


**TRIO JR.500SE AMATEUR RECEIVER**

Covers all the amateur bands in 7 stages. Size: 5-5 x 5" x 8-8 x 14". Full range of accessories. SAE. Macros 99.6. P.A. 10/-.

**DUMMY LOAD RESISTORS**

Carbon 30Q 35w., 5-5w. P.A. 1/0-

**CRYSTAL CALIBRATOR No. 10**

Small portable crystal controlled testmeters. 100 Mc/s. 410 Mc/s. Fre. Controllable 500 Kc/s.-10 Mc/s. 30 Mc/s. on harmonics. Cal. 30 Mc/s. 30 Mc/s. 15 Mc/s. 10 Mc/s. 5 Mc/s. 2 Mc/s. 1 Mc/s. 500 Kc/s.-10 Mc/s. Continuous output. Size: 5x 13" x 9-5 x 5-5 x 14". JOYSTICK AERIALS Full range of Aerials and Tuners in stock.

**TRIO 9850D SE**

4 band covering 550 Kc/s. to 30 Mc/s. continuous and electrical bandwidths. 15, 20, 40, and 80 metres. 8 bands plus 7 diode circuits. 48 ohm output and phone jack. 550-CW - ANL. Variable BFO. 15 meter. Sep. bandspread dial. IF frequency 455 Kc/s. audio output 1-5w., Variable RF and AF gain controls. 15 Mc/s. A.C. Size: 7 x 7 x 5-5 x 10" with instruction manual. £13/11/-. Carr. paid.

**LAFAYETTE DE LUXE V.P.O.**

Five bands 10-80 metres. 10-20 volts output to drive most receivers. 2 amplified H.T. supply. Employes High Q. Crystal calibrator. Size: 15" x 9" x 5-1. Wt. 15 lbs. Operates 220/240v.A.C. Brand new, with instructions. £13/19/-, Carr. 7/6-

**HAMMARLUND SP600X COMMUNICATION RECEIVER**

540 Kc/s.—54 Mc/s. Few only, £100.00.

**HAENSEN SWR-3 BRIDGE**

Impedance 52-watts. Also operates as field strength indicator, complete with telegraphic serial, £9/6 each. F.P. 3/6. F653 plug to suit. £1/1/-.

**EX-AM CONTROL BOX**

With two Laddex 7026 24V. D.C. Input, Change-over Relays. £9/6. Carr. 5/-.

**CODAR EQUIPMENT**

**UNR-J0. 4 BAND COMMUNICATION RECEIVER**


**LATEST CATALOGUE**

SEND NOW—ONLY 7/6 & P&P.

**G. W. SMITH & Co. (Radio) Ltd.**

3, LITTLE STREET, LONDON, W.C.1
34, LITTLE STREET, LONDON, W.C.1
311, EDGWARE ROAD, LONDON, W.1
0-437 9204
0-437 9155
0-432 0387

All Mail Orders to 147 Church Street, London, W.2
Open 9-6 Mon.—Sat. (half day Thurs. at Edgware Road)
plan for a prosperous New Year

ELECTRONICS TESTERS
TEST TECHNICIANS

starting
£19.16.0d. to
£26.11.0d.

The work involves testing and fault finding on complex electronic communications equipment and instruments.

Prosper in Harlow—a town for the family man—where housing and shopping facilities are outstanding, where schools are new and children’s needs are well catered for.
We will help you to find housing and assist you in moving to the area.
Please fill in the coupon below.

Martin Jenner,
Appointments Officer,
Cossor Electronics Limited,
The Pinnacles, Harlow, Essex.

Name.
Address.
Experience.
“RAYMART” SUPER BANDCHECKER

This instrument is an adaptation of the simple Absorption type wavemeter and by utilising a diode and a sensitive meter its application is considerably widened. In addition to the familiar use of checking output frequency the increased sensitivity enables it to be used for many other applications such as:

- Checking of Multi-stage stages in F.M.
- Neutralising R.F. Amplifiers.
- Standing waves on coax Cables.
- R.F. Pick up in wiring.
- R.F. Pick up in Microphone leads, etc.

Price £10 (35-35 Mc/s.) or, including 160 Metre Band £14.16.0. P. & P. 3/-.

“RAYMART” TRANSISTORISED SHORT WAVE RECEIVER KIT

- Uses plug-in coils.
- 5 ranges available.
- Kit supplied with Range 3 coil 16-53 mc/s.
- Full instructions supplied.

Cost of kit £6 (less speaker and battery).

Extra coils 11/- per range.
P. & P. 4/-.

R. T. & I. ELECTRONICS LTD.

Ashtead Old Hall, Ashville Road, London, E.11 Tel: 01-539 4986

AERIAL EQUIPMENT

TWIN FEEDER. 300 ohm twin ribbon feeder, similar £25, 8d. per yard. 75 ohm twin feeder, 8d. per yard. Post on above feeders, 2/- any length.

COPPER WIRE, 14G, H.O. 140ft., 37/6; 70ft., 19/-: Post and packing 5/-: Lengths are approx. only, actually sold by weight.

VARIABLE CONDENSERS, "A" type, 500pF/.8/ each, 2/- P. & P.

EDDYSTONE 817, 240pF/0.06 spacing.

24/6, P. & P. 2/6.

AERIAL INSULATORS. Ribbed, ceramic, 2/6 each. Short stick, 1/- each. Egg, 6d. all plus postage.

2 METRE BEAM, 3 ELEMENT W.S.

YAGI. Complete in box with 1½ to 2½ masthead bracket. Price: £3 7s.

SUPER AERIAL. 70/80 ohm coax, 300 ft., £2; 1½ low loss, 2/3 per yard. 50 ohm 300 watt, 2/6 per yard. P. & P. 2/6.

TOUGH POLYTHERENE. type ML-1 (100lb.), 2d. per yd. or 12/6 per 100 yds. Type ML2 (220lb.), 4d. per yd. or 25/- per 100 yds. ML4 (400 lb.), 6d. per yd. Ideal for Guys, L.W. supports, Halyards, etc. Postage 1/6 on all line.

HAMMARLUND HQ-170

SOMMERKAMP FT-DX 450/500 transceiver £260 (Free)

HAMMARLUND HQ-180

EDDYSTONE EA12 amateur band receiver £150 (30/-)

HAMMARLUND HS 100

EDDYSTONE EA 1600 m/c/a., £25 (30/-)

HAMMARLUND HQ-110

EDDYSTONE EC 10 £40 (20/-)

HAMMARLUND HD-150

RCA AR 88D £35 (20/-)

HAMMARLUND HD-170 £110 (30/-)

HARRY WARD & CO., LTD.

At your service G2AK, G3LAY, G3YFV

Phone 021-236 1635

The Widest Range of Components in the Midlands

* HIRE PURCHASE
* PART EXCHANGE

CHAS. H. YOUNG LTD.

170-172 Corporation Street, Birmingham 4
If you are thinking of dropping a line to either Alan or Sim, making tentative enquiries, technical queries, or just general dope, let me warn you that you’d be better writing directly to me, because Alan and Sim have to re-address your letter to me anyway. The reason is that they have limited office facilities, whereas at Matlock we have all office facilities centrally situated, and your letter gets an immediate answer.

If you’re in the market for a bit of new gear, bear in mind we almost invariably have all the Sommerkamp and Inoue range in stock and although I say it myself you get, price for price, a bit more with these than comparable rigs. That’s why I sell ‘em. Look at the FT-500—there isn’t a cheaper 500 watt rig on the market and yet you get everything which on other rigs, even much more expensive rigs, are optional extras. Same with the FT-250—at £160, less p.s.u. it’s a remarkably low price to pay for Sommerkamp quality and performance. Even with the £45 p.s.u. it’s still top value. Thinking of mobile? Then it has to be the FT-150. (Maybe I shouldn’t say “has to be”—but, in its class, if you think about it you have no choice really.) In the no compromise market the FR and FL-500 are still a best buy for the man who wants separates.

I must also mention the Inoue—at £180 complete it represents very fine value indeed—I’m not going to push it because I’m not sure what the delivery position will be by the time this appears in print. All I say is—if you’re going to lash out a large dollop of dough, you should at least try all the possibilities first and be sure you’re spending it wisely. Anyway, enough of this—I think we’re all agreed you can’t go far wrong with this gear, it’s just that I have to keep reminding you every month!

All in the new line, take a butcher’s at last month’s ad. for all the bits and pieces we have lying around the joint. In the second-hand line we usually have a pretty good selection, and at the time of writing, we have the following:

**Rx’s**

**Tx’s**

**Transceivers**

**Test Gear**

Send me a large s.a.e. and I’ll fill it with all sorts of lists of new stuff, second-hand stuff, bits and bats, etc. The larger the envelope, the more guff you’ll get.

H.P. on any equipment over £38. Got gear to flog? If it’s good I’ll either buy it from you or flog it for you on commission (5%). Incidentally, I’m always interested in top quality laboratory test gear, so if you have a gash Rohde and Schwarz Polyskop kicking about you don’t want—I’ll buy it!

**Service:** If it’s got electrons inside it which refuse to budge or insist on going the wrong way, we can repair it. Not only repair it, but do it quickly and cheaply.

There, that should ensure some loot gets into the till this month—spend, you sinners, spend!

73 de Bill

VE8DP/G3UBO
### Used Equipment

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Price(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>KW Vespa 2 transmitter and p.s.u.</td>
<td>£105.00</td>
</tr>
<tr>
<td>PYE Ranger transceivers, low band</td>
<td>£10.00</td>
</tr>
<tr>
<td>DRAKE MN-4 matching network</td>
<td>£35.00</td>
</tr>
<tr>
<td>HEATHKIT RA-1 receiver, immaculate</td>
<td>£30.00</td>
</tr>
<tr>
<td>HEATHKIT SB-401 transmitter, as new, all crystals</td>
<td>£175.00</td>
</tr>
<tr>
<td>MARCONI TF-340 audio wattmeters</td>
<td>£3.10</td>
</tr>
<tr>
<td>SWAN 410 VFO and adaptor</td>
<td>£40.00</td>
</tr>
<tr>
<td>HAMMARLUND HQ 110 amateur receiver, 160–6 metres</td>
<td>£65.00</td>
</tr>
<tr>
<td>EDDYSTONE 840 C receiver</td>
<td>£45.00</td>
</tr>
<tr>
<td>HARTLEY CT-136 dual trace oscilloscope</td>
<td>£85.00</td>
</tr>
<tr>
<td>CROSSHATCH generator for colour TV</td>
<td>£45.00</td>
</tr>
<tr>
<td>JOHNSON Ranger Mk. 2 AM/CW transmitter</td>
<td>£65.00</td>
</tr>
<tr>
<td>HEATHKIT OS-12 oscilloscope</td>
<td>£20.00</td>
</tr>
<tr>
<td>SWAN 500 transceiver and p.s.u./speaker</td>
<td>£250.00</td>
</tr>
<tr>
<td>DRAKE R-4A receiver, excellent</td>
<td>£175.00</td>
</tr>
<tr>
<td>DRAKE T-4X transmitter and p.s.u.</td>
<td>£200.00</td>
</tr>
<tr>
<td>LABGEAR twin transmitter and p.s.u.</td>
<td>£16.10</td>
</tr>
<tr>
<td>GALAXY F-3 CW filter for Galaxy transceivers</td>
<td>£8.10</td>
</tr>
<tr>
<td>EDDYSTONE 770-U/2 150–500 mHz receiver</td>
<td>£60.00</td>
</tr>
<tr>
<td>Eddystone EC 10</td>
<td>£45.00</td>
</tr>
</tbody>
</table>

### New Equipment

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Price(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>JOHNSON Matchbox 600 W model with SWR meter</td>
<td>£55.00</td>
</tr>
<tr>
<td>JOHNSON Matchbox 2000 W model with SWR meter</td>
<td>£115.00</td>
</tr>
<tr>
<td>JOHNSON TR switch</td>
<td>£19.10</td>
</tr>
<tr>
<td>COPAL digital 24-hour clocks, 201 model</td>
<td>£14.00</td>
</tr>
<tr>
<td>COPAL digital 24-hour clocks, 601 model</td>
<td>£21.00</td>
</tr>
<tr>
<td>RADATEC police radar detector, to clear</td>
<td>£11.00</td>
</tr>
<tr>
<td>KOYO AM/SW/FM/aircraft/VHF receiver, to clear</td>
<td>£39.10</td>
</tr>
<tr>
<td>CDR rotators, ham/M</td>
<td>£70.00</td>
</tr>
<tr>
<td>CDR TR-44</td>
<td>£40.00</td>
</tr>
<tr>
<td>CDR AR-22R</td>
<td>£25.00</td>
</tr>
<tr>
<td>CDR AR-10</td>
<td>£18.00</td>
</tr>
<tr>
<td>KW Atlanta transmitter and p.s.u.</td>
<td>£250.00</td>
</tr>
<tr>
<td>KW 2000B transceiver and p.s.u.</td>
<td>£240.00</td>
</tr>
<tr>
<td>KW 1000 linear</td>
<td>£135.00</td>
</tr>
<tr>
<td>TRIO JR-310 amateur receiver</td>
<td>£77.10</td>
</tr>
<tr>
<td>TRIO JR-500 SE amateur receiver</td>
<td>£69.10</td>
</tr>
<tr>
<td>TRIO TS-510 transceiver and p.s.u.</td>
<td>£212.00</td>
</tr>
</tbody>
</table>

### Information for RADIO SHACK LTD.

182 Broadhurst Gardens, London, N.W.6
Just around the corner from West Hampstead Underground Station

Telephone: 01-624 7174  Cables: Radioshack London N.W.6
Giro Account No. 588 7151

---

### N. W. ELECTRICS

52 GT. ANCOATS STREET
MANCHESTER 4
061–236 6276

**G3MAX**

EDDYSTONE RECEIVERS AND BOXES
JACKSON, DENCO, REPANCO, etc.

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Price(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R209 Mk. II Portable/Mobile Receiver, 1 to 20 Mc/s. 12 volt DC operation. AM/CW/FM. Internal speaker. Ideal for Caravan or small boat enthusiast. Checked and tested before despatch, £15 Carriage 10/-</td>
<td></td>
</tr>
<tr>
<td>Pye 25 Watt Base Station TX/RX, 70 to 100 Mc/s. Set. Tunes to 4 metres. Xtal freq. X6. Less xtal. As new in plywood case, £25 Carriage £1</td>
<td></td>
</tr>
<tr>
<td>Hammarlund SP600. Excellent condition. 540 Kc/s. to 54 Mc/s., £95 Carriage £1. Table Top Case.</td>
<td></td>
</tr>
<tr>
<td>Vibrators, 12 volt synchronous. Type No. 12SR7, 10/- each. Special offer 3 for £1. Postage 2/6.</td>
<td></td>
</tr>
<tr>
<td>Transistor Board. 2/6 Post 1/6. 8 boards £1 Post free. With: 3-GET 872, 1-GET 875, 3-GET 872B, 9-OAS, 3-OA10, 4-min. pot cores, caps. and res.</td>
<td></td>
</tr>
<tr>
<td>Table Top Unit. 18 x 10 x 10&quot; 20 to 80 Mc/s. with plug in coils. 6 valves. MU14 807 O/P VR66-SP42, EL32, DD41. 10mA meter. Transformer 375-0-375 120mA. 6V. 2A. 4V. 2A. 4V. 1-5A. Circuit on lid. Useful for Tx. conversion. £4. Carriage £1.</td>
<td></td>
</tr>
</tbody>
</table>

Business hours: 9 a.m.–6 p.m. Tuesday-Saturday

CLOSED ALL DAY MONDAY
SPECIAL OFFER
FROM HEATHKIT

You can save up to £10
BUY YOUR HP-23A POWER SUPPLY AT THE SAME TIME AS YOUR TRANSCEIVER

DE-LUXE ALL BANDS 80–10M. TRANSCEIVER, SB-101
Normally Kit K/SB-101, £200 14s. Carr. 9s.
Normally Kit K/HP-23A, £30 18s. Carr. 11s.
SPECIAL PRICE £222 Carriage 20s.

ECONOMY ALL BANDS 80–10M. HW-100
Normally Kit K/HW-100, £137 8s. Carr. 11s.
Normally Kit K/HP-23A, £30 18s. Carr. 11s.
SPECIAL PRICE £159 Carriage 22s.

SINGLE BANDERS
HW-12A, 22A, 32A
Normally Kit K/HW-12A, £62 4s. Carr. 11s.
Normally Kit K/HP-23A, £30 18s. Carr. 11s.
SPECIAL PRICE £83 Carr. 22s.

Normally Kit K/HW-22A or K/HW-32A, £65 10s. Carr. 11s.
Normally Kit K/HP-23A, £30 18s. Carr. 11s.
SPECIAL PRICE £86.16.0 Carriage 22s.

SEND FOR SPECIFICATIONS

DAYSTROM LTD.
Heathkit Division,
GLOUCESTER, GL2-6EE

Credit Terms Available

To DAYSTROM LTD.,
Dept. 36/7,
Gloucester,
GLOUCESTER, GL2-6EE
Since February is often the coldest month of the year I can forget about aerials for a bit and have a go at the station equipment instead. I expect you will be forgetting about your aerial as well so why not ensure the easy life for your P.A. by investing in a KW E-Z Match? This is an aerial tuning unit par excellence (and very good it is too!).

A.T.U.'s are not the magic boxes that the uninitiated think they are. They cannot perform miracles and make a rotten bit of wire work like a quad, but they can save your poor old P.A. tubes from severe embarrassment by killing those T.V.I.-causing standing waves before they get in your P.A. box and create havoc. For £12 10s. 0d. isn't it worth it?

Now then, having got you fixed up with an A.T.U. you'll need to know what you are doing with it. For S.W.L.'s it's easy ... they only need to tweak the knobs for maximum audio. The fully-fledged T.T.P. (Transmitting Type Person), however, is less fortunate. He (or she) has no indication on the transmitter of what is happening when the knobs are twiddled. Therefore an S.W.R. indicator is called for, and what better to suit the EeZee Match than the KW Match? None, of course.

Inserting £9 worth of KW Match betwixt TX and ATU merely leaves the T.T.P. to tweak away at his A.T.U. for minimum indication when switched to "Reflected." Result—a happy P.A., a happy T.T.P. and probably a happy neighbour too! 73 es BCNU, Mike.
INDEX TO
ADVERTISERS

PAGE
Amateur Electronics (G3FIK) 776
Amateur Radio (C. H. Young) 778
Belding & Bennett (Morse) 784
Burns Electronics ... 777
Cossor Electronics, Ltd ... 725
Daystrom ... 729
Derwent Radio ... 784
Echelford Communications 783
Eddyson'T Agents ... 721
Emsac ... 722
G. Francis (G3TWV) ... 779
Glasgow Electronic Services 780
Grigg ... 780
G.W.M. Radio ... 782
Hamgear Electronics ... 732
Henry's Radio ... 781
Ihno ... 781
K.W. Electronics inside front cover, ... 730
Laskys Radio, Ltd. ... 779
Lowe Electronics ... 727
Ministena ... 780
Mosley ... 722
N.W. Electrics ... 728
Partridge Electronics ... 777, 780
Partridge (G3PRR) ... 780
Peter Seymour back cover, 730, 776
Radio Shack ... 728
R.T. & I. Electronics, Ltd. 726
Small Advertisements ... 778-784
Smith, G. W. (Radio) ... 724
Spacemark, Ltd. ... 784
SSB Products ... 782
Stephens-James, Ltd. ... 732
S.W.M. Publications inside back cover, back cover, 721, 730, 732,
776
Symbol Books ... 777
Taurus Electrical Services... 783
Telecomms (G3SED) ... 777
The Amateur Radio Shop... 777
Trio... 723
Wemscol ... 777

SHORT WAVE
MAGAZINE

(GB3SWM)

Vol. XXVII FEBRUARY, 1970 No. 316

CONTENTS

Page
Editorial ... ... ... ... ... ... ... ... ... ... ... 733
Design and Construction of A Low-Pass Filter, by I. E. Hill, G6HL ... 734
The Linear Amplifier Stage in SSB Working,
by E. P. Essery, G3KFE ... ... ... ... ... ... ... ... ... 737
Another Top Band Aerial Layout, by D. W. Blackford, G3NPB ... 740
Explaining Binary Codes, by P. R. Cragg, G3UGK ... ... ... ... 741
VFO Control on Two Metres, by B. A. Pickers, B.Sc., G3YUA ... 743
High-Impedance RF Probe, by R. C. Whelan, GW3PJT ... ... ... 746
MW Car Radio as IF/AF Amplifier, by M. J. Marsden, G8BQH ... 746
Another Break-In System, by A. G. F. Dutton, G3TIE ... ... ... 748
Communication and DX News, by E. P. Essery, G3KFE ... ... ... 749
VHF Bands, by A. H. Dormer, G3DAH ... ... ... ... ... 756
The Month with The Clubs—From Reports ... ... ... ... ... 762
Region I Prefix Area—Map ... ... ... ... ... ... ... ... ... ... ... 767
The R.A.E.—Questions & Answers: May 1969 Examination ... 768
The Other Man's Station—G3RAC ... ... ... ... ... ... 774
New QTH's ... ... ... ... ... ... ... ... ... ... ... ... ... 775

Managing Editor: AUSTIN FORSYTH, O.B.E. (G6FO/G3SWM)
Advertising: Maria Greenwood

Published at 55 Victoria Street, London, S.W.1, on the last Friday of the month, dated the month following.
Telephone: ABBey 5341/2
(STD 01-222-5341)
Annual Subscription:
Home: 45s. (48s. 1st class) post paid
Overseas: 45s. ($6.00 U.S.), post free surface mail

Editorial Address: Short Wave Magazine, BUCKINGHAM, England

AUTHORS' MSS

Articles submitted for Editorial consideration must be typed double-spaced with wide margins on one side only of quarto or foolscap sheets, with diagrams shown separately. Photographs should be clearly identified on the back. Payment is made for all material used, and it is a condition of acceptance that full copyright passes to the Short Wave Magazine, Ltd., on publication.

© Short Wave Magazine Ltd.

E. & O. E.
**HAMEG ELECTRONICS**

Try this preselector on your communication receiver, a pre-amp amplifier with built-in antenna coupler covering from 1.8 to 32 mc's completely. A gain of up to 35 db, improving image rejection and low level signals. A new low line case blue silver with ultra modern controls. Mainly powered, Price £7.16.0 send for details.

29 CARLYLE ROAD, NORWICH

---

**CALL BOOKS**

**INTERNATIONAL:**

**RADIO AMATEUR CALL BOOK**

Winter Edition ........................................... 45/6

"U.S. Listings" ........................................... 69/6

The two together, covering the World .......... £5/10/0

"G's" only (1969/1970) .................................. 7/3

**MAPS**

**AMATEUR RADIO MAP OF WORLD**


**DX ZONE MAP (GREAT CIRCLE)**

In colour with Country/Prefix Supplement Revised to September, 1968 ........................................... 14/3

Black and White only (plus 9d. with Country/Prefix Supplement) ........................................... 5/6

**RADIO AMATEUR MAP OF THE U.S.A. AND NORTH AMERICA**

State boundaries and prefixes, size 24" by 30", paper ........................................... 8/9

**RADIO AMATEUR'S WORLD ATLAS**

In booklet form, Mercator projection, for desk use. Gives Zones and Prefixes ........................................... 16/-

**QRA LOCATOR MAP**

(R.S.G.B.) ........................................... 9/-

---

**LOG BOOKS**

Standard Log ........................................... 7/9

Log and VHF Contest Log ........................................... 7/9

Receiving Station Log ........................................... 7/3

---

**MORSE COURSES**

G3HSC Rhythm Method of Morse Tuition

Complete Course with three 3 speed L.P. records with books ........................................... 84/-

Beginner's Course with two 3 speed L.P. records with book ........................................... 60/6

Single 12" L.P. Beginner's with book ........................................... 50/-

Single, 12" L.P. Advanced with book ........................................... 50/-

Three speed simulated GPO test. 7" d.s. E.P. record ........................................... 15/-

Plus 5% for postage and insurance

---

Available from

SHORT WAVE MAGAZINE Publications Dept., 55 Victoria Street, London, S.W.1. 01-222 5341

(Counter Service, 9.30-5.15, Mon. to Fri.)

(Nearest Station: St. James's Park)

(540 A/C No. 547 6151)
The next issue of Short Wave Magazine starts a new volume—our 28th in this long series devoted to Amateur Radio. Not only shall we be changing the colour of the cover but also as usual each copy will contain, as a free loose supplement, an index to the volume now concluding.

And there will be a more significant departure from the norm—we shall be adopting the nomenclature now being advocated for the expression of electrical terms and quantities for the era into which we are moving. This does not just mean the use of the Hertz (Hz for cycles, kHz for kilocycles and mHz for megacycles) but also decimalisation where appropriate, and the expression of weights and measures in kilograms and grams, kilometres, metres and centimetres.

While we do not approve the necessity for these changes—after all, the Hertz symbol is imposed and as regards metrification and decimalisation, we are not in the Common Market yet—it must be recognised that the younger generation will have to become familiar with all these terms within the next decade, so it behoves us to be as helpful as we can be in our particular field.

Anyway, the change will be gradual, and made as easy and as painless as possible in the interests of all concerned—our older readers need not fear that they are in for a period of bafflement!
DESIGN AND CONSTRUCTION OF A LOW-PASS FILTER

STEP-BY-STEP APPROACH AND THE CALCULATIONS

I. E. HILL (G6HL)

Most of our handbooks give some basic formulae for the design of filter sections but omit to make it clear how to put the sections together to produce an effective unit. Practical constructional details are given but American publications favour data for filters having a relatively high cut-off frequency, which are often not suitable for the Ch.1 transmissions in the U.K. On the other hand, British designs tend to assume that 75-ohm coax will be used for the feed-line. There seems, therefore, to be a need for a reasonably easy guide to the design of LP filters for specific applications.

The writer operates from a near-fringe area for TV Ch.1, in which it is also possible to receive Ch.3. Because of the wooded nature of the district there is some attraction in using a vertical transmitting aerial with unbalanced coax feed—but as there are many TV receivers in the immediate vicinity a high order of harmonic suppression is essential. The G6HL Tx itself runs a linear PA in Class-AB1. The DC inputs are carefully and effectively filtered, all and a pi-tank is incorporated. When the Tx output is fed to a screened resistive dummy load, unless direct coupling is used nothing is detectable on frequencies above 30 mc.

This general condition of totally effective screening must be met before there is anything to be gained by adding a low-pass filter in the Tx output circuit.

Having regard to the fringe TV signal condition, the proximity of TV receivers, the use of a vertical ground-plane radiating system and the desire to make it good while one was about it, the decision was to develop a low-pass filter with more attenuation than really necessary. The preferred solution was for a filter having two constant-K mid-sections, M-derived end and centre sections—refer Figs. 1 and 2. Availability of coax dictated that the load resistance should be 52 ohms. Most of the G6HL operating is CW in the LF areas of the bands, so 42 mc was selected as $F_{\infty}$, the frequency for maximum attenuation and 36 mc as a reasonable cut-off frequency, $F_c$. With these parameters and assuming a coil of Q=100, the calculated performance of the filter approximates to Fig. 3. This gives attenuation of 100 dB around 42 mc and not less than 58 dB anywhere above 40 mc.

In the pass-band, the calculated attenuation was 0-14 dB at 3-5 mc, 0-16 dB at 14 mc, 0-19 dB at 21 mc and 0-31 dB at 30 mc. The actual model as constructed did not quite achieve this expectation, but was not worse than 0-5 dB at 21 mc and below, and 0-75 dB in the 28-30 mc band. This was considered to be acceptable—in fact, the figures are good for a home designed and built unit.

**Design Procedure**

(a) First determine parameters. In this case

\[
F_c = 36 \text{ mc} \\
F_{\infty} = 42 \text{ mc} \\
R_L = 52 \text{ ohms}
\]

(b) Then, determine configuration. In this case, two constant-K mid-sections, M-derived end and centre sections—refer Figs. 1 and 2.

(c) Calculate basic values for $L$, $C$ and $m$

\[
L = \frac{R_L}{\pi F_c} = 0.46
\]

![Fig. 1. Complete Low-Pass Filter, in sections.](image)
Fig. 2. Finalised Low-Pass Filter—Cut-off frequency, 36 mc; maximum attenuation at 42 mc; load impedance, 52 ohms.

\[ C = \frac{1}{\pi F_c R_L} = 170 \]
\[ m = \sqrt{1 - \left( \frac{F_c}{F_{co}} \right)^2} = 0.517 \]

(d) Calculate the end-section values

\[ L_1 = m.L = 0.238 \]
\[ L_2 = \frac{1 - m^2}{4.m}.L = 0.163 \]
\[ C_2 = m.C = 87.9 \]

(e) Calculate constant-K section values.

(f) Calculate M-derived end sections.

(g) Enter the individually-calculated values on Fig. 1 and add values of adjacent coils to give the final design shown in Fig. 2.

Construction

The coils should be wound using 12 or 14g. enamelled to \( \frac{1}{8} \)in. dia., spaced to 8 turns per inch. Coil sizes in the actual design shown here are: End sections, 54 turns; centre section, 31 turns; intermediate coils, 6 turns.

Fig. 4, p.736, gives a reasonable relationship between

Fig. 3. Calculated performance—see text.
inductance and turns for self-supporting coils wound to half-inch diameter and spaced at 8 turns per inch.

**Capacitors**

When the transmitter is correctly adjusted and working into the intended load—in this case 52 ohms—the voltage will be low but under possible temporary mis-match conditions and perhaps during Tx adjustments, the voltage may rise to high values. For the usual amateur power levels the condensers should therefore be rated 750/1000v. Lead inductance should be at a minimum (short and direct wiring) and the capacitors of the type capable of handling RF currents. For these reasons, the choice must be air-spaced types (preferably), ceramic or silver mica, in that order of preference. For the prototype, which has worked out so successfully, capacitors were built up using fixed plates on #4 in. spacer washers. This produces condensers capable of handling RF powers up to one kilowatt.

**Screening**

The whole filter must be effectively screened and there should be maximum physical separation between input and output—this is always a feature of commercial low-pass filters. For the amateur constructor, a suitable layout is shown in Fig. 5.

**Assembly and Adjustment**

Layout should be electrically and mechanically symmetrical and connecting leads kept as short as possible and of equal length for each section. The best procedure is to fit all capacitors and adjust them in situ using a capacity bridge. The prototype, which was built with air-spaced condensers, had the top plate of each slotted so that it could be adjusted with a knife. Alternatively, screw-adjusted variable capacitors could be used.

Fit the coils in each of the M-derived sections, earth the end remote from the capacitors and, using a reliably-calibrated GDO, adjust the coil turn-spacing until the section is resonant at F∞, in this case 42 mc. Take off the earth and fit the remaining inductances.

If the capacities in the M-derived sections can be made variable, even if only over a limited range, F∞ can be varied to give a single-frequency attenuation, as in Fig. 3, or alternatively two or three maxima closely spaced, resulting in a broadening but also some reduction in the area (band width) of maximum attenuation. Together with this possible variation will also go some change of attenuation in the pass-band. If such adjustments are attempted, they are best done using a spectrum analyser.

**Following the Design**

If the detail given here is followed reasonably closely—noting that the critical items are capacitor values, coil inductance and section wiring—it should be relatively easy to produce an effective low-pass filter showing not more than 1 dB attenuation in the pass-band, not less than 55 dB in the stop-band and something like 90 dB at the frequency of maximum attenuation. This should pretty well eliminate harmonics without having any noticeable effect on the fundamental transmission on any amateur HF band.

But the final judgment will always be with the owners of neighbouring TV receivers, trying to lock a picture in a fringe area!

**SOME R.A.E. STATISTICS**

For the May 1969 Radio Amateurs' Examination, there were 1712 candidates, of whom 1077 (62%) passed. For the three years 1967-'69, the entrants have totalled 4987, with 3092 passes—or about 62%. These figures indicate a fairly high failure rate, of well over one third, which suggests that better preparation is needed. This is a pass-only Examination, of no great difficulty, and a pass-rate of around 75% could reasonably be expected.
THE LINEAR AMPLIFIER STAGE IN SSB WORKING

USING TV LINE-OUTPUT VALVES
-COOLING AND VENTILATION-
LOADING AND FULL OUTPUT

E. P. ESSERY (G3KFE)

USING colour-TV line output valves as linear amplifiers for SSB transmitters is a relatively new practice in Amateur Radio, and is one way to generate big SSB signals with fairly low power-pack voltages and in small volume. Such transmitters operate very well, but in view of some comments heard over the air, it is perhaps as well to consider the ins-and-outs of their use.

In the first place, most amateurs who have been around for some time cut their teeth on a transmitter which ended up in an 807 or one of the numerous derivatives. These seem to stand up to an almighty pounding without taking harm, and the builders of those transmitters, when first they were putting them on the air, often found they would not “dip” and just left them to stew while they went off for a coffee and thought about the problem. Later, they probably rebuilt the PA stages with 6146’s—wondering what all the fuss was about when they got little or no extra RF out, besides having to write off the odd valve if it was allowed to run away for too long.

Advent of the 6146

However, the 6146 really came into its own with the advent of SSB. It gave much more than the 807 when biased in Class-AB1, which was not surprising since it was originally designed as a modulator to give better output without grid current. Now, SSB transmitters are well-known as tending to be free from TVI if the PA is biased in Class-AB1 or Class-B; but putting the first whiff of grid current in—that is, going to AB2—is a sure way of upsetting the TV, and, incidentally, of bringing up the splatter level slightly, even though the stage is designed to stand some grid-current.

A pair of 6146’s was for long the favoured way of generating a Sideband signal at the 150-180 watt level, which suits so many U.K. operators, and is equally suited to the high-power merchants who can use it to drive a separate linear in grounded-grid, or passive grid configuration without too much difficulty.

Getting More Power

However, with the widespread development of colour TV, it began to be realised that a range of valves was available which could, in the same volume as the 6146, give double the output—a pair of valves at four hundred watts, or, in a linear, four running to a kilowatt input.

But—as with the change from 807 to 6146, so with the transition to the colour-TV valve: More care is needed if life is not to be unacceptably short, in fact lots more care. Let us look at the reasons.

In the first place, although the valve is able to give these relatively enormous peak outputs, the valve is momentarily, dissipating as many watts as it is giving output, give or take a little. This is evened out when the thing is standing by with no talk into the microphone, and the valve gets a proper rest while the rig is at “receive.” Nonetheless, we are running the valve well over the top on peak, so that the average dissipation over a period is just within limits. The limits are set by the temperature the valve bulb may reach—around 225°C., when it is measured during a period of transmission. If one rises much above this, a hot-spot will develop, the glass at that spot will become plastic, the vacuum will suck the envelope inwards—and you need a new valve. Even if this sad event is avoided, one still has to hold the anode temperature itself down to below 500°C, if damage to the valve is to be avoided, resulting in steadily rising anode current when not talking, which in its turn increases temperature and so on, rather like thermal runaway in a transistor, until again the envelope “sucks in.”

Another problem is that the valve is physically smaller, and so the clearances are also reduced; this means that accidental operation into a severe mis-match can destroy it. A case in point occurred when the writer’s ATU put a short-circuit on to the feeder (a fixed capacitor went down) to the transmitter. The result was flashing-over noises in the valve, which in fact alerted him to the condition. However, it was only a few hours later that the valve showed signs of decrepitude and had to be changed. The flashover, which would not have worried an 807 on full power, was enough to write 90% off the life of a 6HF5 working on the Top Band QRP notch.

Suitable Types

What does it mean, and what can we do about it? First, of course, there are many valve-types to choose from, with the 6HF5, 6DQ5, 6GE5, 6GB5, 6JE6, 6LQ6, 6KD6, 6JS6 and the European PL505 as the first to spring to mind. Some of these are less touchy than others. For example, the 6HF5 in the PA of the K.W. Vespa Mark II has been replaced in later models by the 6LQ6, which is a little more tolerant; and owners of the earlier 6HF5 transmitter can, it is understood, obtain from K.W. a modification kit, including the valve, a glass-fibre PA coil and all the other bits, ready wired to a base for fitting in. Such a modification is well worth while, and should be looked at by owners of other equipments containing the 6HF5, as a possible modifica-
The 6HF5 is one of the worst offenders in this context.

The whole problem turns on the matter of heat dissipation—hence, if you insist on putting the Call Book and the transmitter handbook and a couple of old magazines on top of the transmitter, lay in a good stock of spare PA valves! For the same reason, the PA standing current becomes critical; for instance, the PA of the Vespa must be set to give a standing current of 25 mA; this figure is the compromise between heating—you would like no standing current from this point of view—and linearity. The standing current must be checked and set right every time the transmitter is used.

Operating Factors

Use of excessive ALC is an often unsuspected cause of failure. ALC enables the operator to bring up the average level of modulation without splattering—but the duty cycle becomes heavier and results in the PA being hammered to death in very short order if the ALC is used to the limit. The motto here should be to “ talk it up ” to the maximum currents specified in the handbook and no more, so that the ALC just takes out the odd “ spike ” from the voice waveform; this will usually get you further on in the pile-ups anyway, because your signal will be more readable than the others.

With CW and, more so, AM operation, using these valves is a matter for the utmost care. Preferably, one should eschew all AM operation, as there is no doubt that this mode does so much to shorten the life of the valves. Where CW operation is concerned, it is wise not to use these valves at the 150-watt level on CW if the input on SSB is given as 220 watts p.e.p.; rather, be conservative, and stay at around 100 watts input under key-down conditions, which will have the effect of prolonging life, probably reducing the magnitude of the TVI problem by keeping harmonic output down, and is still quite enough to work all round the world.

Operation of the transmitter should always be into either a resistive dummy load, or into an aerial with a VSWR no greater than specified (this varies a little from transmitter to transmitter); the reasoning here is that although operation into a slightly higher VSWR may not damage the valve as such if it is correctly loaded into the reactive load, the voltages across the components in the PA stage will probably rise, and in these very compact designs a flashover of the PA loading capacitor may accidentally occur. Such an arc does not damage the variable capacitor, but will probably reflect a sudden transient back into the valve, sufficient to damage it.

Parallel Pairs

Using two or more of these valves in parallel is a popular way of obtaining full power from a relatively low HT voltage. If this is done, either the valves must be matched, or, better, the biasing circuit should be so set up that each valve draws the same standing current. Ideally, a meter should be permanently wired in each valve anode circuit, or at least the same meter be switched to each valve in turn. If all the valves draw the same standing current, they will all “ track ” within 10% over the input range, which will be enough to prevent damage due to excessive power loading in one valve.

Cooling

If one is considering home-construction, and has reasonable metalworking facilities, it might be worth making heat-dispersing valve-cans; these are, of course, available for normal B9A and B7G envelopes, but would need to be home-made for odd-shaped valves. The principle is to have an inside element in the can, which presses on the valve envelope and on the other side the screening can, by way of springy “ fingers ” of metal. The heat is transferred through these from the envelope to the black matt can and so to air, which results in a considerable improvement over a similar valve in free air, and a spectacular one when compared with the same valve in an ordinary can. (However, when properly fitted they do transfer a large amount of heat also to the chassis.)

Cooling is aided by circulation of air—rather an obvious statement, but often neglected. A louvred case with a conventional chassis inside is a heat-trap as far as underside components are concerned, and no amount of louvering will make matters any better, unless and until the hot air can be allowed to convect through holes in the chassis, where it collects again; it can then be let out by drilling vents in the roof of the case. Applying this reasoning to the transmitter, the PA screening enclosure and the case can be made of Expanet or similar material which lets air through freely. Holes around the valve base, and plenty of clearance above the bench will then let the valve do the work of heating air and expelling it from the enclosure—as they say, you can fry eggs on the top but the sides are stone cold. In the limit, a small blower could be fitted, albeit this is a counsel of despair with a poor mechanical, or, rather, thermal, design. Most commercial designs can stand a lot of modification to improve convection cooling.

Summing it all up, what are we in fact saying? Just that the use of colour-TV line-output valves as PA stages is a good way of packing a powerful punch into a small volume provided steps are taken to ensure that the transmitter handbook is followed carefully, the rig is given every chance to keep itself cool, and tuning-up is carried out rapidly.

Tuning Up

Finally, a method will be described which will enable the PA to be tuned and loaded without undue stress on the valve, if a VSWR bridge (which is essential) is available.

Assuming the rig is switched on but at “ receive,” switch to “ tune,” and detune the PA tuning condenser. Insert a whiff of carrier and peak the PA grid or pre-selector control till the anode current starts to rise. Peak the anode current by tuning the PA grid, while holding the anode current down by simultaneous adjustment of carrier insertion to as low a level as possible. If standing current is 25 mA without drive, it should be possible to achieve the peaking without at any time exceeding 50 mA, and in a time of less than one second. Once satisfied that a true peak has been achieved, reduce carrier insertion to zero. With PA connected to dummy load through VSWR indicator, switch the indicator to “ forward current ”; insert a shade of carrier and peak the PA-tune condenser for a maximum forward current, still maintaining anode current below 50 mA absolute.
maximum by carrier insertion control. Swing the carrier insertion up to full and back to zero rapidly, and note at what current it peaks. This value should be the current to which the transmitter is loaded according to the handbook, e.g., for the Vespa Mark II, 130 mA. The value can be noted, by one swing of the carrier insertion control up and back. If it is correct the transmitter is now properly loaded into the dummy load. If not, and it “flattens” either above or below 130 mA, alter the setting of the PA-load control, repeat the PA-tune condenser at low level, as before, and again swing the carrier insertion right up and back. By doing this, the PA is never at “full bore” for more than a fraction of a second, or at low level more than a second, at a time.

When the PA is loading to the current specified, note the setting of the loading condenser and tuning condenser for future reference. The transmitter is now switched to the aerial. No adjustments are made to the transmitter, other than to inject a whiff of carrier, and rapidly to tune the ATU for zero reverse current if one is in use. Should the transmitter be feeding a dipole, or similar coax-fed system with a known low VSWR, then in the absence of the ATU it is permissible to insert a tiny bit of carrier, and peak the forward current with the PA tuning control, followed by a rapid swing up and down of the carrier insertion control to ensure the transmitter is still loaded to its correct current. For SSB operation, now switch out the carrier—or for CW insert carrier to the proper key-down value. And, away you go!

This method is specified for the SR-400 transceiver, and can be used with others; it ensures that the PA valve is not stressed while tuning-up, and that it is correctly loaded for maximum transfer of energy at the high power level. The normal method is slower, and stresses the valve more, but can be used provided that the PA is given a rest by cutting carrier every two seconds at least, for a period, of say, five seconds.

By taking these precautions, it should be no problem at all to get a life of about a thousand hours or more out of even the most “touchy” of the tribe of line-

output valves operated in SSB PA service at the two-hundred watts per valve level of input.

Finally, let us look at the operating conditions for some of these valves, shown in Table I, and also, in Table I, at the published ratings of the various types as used in TV service, the latter information incidentally all coming from RCA publications relating to their own types—which means that the data are comparable. From Table I, it will be noted that the types fall into two clearly defined groups, the first having heater ratings around 1½amps., and the second, having heavier heaters drawing a couple of amps. or more and heavier anode structures capable of dissipating 25-30 watts. Bulb temperatures, it will be noticed, show variations between 200° and 250°C as maximum. As a guide, an unblown valve with anode temperature just below 500°—a level which, if exceeded, will definitely shorten life—has a bulb temperature, in the case of the 6KD6, of over 200°. Blowing it with a 3in. diameter fan placed a couple of inches away brings the envelope down to about 55°C, provided the fan is running all the time, including standby periods.

Reverting to Table II, it will be noticed that conditions are given for both grounded-grid and grounded-cathode service, with Class-AB1 and Class-B bias; but it should be realised that the operating bias must be set for the individual valve to give the specified standing anode current; and it is perhaps as well to make the point that not only should the bias be adjustable, but all possible precautions against instability of any sort must be built-in, not only for the desired clean output signal, but because if the amplifier gets at all skittish in the early testing stage the currents will melt the envelope just as fast as a blowtorch will see off an icerube!

### TABLE I

**Operating Conditions—TV Sweep-Tube Service**

<table>
<thead>
<tr>
<th>Valve</th>
<th>Vh</th>
<th>Ih</th>
<th>Anode Diss. (watts)</th>
<th>Va</th>
<th>Vg2</th>
<th>Bulb Temp. (deg. C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6G05</td>
<td>63v.</td>
<td>2.5A</td>
<td>24</td>
<td>990v.</td>
<td>190v.</td>
<td>220°</td>
</tr>
<tr>
<td>6G65 (PL500)</td>
<td>6.3</td>
<td>1.38</td>
<td>17</td>
<td>700</td>
<td>275</td>
<td>200°</td>
</tr>
<tr>
<td>6G65</td>
<td>6.3</td>
<td>1.2</td>
<td>17.5</td>
<td>770</td>
<td>220</td>
<td>200°</td>
</tr>
<tr>
<td>6H6S</td>
<td>6.3</td>
<td>2.25</td>
<td>28</td>
<td>900</td>
<td>190</td>
<td>225°</td>
</tr>
<tr>
<td>6J6S</td>
<td>6.3</td>
<td>2.25</td>
<td>28</td>
<td>990</td>
<td>190</td>
<td>225°</td>
</tr>
<tr>
<td>6KD6</td>
<td>6.3</td>
<td>2.8</td>
<td>33</td>
<td>990</td>
<td>250</td>
<td>225°</td>
</tr>
<tr>
<td>6L6Q6</td>
<td>6.3</td>
<td>2.3</td>
<td>30</td>
<td>990</td>
<td>220</td>
<td>250°</td>
</tr>
</tbody>
</table>

### TABLE II

**Typical Operating Conditions, Linear Service. (Single Valve)**

<table>
<thead>
<tr>
<th>Valve</th>
<th>Class</th>
<th>Mode</th>
<th>Va</th>
<th>Vg2</th>
<th>Ia</th>
</tr>
</thead>
<tbody>
<tr>
<td>6H6S</td>
<td>AB1</td>
<td>normal</td>
<td>800v.</td>
<td>230v.</td>
<td>25mA</td>
</tr>
<tr>
<td>6L6Q6</td>
<td>AB1</td>
<td>normal</td>
<td>800</td>
<td>230</td>
<td>25</td>
</tr>
<tr>
<td>6L6E</td>
<td>AB1</td>
<td>normal</td>
<td>850</td>
<td>180</td>
<td>25</td>
</tr>
<tr>
<td>6L6Q6</td>
<td>grounded-grid</td>
<td>1200</td>
<td>0</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>6L6E</td>
<td>grounded-grid</td>
<td>1200</td>
<td>0</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>6KD6</td>
<td>AB2</td>
<td>grounded-grid</td>
<td>900</td>
<td>0</td>
<td>25</td>
</tr>
</tbody>
</table>

Note: Ia is standing anode current under correct bias conditions, per valve.

**International Instruments, Electronics and Automation Exhibition**

This large and important exhibition will be held at Olympia, London, during the period May 11-16. It will emphasise the growth of the radio-electronics industry, and its large and expanding export potential.
ANOTHER TOP BAND AERIAL LAYOUT FOR RESTRICTED SPACE OPERATION D. W. BLACKFORD (G3NPB)

In 1965 the writer left Northumberland after having worked Top Band for five years with an end-fed half wave aerial. On arriving at the present QTH in St. Ives, Cornwall, the fact was accepted that now a quarter-wave aerial would have to suffice, as the house is situated very nearly in the middle of a 170ft. garden. It was possible to work out of the county with some struggle but for the most part G3NPB had to be content with local contacts. Recently, however, after a great deal of thought a more efficient 160-metre aerial system was embarked upon.

The initial planning involved considerations of feeding the aerial. It was decided that centre feeding was necessary, hence input impedance had to be considered. A normal half wave dipole for 160 metres, at heights practicable for amateurs, is said to have an input impedance of about 15 ohms. Fed at the centre with 70-ohm coax there is a considerable mismatch and the aerial is nowhere near as efficient as it should be. Two achieving a good match came to mind: The first one was that if the dipole is folded then the input impedance is raised about four times, giving a reasonable match to 70 ohm coax, consequently raising the efficiency of the aerial. The other fact is that the input impedance of an aerial, from minimum at the centre, gradually rises if the feed point is moved from the centre outwards—therefore, by off-centre feeding, a point can be found that gives an impedance to match 70-ohm coax.

Practical Considerations

After coming to these conclusions a start was made to fit a half-wave dipole for Top Band into 170 feet. The house being in the centre of the 170ft. span a short mast was attached to the chimney and 250 feet of 20-gauge hard drawn copper wire was measured out, the length was cut at the centre and 70 ohm coax was attached. The length was then erected in the form of an inverted-Vee, with the feed point at the centre—See sketch.

The aerial was pulled tight and secured at each end at about 6ft. 6in. high. The picture now was that an inverted-V in position, 170 feet long. At each end there was a 40ft. length of wire. This was pulled back at 6ft. 6in. height immediately below the inverted-V top, insulators were fitted and then the two legs were attached to the house. The aerial proved to be resonant on 1910 kc.

The aspect from the side is a triangle with a gap in the base, the gap being beneath the current anti-node.

The next step was to achieve a 1 : 1 SWR. This was done surprisingly easily by off-centring the aerial by only a few feet. It is worth noting that this was done by cutting wire from one end and adding it to the other.

Results

The results on the air have been spectacular. Good reports are being received from all over the British Isles and 61 counties have been worked in about six weeks. Inverness has been the best QSO to date, all contacts being with 20 watts p.e.p., SSB.

These ideas may be worth experimenting with by other amateurs who are interested in Top Band and can only erect quarter-wave aerials. It will be obvious that this aerial can be fitted into less space than the 170 feet used at G3NPB and it is likely to be very nearly as effective whether the apex of the aerial is the feed point or not, provided that the aerial is symmetrical. Another worthwhile experiment could well be a similar layout in a really restricted space, so that it forms a complete triangle—either as an open or closed loop.
EXPLAINING BINARY CODES

STRAIGHT AND BINARY CODED

DECIMAL

P. R. CRAGG (G3UGK)

As more and more use is made of digital techniques in the commercial electronic market, so these techniques are being applied to amateur equipment. Electronic keyers, digital frequency meters, digital clocks and receiver read-out are just some of the many applications. To understand how these devices work, it is necessary to have some comprehension of the binary system of counting.

First, though, we must consider why a new counting system had to be devised for use in electronic circuits. Electricity is current. Current can be measured in two ways: (1) By determining the amount of current flowing, or (2) By a simple check of whether current is flowing or not flowing, the amount being unimportant. Method (2) is obviously the easier one to deal with, but it has the limitation of having only two states—“current” or “no current.” Hence, the binary system, which also has only two conditions “1” or “0.” By stating that a binary “1” equals “current,” and a binary “0” equals “no current,” we can use electricity to count for us, in binary. Note that the current is usually converted into voltage, and in electronic counting circuits, known as “logic,” we will use voltage levels as our counting unit, rather than current. The same principle applies, though, of zero volts to represent one binary level, and a predetermined voltage to represent the other.

To understand how we can add up, using only two digits, a little elementary mathematics is called for. Take the normal decimal system we all use: The number 1234 can be displayed in a table like this:

<table>
<thead>
<tr>
<th>10³</th>
<th>10²</th>
<th>10¹</th>
<th>10⁰ ——Base line</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>100</td>
<td>10</td>
<td>(1)</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4 ——Digit line</td>
</tr>
</tbody>
</table>

This tells us that we have one “10³,” two “10²’s,” three “10¹’s” and four “10⁰’s.” We are working to a base of 10, and have 10 digits to use in each position before we must carry over to the next. Note that any figure to the power of “0,” as “10⁰,” equals 1.

This may all be very obvious, but it is necessary to understand it fully, in order to see how the binary system works. Instead of working to the base of ten, we work to the base of two. Compare the decimal base line to the binary base line:

<table>
<thead>
<tr>
<th>2³</th>
<th>2²</th>
<th>2¹</th>
<th>2⁰ ——Decimal</th>
</tr>
</thead>
<tbody>
<tr>
<td>(8)</td>
<td>(4)</td>
<td>(2)</td>
<td>(1)</td>
</tr>
<tr>
<td>10³</td>
<td>10²</td>
<td>10¹</td>
<td>10⁰ ——Binary</td>
</tr>
</tbody>
</table>

Whereas we had ten digits to use in each position before a carry-over, we now only have two. So if we have a binary number 1010, this will appear in our binary table like this:

<table>
<thead>
<tr>
<th>2³</th>
<th>2²</th>
<th>2¹</th>
<th>2⁰</th>
</tr>
</thead>
<tbody>
<tr>
<td>(8)</td>
<td>(4)</td>
<td>(2)</td>
<td>(1)</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

We are saying that we have one “2³,” no “2²’s,” one “2¹,” and no “2⁰’s.” Stated more simply, we have one “8” plus one “2.” 8 + 2 = 10.

The decimal number 1234 we started with can be written in binary like this:

<table>
<thead>
<tr>
<th>1024</th>
<th>512</th>
<th>256</th>
<th>128</th>
<th>64</th>
<th>32</th>
<th>16</th>
<th>8</th>
<th>4</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Adding up: 1024 + 128 + 64 + 16 + 2 = 1234.

Our binary number will usually be written simply as 10011010010.

Converting from binary to decimal is easy, by using the table, but conversion from decimal to binary is a little more complicated. However, by following a simple set of rules, it can be done quite quickly.

**Rule 1.** If the decimal number is odd, put a “1” in the lowest binary position.

**Rule 2.** If the decimal number is even, put a “0” in the lowest binary position.

**Rule 3.** Divide by 2, round off downwards, if necessary, and following Rules 1 and 2, put a “1” or “0” in the next highest binary position.

**Rule 4.** Continue as instructed in Rule 3, until left with the figure 1. This being odd, represents a “1” in the next highest binary position, and also the end of the calculation. For example, take the number 89, and convert to binary:

89 is an odd number, so following Rule 1, put down a “1” in the lowest position.

Divide by 2. 89/2 = 44½. Round off downwards, as in Rule 3, to 44, which is even, so put down a “0” as in Rule 2.

44/2 = 22, which is even, so put another “0”.

22/2 = 11, being odd, so put a “1”.

11/2 = 5½. Round off downwards = 5, which is odd, so...

5/2 = 2½. Round off downwards = 2. 2 is even, so...

2/2 = 1. Follow Rule 4. The final binary number is... 1011001

To check, use the table:

<table>
<thead>
<tr>
<th>64</th>
<th>32</th>
<th>16</th>
<th>8</th>
<th>4</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

64 + 16 + 8 + 1 = 89

**Computer Binary**

This form of binary representation is known as “straight” or “pure” binary. A more commonly used form, in computer technology, is known as “Binary
Coded Decimal," or BCD. It works like this:–

Take our number 1234. Now convert each digit to straight binary: –

\[
\begin{array}{cccc}
1 & 2 & 3 & 4 \\
8 & 4 & 2 & 1 \\
0 & 0 & 0 & 1 \\
\end{array}
\]

or, 00010001001000 in BCD. (Compare with 10011010010 in straight binary.)

From this, it is obvious that, when presented with a binary number, you must know whether you are dealing with straight binary or binary coded decimal. BCD always comes in groups of four, since the highest single decimal digit being "9" is represented as 1001 in binary. Any higher number must contain a carry over in decimal, and hence another group of four in binary.

Easy, really, isn’t it? Try some examples of your own.

"MOHICAN AS STATION RECEIVER"

In this article in our December '69 issue, the circuit of Fig.3 on p.618 should have been drawn as below. The author has done suitable penance and hopes that he will be forgiven by anyone who may have been misled.

![Fig. 3](p.618)

"ECONOMICAL AM PHONE ON TWO METRES"

In this article in our January issue, in Fig.1 p.674 the unmarked variable at the centre-tap of L4 should be an -001 µF bypass capacitor. And in Fig.2, p.675, R5 is 2.5K and R6 250K, and not as shown in the table of values.

On the subject of this article, a correspondent writes as follows: “G3YUA is to be congratulated on his simple design of a high-power transmitter for two metres as described in the January 1970 issue of the Magazine. However, a word of warning should be sounded regarding the setting-up procedure. Experience with the modulation system specified shows that it is not adequate merely to set the carrier at any level and then to vary the output of the transmitter by adjustment of the audio gain. It will be found in practice that the permissible peak-to-peak AF voltage on the screen and the DC potential of that electrode are closely related, and that there is only one setting at which maximum undistorted output can be obtained.

"It is certainly desirable that the resting carrier level should be high, and so it is preferable to set the screen voltage at that point which will accommodate the greatest audio swing without distortion at the highest permitted output level, and thereafter to vary the audio gain downwards to obtain the reduced output required for local contacts. An audio signal generator and a 'scope on the transmitter output will quickly demonstrate the truth of this statement.”

"THE 1970 RADIO AMATEUR’S HANDBOOK"

This new edition, the 47th, of a well-established manual, enjoying world-wide sales and a reputation as “the radio amateur's bible” will shortly be available from us. The ARRL Handbook (as it is usually known) is constantly revised and this edition will be right up to the minute as regards technique and construction for all amateur bands, with much new material—in fact, it is now by far the most up-to-date practical radio amateur manual available. The price is 55s. (paper cover) or 70s. in hard covers, post free, of the Publications Dept., Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1. Deliveries will start about the end of March.

For anything you may want to buy, sell or exchange use the Readers' Small Advertisement section of "Short Wave Magazine"—see pp.778-784 this issue.
VFO CONTROL ON TWO METRES

DISCUSSING A PRACTICAL DESIGN

B. A. PICKERS, B.Sc. (G3YUA)

The increase in the number of stations using the two-metre band has led to a demand for variable frequency control, if only to avoid bunching due to so many people choosing crystals at or near the same frequency. This would also help populate the vacant sections of the band, and at the same time, two or more stations in QSO would be able to share the same frequency. This would save space, and would be helpful in network operation and answering CQ's.

However, a variable frequency oscillator for the two-metre band is a very difficult instrument to build and use, and under even the most ideal conditions its frequency stability is open to doubt. What we must do, then, is to look for an alternative means of having variable frequency control at VHF, and what better than the well-proven superheterodyne converter used in the majority of receivers.

The circuit described here is the result of some research

Table of Values

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1, C3</td>
<td>0.001 µF</td>
</tr>
<tr>
<td>C4, C5</td>
<td>0.001 µF</td>
</tr>
<tr>
<td>C8, C9</td>
<td>0.001 µF</td>
</tr>
<tr>
<td>C12, C14</td>
<td>8 + 8 µµF, split stator</td>
</tr>
<tr>
<td>C6, C10</td>
<td>15 µµF, var.</td>
</tr>
<tr>
<td>C11</td>
<td>000 µµF</td>
</tr>
<tr>
<td>R4</td>
<td>1,000 ohms</td>
</tr>
<tr>
<td>R5</td>
<td>100 ohms</td>
</tr>
<tr>
<td>R6</td>
<td>27,000 ohms</td>
</tr>
<tr>
<td>R7</td>
<td>27,000 ohms</td>
</tr>
<tr>
<td>R8</td>
<td>22,000 ohms</td>
</tr>
<tr>
<td>L1</td>
<td>50,000 ohms</td>
</tr>
<tr>
<td>L2</td>
<td>100,000 ohms</td>
</tr>
<tr>
<td>L3</td>
<td>22,000 ohms</td>
</tr>
</tbody>
</table>

TABLE OF COIL DATA

<table>
<thead>
<tr>
<th>Coil</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>15 turns 22g., on § in. diameter former.</td>
</tr>
<tr>
<td>L2, L3</td>
<td>Two turns 16g., air-wound, adjust for resonance (see text).</td>
</tr>
<tr>
<td>L4</td>
<td>33 turns 22g., on 1-in. dia. former, with one-turn link.</td>
</tr>
<tr>
<td>L5</td>
<td>Four turns 14g., § in, dia. self-supporting, with pick-up loop.</td>
</tr>
</tbody>
</table>

Fig. 1. The Oscillator-Mixer Unit for the Transverter.
at G3YUA in an attempt to get good frequency stability coupled with true VFO operation over the entire two-metre band.

Circuit Design—See Fig. 1, p.743

Whilst any fundamental could, in theory, be used as the variable frequency oscillator, most stations would possibly want to use some existing equipment to drive the translator, and as the variable frequency oscillator must have a frequency swing of 2 mc, it was thought best if the variable injector frequency was 28 to 30 mc. Most existing AM and SSB transmitters and transceivers could therefore be used.

The unit as described was built on to a chassis 9 1/2 x 6 1/2 x 2 inches, and housed in a Vero Electronics cabinet. The power supply was also built on the same chassis as the translator. Stabilised power was needed for the oscillator, doubler and mixer screen grid, but otherwise no special power supply features were required.

The crystal oscillator itself was screened from the amplifier and mixer, and constructed along the lines of a conventional crystal-controlled transmitter for VHF. V1 is an ECL80, the triode half of which is an overtone crystal oscillator with its anode tuned to 58 mc. This is coupled to the control grid of the pentode half, which serves as a frequency doubler to 116 mc. The anode of this stage is series tuned by C6. The 116 mc output from V1 is taken to a simple amplifier, V2, which in this case is an EF80; however, any RF pentode would be suitable but, of course, some alteration in component values might be necessary.

This completes the construction of the crystal-controlled injector stages, and they can now be set up and tested. With the power applied, and with no crystal in place there must be no output from any stage, whatever the settings of the tuning capacitors. Any output will indicate parasitics and these could be reproduced in the two-metre band, or interfere with important out-of-band services. Normally, this type of instability can be cured by good screening and 100-ohm grid stoppers. It is most important that these stages be made “clean.” With the crystal in place (when oscillation should occur) peak all stages for maximum output, using an absorption wavemeter. Initially, a grid dip oscillator is helpful in making sure that the tuned circuits are resonating at the required frequency.

Mixer Section—V3

Valve V3 is the mixer, and uses for its bias a 25-volt zener diode, dispensing with the need for a separate bias supply unit. It is important that the diode be correctly by passed, as the top end of the diode must be at zero RF potential. The injected RF is link-coupled from the anode coil of V2 to the cathode of the mixer, with a one-turn link. The coupling should not be too tight, otherwise there will be some difficulty in tuning the anode of V2. The control grids of the mixer are tuned to 29 mc with 33 turns of 22g. on an unslugged gin. former, no capacity being used to tune this circuit, and it is made self-resonant with the valve capacities. A point worth noting is that no tuned circuits in this unit should be checked with a grid dip oscillator until all the valves are in place, with heaters running, otherwise the circuits will all appear to be tuned far too high in frequency.

A single-turn link around the centre of the mixer grid coil transfers the energy from the variable frequency driver unit. To monitor the correct operating conditions of the mixer stage it is advisable to have an 0-50 mA meter in the anode circuit, not the anode and screen circuit. With power applied to all stages, but with the crystal removed, this mixer will pass about 2 mA. After peaking up the crystal chain for maximum output, the mixer will show some 10 mA of anode current. With the application of about 5 watts of drive from the variable
frequency driver, the mixer current will increase, but it should not be allowed to go higher than 45 mA.

**Output**

We now have a little VFO-controlled RF on two metres, which was the object when we started! Also we have some VFO-controlled RF coming out at 88 mc, and some fixed-frequency RF at 116 mc. This is the difference between 116 mc and 28 mc. The 116 mc RF is of course the crystal-controlled injection frequency.

There is no cause for concern over this as it is the normal thing to happen. What we must do is to remove the unwanted frequencies, and leave our two-metre output untouched. This is not difficult, and any strip-line or coaxial filter will work very well indeed. The filter used at this station is the coax filter very fully described in the A.R.R.L. VHF Handbook (p.300). The unit, as it now stands, can be used for local contacts on low power using the following modes: FM, AM, SSB and CW. So it is quite versatile! If bigger things are yearned for, there is sufficient output to drive a pair of 4CX250B's to a kilowatt.

With a 58 mc crystal as the prime injector, the unit can be left switched on during periods of receiving without hearing birdies or spurii.

---

**SOLID-STATE CRYSTAL SWITCHING**

**B. A. PICKERS, B.Sc. (G3YUA)**

The switching of crystals in RF circuits presents various problems, associated with long leads and physical layout. The simple answer to such problems is to use solid-state switching at DC levels. This simplifies both the layout and eliminates any tendency for instability that might result from long control leads.

The circuit below is best suited for oscillators in the parallel mode of resonance with one side of the crystal at earth potential. Any high-speed switching transistors may be used for Tr1, Tr2, Tr3 in this circuit, and the crystals can be switched with only 1.4 volts DC from a small mercury cell.

In the diagram is the circuit for a small crystal calibrator housed in a die cast case, 4½ x 2½ x 1½in. The crystals are mounted on an external surface.

The same method of solid-state crystal switching can be used in similar circuits, such as master oscillators in transmitters and similar equipment.

---

**MOBILE RALLY DATES**

The fixtures already arranged for the coming Mobile Rally season are as follows:


**June 14**: First Elvaston Castle Mobile Rally, near Derby, organised by the Nunsfield House (Derby) Amateur Radio Group.

**June 20-21**: Anglian Mobile Rally, at the Anglian Show Ground, Ipswich.

**June 21**: University College of Swansea Amateur Radio Society's Rally, Singleton Park, Swansea.

**July 5**: The eleventh Mobile Rally organised by South Shields & District Amateur Radio Society.

Organisers who want publicity for their events are reminded that they should send information in to us well in advance. Address is: SHORT WAVE MAGAZINE, BUCKINGHAM.
HIGH IMPEDANCE RF PROBE
USEFUL ADDITION FOR THE MULTIMETER

R. C. WHELAN (GW3PJT)

DURING some experimental work with transistor circuits, a need arose for a simple RF probe which did not appreciably shunt the circuit on test. For convenience and reasons of cost, it was decided to construct a small probe which could be used as an extension to the station multimeter.

The circuit developed is shown in the diagram. A conventional diode detection circuit feeds a FET source follower. The output to the multimeter is taken from the source—a simple potentiometer allows the standing voltage across the source resistor to be balanced out.

As constructed, the unit, including battery and switch, fits into a tobacco tin. An empty ball-point pen is used for the probe, with a flying lead as earth connection. The multimeter leads plug into two small sockets on the tin. The circuit is conveniently made up on a small printed circuit board. Calibration can be by using an oscilloscope and a signal generator, in the usual way.

In practice, the probe has proved to be an extremely useful addition to the multimeter, but it has been found that the input voltage should be kept below 5 volts to avoid over-running the FET.

MW CAR RADIO AS IF/AF AMPLIFIER
FOR TWO-METRE CONVERTER

M. J. MARSDEN (G8BQH)

For G8BQH/M the car radio is used on medium-wave as a tunable IF/AF amplifier for the 2-metre FET converter.

The main problems with such a system are: (1) IF breakthrough from broadcast stations; (2) Oscillator chain frequency; (3) Second-channel and image interference; (4) Bandwidth of IF output relative to intermediate frequency.

These problems are now discussed with reference to the FET converter used by G8BQH/M—that is, the design by G3BKQ in the October 1967 issue of SHORT WAVE MAGAZINE. However, the modifications suggested can be applied to any design.

(1) The broadcast breakthrough that one would expect on medium-wave is overcome immediately a car radio is used, especially in a car. Car radios require an external aerial, no internal device being used, and are usually in a metal case to eliminate interference, which also acts as screening to the RF stages; the body of the car, if it is metal, acts as a further screen around the set. Hence, breakthrough is reduced to a minimum. The author's rig has a small slider switch on the underside of the car set, enabling switching between the normal aerial and the converter output.

(2) The range of most medium-wave receivers is 600 to 2000 metres, that is 500 kc to 1.5 mc. Hence, only 1 mc of bandwidth is possible. Because the 2-metre band is 2 mc wide, the oscillator chain in the converter will have to be capable of giving two different frequencies into the mixer, these being 1 mc apart, so that the band can be covered by two sweeps of medium-wave. This can be done by switching between two crystals in the oscillator stage of the multiplier chain. G8BQH chose to use crystals around 8 mc frequency and multiply up eighteen times, although any starting frequency can be

MEMBERSHIP OF F.I.R.A.C.

This is the "Fédération Internationale des Radio Amateurs Cheminots"—meaning those licensed AT-station operators interested in or employed by railways, anywhere in the world. The Society now has a membership of some 700 in 17 countries, of whom 34 are in the U.K., represented by the British Rail Amateur Radio Society, of which the hon. secretary is H. A. J. Gray, Eleven, Swanton Drive, East Dereham, Norfolk.

DETAILS FOR THE TWO CRYSTALS USED

<table>
<thead>
<tr>
<th></th>
<th>&quot;LF&quot; Xtal (for lower half of the band)</th>
<th>&quot;HF&quot; Xtal (for higher half of the band)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiplier Chain O/P.</td>
<td>7.981.25 mc HC6U approx.</td>
<td>8.038 HC6U approx.</td>
</tr>
<tr>
<td>IF Tunes</td>
<td>144.16 mc-145.16 mc</td>
<td>145-146 mc</td>
</tr>
<tr>
<td>2nd Channel</td>
<td>143.16 mc-142.16 mc</td>
<td>144-143 mc</td>
</tr>
</tbody>
</table>
used as long as the correct frequency appears to the mixer. The two frequencies needed in the mixer are 143.5 mc, enabling 144-145 mc to be tuned, and 144.5 mc, for coverage 145-146 mc. Obviously the portion of the 2m. band tuned is determined by which crystal is switched to the oscillator.

The crystals used by G8BQH are given in a table herewith on p.746, together with the frequencies they multiply up to and other details. The exact frequencies required were only obtainable to special order, at considerable expense, so the nearest available frequencies were used. This meant losing 144.0-144.16 mc (which, being mainly CW, was not required by the writer); also there is a slight overlap between the two ranges. The ideal value for the “LF” crystal would be 7.972 mc multiplying up to 135.5 mc. Obviously as the frequencies through the multiplier chain are going to be higher than those used in most converters, it will be necessary to remove a few turns from some of the coils.

(3) Image interference using this design has not occurred, probably due to the fact that the front-end is very selective. Details of second-channel coverage are given in the table opposite and it will be seen that the frequency ranges that could cause trouble are rather inactive, and the author has experienced no such interference.

(4) The bandwidth of the converter output itself is 500 kc to 1.5 mc, hence a tuned circuit in the output of the mixer stage cannot be used unless its tuning is ganged to the tuning of the car radio. The tuned circuit can be replaced by a 4.7K resistor and the IF output taken off through a .002 µF capacitor and a filter to remove any signals above 1.5 mc. The filter simply consists of a 22 µF capacitor across the output socket of the converter. In the G8BQH/M version the noise due to the front-end of the converter is constant when tuning across medium-wave, except there is a very slight decrease in level between about 1.3 mc and 1.5 mc, but this in no way degrades reception in this range.

It can be seen from the table that just one crystal, the “LF,” would be sufficient for a station in the south of England, since the majority are below 145-146 mc. In fact, G8BQH/M survived on just the one crystal for several months. Also, it will be noted from the table that the multiplied output of the “HF” crystal appears on Two. The frequency it comes out on is in the section of the band not tuned when using the “HF” crystal, hence no trouble will be suffered by “birdies” on the band. The G8BQH/M converter is free of any spurious signals.

The Main Rx

Car radios have a lot of RF gain and AGC and are therefore quite suitable for mobile working where QSB is a problem.

The design used by G8BQH/M has a negative earth rail and cannot be connected to the electrical system of cars with a positive earth. The voltage variations on a car battery would, however, upset the converter, and the supply would have to be stabilised at a value below 12v, or 6 volts, depending on the car battery. For these reasons the converter has its own 13.5 volt supply. The on/off switch on this supply sends an earth to the transmitter in the “off” position. If the transmitter is switched on the relays will be operated by this earth connection, thus turning the converter on/off switch into a transmit/receive switch. A small slider type is used to switch between the two crystals in the oscillator. The whole converter is in a die-cast box and sits on the parcel shelf in front of the driver.

The full circuit is not given as any design of converter can be used, with the foregoing modifications incorporated.

Finally one useful point about this system is that many car radios have pre-selector buttons. One of these can be set on the transmitter’s frequency for the purpose of checking one’s channel before transmitting; the others on stations frequencies that you might need to tune to quickly.

RADIO AMATEUR CAMPANOLOGISTS

During the Swindon Mobile Rally last August, a team composed entirely of radio amateurs rang a quarter-peal of Grandsire Doubles on the bells of Lydiard Tregoze Church. Those involved were: G3FHL, ringing treble; SWL Peet, on the second; G2FIX, on the third; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UHO, taking fourth; G3UH
ANOTHER BREAK-IN SYSTEM

FOR QUICK AND QUIET OPERATION

A. G. F. DUTTON (G3TIE)

By bitter experience, the writer has learnt that, except by sheer good luck, not many of the usual simple systems for break-in working will be satisfactory unless tailored to the rigs with which they are to work—and that includes the receiver as well as the transmitter.

No doubt all will function after a fashion, but if a completely silent make-and-break is required, there are difficulties:

1. **Silent Make:** The Rx must have time to lose sensitivity before getting the fairly strong signal which will leak through the T/R switch.

2. **Silent Break:** The rate at which the Rx recovers must be controlled if there is a Q-multiplier or crystal filter near the front-end. If not, there may be a horrid crack on key-up.

3. **VFO:** Unless the VFO is completely inaudible during listening periods it will prove most distracting. Even with a mixer-VFO it has been found that leakage can occur.

The most attractive circuits (on paper) are those which are entirely electronic and generally the muting has to be on the AGC line. Apart from a time-constant that can make recovery irritatingly slow, muting is necessarily simultaneous with transmission, and this the writer finds unacceptable.

Muting by lifting the RF and IF cathode line is very efficient but unless back-contacts on the key are used, a relay is required. Apart from the fundamental drawbacks of these electro-mechanical devices, they can make things very much easier, particularly if their special characteristics are used to advantage. The fractional delay between "break" and "make" on a change-over relay can give the pause which will obviate the click on key-down. Unhappily, in the reverse situation the natural delay may be insufficient to prevent a loud click on key-up!

**Practical Arrangement**

The circuit at Fig. 1 shows a method of BK control which has some flexibility and is quieter than many conventional relay configurations.

When the key is depressed, it energises a standard miniature change-over relay which mutes the receiver a moment before switching on the VFO. Not only does it bring in the VFO but it also energises Relay 2 (RLB), a dry-reed switch, to key the cathode of the PA or buffer through a normal click-filter. This is of course sequential switching, which will minimise the transients normally associated with oscillator keying.

RLA1 is slugged by a 250 μF capacitor C, so that it holds-in between letters and delays the recovery of the Rx until the high voltage that has built up across the crystal filter (or Q-multiplier) has had time to discharge. While RLA is held in, the reed relay (RLB) will follow the key up to very high speeds quite silently, and the VFO will run continuously, although full BK will allow listening between dots. This can be distracting and therefore a disadvantage, whereas listening between words would be perfectly acceptable, and indeed desirable.

Initially, Relay 1 (RLA) was a dry-reed switch but it was found to give insufficient delay between "make" and "break," so a miniature 2-pole change-over relay...
was substituted (S.T.C. Type 24, 130 ohms). A 220-ohm resistor was wired in series to slow down the action of this relay and to reduce the discharge rate of the slugging capacitor.

The two OA5 germanium diodes CR1, CR2, were chosen because they were available, and they are included to avoid interaction between the various circuits. The BY-100 CR3 restricts the slugging to RLA 1 only; with the large condenser to charge an OA5 proved incapable of handling the current.

All components, including another BY-100 as rectifier, were mounted on a small piece of paxolin fastened to the screw securing the clamp holding the 2000 $\mu$F smoothing condenser which, with the rectifier, provides the 12-volt relay supply.

The circuit of Fig. 2 shows a later modification to the Rx, which proved advantageous. The effect of this is to apply full mute to the RF valve regardless of the mute gain, thus avoiding blocking of the front end during "transmit" periods.

---

**COMMUNICATION and DX NEWS**

**E. P. Essery, G3KFE**

**THIS** is a time of year when interest seems inevitably towards the lower frequencies; and indeed in some cases off the operating side altogether and on to the soldering-bench. Much of course depends on the operating times of the station, and where the rig is actually located—a transceiver by the fireside does not encourage the art of home-construction, and an icy shack at the bottom of the garden is enough to discourage any sort of activity! But that was ever the pattern of things, and who are we to wish it changed?

**The Tables**

As promised, some changes. The existing Six-Bander, and the Top Band Ladder will remain as they are. However, a Five-Band Table, excluding 1·8 mc and starting from January 1, 1970, will also appear in future.

In addition, we will have a "Counties and Countries on Top Band" Table, covering a period of up to one year of operation on Top Band. This is primarily for First-Year operators, who should specify the date of first licensing in the initial entry. There will be a "place of honour" at the top of the Table, in which will go the callsign of the station which has turned in the best score in a period of one year and the score he actually made in the specified period of one year. New licencees go in from the date of first QSO, and come up for consideration for the place of honour one year from that date. Owners of old calls may not come into the Table proper, but may be considered for the place-of-honour on the basis of their score taken over any period of exactly one year, which must commence on or after January 1, 1969, and be specified. The Table will be in two sections, CW/Phone, and CW Only, and there will be a seat of honour for each section. Since it is hardly likely that anyone can work all 98 counties and also make a score better than W1BB's 103 countries in one year, there should be plenty of scope!

Please start sending in claims for the new Five-Band Table right away—countries worked on 3·5 to 28 mc.

**Top Band**

This is the time of year when Top Band really begins to hum in the DX stations. G3IGW (Halifax) fixed himself up some tests with VK6NK and SWL's Allen and Drew, all of Perth, Western Australia, to run through the last three weeks of December. Conditions seem to have been extraordinarily good, and Mike rang the bell well and truly on December 13, with his signals peaking 589 to SWL Allen and a good solid contact with VK6NK into the bargain. On the 15th, G3IGW was heard 1400 miles further east by VK5KO, for four minutes. As if this wasn't enough, the tests continued, with forty at other times, or as conditions would have it, when VK6-land. Then again on December 23, G3IGW made a second two-way of it. He was heard in VK no less than eight times during the periods of the tests, and has the QSL and the tape of the QSO from SWL George Allen to remind him of the feat. G3IGW found the 160m. band generally in better shape than it has been for some time, and made a first-ever QSO with 9X5SP at 2115z. Other signals hooked in the late evening period before midnight included VE3EK at 2230, VP9GJ at 2247 and KV4FZ at 2234z, as well as K2GNC at 2115z. Thus, Mike's score for countries on Top Band shoots up from 42 to 46, which must make him the pacemaker for the U.K. Congratulations to all concerned!

On a more domestic note, G2HKU (Sheppey) reports OK3TOA on CW, plus GM3WIG and PA0PN on SSB—with a terse tailpiece to the effect that since he can't seem to raise counties 97 and 98 to complete the set, he must be developing "cloth ears." Not so, Ted—they just haven't been available!

County-chasers looking for Kinross should be on the alert from Friday evening February 6 to February 8, when GM3FSV and GM3OGJ will be out to set Top Band alight. Operation will be on most bands, and so perhaps it would be as well to give the complete rundown here. GM3FSV/A will be on CW, 30 kc from the lower band-edge, with times as follows: Top Band 2100-0200z, 14 or 21 mc 1200-1800z, and Eighty and Forty at other times, or as conditions permit. GM3OGJ/A will be working to the same time schedules, but on 1875, 3740, 7065, 14190, 21110 or 21350 kc. Incidentally, this one could result in W2QHH raising his last missing county in U.K., which
would be a fine achievement.

It is well said that work is the curse of the drinking classes; and for G3WSS (Co. Down) work has most definitely put a damper on his activity. However, Cyril did manage to connect with G3DSVK, raised a card from OE7ZUJ/P for a new country confirmed, and got a certificate from CQ Magazine as Top GI in the 1969 CQ WW 160 Contest. Congratulations.

Many stations, both U.K. and overseas, have been taking an interest in the WAB exercise set up by the Cannock Chase chaps, profits on which go to charity, including R.A.I.B.C. This thing has really boomed, and must have just about drowned the Cannock lads in paperwork, with people everywhere being challenged to give their WAB location. But it would be no bad idea for all those who want to write to G3ABG—QTHR—about it to enclose an s.a.e. or, better still, go the whole hog and spring the "record book" at ten bob which puts you right in the picture. Incidentally, QSO's from way back as far as January 1, 1946, can be counted.

Newham Radio Club write to give advance information that they will be going out /P to Wales in the first two weeks of August; they would appreciate hearing from any-one looking for GW counties of their needs. Letters to S. Freedman, 3 Avenue Terrace, Crownfield Avenue, Newbury Park, Ilford (01-590 0324), please—Stephen seems to have been "elected" to the paper-work side of the job!

At G3LXD (Church Crookham) there is nothing to report, other than a QSO with KV4FZ on December 27; he was booming through for more than an hour.

G3XJ (Palmers Green) seems to have been doing nicely, having booked in HB9T; OE3K1W, OE5XXL, ZB2BO, in the way of EU/DX, plus GW3JNA, GW3AKB, GM3EZQ and GC2CNC (Jersey) who is hampered by a very poor aerial for Top Band, but will continue to be on while he can raise the stuff.

Just one trip to Top Band was made by G3XAP (Stowmarket) but his CW hit the jackpot—a QSO with HB9CM for a new country.

That light-house site of GW3UUZ's is near ideal for Top Band, and the local Club use it for contests so much that Andy's more personal activity is considerably down. However, by November 23, the quarter-wave vertical was back up, and GW3UUZ put out a tentative CQ to see if anything was not working right. No problem—at 0730 the CQ went out, and at 0800 he switched off again, perfectly satisfied with W1DEO and K1PBW who booked in, the former for a new State...

G3WPO (Burgess Hill) on the other hand, has a far from ideal location, and his attempts to improve his Top Band signal in face of these difficulties culminated in his piece in October's SHORT WAVE MAGAZINE. He now manages to get out quite well, to HB9T, many OK's, DJ1RK, OK4CM/MM (who sounded to be genuine) PA's, OE4SZ, DL0KF, HB9NL, HB9CM, PA0CD and over the Pond to K1PBW, VE3QU, plus a near miss with KV4FZ, which went down the pan due to QRN. Some /A activities are planned, from a spot locally at which a Vee dipole with the apex at 90 feet is already erected. There is talk of a rhombic at the same height!

Nice to hear again from GM3JAA (Inverness) after a very long silence. Jim has been having a dabble in the TransAtlantics, and comments on the effect of the time-difference between them and the folk down in South England. For instance, on January 11, at 0803z, W1BB sent "band dropping out fast, now QRZ" to which GM3JAA replied, for a last desperate try. Back came W1BB at 0810z reporting the GM3JAA signal peaking to 559, at a time when the south of England stations were lost to W1BB, and all but gone with GM3JAA himself. The uninitiated may well enquire "So what?"—but it proves once again the old Top Band adage that the path from A to B is open during darkness but peaks around the dawn period at one end or the other of the path, very markedly. And it also points up the advantages or otherwise of having a site that sits on the right sort of ground. GM3JAA has an aerial which is probably better than average—he knowing about aerials—but signals to W peak at about 3-4 S-points lower than they do to the general run of stations down South, purely as a function of the local rock structure.

G3VPS (Wartling) will be with 9H1BL during the period March 21-April 6, and is taking some Top Band gear with him. It is understood Peter will be giving details in time for next month; and preliminary experiments over there show that G's on Top Band should be workable ten-a-penny, if listening tests in Malta are anything to go by.

E i g h t y  a n d  F o r t y

As always, these two bands are somewhat neglected in the DX context; which makes it all the more alarming that no less than three of the letters this time have acid comments to make on the tendency of some G stations to disregard the band-planning provisions and use the bottom 10 kc for inter-G working, right on top of the DX.

GW3UUZ (Nash Point) seems to have jumped in on Eighty with both feet, using his Top Band aerial. As an example of the sort of results he has been achieving, one CQ, on the morning of December 19, produced a string of W9's and UL7TH. Another, on January 4, resulted in a pile-up of twenty W's, covering all areas except W6 and 7, all subse quemly worked.

An interesting one for G2HKU was OY1R, who suddenly popped up out of the racket on 3779 kc, although Ted did find that the biggest annoyance on the band was the number of people who tune up on top of QSO's.

At G3VMK (Abbots Langley) the emphasis has been on 3.5 me CW, in the morning period. In terms of results, we see all W call areas, including five W6's and a couple of Sevens, assorted ZL's, 9Y4 for a new one, KH6GLU who escaped the net, and VK's. The evening gave ZL, UL7GW and a few UA9's, all around 1630z, JA1MCU missed at 1830z, and CT3AS worked at 2200z. The main gripe—a G5/2 using 3508 kc on AM at 0830z on Saturday mornings! This particular character wiped up a three-way contact between ZM3GQ, WB6HGU and G3VMK. Turning to Forty, not so much activity was registered, but a careful listen around at lunchtime on December 27 showed JA's and VS6DSO there at potentially workable strength.

G8HX (Mansfield) has deserted Top Band in favour of the HF's, the reason being the arrival in the shack
of a DX-100U which Frank reckons to be an FB CW transmitter—it certainly is. All the bands have been tried, but Eighty is being given fuller treatment, with most W call areas raised before going to work. An "odde" was SM2AX, working other stations over a period of a couple of hours and giving his location as "Oslo."

An unfamiliar callsign on the LF bands enters the lists at this point, namely G3NOF (Yeovil) who has put up an E-W wire, 274 feet long and fed through an L-match, at 30 feet. This has been used in the evenings and early morning periods with some effect. Around 2300, conditions have been pretty fair to VE1 and VO1, while mornings have shown up VE3, W and South America. Three gotaways were KV4FZ, HK3W0, TA3MQ. But OJ0MR, PY7ASAQ, TP5TP, VE1AAW, VE1ALJ, VE1IE, VE1UA, VE3ACD, VE3DLC, VE3WQ, VO1CM, VP9GJ, VS6DO, YV4UA, W2HCW, WA1AIM/VO2 and XE1KS all fell neatly into the bag.

G2NJ (Peterborough) is still on his MM-chasing plan, and found another one in the shape of YO4ASG/MM, in the Aegean Sea off West Turkey. CW, as usual, and at 2345 on Forty.

At G3VLX (Sidcup) the threat to desert Top Band has become real—not a mention this time, although the 200-foot end-fed has not been idle. CW on 3.5 mc gave 3Z9PT, OH3MM, HB9QA, DM4ZKH, UY5MV, UC2LB, HAK8CKK, while SSB produced LA, DK, OY1R, YU, OK, IL, GM, ON, EI, PA, OZ, to start off the score in countries.

Eighty SSB gave G3XAP a first-ever in CN8MN—but the main interest was down at the CW end of Forty. Phil lost a QSO with a W7; he disappeared under a G2 who came up on channel, worked a well-known G3/3, and then complained bitterly that G3XAP was QRM'ing him! The lost QSO was in fact Phil's first W7, on any band, which was bad enough—but to add insult to injury the offender was overdriving his KW-2000 and producing clicks over a wide area, so had not read the instructions about driving his transmitter! One can sympathise to some extent with both sides in such a situation—G3XAP robbed of his prey, and the G2 probably wondering whatever had hit him and almost surely not knowing a W7 was anywhere around, let alone right underneath him. But the situation need never have arisen if the tacit agreement to use the LF 10 kc for intercontinental working were rigidly observed by all concerned.

G3XTJ has a semi-vertical dipole, as he describes it, with which he has been giving 7 mc CW a pretty fair roughing-up, more being heard than actually worked as yet, while he finds his feet on 40 metres. Worked were VP2MU, OJ0MR, U05, EA, most W call areas and VE. "Heard" included W6, PY, PJ2HT, HK2RAC, XE2WS, XE1OE, YV1PW, VK2AVA, VK3MR and C31AP.

CW was also the mode favoured by G2DC (Ringwood). Though Jack only operates using the key, he is not averse to listening round the Phone band and the run-of-the-mill stuff added all W call areas, as well as VE1-3. Jack thoroughly approved of the way the OJ0MR, Market Reef, exercise was carried out by the OH chaps, and their slick operating. Apparently, the Reef well justifies the granting of independent country status, as it boasts a lighthouse as well as the statutory horde of crabs! Seriously, whatever may be thought of the criteria currently being used to define a "country" one cannot but admire the way this particular show was organised and carried out. As for Forty, the grapevine worked again when Jack got the buzz that EA9EJ used CW in the small hours. Consideration suggested between 0100 and 0200 should do it, so Jack turned out at 0115z, heard him, hooked him first call, and was back in bed by 0145! Market Reef was also raised, at 0630z, to make it two new ones for the band and the run-of-the-mill stuff added all W call areas, as well as VE1-4.

All of this just goes to prove your scribe's oft-repeated assertion that 40m. and 80m. are often as good as the more popular ones when it comes to DX'chasing—but it also shows how one must pay attention to the aerial system and the way of getting

**SIX-BAND DX TABLE**

*(All-Time Post War)*

<table>
<thead>
<tr>
<th>Station</th>
<th>Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>G2DC</td>
<td>338</td>
</tr>
<tr>
<td>G3DO</td>
<td>337</td>
</tr>
<tr>
<td>G3NOF</td>
<td>318</td>
</tr>
<tr>
<td>G3LZQ</td>
<td>259</td>
</tr>
<tr>
<td>G3MKM</td>
<td>249</td>
</tr>
<tr>
<td>G3IGW</td>
<td>207</td>
</tr>
<tr>
<td>G3RJB</td>
<td>168</td>
</tr>
<tr>
<td>G3XYB</td>
<td>164</td>
</tr>
<tr>
<td>9HBL</td>
<td>163</td>
</tr>
<tr>
<td>G3PQF</td>
<td>161</td>
</tr>
<tr>
<td>G3VPS</td>
<td>135</td>
</tr>
<tr>
<td>G3WPO</td>
<td>103</td>
</tr>
<tr>
<td>G3XAP</td>
<td>95</td>
</tr>
</tbody>
</table>

*Note: Placings this month are based on the "Countries" Column. Claims must be made at least every three months to retain a place.*
power out from the shack if real success is to be achieved.

The HF Bands

As usual at this time of year, 14, 21 and 28 mc have all been very much daylight bands during the period under review. However, Twenty at least has shown rather more than the odd flicker of life during the evening hours, and just about every time this has happened at G3KFE, he has found the band dominated by an enormous signal from VP2VI. No less than three times this big signal plus the absence of any competition has provoked your conductor into firing up the machinery—and each visitor or a phone call!

Contests

Several to mention this time: We have already talked about WAB elsewhere, and here it only remains to say that they are running contests as well. Dates are as follows: HF Phone, March 15; HF CW, March 29; LF Phone, April 5; LF CW, April 12. All contests are for twelve hours, 0900 to 2100 GMT. Exchange RS(T), serial number, county, and WAB number. Overseas stations give RS(T) and a serial number. The U.K. multiplier is the sum of all the WAB areas worked plus the total DXCC countries worked, with VE, VK and W call areas each counting as separate countries. Logs to arrive with G3ABG or G4CP (QTHR) within fifty days of the contest. Entrants must declare that they have operated within the licence conditions and the Band-Plan. Details, if required, by contacting G4CP and G3ABG, with s.a.e.

RTTY enthusiasts should be aware of the Second WAE RTTY Contest, which is to run from 0001 April 25 to 2359z on April 26, with a total of twelve hours' rest taken in up to three periods during the contest. Call “CQ WAE” and exchange QSO number, RS(T), and time in GMT. A point for a contact in your own continent, three if he is in another continent. A multiplier based on WAE and ARRL countries lists—taking call areas as “countries” in the following territories: JA, PY, VE, VO, VK, W/K, ZL, ZS, UA9 and UAO—will be used plus another one for QTC-Traffic, a term which means much to the RTTY contest types but not much to the rest of us! However, all the details can be obtained from Ulrich Stolz, DJ9XB, D.597 Plettenberg, In der Ostert 3, West Germany.

The ARRL DX Contest usually takes the lid well and truly off the HF bands. This year we have Phone on February 7-8, March 7-8, with the CW sessions timed for February 21-22, and March 21-22. Each 0001 GMT Saturday, straight through to 2359 on the Sunday—real hairy-chested stuff! Stations outside send RS(T) plus a three-digit number indicating power. Deadline for all reports is April 10, to ARRL Communications Dept., 225 Main Street, Newington, Conn., U.S.A., 06111.

Advance warning now of the CQ WW WPX SSB affair, which plays off over the weekend April 11-12. Rules are as in previous years, with the exception that this year as an experiment double points accrue from QSO's made on 160, 80, and 40 metres. Don't forget that in this one it is prefixes, not countries, that count for multipliers, and that only thirty of the 48 hours may be used, rest periods being 18 hours in up to five periods.

Results, now, also from CQ. Last year's CQ WW WPX battle showed K4VIZ as winner of the single-band operator category, just to prove he is no one-band merchant. But, sadly, only a couple of U.K. stations anywhere in the lists, these two being G3NLY with the best single-band entry on Forty, and GM3VTB who came sixth on Eighty. Claimed scores—not results—for the CQ WW DX Phone and CW Contests for 1969 are also to hand, but the only G call noted anywhere, CW or Phone, is that of G2BW, sixth in line in the 28 mc single-band CW list. It baffles us why there are not more U.K. entrants for these Contests—as we know, large numbers take part!

Awards

One with a worthy object is the "Mayflower 70" which you get by working five stations in Plymouth, plus, if you are a G, five more in the county of Devon. The scheme is intended to benefit the Cheshire Homes Amateur Radio Fund, whose objects are to provide amateur-band gear at each of the Cheshire Homes, at first of course by way of a receiver. In effect, you pay for your certificate by a donation to CHARN Fund (cheques being made out to the Fund), while the work-and-worry is borne by the organisers. G3VUC, QTHR, is the man for details. This one is worth support even if you do not make a habit of wall-paper collecting.

This and That

A very hot-under-the-collar letter comes from G3YJD (Watford) who complains that DX stations encourage bad manners on the bands, in that operators who call in before the end of a QSO are given priority by the DX station, while those who wait in the queue get left in the cold. Fair comment, as far as it goes, but distinctly unfair to the DX chaps. Clearly, when a "DX station" is by modern definition not so much a long way off but rather a new country to the 'chaser concerned, what is DX to VE, VK and W call areas each counting as separate countries. Logs to arrive with G3ABG or G4CP (QTHR) within fifty days of the contest. Entrants must declare that they have operated within the licence conditions and the Band-Plan. Details, if required, by contacting G4CP and G3ABG, with s.a.e.

TOP BAND COUNTIES LADDER

<table>
<thead>
<tr>
<th>Station</th>
<th>Confirmed</th>
<th>Worked</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Phone and CW</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G2NJ</td>
<td>98</td>
<td>98</td>
</tr>
<tr>
<td>G3HDO</td>
<td>98</td>
<td>98</td>
</tr>
<tr>
<td>G2KU</td>
<td>96</td>
<td>96</td>
</tr>
<tr>
<td>G3WPO</td>
<td>95</td>
<td>94</td>
</tr>
<tr>
<td>G1WSS</td>
<td>90</td>
<td>92</td>
</tr>
<tr>
<td>G3VLX</td>
<td>81</td>
<td>97</td>
</tr>
<tr>
<td>G5XQ</td>
<td>76</td>
<td>83</td>
</tr>
<tr>
<td>G3XJ</td>
<td>63</td>
<td>88</td>
</tr>
<tr>
<td>G3XT</td>
<td>62</td>
<td>78</td>
</tr>
<tr>
<td>G3KFE</td>
<td>50</td>
<td>66</td>
</tr>
<tr>
<td>G3LD</td>
<td>37</td>
<td>65</td>
</tr>
</tbody>
</table>

| **Phone only** | | |
| G2NJ | 98 | 98 |
| G3TSL | 94 | 97 |
| G3WPO | 91 | 90 |
| G3GB | 84 | 95 |
| G3POF | 81 | 92 |
| G3JX | 39 | 67 |
| G3WSS | 44 | 59 |
| G3NP | 17 | 62 |

(Failure to report for three months entails removal from the Table. Claims may be made at any time. Six months of "Nil" reports will also result in deletion.)
ever to G3YJD, and only of mild interest to G6FO—but in any case will be extremely popular with some of the 300,000-odd licensed amateurs in the world. If only fifty are calling him—a relatively low degree of popularity—the DX station will be working them most likely at the rate of one every couple of minutes; in other words he is going to pick whichever caller is on his listening frequency and is heard through the rumpus. But if all fifty callers sit and each wait for the other 49 to work the guy—none of them ever get a QSO! Surely the point is that calling on the correct frequency is the thing; and if the DX has in fact registered your presence because you have called on the right frequency, then you will certainly get your QSO, but if he hasn’t, then you won’t. Ergo, you call him on the right frequency; then you time the call to the right moment for him to be listening for a call, and no other; it is a question of timing alone, and calls for sharp responses and an understanding of what the DX is doing. After all, the DX station almost invariably “cuts down to size” anyone making a real nuisance of himself—but 90% of the calls to him are slightly mistimed and raise no response. Agreed, a DX operator who fails to control the pack is clearly not competent—but he doesn’t stay that way for long! The only advice one can give is for an aggrieved one to sit in on the sharp-end of a king-sized pile-up for a few hours, and then marvel at the DX operator’s forbearance!

Changing tack a little, a welcome note from W6AM (Long Beach, Cal.) encloses some historical information on Don’s set-up over the years. His first Phone station was an arc job, about 1912, using the call 60C with an aerial that ran over three sets of 2200-volt power lines! 1919 saw about 1912, using the call 60C with the first Phone station was an arc job, Don’s set-up over the years. Agreed, a DX operator who fails to control the pack is clearly not competent—but he doesn’t stay that way for long! The only advice one can give is for an aggrieved one to sit in on the sharp-end of a king-sized pile-up for a few hours, and then marvel at the DX operator’s forbearance!

Ten Metres

After the diversion, back to the matter in hand. G3NOF found a few ZS’s around 0900, followed by VK about 1100, with N. America in the afternoons until the closure near 1700; this was followed by the odd re-opening at 1800z. SSB QSO’s were registered with AX3VK, FL8MB, W8BP, W7XEE, all U.S. call areas other than W7, ZS, and 9J2ED.

Trials at G3VLX of the new rig with a W3DZZ-type trap dipole resulted in SSB contacts with W, UB5, VU2, 9J2, 5N2, and G(!) to start the score rolling.

G2DC looked, as always, mainly at the CW end, where the band was opening to the East around 1000 and to VK most days at 1100. AX2BPW, VK2FZ, MP4BBA, VK8HA, VK9GN, PY1HO, UF6FE, ZE1DC, ZS1EJ, all W call areas and VE1-4. Jack was a little startled at the collection of odd prefixes that came his way as, for example, AX(VK) Cook Bicentenary; CV, which is CX in a new shirt; and 4M5 for YV.

Putting up a 28 mc dipole to give a contact with a friend produced a couple of interesting QSO’s for GW3UUZ. The first CQ raised W8JK on AM and resulted in a most interesting matter about Aerial Theory and Practice with the author of the standard textbook on this subject; real “horse’s mouth” stuff. The second try raised K4JXZ for a new State.

Keep a look out on 28-028 CW for the QRPP signals from G3XBY (Wombourne) who has a couple of BC-109’s in the PA to take 500 milli-watts. With this he has raised UA1DV at 449, and G3TCK at 549. However, being crystal-controlled is a bit of a snag, and Dale would appreciate reports. With the big rig, Sideband yielded JW1CI, VP2AC,
XW8BP, ZC4AK, ZE, ZS, 5Z4LS, 6W8AL and 7Q7JG.

QSL Matters
A few points of interest crop up in the "DX-pedition of the Month" Bulletin, to hand from W2GHK. First, the question of care in getting time right on the QSL card—a surprising number of people get snarled up by keeping the shack clock on local time. Stay with GMT—and licence conditions!

In the case of contest QSO's, the band and serial number of the QSO are a help. W2GHK points out the need for an s.a.e. for each and every card for which direct return is desired, for the simple reason that DOTM cards are handled by several volunteers from various locations, which confuses the issue no end if you want to get several cards into one envelope. Another good reason is that if one of the cards you want in that envelope is for a station who has been a bit tardy in sending in logs, then the whole batch are hung-up waiting the late arrival. However, DOTM have no objections to Bureau cards, and deal with all cards from the Bureaux, sending return cards the same way, as also they do for direct cards without s.a.e. or IRC. Incidentally, a 4 x 9½-inch envelope, stamped and self-addressed, will result in a copy of the next DOTM Bulletin if you want it. Address is: P.O. Box 7388, Newark, New Jersey, 07107, U.S.A.

Some other addresses: G3XTJ quotes VP2MU as being via VE2YU, and OJ0MR via OH2NB. From G3NOF we have TF5TP via DL7FT; PJ7IC through VE3EUU; CN8DW to W6GZI; all VP2V's via VE3ACD; HL9UZ to WA2FRW; HL9VL to WA7KSD; XW8BP to DL7FT; CT2AK to VE7BWG; VP9BK to VE2DCY.

Fifteen Metres
Of course, for this band it is usual to think of GM3JDR (Golspie) who has been exclusively on 21 mc for a long time now. Activity has been down somewhat in that Don has been packing up for a move over to Ackengill, Wick, Caithness—if he gets much further North, he will fall off the end! However, the new place is country so no TVI troubles should arise, and there is lots of room to lay out an aerial farm. This should, in due course, result in operation on all bands from Ten to Top Band. Only one DX SSB contact was registered during the month, with ZS5IQ, but CW came up with IR0XPS, YT2OR, KZ3MR, KP4DXW, 9HIAY, VK5DS, PY1DF, 9H1AZ, ZB2BO, TJ1QQ, SU11M, 4Z4SG, PY7VMT, UA9BZ, VK6SA, UH8KAA, all W call areas except 6 and 7, and the same areas for Novice calls. (Incidentally, if you are on CW, don’t forget to look for the U.S. Novices.)

At G3NOF the pattern has been rather what one would have expected for the time of year, and SSB QSO's ishied up out of the sludge included FG7XX, G3WLV/ VP5 (S. Caicos), HP9FC/MM, JA's, KR6HX, KR6KS, KR8CA, OJ0MR, VS6BE, VS6DO and VK's. Don has a new case of TVI on his hands, thanks to a neighbour, who previously was clear, buying a transistorised receiver. This problem possibly accounts for G3VLX not having given the band such a work-out as he has the others, two QSO's only making a W and SV1BN.

However, G2DC reckons 21 mc to be the best of the boiling for good all-round DX with tolerable QRM levels. Jack finds it often pays to hang on when the band appears to be dying out in the U.S., as often some good QSO's may then be racked up with South Americans. G2DC worked CW with OJ0MR, OA, CX, LU, PY, VK's assorted, TJ1QQ and XW8AX.

CW on 15m. produced only PZ1AV and VS6AA for G3XBY, but ZL3JO, TF2WLS, OJ0MR, and K4CQF/MM registered on Phone with him.

Twenty
Some say Good Old Twenty—some say the other thing! It could almost be summed up as DX-in-Daylight and Nix-by-Night—although, as hinted, the evenings were sometimes quite interesting with North Americans, Caribbean, and South Americans, the odd weak—very weak at G3KFE!—VK, 7Z3AB working a YV and disappearing at the mere smell of a call from the U.K. and other oddities showing up in the teeth of the comb.

G2DC describes 20 metres as "boisterous" during daylight hours, with all-round DX to be found. For him, OJ0MR was a new one on this band, and ZM1AT/K on the Kermadecs, who said he would be there for a while and gave the best times for U.K. contacts as 0730-0800z via long path, his favoured frequencies being 14030 and 14195 kc.
Aerials of all shapes and sizes pop up at GW3UUZ, and Andy used a 270-foot end-fed at 90 feet to raise VU2OLK for a new country.

G3NOF found the mornings pretty unproductive, the openings to VK/ZL being poor and of short duration, but W6 and W7 have been pretty strong around 1700z, with evening openings to Central and South America. CE60AE, DU1FH, FG7TH, FP8CS and HL9VL all escaped, but Don did manage to bring in HL9UZ, JA's, OJ0MR, TA2SC, TU2CS, VE4ZX, VE6AO, VE7AAD, VE7BD, VK's, VP2Vl, VP8KD, VP8KO, W6's, W7AAD, W7BBH, W7BTH, W7CHZ, W7LFA, ZL and 9Y4AA.

G3XBY rang up his first 100 countries on Twenty by raising GM3JUD on CW, a method which also turned up PJ2VD. Sideband gave VP2Vl.

**Forward Planning**

February 8 is the start timing for TI9CI to be in business for about five days; there is a rumour that the lads plan to go on to Roncador Cay and operate from there as W9FIU/KS4B. W4AMG/Spratly will probably be all over by the time this is in readers’ hands, Jens being accompanied by operators of the calibre of HS3DR, VS6AA, VS6BF and VS6DR. From there Jens has ideas about activating several rare spots with the help of his yacht Exodus. Cards, and donations after the trip to help finance the next one, to P.O. Box 16321, Hong Kong accompanied, in the case of cards, by an s.a.e. and five IRC’s. This is only one of the boats which, if plans for 1970 all mature, will be out. Another, *Mia Mia*, is already fitted up with Yaesu (Sommerkamp) transceiver and linear.

Keep tabs on TJ1QQ, as it is believed Herman will shortly be on from Fernando Poo, with the new prefix 3CIQQ—cards to W4DQS for this one. Qatar is coming up soon—latest information suggests February 21-27, with OD5BZ and various other operators. Cards should be sent to MP4BHH, with s.a.e. and IRC.

**Sign-Off**

That’s it once again; deadline for next time is February 9 for the March issue, with March 9 for April. Address, as always, your letters to: “CDXN,” **SHORT WAVE MAGAZINE**, BUCKINGHAM, and if you can get your table entries in early, please do so. Thanks! 73 de G3KFE.
VHF BANDS

A. H. DORMER, G3DAH

The comment about conditions last month might well be repeated. With the exception of a couple of very minor lifts, which brought propagation up to the height of terrible, the bands have been very unstable. Pressures from Christmas up to the first week of January showed maxima and minima of 1022 to 1000 mb, but the bad weather from January 8 until January 14 coincided with a drop to just over 990 mb, and activity and DX went with it. At least the Quadrantic meteors in early January did some good for M/S operators. It was instructive to note that under these poor tropo. conditions, it was the well-modulated signal which was getting the contacts. It was instructive to note that under these poor tropo. conditions, it was the well-modulated signal which was getting the contacts. It was instructive to note that under these poor tropo. conditions, it was the well-modulated signal which was getting the contacts. It was instructive to note that under these poor tropo. conditions, it was the well-modulated signal which was getting the contacts. It was instructive to note that under these poor tropo. conditions, it was the well-modulated signal which was getting the contacts. It was instructive to note that under these poor tropo. conditions, it was the well-modulated signal which was getting the contacts. It was instructive to note that under these poor tropo. conditions, it was the well-modulated signal which was getting the contacts.

The second step really provided the answer to the problem. A number of operators were asked how they went about sending and requesting QSL cards, and it soon became apparent that the fault lay frequently in the method adopted. Some failed to appreciate that many, if not most, active amateurs of long standing are no longer interested in sending and receiving QSL cards—except those of particular value, perhaps for an outstanding piece of DX or a rare county or country—and that unless they are asked for a card, do not automatically send one for all contacts. After all, this can be an expensive and time-consuming business. For example, G3DAH has worked over 700 new stations during the last eighteen months. So, if a card is required in confirmation of a contact, a request for one should be made during the QSO and then followed up with one's own.

Then there is the QSL direct. It appears that many operators wanting a particular card have assumed that because they have sent a card direct, they will automatically get one back the same way. Consider the case of the DX-pedition where a hundred and more contacts are made from some rare spot. Most of the stations contacted will want a QSL card, and the cost of sending these out by post, to say nothing of the cost of the cards themselves, may be more than Club or private funds should be asked to bear. So, if a card is wanted urgently, send one direct by all means, and more contacts are made from a particular QTH is now: G5/3 calls, the visitor's home call should also be included. Similarly, stations with special calls should lodge particulars of their home call and address with the relevant QSL bureaux. There seems to have been a spot of bother with Belgian amateurs and their QSL bureau, as a result of which the incorrect address has been inserted in certain publications. The correct QTH is now: UBA QSL Bureau, PO Box 634, Brussels 1.

Buooy

The VHF beacon at SM4UKV has been withdrawn from service and will not be reinstated. The Swedish authorities are considering the installation of two new beacon stations,
SK1VHF on the island of Gothland, and SK2VHF in the neighbourhood of Umea in Northern Sweden. Further information as it becomes available. The Max Planck Institute beacon, SM4MPI, continues to be heard in this country and is a very good indicator of propagation towards Scandinavia. Frequency is 145.96 mc with a power of 150 watts, and although the antenna is headed 330° it seems to have a good side-lobe into the U.K.

The Radio Society of Rhodesia has been advised by the Ministry of Posts that the 50-54 mc band is withdrawn from amateur use as it is required for TV. There has been no activity on 50 mc since December 1969, and hence no 2E1AZC beacon, although the 70 mc installation is still operative.

The ZB2 beacons are to be moved to Iceland following the withdrawal of permission for operation on the Rock. Frequencies will be 145-129 mc and 70-275 mc and operation will be continuous. To those who raise an eyebrow at the frequencies, which do not accord with the new Region 1 Plan for beacon operation, the answer is that they are to be Government sponsored and are not, therefore, required to conform. The third beacon will be on 50-099 mc and operation will be restricted to outside the limited number of TV hours in Iceland.

The Sutton Coldfield 70 cm beacon should shortly be showing on 433-5 mc with the callsign GB3SC.

GB3SX is on 70-699 mc during tests and will ultimately be set up at Crowborough, Sussex. Permission is being sought for two beacons in the 23 cm band, one probably in Bucks. and the other on the South Coast.

Australis "Oscar 5"

The date for the launch of this satellite goes back and back. The latest forecast is now January 19, so by the time these notes appear it may well be up there. Just to recall the salient features: This is not a transponder, but carries a beacon operating continuously on 144-050 mc with a power of 50 milliwatts. It will have a retrograde orbit with a period of about 115 minutes and an inclination of 101-6°. Reception of the signal should be possible using standard amateur equipment, although the interpretation of the telemetry will

---

**FINAL ANNUAL THREE BAND TABLE**

*January to December, 1969*

<table>
<thead>
<tr>
<th>Station</th>
<th>FOUR METRES Countries</th>
<th>TWO METRES Countries</th>
<th>70 CENTIMETRES Countries</th>
<th>TOTAL pts.</th>
</tr>
</thead>
<tbody>
<tr>
<td>G3DAH</td>
<td>25</td>
<td>70</td>
<td>16</td>
<td>139</td>
</tr>
<tr>
<td>G3COJ</td>
<td>15</td>
<td>60</td>
<td>3</td>
<td>125</td>
</tr>
<tr>
<td>GB8MD</td>
<td>—</td>
<td>58</td>
<td>9</td>
<td>112</td>
</tr>
<tr>
<td>G2JF</td>
<td>—</td>
<td>60</td>
<td>14</td>
<td>110</td>
</tr>
<tr>
<td>EI6AS</td>
<td>29</td>
<td>55</td>
<td>12</td>
<td>103</td>
</tr>
<tr>
<td>G3LAS</td>
<td>26</td>
<td>49</td>
<td>11</td>
<td>103</td>
</tr>
<tr>
<td>G8AUE</td>
<td>—</td>
<td>44</td>
<td>5</td>
<td>98</td>
</tr>
<tr>
<td>G8ATS</td>
<td>—</td>
<td>43</td>
<td>7</td>
<td>97</td>
</tr>
<tr>
<td>G3EHM</td>
<td>—</td>
<td>56</td>
<td>11</td>
<td>94</td>
</tr>
<tr>
<td>G2AXI</td>
<td>28</td>
<td>41</td>
<td>8</td>
<td>91</td>
</tr>
<tr>
<td>G3EKP</td>
<td>34</td>
<td>24</td>
<td>6</td>
<td>84</td>
</tr>
<tr>
<td>G8APZ</td>
<td>—</td>
<td>47</td>
<td>8</td>
<td>80</td>
</tr>
<tr>
<td>GD2HDZ</td>
<td>—</td>
<td>50</td>
<td>7</td>
<td>78</td>
</tr>
<tr>
<td>G15ALP</td>
<td>14</td>
<td>45</td>
<td>10</td>
<td>75</td>
</tr>
<tr>
<td>G8AYN</td>
<td>—</td>
<td>33</td>
<td>6</td>
<td>69</td>
</tr>
<tr>
<td>G8BYV</td>
<td>—</td>
<td>28</td>
<td>9</td>
<td>67</td>
</tr>
<tr>
<td>G8BWW</td>
<td>—</td>
<td>54</td>
<td>10</td>
<td>64</td>
</tr>
<tr>
<td>G8ADP/A</td>
<td>—</td>
<td>36</td>
<td>6</td>
<td>64</td>
</tr>
<tr>
<td>G3OHH</td>
<td>51</td>
<td>6</td>
<td>—</td>
<td>57</td>
</tr>
<tr>
<td>G8AUN</td>
<td>—</td>
<td>43</td>
<td>11</td>
<td>54</td>
</tr>
<tr>
<td>G8CEZ</td>
<td>—</td>
<td>45</td>
<td>8</td>
<td>53</td>
</tr>
<tr>
<td>G3TDH</td>
<td>46</td>
<td>6</td>
<td>—</td>
<td>52</td>
</tr>
<tr>
<td>G8ABA</td>
<td>—</td>
<td>41</td>
<td>7</td>
<td>48</td>
</tr>
<tr>
<td>G8BJK</td>
<td>—</td>
<td>39</td>
<td>6</td>
<td>45</td>
</tr>
<tr>
<td>GW5NF</td>
<td>—</td>
<td>37</td>
<td>8</td>
<td>45</td>
</tr>
<tr>
<td>G8APJ</td>
<td>—</td>
<td>26</td>
<td>6</td>
<td>42</td>
</tr>
<tr>
<td>G8ASR/A</td>
<td>—</td>
<td>35</td>
<td>6</td>
<td>41</td>
</tr>
<tr>
<td>G8BC</td>
<td>—</td>
<td>34</td>
<td>6</td>
<td>40</td>
</tr>
<tr>
<td>GC8A/azP</td>
<td>—</td>
<td>35</td>
<td>5</td>
<td>40</td>
</tr>
<tr>
<td>G3AHB</td>
<td>—</td>
<td>24</td>
<td>4</td>
<td>37</td>
</tr>
<tr>
<td>G8BKR</td>
<td>—</td>
<td>21</td>
<td>3</td>
<td>36</td>
</tr>
<tr>
<td>G8BDJ</td>
<td>—</td>
<td>23</td>
<td>6</td>
<td>35</td>
</tr>
<tr>
<td>G3KMI</td>
<td>12</td>
<td>14</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>GW8CGN</td>
<td>—</td>
<td>26</td>
<td>4</td>
<td>30</td>
</tr>
<tr>
<td>G8ARM</td>
<td>—</td>
<td>23</td>
<td>5</td>
<td>28</td>
</tr>
<tr>
<td>G8CZD</td>
<td>—</td>
<td>17</td>
<td>3</td>
<td>20</td>
</tr>
</tbody>
</table>

Above shows final placings for the year 1969. The new Annual Table opened again w.e.f. January 1, for which entries are invited and should be made immediately to: "VHF Bands," SHORT WAVE MAGAZINE, BUCKINGHAM. This Table will run for the period January-December, 1970, and from time to time will be broken down by bands. All VHF operators are asked to send in claims as often as possible, so that the Table can be kept up to date.
**FINAL 23 CM ANNUAL TABLE**

*January to December, 1969*

<table>
<thead>
<tr>
<th>STATION</th>
<th>COUNTIES</th>
<th>COUNTRIES</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>G8AUE</td>
<td>14</td>
<td>2</td>
<td>16(Also 1:1 on 13 cm)</td>
</tr>
<tr>
<td>G8ARM</td>
<td>7</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>G8ADP/A</td>
<td>5</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>G8BAV</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>G8AYN</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

This Table shows the final placings for 1969. The new Table started from January 1 and runs till December 31, 1970. Claims should be sent in to: "VHF Bands," SHORT WAVE MAGAZINE, Buckingham.

require something rather more sophisticated. Further details will be published when the exact orbit parameters have been established. (Readers who want additional information are referred to "VHF Bands" for July 1968.) Be it noted that Bill Browning, G2AOX, QTHR, is the U.K. co-ordinator for the project, and that the special reporting forms, which are a must, can be obtained from him on receipt of an s.a.e., but please make it foolscap size.

**VHF Annual Tables**

Overall winner this year turns out to be your scribe with a lead of 14 over the runner-up, G3COJ of High Wycombe, Bucks., who will receive a substantial margin. Thanks go to all readers who have supported this feature during the year. The New Tables start from January 1st, 1970, so please send in your claims regularly. It would be of interest to see more entries for 23 cm.

**The New Band Plan**

Although it is perhaps early days yet to comment in detail on the impact of the new VHF Band Plan, there are a couple of points which are worth making. The first is that one still hears phone in the CW segment of 144-0 to 144-15 mc. This has not been noted on Four or 70 cm. How much is ignorance and how much deliberate one cannot know. However, for those who have not yet re-crystallised, but who would like to, the facility of a crystal exchange through this Column is still open.

The adoption of a Modulation Index of 1 for NBFM operation has caused some criticism since, as pointed out in this Column in October last, this index is not a constant. The IARU Region 1 Bulletin for December 1969 throws further light on the subject by suggesting that the Deviation Ratio should have been specified rather than the Modulation Index. The intention of the Brussels Conference in May 1969 was that a standard should be specified such that NBFM really was narrow-band (NB). This the use of the Modulation Index did not do. A specified Deviation Ratio of 1 (unity) does, however, produce the required answer, since the definition of this constant is that it is equal to the maximum deviation under full modulation divided by the maximum audio frequency permitted—so, with a maximum audio frequency of 3 kc and a deviation ratio of 1, the peak deviation will be 3 kc, the standard required. Since the average male voice does not carry significant amounts of the higher audio frequencies, the difference in bandwidth radiated by an NBFM system with a deviation ratio of 1 and an audio of 3 kc, and the equivalent AM transmission, is barely detectable. So, Deviation Ratio of 1 it should be.

In addition to the method for setting up an NBFM system outlined in "VHF Bands" for October 1969 (p.507), the following is a useful alternative: From the usual Bessel function curves for FM transmission, it will be noted that at certain values of modulation index the carrier amplitude reduces to zero and then reverses phase. The first of these zero points occurs at B = 2.4. Dividing the audio frequency of 3 kc by 2.4, one gets 1.25 kc. If, therefore, an audio signal generator is set to this frequency at an output level equal to the speech output from the microphone in use, and is then used to modulate the FM system while observing the carrier level on a selective receiver, it will be found that as the audio gain is advanced a point will be reached at which the carrier level, as shown on an S-meter, say, will reduce to zero, and this setting represents the correct deviation ratio. Since speech is not a pure tone, this procedure can only give an approximate answer but, in the absence of a deviation meter, can be regarded as accurate enough. Tailoring the audio response of the modulator by speech compression, clipping and filtering, will considerably improve the efficiency of the system.

Finally, to remind readers of the details of the new Band Plan, the Table opposite sets out the salient features.

**VHFCC Awards**

Awards this month go to Mike Gibbins, G3FDW, a very well-known operator on four metres; to G8CAJ, Richard Flowerday; and to Robert Hooper, G3WEV, the two latter for their work on two metres. Congratulations to them all.
**The Short Wave Magazine**

**Volume XXVII**

G3FDW operates from Retford in Notts, and has a QSL return rate better than any reported so far. Out of the 69 English counties worked, he has QSL's from 58 of them, which is pretty good going. All contacts were made with SSB, CW or NBFM, as Mike does not usually work AM. Details of his station appeared last month.

From Harlesden in North London, G8CAI gains the two-metre Award with a QSL return rate of about 75%. The QTH is 100ft. a.s.l. with an excellent take-off in all directions except around North, where he gets screening from the house, but this is shortly to be remedied by raising the 8-element Yagi from 27ft. to 38ft., with the eight-over-eight slot for 70 cm at 42ft. Most contacts have been made with a QQQV06-40A PA running at 50 watts input, and modulated by a pair of 5B/254M's in Class-ABI, although a 15 watt rig having a QQV03-10 as the output stage was also used for part of the time. The receiver is a home-built transistor double conversion superhet with a tunable IF of 16-18 mc, the first stage being a 2N3819, but again, for part of the time, an R.1155 was used with an FET converter. It looks as if Richard has found plenty of time for construction as well as for operating. The latest project is a two-metre Tx with a BLY33 in the PA.

Bristol is the QTH from which G3WEV gains his Award. A black spot for VHF, he says, although one must remark that this is not so for everyone—look at the way G6GN gets out! The gear used was a TW2 transmitter to a six-element beam at 25ft., the receiver being a JXK converter to a Heathkit RAI. The QSL return rate was initially 55% all contacts being QSL'd direct, and a further reminder card raised this to 75%. Bob does not say if he sent an s.a.e. with all the cards, but if he did, someone is being a bit mean.

**D - o - t - i - c - a**

Both G3LTF and G3CCH achieved some excellent DX during the Quadrantids meteor shower at the beginning of January this year, and for those who would like to have a go at this method of VHF transmission, the Table opposite gives some details of the predicted meteor showers for the remainder of this year. Best time is usually very early morning, before 0600 hrs. local.

Readers of this Column in the December 1969 issue will have seen the reference to the outstanding achievement of G3LTF (Chelmsford, Essex) in working no less than five OH stations during the opening to Scandinavia during October last. Further details of this success are now to hand. The stations worked were: OH0AA, OH3TF, OH2GY, OH2NX and OH3RG, all between 2000 and 2130z on the night of October 19. Signal strengths varied between RST 539 and RST 579 for all contacts. At 2130, OH2AA had climbed to RST 599! To put this into quantitative terms, the signals were about +10 dB over noise in 500 c.p.s. bandwidth. Peter followed these QSO's with contacts with SM3, 4, 5 and 6, and from an examination of the QRA Locators given, it looks as if the ten contacts gave an average range of some 1,100 miles. His best-ever DX contact on extended tropo propagation on two metres remains that with UA1DX in Leningrad.

**THE VHF/UHF BAND PLAN**

<table>
<thead>
<tr>
<th>Four Metres</th>
</tr>
</thead>
<tbody>
<tr>
<td>70-025 to 70-1 mc</td>
</tr>
<tr>
<td>70-1 to 70-7 mc</td>
</tr>
<tr>
<td>70-675 to 70-7 mc</td>
</tr>
<tr>
<td>70-26 mc</td>
</tr>
<tr>
<td>70-56 mc</td>
</tr>
</tbody>
</table>

* * *

**Two Metres**

| 144-0 to 144-15 mc | CW only. |
| 144-15 to 144-5 mc | SW Zone A. |
| 144-5 to 145-1 mc | SE Zone B. |
| 145-1 to 145-5 mc | Midlands Zone C. |
| 145-5 to 145-95 mc | North Zone D. |

**70 Centimetres**

| 432-0 to 432-1 mc | CW only. |
| 432-1 to 432-2 mc | Zone 1. |
| 432-2 to 432-3 mc | Zone 2. |
| 432-3 to 432-5 mc | Zone 3. |
| 432-5 to 432-7 mc | Zone 4. |
| 432-7 to 432-9 mc | Zone 5. |

* * *

On November 16, G3LTF had a M/S QSO with OY2BS via the Leonids. It took about 1 1/2 hours to complete, and peak signals were up to 30 dB over noise in 100 c.p.s. He has recently been hearing W1FZJ /KP4 on two-metre E-M-E, having rigged up a couple of crossed 10-ele Yagis for the purpose, since nearly all his E-M-E work these days takes place on 70 cm, with a dish antenna. Just before Christmas he was copying the KP4 at 8-10 dB over noise in 100 c.p.s. bandwidth. The signals were also readable in 500 c.p.s. The receiver for Two is the usual TIS34 cascode job, with a noise figure of about 1-5 dB. The line loss is only 0-7 dB! G3LQR also heard W1FZJ on December 24. The American station has now had QSO's with SM7BAE, who uses 16 10-element Yagis; with K2CBA; and with W1MX, who has 16 × 3 Quads. Incidentally, SM7BAE has had his 7th E-M-E QSO with ZL1AHR; the latter copied SSB during the last exchange.

**Major Meteor Showers—1970**

<table>
<thead>
<tr>
<th>NAME</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aurigids</td>
<td>February 5-10</td>
</tr>
<tr>
<td>Bootids</td>
<td>March 10-12</td>
</tr>
<tr>
<td>Lyrids</td>
<td>April 22</td>
</tr>
<tr>
<td>ETA-Aquarids</td>
<td>May 5-7</td>
</tr>
<tr>
<td>Arields</td>
<td>June 4-11</td>
</tr>
<tr>
<td>Zeta-Pereids</td>
<td>June 5</td>
</tr>
<tr>
<td>Beta-Taurids</td>
<td>June 27-July 3</td>
</tr>
<tr>
<td>Delta-Aquarids</td>
<td>July 29-August 2</td>
</tr>
<tr>
<td>Perseids</td>
<td>August 13</td>
</tr>
<tr>
<td>Cygnids</td>
<td>August 16</td>
</tr>
<tr>
<td>Orionids</td>
<td>October 19-23</td>
</tr>
<tr>
<td>Taurids</td>
<td>November 5</td>
</tr>
<tr>
<td>Leonids</td>
<td>November 17</td>
</tr>
<tr>
<td>Geminids</td>
<td>December 13</td>
</tr>
<tr>
<td>Ursids</td>
<td>December 23</td>
</tr>
</tbody>
</table>

* * *

**THE VHF/UHF BAND PLAN**

**Abridged Version**

| 432-9 to 433-1 mc | Zone 6. |
| 433-1 to 433-3 mc | Zone 7. |
| 433-3 to 433-5 mc | Zone 8. |
| 433-5 to 433-7 mc | Beacons. |
| 433-7 to 433-9 mc | RTTY International and UK North. |
| 433-15 mc | RTTY UK South. |
| 432-6 mc | SSB calling channel. |
| 432-15 mc | SSB calling channel. |

* * *

23 Centimetres

| 1297.95 to 1298 mc | CW only. |
| 1296 to 1296.15 mc | All modes. |
| 1296.15 to 1297.95 mc | Beacons. |

* * *

23 Centimetres
SWL James Clay, of Margate, Kent, has just received confirmation of his reception of a couple of choice ones back in August 1969. These are YU2OB and HG5AIR, both on two metres. James has a 4-ele beam at 23ft. from a QTH 100ft. a.s.l. The receiver is a 6CW4 converter into a CR-100.

General News

The wall version of the QRA Locator Map is available from SHORT WAVE MAGAZINE, 55 Victoria Street, London S.W.1, price 9s. The South Bucks. VHF Club have arranged a talk on amateur television for their next meeting at Bassetbury Manor, High Wycombe, on Tuesday, February 3. Time is 8 p.m.

G8AYN (New Addington, Surrey) is temporarily off the air on 23 cm., while rebuilding the tripler stage of the transmitter. G8BCN (Clacton-on-Sea, Essex) seems to have completed a long building session. On 70 cm. he now has 24 watts into a QQV03-20A and a home-built, 24-element, long Yagi, with which he has worked seven OZ's. On two metres a QQV03-10 with 12 watts DC input feeds a 10-ele home-built Yagi, and he is now equipped for 23 cm. transmission using a 2C39A tripler running at 20 watts. The antenna is a 41ft. parabolic dish at 25ft. A converter for 23 cm. is under construction, and should be ready shortly. Meanwhile, contacts are being made with one borrowed from G8ATL. RTTY equipment is also installed, complete with reperforator and tape distributor, the TU being a DL6EQ type.

G3JHM (Winchfield, Hampshire), G3JVL (Hayling Island, Hants.) are two of those operators who have taken up the challenge of spanning the Atlantic by 50/70 mc skeds with VE3AI0 in Ontario. It appears that there is a rare form of "forward Aurora" which should make such contacts possible between TF3 and VE and, if the Curtain moves far enough to the South, between G and VE. Arrangements are being made for the TF3 beacon aerial pattern to have a lobe in the general direction of W/VE, and the integrated logic keying unit constructed by G3JVL will shortly be shipped to Iceland. Incidentally, for those who are going to have a shot at this DX, please keep the keying speeds down to 10-15 w.p.m., as VE2AI0 uses a phase lock receiver and integrating detector. His Tx power is 1 kW to multiple stacked Yagis. (P.634, December, refers.)

A meeting has been arranged for 2.30 p.m. on February 14 at the Imperial College of Science and Technology, in South Kensington, London S.W.9, to form specialist groups to handle aspects of the TRIDENT project. Papers on this subject will be presented and future plans discussed. Representatives of VHF Groups are particularly welcome, and should contact G3JHM, QTH, for further details.

G3JHM is planning a DX-pedition this summer and would like to hear from interested parties which counties are most in demand on four metres. Lawrence Woolf has now dropped his /P call and becomes GC8AAZ, in permanent accommodation at 57 Elizabeth Avenue, St. Brelade, Jersey. The gear is not finally set up yet, and only local contacts are being made at present but, shortly, a ten-element array for two metres and a multi-beam for 70 cm. will be in use, and Lawrence will be back in the DX business again. Future plans are for SSB on both bands, and, ultimately, video. For those who want a QSL card direct, don't forget that one cannot now send an s.a.e. to the Channel Islands with an English stamp; it will have to be IRC's.

G51ALP in Londonerry is looking for Sunday morning skeds on two metres. He continues to get good results over the 285-mile path to G3CCH in Scunthorpe, mostly on SSB, but CW is used when conditions are poor, and he would welcome other long-distance contacts on a regular basis. He now has his collinear array back up, with added directors to give it a gain of some 15 dB over a dipole. Jack is also interested in M/S contacts. Oversea journals please copy!

If Bill Jarvis, G8APX, can get the necessary authority, he will be operating mobile from the Rannoch to Kings Cross train on the evenings of February 2 and 3. Transmission will be A3 on 144-88 mc, so for those who have not yet had a QSO with a train, here is your chance.

How to sell a receiver! G8BMI (Keighley, Yorks.) was working a station who was on SSB, and was having some trouble copying this mode. The QSO was terminated. Came a knock at the 'BMI door. Other end of the QSO was there. Do you want to buy a decent receiver? Yes! Well, get a crane, I have an
AR88 in the car outside. Sale completed and both parties satisfied.

G8AYC/G6ADK/T (Gillingham, Kent) has been putting out some good video and is now planning a colour set up. A recent interesting QSO took the form of a three-way video-and-audio contact with G2WJ/T and G6NOX/T, both in Essex, all stations being on separate frequencies. This may be the first time that this sort of hook-up has been successfully achieved.

Good news for listeners south of the Midlands: G2JF (Ashford, Kent) will now be reading the Sunday morning news bulletins on 145.1 mc. Transmissions are timed at 10 a.m. beaming North, and 10.30 a.m. beaming West.

The venue for the 1970 Scottish VHF Convention has been announced as Dundee. Date and further details will be published here as they become available.

It appears that there may be another G3BA trip to Eire at the end of May. Recalling previous successful forays, this will be one to underline in the diary.

His many friends will be sorry to hear that GD2HDZ has been laid low with influenza followed by pneumonia, and that the shack has therefore been out of bounds to him for some time. However, Arthur is well on the way to recovery now and hopes soon to be back on the two-metre and 70 cm. air.

The absence of G8AUE from the bands recently is explained by his QSY to Farm Close, Pentrich, Derbyshire. The take-off is good all round from the 500ft. a.s.l. site about 14 miles north of Ripley, so his signals on VHF and UHF should be just as good as they always were from Shottle.

Contests

Propagation during the two-metre SSB contest on January 12 was very poor. Not only was there little DX over 150 miles, but what there was, was degraded by heavy QSB. G3GZJ (Redruth, Cornwall), to whom congratulations on winning the previous event, was heard working into the two-metres with considerable difficulty, and G13KXP and E6AS were both on, but barely readable, even by G3BA! Under these conditions it is difficult to make an assessment of the activity level, but from the scores being passed towards the end of the contest, an inspired guesstimate might be that it was down compared with previous events.

Conditions during the 70 cm. Cumulative Contest on Friday, January 16, were very poor indeed and by half-way through the event activity was down almost to vanishing point.

Forthcoming contests are: February 8—70 mc Fixed Station; February 11—432 mc Cumulative; March 3—432 mc Cumulative.

Deadline

Deadline for the next issue is February 7. The address for claims, news and comments is: SHORT WAVE MAGAZINE, BUCKINGHAM. Cheers for now and 73 from G3DAH.

Late Flash: Reference p.757, we are glad to be able to report that Australes Oscar 5 was fired at 1131z on January 23, and achieved orbit successfully. The first U.K. "sighting report" was by G3DAH, Herne Bay, who logged the tracking signal on 144.050 mc at 1244z, lasting till 1307, when the satellite dipped below our northerly horizon. His beam heading was from SE round to NW, and signal strength varied from S2-S5.

At the moment of writing, it is not possible to give orbit predictions, as this reception was on the first pass—however, if you hear a cheeping hi-hi signal, with varying tones, that will be it. Editor.

MEMBERSHIP OF THE I.T.U.

There are now no less than 137 nations who are members of the International Telecommunications Union, Geneva, the world authority for the control and government of all radio and telecommunications traffic, including international landline circuits, marine communication and all the rest. It is through the I.T.U. that frequencies are allocated and at the present time there is heavy pressure by the emergent countries for exclusive channels on all bands, HF and VHF. In fact, the allocation of exclusive frequencies is not now practicable (because they no longer exist) and the principle of sharing, on a carefully arranged regional basis having regard to usage and frequency, has become accepted practice.
THE MONTH WITH THE CLUBS

By "Club Secretary"

(Deadline for March issue: February 6)

(Please address all reports for this feature to "Club Secretary," SHORT WAVE MAGAZINE, Buckingham.)

B EFORE looking into the file of reports this time, all those who took part in MCC should give ear to Verulam’s comments on their disqualification in the Contest. They wish to make their apologies known to all who were inconvenienced by their clicks, which were eventually traced down to an intermittent “dry joint” connecting the 5 μF capacitor to the keying jack of their KW-2000 transmitter. What distresses them more than anything about it all is that not one of the 200-odd contacts they made considered it worth while to report those clicks to G3VER in the contest; had just one out of the hundreds taken trouble to send one extra letter in their contest exchange, G3VER would have stopped to find out what was wrong—and in all probability effected a cure by thumping the top of the transmitter.

All that needs to be added is that it is a credit to Verulam that they have reacted in such a sporting manner; and to rub home the point about reporting correctly, to all the other Clubs and their operators.

Scotland and the North

First off, we look at Scotland, and a new formation in the Edinburgh area. This one is called the Pentlands A.R.C., and welcomes anyone interested in coming along, whether as visitor or prospective member. Book the Last Friday in each month, provisionally, at the Iona Hotel, Strathern Road, kicking off at 7 p.m. Incidentally, while this is the normal date each month, we gather there is a possibility of a change of date, so it is important to contact the hon. sec. at the address given in our Panel. It remains for us to wish them a long and successful club life.

At Lothians, the lads foregather at the YMCA, St. Andrew Street, Edinburgh, on February 12 and 26. For the former date, a Brains Trust is set up, but on the 26th a CW evening is in prospect transmitting and receiving, for both the transmitting types and the SWL’s.

The latest news we have for Spen Valley at the time of writing is for January—a programme that looked to be of considerable interest. Doubtless there is as good a deal fixed up for February—try Thursdays at the Grammar School, Heckmondwike.

Derby have quite a good month, even for them. Above all there is the annual dinner and dance at the Derbyshire Yeoman, Kingsway, Derby, which is booked for February 14—tickets from G2CVV, if any are left. February 11 is down for Mr. R. E. F. Street to talk about Printed Circuits for the Home Constructor, while on the 18th there is an Open Evening for the SWL’s. To round things off, comes a talk on the techniques of Passing the R.A.E., dated for the 25th. All of these, unless otherwise stated are at Room 4, 119 Green Lane, Derby.

Over now to Wakefield, where the lads use the Wakefield Youth Centre, Zetland Street, for Hq. They get together here on February 10 to hear G3VTD discussing Walkie-Talkies, and again on February 24, when it is hoped that all will bring along some item of home-brewed tackle, as part of a display and talk.

Northern Heights come next; they are still in temporary Hq. at the Peat Pitts Inn, Ogden, Halifax, but we have no details of the programme at the moment of writing; for which reason it is suggested you contact the hon. sec.—see Panel p. 765.

Another new group is called the North Leeds; it is understood that in February they are to move into what they hope will be their permanent accommodation, and again, therefore, contact the hon. sec. for the latest dope on both the programme and the venue.

Weekly on Fridays at Room 7, Nunsfield House Community Association is the way this Derby group works; thus, there is February 6 for a Film Show by G3ALA and on the 13th a Night-on-the-Air with the group KW-2000A. Three-Phase Mains Supply is the theme taken by G3VKH on February 20, while on the 27th they are “going out” to the Victor Buckland Studio in Derby to hear a recital of records.

There are a couple of interesting items down for Bradford this month. February 3 is titled “The Blacksmith and his Art,” by G3WVD—believed to be connected with home-construction, albeit the speaker is playing it close to his chest so no-one really knows for sure. On February 17 G3MFJ is the speaker, and goes away from radio to lecture on “Time Lapse Line Photography.”

The West and Wales

This is an ever-growing clip of late. We start off by calling at Barnstaple and District, who have the 11 and 25 February for their dates at Crinnis, High Wall, Sticklepeth, Barnstaple, Devon. This is a new club in a fairly remote area, and the first couple of meetings have been very successful.
Still in Devon, with Saltash, we find they are at Burraton Toc H on February 6, for a Radio Darts Quiz (which sounds rather intriguing!) and on the 20th they will be treated to a practical demonstration of the relative merits of Top Band and Two.

Over the border we have Cornish, who serve a mighty big county. Their main meeting is on the first Thursday in each month, at the SWEB Clubroom, Pool, Camborne, when there will be a talk, by G3OCD, in which he will be discussing "How to use I.C.'s" and a short one discussing a home-brewed digital clock cooked up by G3VGO. In addition to this there are quite a few other activities by way of sub-sections, details of which could be obtained from the hon. sec.

Taunton have passed the AGM and are still pressing on at the work of converting and re-equipping their caravan as a portable Club station for all bands from two metres to Top Band, complete with a pneumatic forty-foot pole and the essential tea-making tackle. The lads get together every Friday at the Barracks, Mount Street, Taunton.

At Plymouth they seem to have had a spot of bother with the duplicator, so that we find it difficult to say where or when the next meetings will be! But they have a good Secretary and his address is in the Panel on p.765.

Chippenham have a place at the Boys' School at Hardenhuish Lane, Chippenham, where they have a session every Tuesday. February 24 is set aside for a discussion evening, but for most of the other nights it is believed the lads are attacking a Club Project—a two-metre transmitter to complement the MOSFET converter which they have just finished.

Now to the Welsh groups: Swansea University have a note to say that the programme is "open," while they are planning something special for the Rag Week on February 8-14. Visitors or prospective members should contact GW3TSH, as Panel.

Flint have their Hq. in the Central Library, Church Street, Flint, where they may be found on any Friday. In addition to this, there are various other activities in the pipeline such as films, lectures, a car rally, a hi-fi demonstration, and such like.

The Special-Interest Group

Here we are looking at the Clubs who cater for special interests, or those whose members are all of the same service or employment.

Civil Service first: They are very well off in the matter of Hq., at the Civil Service Recreation Centre, Monk Street, London. There is an informal at Hq. on February 3, starting at 6.30, to solve equipment and operating problems. February 17 is down for a talk on Marine Operating in the Heyday of Morse, again slated to start at 6.30. It should be noted that one of the advantages of this group's Hq. is the facility for obtaining a light snack on the premises before the meeting (and a pint afterwards!).

The Royal Navy has its own Society, catering for both serving types and those who were previously in the Navy; they also have associates who are serving in foreign navies. There is a Hq. station, a good Newsletter, and various services available to the members. For details, contact the Hon. Sec.—see Panel.

Recent presentation at the Silverthorn Radio Club, when SWL Philip Jones (left) received the G3NJL trophy for the most meritorious piece of home-constructed equipment, a radio-controlled boat.

Picture courtesy "Waltham Forest Guardian & Gazette"

Nice to have a copy of BATC's magazine, CQ-TV. Here we have a group whose interest is the /T form of Amateur Radio; apart from Conventions, displays at various functions, and so on, there is the first-class CQ-TV which is always full of interesting pieces on the techniques of A/TV.

RAIBC is for the blind and invalid members of our hobby, who keep in touch with each other through operating or listening to the Club nets on Eighty. They are to be found between 3650 and 3700 kc at 1000 on Tuesdays, 1400 Wednesdays, and then the Cheshire Homes Net at 1400 on Thursdays gives added interest; all the quoted times are BST. Naturally, such a group divides into the members proper and the supporters, with hon. sec. G3LWY at the hub of things to co-ordinate and do the vital task of producing the newsletter Radial each month, and on time.

A.R.M.S. is the one for the mobileers; members are scattered over several countries, and there are certificates and awards sponsored by them to be worked for, as well as the monthly Mobile News. Details from G3FPK, address as Panel.

A National Society in its own right is the Radio Society of East Africa, which caters for all the amateurs in the area. The current issue of QTC carries an extremely interesting retrospect article by Bob Tanner, 5Z4AA, covering the radio aspects of his 27 years in East Africa.
British Railways mention in their Newsletter a series of changes of net frequencies, both in the inter-G context and internationally—this group is affiliated to an international tie-up of railway radio amateurs.

The Midlands

Scunthorpe first; a recent AGM brings in a new hon. sec., who promises to keep in touch with a detailed programme. For February 3 they have a series of taped interviews with amateurs, not necessarily members, who discuss their station and its activities. On the 10th there is a visit to the local telephone exchange, and G3CCH talks about VHF on the 17th—he is a very-well-known VHF man of great experience. February 24 is devoted to a Construction Night. The chaps have a place at the local Hobbies Centre, available seven nights a week, in Franklin Crescent, Scunthorpe.

No. 28 Hamilton Terrace is the venue for the Mid-Wickeshire meetings. Having just dealt with the AGM, the next few sessions will be as follows, while the new committee get on and fill the holes for the rest of the year: February 2, Integrated Circuits; February 9, a Surplus Sale; February 16, Films; and on February 23 a visit to Serck Controls Ltd., Leamington Spa, starting at 7 p.m.

Looking now at Midland who are at the Midland Institute in Margaret Street, Birmingham, we see that G3KPT is the speaker for February 10, taking as his subject the QRA Locator.

East Worcestershire have no meeting in the usual sense fixed for February, but instead have a booking at the Village Inn, Beoley for the annual dinner on February 12. For details, get in touch with the hon. sec.

Peterborough next, and here the latest we have on file covers January, so we have to refer you to G3KPO—see Panel. Incidentally, here is a Club which is going against the normal trend of things—they recently reduced the subscription from fifteen shillings down to 2s. 6d.!

Turning northwards, Wirral DX Association are next in the pile. This crowd get together in members’ homes, and so it is essential to make contact with the hon. sec. before attending a meeting—see Panel. It is understood that the February gathering will be treated to a talk and demonstration by G3VUY of his transistorised transceiver, which covers 1-8 and 14 mc.

Surprisingly enough, the Wolverhampton Newsletter shows only one meeting in February—a Film Show at Hq.—when the usual form seems to indicate rather more. Perhaps it would be a good idea to get in touch with G3UBX to see if there is anything else doing during the next few months of the additional facilities. Lucky chaps!

Tuesday evenings at the Guardroom sounds a little ominous to the uninitiated, but in fact No. 2 Guardroom at Sobraon Barracks, Burton Road, is the place where the Lincoln chaps foregather. February 3 is devoted to history, while on the 10th there is a tape talk on an unspecified topic. February 17 is down for films, and on the 24th the month is rounded off with an Open Evening.

The hon. secretary points out his change of address for the benefit of prospective members and visitors to Solihull; this, of course, is reflected in our address Panel. However, this implies no neglect of the matter in hand, so in the same letter he tells us that February 17 is the date, at the Manor House, 126 High Street, Solihull, when Mullard films are to be shown.

Your conductor is in a bit of a twist over the Worcester doings, because the last copy of the news sheet to reach him covered December. However, it is known that the return leg of a skittles match against Gloucester is to be played off on February 19. This happy band is to be found at Perdiswell Park, Droitwich Road, but for all the details get in touch with G3TQD, as Panel here.

At Nottingham the vice-chairman has taken over the secretarial duties temporarily, owing to the present incumbent being posted abroad. He tells us the chaps have February 5 for a natter-session, and a film on the 12th. A talk is promised for the 19th, and a Bring-and-Buy Sale is proposed for the 26th. For all these, the venue is Sherwood Community Association, Woodthorpe House, Mansfield Road, Nottingham.

Coventry are so well entrenched that they forget to tell us where they meet. However, the programme is as follows: February 6 and 20 are Nights-on-the-Air, when the Club transceiver will be in action, and as a sideline an R.A.E. lecture and Morse practice respectively. February 13 is the big one as Texas Instruments are to return leg of a skittles match against Gloucester is to be played off on February 19. This happy band is to be found at Perdiswell Park, Droitwich Road, but for all the details get in touch with G3TQD, as Panel here.

February 3 is devoted to the Lincoln chaps foregather.

The London Area

Rather difficult to define, and it must be hoped that nobody who thinks they should be in this clip find they are in the Southern pile, or vice-versa.

The first and third Friday of every month is booked by Purley, the former in the small, the latter in the large, room of the Railwaymen’s Hall, 58 Whyteleafe Road. Naturally, the February 6 date, therefore, is an informal
enable any doubts as to the accuracy of the standards in precision test equipment organised by various folk to Croydon, where in December the lads had a very useful address.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the doyen of Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the HQ. details, contact G3FZL at the address below.
us that on February 17 there is a Film Show at Chiswick Trades and Social Club, 66 High Road, Chiswick, London, W.4. Visitors, as always, very welcome.

At North Kent, the dates to book are February 12, for a talk by G3JKY on Amateur Direction-Finding, and the 26th, when Mr. Cassell of Broadway Radio will explain the ins-and-outs of Stereo Broadcasting.

G8CPJ holds the fort at Cray Valley on February 6, with his lecture on UHF colour television, and on the 20th there is the usual natter evening. Both dates are at the Congregational Church Hall, Court Road, Eltham, S.E.9.

The South

February 6 at the Adult Education Centre, Monson Road, Tunbridge Wells, will see the West Kent crew taking part in a discussion in which members give their ideas on equipment design. Mr. G. Peacock returns on February 20, taking this time “Aviation and Radar in Great Britain” as his theme.

Alternating between practical evenings and films or talks is a syllabus which lots of groups seem to like, although it is often very hard for the secretary to find out what is happening. Colchester seem to thrive on it, and for February the practical sessions are on the 11th and 25th in Room 40; February 4 is Films, in Room 4 or 41, and the latter room is used on the 18th for G8BVE to hold forth. Colchester’s full title announces their Hq. North-East Essex Technical College and School of Art, Colchester, Radio Society—whew!

A home-built, home-designed, all-transistorised amateur band receiver of his will be demonstrated and explained by G3VCY to the chaps at Maidenhead on February 2, the informal following on the 17th. All are welcome at both these events, at Victory Hall, Cox Green, Maidenhead.

The Church Hall, Amphill Road, Shefford, is home for one evening each week to the local group, who recently rustled up an attendance of no less than 54 for a talk by Texas Instruments on Transistor Transmitters, which indicates how strong they are. For February, they have a Surplus Sale and Quiz on the 5th, followed by G3ROL on Portable Power Supplies on the 12th. G3TDW looks at Propagation on the 19th, and G3VMI is down for the 26th to discuss his Capacity Bridge ideas.

After many years in the wilderness Dorking have at last been able to fix up accommodation on a permanent basis at the Wheatsheaf, in a small hall with a lockable shack attached. Go and see them on the second and fourth Tuesdays in each month—the next few weeks, obviously, will be mainly occupied in getting organised.

At Verulam, the third Wednesday in each month is the usual form, in the Council Chamber, St. Albans Town Hall, where an attendance of around fifty is usual. The annual general meeting has recently passed, and so, although we have January’s subject—G3JGO on TVI—all we can say about the February doings is that several items are already in the pipeline for the next few months and should be finalised in time for the meeting; so a contact with the hon. sec.—see address Panel—should bring the latest information.

Every Tuesday at the Rose Wilmot Youth Centre, Littlehampton Road, is the Worthing form. One notes a Constructional Contest on February 10, a Ragchew on the 17th, and G3JKY expounding the principles of Simple D/F gear on the 24th. Lastly, there is the most important social event of the year, namely the annual dinner on the 28th, tickets for which can be obtained from G6KFH/T.

Guildford have the second and fourth Friday in each month at the Model Engineering Hq., Stoke Park, Guildford. A GPO lecture on TVI and Frequency Measurement is slated for February 13—straight from the horse’s mouth, as it were! but the 27th was still open at the time this went down.

Brighton Technical College have a Film Night on February 5, and what looks like a second part to G3SKI’s talk on Colour TV. Meeting room, at the time of writing was still to be settled, but no doubt an intending visitor will be able to find out at the entrance to the College—or it can be obtained by contacting G3SKI.

It is some time now since we heard from the Southampton group; but we gather G3XFD has been given strict orders to write every month—good! They have a monthly booking at the Lanchester Lecture Theatre, Southampton University, for the second Saturday in the month. Other gatherings seem to take place at the “Elm Tree” at Swanwick. Scouts are being put out to search for a permanent clubroom, and the general feeling is one of optimism and expansion—which is just how it ought to be.

Burgess Hill means, in the Amateur Radio context, Mid-Sussex, this being the name of the local Club. They have their meetings and hold the club station at Marie Place, Lymelands Road, Burgess Hill. Recently, they saw off the AGM business, and now have Thursday, February 5, set apart for G3JGR to talk about Non-professional Construction. G3JHM has the other evening, when he holds forth on 4-metre affairs—and who better to tell them? This one is slated for February 19.

For February, Bishops Stortford have a special attraction, with G3LTF coming along to talk about his famous UHF moon-bouncing results, visitors of course being very welcome to this one, at the British Legion, Wind Hill, Bishops Stortford.

Southdown covers the Eastbourne district and has its being in the Victoria Hotel, Latimer Road; the February details are not to hand, but no doubt the hon. sec. could confirm your scribe’s belief that the date is February 2.

Conclusion—and Deadline

No less than ten Club reports arrived far too late to be taken into this feature—despite the fact that the deadline date was given in the two previous issues. It is essential that we receive reports by the due date, as there is neither time nor opportunity to write in late items when the copy is ready for the printer. “Month with The Clubs” is a news-feature article, and so is produced to a tight schedule.

Next few deadline dates are: February 6 (March issue); March 6 (for April); and April 3 (May issue). Please note these and action accordingly! The address is simply: “Club Secretary,” SHORT WAVE MAGAZINE, BUCKINGHAM. 73 and BCNU.
Map of the Region I Area, showing Prefixes.


North Atlantic
Ocean

South Atlantic
Ocean

Pacific Ocean

Indian Ocean


Map of the Region I Area, showing Prefixes.


Map of the Region I Area, showing Prefixes.


Map of the Region I Area, showing Prefixes.


Map of the Region I Area, showing Prefixes.


Map of the Region I Area, showing Prefixes.


Map of the Region I Area, showing Prefixes.


Map of the Region I Area, showing Prefixes.


Map of the Region I Area, showing Prefixes.


Map of the Region I Area, showing Prefixes.


Map of the Region I Area, showing Prefixes.


Map of the Region I Area, showing Prefixes.


Map of the Region I Area, showing Prefixes.

THE R.A.E. — QUESTIONS AND ANSWERS

GUIDANCE FOR THE BEGINNER

As in previous years, the treatment here is of the City & Guilds examination for radio amateurs, to be held in May this year, the paper below being that set for the May, 1969, R.A.E. Note that both questions in Part I are always obligatory — and can be answered easily if the Licence Regulations have been carefully studied. Though for the Exam. itself there is a choice of six out of the eight questions set, here all have been answered to illustrate how they can be tackled. From the point of view of the average candidate, these answers have been expanded rather more than might be advisable within the time allowed — normally, a candidate could allot himself only about 20 minutes per question. Long and detailed explanatory answers are not usually required. Some of the answers given here also illustrate the approach to current practical problems. The R.A.E. is Subject No. 55 in the City & Guilds of London Examinations Syllabus and its pass-certificate is the basic qualification for an AF-station licence in the U.K. — Editor.

RADIO AMATEURS' EXAMINATION — May, 1969

This paper contains ten questions. Answer eight questions, as follows: Both questions in Part I (which are compulsory) and six questions in Part II. Failure in either part will carry with it failure in the examination as a whole. The maximum mark for each question is shown.

Part I

Q (1). What are the conditions of the Amateur (Sound) Licence as regards the purposes for which the station may be used? State three types of message or communication which may not be sent from an amateur sound station.

(15 marks)

Answer (1)

The use of the station is allowed for the purpose of sending to and receiving from other licensed amateur stations, as part of the self-training of the licensee in communication by wireless telegraphy (which includes telephony), messages in plain language which are remarks about matters of a personal nature in which the licensee or the person with whom he is in communication has been directly concerned. Also, for the sending of signals, not being in secret code or cypher which form part of, or relate to, the transmission of such messages.

Three types of communication which may not be sent by the station are as follows: (a) Messages of an indecent, obscene or grossly offensive nature; (b) Broadcast messages; (c) Business messages.

Q (2). Describe what is meant by over-modulation of an amplitude-modulated radiotelephony transmission. Why must this condition be avoided? Describe a method or device for indicating when a transmission is being over modulated.

(15 marks)

Answer (2)

Over-modulation is a condition in which an AM transmitter is fed with an excess of modulation signal. Consider Fig. 1: At the points (a) can be seen the carrier, with no modulation; at (b) the carrier is modulated by a sine-wave AF signal to less than 100% modulation; the same waveform is seen at (c) with 100% modulation of the carrier, the AF waveform still being undistorted. A further increase in the modulating signal, as at (d), results in over-modulation. Note the distortion of the AF envelope, and the fact that the carrier is at zero for an appreciable period of time. See also that the rise from and fall to zero is extremely steep. The result is the radiation of a wide band of signals which were not part of the original RF and AF signals, with a consequent loss of intelligibility, " splatter " across adjacent channels (which may result in world-wide interference) plus, often, considerable increase in interference to television reception.

Methods of indicating over-modulation are many. A good one is to look at the outgoing RF signal, by a small capacity coupling to an oscilloscope of suitable bandwidth; setting the trace to free-run at a low speed will show over-modulation as bright flashes where the carrier disappears on the centre-line of the trace. A simpler way, if one has a separate power supply for the PA stage, is to observe the anode current in the PA when modulation is impressed on it. It will be found that at the point of over-modulation the anode current will start to "jump about" where previously it was steady.

Part II

Q (3). What is the superheterodyne principle of radio reception? With the aid of a circuit diagram describe the action of the frequency-changer of a superheterodyne receiver.

(10 marks)

Answer (3)

In the superheterodyne receiver the frequency of the incoming signal is changed to some " intermediate frequency " (IF); the most effective adjacent-channel selectivity and the gain of the receiver then occur at this, usually fixed, frequency. In this way, the receiver can be made to have more gain and a constant degree of adjacent-channel rejection, no matter what the actual signal frequency may be. However, the design of the receiver overall is somewhat complicated by the need to foresee, and prevent, " spurious responses " at unwanted signal frequencies.

Consider Fig. 2. The triode section operates as a simple oscillator with inductive feedback through the secondary of L2, tuned by VC2. The oscillations are coupled via C2 to the cathode of the pentode. The
incoming signals are impressed in some way across L1—the exact manner is irrelevant—which in its turn is tuned by VC1. Due to the slight non-linearity of the valve, not only will the signal and oscillator frequencies appear at the anode, but also sum and difference frequencies of the two we started off with; T1 is tuned both on its primary and secondary side, so that it will respond strongly to one of the signals and reject all others down the decoupling element C5. In normal practice VC1 and VC2 are “ganged” so they operate together, the oscillator then being made to tune higher in frequency than the signal by an amount equal to the IF at all positions of the ganged control, thus producing a frequency-changer stage having “one-knob” tuning. As to values, these are shown in Fig. 2, apart from VC1, VC2, L1, and L2. These latter, of course, will be set up for whatever signal frequencies—and hence oscillator frequencies—it is desired to receive.

Q (4) What is meant by the RMS value of an alternating current of sine wave-form? Sketch a sinewave of 282.8v, peak, 50 c/s. What is (a) the period in seconds of one cycle, (b) the RMS value of the voltage?

An EMF of 200v, RMS, 50 c/s, is connected to an inductor whose resistance is 10 ohms, and inductive reactance at 50 c/s is 30 ohms. What are the RMS and peak values of the current which would flow?

Answer (4)

The RMS value of a sinewave alternating current is the name given to the equivalent in heating power of the AC, to a DC applied to the same element. For instance, a 240 volt AC mains supply will give the same amount of heat out of a 1 kW electric fire as 240 volts DC, but the peak value reached by the AC will be considerably higher—1.414 times the RMS value in fact.

See Fig. 3A: Here we see a sinewave of 282.8v, peak, 50 c/s. Hence, the time for one period, or cycle, is 1/50 second. As the peak value of the voltage is given, $V_{rms}$ will be given by $0.707 \times V_{peak}$, i.e., 200 volts.

Fig. 3B shows the circuit for which we have to calculate current, I. First, the impedance:

$$Z = \sqrt{R^2 + X_L^2}$$

$$\therefore Z = \sqrt{100 + 900} \quad i.e. \quad \sqrt{1,000}$$

Whence $Z = 31.6$ ohms ———— (1)

Now, the RMS current is given by $I = E/Z$, i.e., $I = 200/31.6$ amps RMS

that is, 6.3 amps RMS

Now, $I_{peak} = 1.414 \times I_{rms}$

i.e. $1.414 \times 6.3$ amps, or 8.9 amps peak.
Q (5). Describe a simple experiment to show the existence of a magnetic field around a wire carrying an electric current. What is the effect on the magnetic field if the wire is wound into a coil on a soft-iron core?

State a rule for determining the polarity of the electromagnet so formed. (10 marks)

Answer (5)

The simple experiment may be as shown at Fig. 4A, where a length of wire is threaded through a small hole in a piece of card, and fed with the current flow shown. Iron filings are sprinkled on the card, and at a tap will take up the positions shown, concentrically around the wire as long as the current flows; on switching off, another tap of the card will result in the iron filings taking up random positions.

Winding the wire in a coil on a soft-iron core is shown at Fig. 4B, where the direction of current and of the winding is clearly shown. This disposition results in the lines of force taking up the pattern indicated, and the direction; the North and South poles are also indicated. The effect of coiling is to intensify the magnetic effect, and considerable further strengthening of the field results from slipping the coil over the slug of soft iron. To determine which end of the magnet is South, consider Fig. 4C: Looking at the end of the solenoid, the direction of conventional current flow being as shown by the arrow-heads on the letter “S” will result in the end nearest the observer being a South pole.

Q (6). Describe with the aid of a circuit diagram how a transistor can be used as an amplifying device at audio frequencies. (10 marks)

Answer (6)

A suitable circuit is shown at Fig. 5, taken from the Mullard Reference Manual of Transistor Circuits, p.136.

This uses the “Half Supply-Voltage Principle.” If a crystal pick-up is connected at x-x, the output voltage will appear at the slider of the potentiometer, and be conducted hence to the primary of the transformer T1, primary inductance of which should be as shown. From the secondary winding, the signal is conducted to the primary of the transformer T2, and out at the terminal x-x.

![Fig. 4](image_url) Question 5

![Fig. 5](image_url) Question 6
base of the OCT72 transistor, which is biased by setting the 100K resistor so that it draws 33 mA from the nine-volt supply, 4.5 volts of which appears across the 120-ohm speaker. Provided the speaker has a strong magnetic field some 60 mW of AF will come out of the speaker for a drive of 3v. at 1-2 cm/sec from the pick-up.

Q (7). Draw the circuit diagram of a CW transmitter, consisting of oscillator, buffer/frequency multiplier, and power amplifier stages with pi-network output and capable of operating in the 3.5, 7.0, and 14.0 mc bands. Explain how the pi-network is adjusted to obtain maximum RF output for a given DC power input to the power amplifier stage. (10 marks)

Answer (7)

Refer to Fig. 6 for a suitable circuit. V1 is a Hartley ECO oscillator, V2 the buffer/multiplier, and V3 the PA. If the oscillator is working on 3.5 mc, the VFO output at fundamental frequency is amplified in V2 and V3. At 7 mc, the VFO output is doubled in V2 grid circuit, amplified in that valve and again in the PA. On 14 mc, frequency doubling is carried out in V2 grid and also in V3 grid, to give 14 mc there, which is then amplified without further multiplication in the PA. The four RF chokes are all of similar inductance, 1 mH, but should all be of different construction to avoid any troubles with LF parasitics. S1 is the bandswitch, while S2 provides for the HT to be on the VFO only for netting.

The pi-network adjustment falls naturally into two phases. First, calculating the values—which is made much easier if a suitable set of Abacs is to hand—for CT, CL, and Lx. Voltage rating of the two capacitors will also be decided at this stage. When this is done, and the transmitter ready for testing, full drive on the desired band should be applied to the PA grid, with a 75-ohm load on the output—assuming this is the feeder impedance into which the transmitter is intended to work. Set CL to maximum, and rotate CT till a drop in RF output occurs. Note the current off-resonance and at the bottom of the dip. If the latter is not what was desired in the way of anode current, alter the setting of CT, a little and re-dip the PA. By repeating this procedure several times an adjustment will be found where the current at the bottom of the dip is as required, CT and CL are at the correct values or very near to them, and maximum RF voltage appears across the load resistor, as shown by a valve-voltmeter. It may be found that at the desired anode current, little or no dip is perceptible, and RF output has fallen from its maximum value. If this is the case, over-coupling is to be suspected, and the design should be checked out, with particular attention to the HT volts on load, and to the values predicted for CT and CL, as well as Lx. If maximum RF output occurs other than at the bottom of the dip, the need for neutralisation should be considered.

Finally, the grid drive and PA current should be monitored simultaneously—the grid drive by means of a valve-voltmeter as previously used on the output—and any signs of sudden jumps in either noted as indications that there is instability in the stage, which must be corrected.

Q (8). Describe how two radio stations can communicate with each other by long-distance ionospheric propagation. Why is it usually necessary to change frequency according to the time of day? (10 marks)

Answer (8)

Around the earth there are several bands or "layers" of ionised air, at various heights above ground. These
layers are ionised by the sun, to an extent which is related to time of day, time of month, and the number of sunspots—the latter changing in accordance with an eleven-year cycle. The daily change is one of a tendency for layers to de-ionise during the hours of darkness.

The lower layers act mainly as absorbers of HF signals, the effect tending to reduce with increase of frequency. The upper layer, known as the F-layer, is the one that does most of the refracting of signals from earth back to earth, operating on all frequencies below a certain Maximum Usable Frequency for the path; above this MUF in frequency signals are not returned but escape into outer space. Optimum Working Frequency, as far as the commercials are concerned, is about 85% of the MUF on the path, allowing for random changes in ionisation.

Thus the pattern is, in general, that the lower frequencies allocated to amateurs are useful more at night than in the day for long-distance work, while the opposite is the case with the higher-frequency allocations. The best band to use for a given path is the one nearest to the MUF for that path at the time of communication is desired, and in general a switch to a lower band is indicated if the path in question is in darkness. On any given band, optimum conditions for long-distance working often seem to coincide with sunset or sunrise at one or both ends of the path; this would appear to be due to the process of the F-layer splitting into two (F1 and F2) after dawn and re-combining into a single layer at night.

Q (9). Describe a form of multi-band aerial system capable of radiating with reasonable efficiency. What precautions should be taken to suppress harmonic radiation? (10 marks)

Answer (9)

There are several possible methods of making a multi-band aerial system, depending on where and how one is able to feed it. Just about any length of wire may be opened and fed into the centre with open-wire feeders and a tuning network, but there is some merit in the arrangement, attributed to G5RV, shown in Fig. 7.

Here the top is made 102 feet long, opened at the centre, and either fed with "tuned" open-wire feeders, or, as shown, with coaxial connection to the bottom of a length of 34 feet of open-wire feeder. At 1.8 mc, both legs of the feeder are strapped together and worked against a good earth as a "Marconi" system; on 3.5 mc it operates as a half-wave centre fed with part of the half-wave incorporated into the feeder, and similarly on 7 mc as two half-waves; in each of these cases the termination will be somewhat reactive but the transmitter should be able to cope satisfactorily. At 14 mc the aerial is optimised, operating as three half-waves on the top, through a half-wave of open-wire feeder to give a good match to 75-ohm coax, which can be still further improved by adjusting the height until the VSWR is unity. At 21 and 28 mc, the aerial is also very effective, albeit here again the transmitter may be expected to "see" a rather reactive termination.

Any such multi-band aerial system is in itself prone to harmonic radiation, and it should therefore be fed through a low-pass filter from the transmitter, and, unless the aerial can be made to give unity VSWR on the band in use, should be connected through a matching network to ensure that the feeder from transmitter and LPF to the ATU is at 1:1 VSWR and unbalanced, so that the LPF is given a chance to keep harmonic radiation down to acceptable limits.

Q (10). Explain how a moving-coil instrument can be adapted to measure current at (a) audio frequencies, and (b) radio frequencies. (10 marks)

Answer (10)

See Fig. 8A: Here is shown a moving-coil meter movement connected as the load in a full-wave bridge rectifier circuit. If such a meter is used in conjunction with the usual meter multipliers it will, with some slight rescaling at the low-voltage end of the ranges, be usable
for measuring AF voltages of substantially sine wave-
form. In order to "look" directly at AC current, it would
be necessary to use "current transformers" at the ranges
other than basic, and the design of these is rather outside
the scope of R.A.E. However, the instrument can be
used indirectly by measuring the voltage across a known
resistor. At RF, one can use a thermocouple arrange-
ment at the expense of some considerable cramping of
the lower end of the scale, but it is easier once again to
measure RF voltage by way of a diode probe as dia-
grammed in Fig. 8B. Here, output is fed to a DC valve-
voltmeter. D1 should have a high reverse resistance, C1,
about 100 µF, must be rated for the highest DC voltage
likely to be met by the probe. The output of the diode
is developed across R1, 68K; R2 and C2 play no real
part in the operation, being inserted to prevent stray
RF from the probe getting into the DC valve voltmeter.
Such a device can be used to measure the RF voltage
across a known value of resistor, and hence, indirectly,
to measure current.

FOR GOING METRIC
A leaflet is now available giving illustrated examples
of how to read a micrometer in steps of 0.01 mm. and,
where a vernier scale is fitted, to 0.001 mm.—together
with a comparison inch-scale from .05in. to .001in.
Copies are obtainable free of charge from: Information
Office, Dept. 3, The Metrication Board, 28 Kingsway,

RADIO AMATEURS' EXAMINATION—MAY 1970
Those intending to sit the next R.A.E., in May, are
reminded that applications must be in before the end
of February. It is not possible for us to give an exact
date, because the Technical Colleges and local centres
up and down the country where sittings are held have
differing closing dates (after which a heavy late-fee is
often charged). If you are taking a course of R.A.E.
instruction at an evening institute or some other such
establishment, your instructor will know about this.
If not, apply to the local office of the Education Authority
for your area, quoting "Subject No. 55, Radio Amateurs'
Examination, City & Guilds."

DEPOSIT CREDIT ACCOUNT SCHEME
The well-known firm of Home Radio, Ltd.—com-
ponent specialists, holding something like 8,000 items
regularly in stock—have introduced a credit scheme
which will be of interest to readers. Called a Deposit
Credit Account, a customer decides what credit he
requires on a monthly basis, to the nearest £10. The
deposit is then half that amount—say, £20 where credit
of £40 is requested, or £5 if it is £10. During the first
month, goods may then be ordered, for immediate
delivery, up to the value of three-quarters of the full
credit agreed; after the initial transaction, this may be
drawn upon in full. Payment becomes due in the month
following the despatch of goods. The initial deposit is
held till the termination of the agreement—this can be
allowed to run for months, or even years, without any
purchase being made, or only a small proportion of the
credit actually used.

Apart from the credit facility, the advantages are
that orders can be accepted by telephone (any time, day
or night, including Sundays), order forms and pre-paid
envelopes are provided, also a new catalogue each year
while the agreement remains in force.

Full details of this useful scheme for customer-conven-
ience in the idiom of modern trading can be
obtained from: Home Radio (Components), Ltd.,
234-240 London Road, Mitcham, Surrey, CR4-3HD.

"...yes, it is a bit rough, but it does work . . ."
This should more properly be described as a rather special Club station, for G3RAC is owned and operated by a group of radio amateurs employed by Racal-BCC, Ltd., Western Road, Bracknell, Berks.

Started as a modest two-man partnership 20 years ago and originally intended as a consultancy in the field of radio communication planning, the firm has grown to a large international organisation, embracing a group of 25 companies and now employing some 3,000 people—of these, about one in every six is engaged in research and development. The main fields of action are commercial HF communication equipment and electronic instrumentation, involving the most modern techniques and engineering methods.

It is not surprising that the Racal Group has attracted many professional engineers and designers whose own hobby-interest is Amateur Radio. To cater for and encourage this interest, the firm has provided extensive facilities. An Amateur Radio Club has been established, with well-equipped stations at home and overseas. G3RAC, the Hq. station at Bracknell, is located on the flat roof of the Engineering Building, and that it is pretty well equipped is very evident from our photograph!

All amateur bands can be worked, in any mode, but G3RAC is usually operated on CW or SSB. The main Tx, at left in the picture, runs a 4CX350 in the linear final, and a full range of Racal receivers and receiving adaptors is in use. The antennae consist of high-gain rotatable Yagis, with various long wires for the lower frequencies.

The VHF/UHF installation, accommodated in the same room, signs G8DDG and, of course, beams are in use for these bands. Other Racal stations are G3XOX at the Reading plant, and VK2RAC in Australia.

At Bracknell Hq. they have available or under construction a range of portable and transportable equipment and participate in numerous operating events. They were on for the last MCC—they won in 1965 with 625 points—but unaccountably did not send in an entry this time.

Sessions on the air are fairly regular in the early mornings, at lunch time, during the evenings and over weekends. The main operating interest is contact with Racal members overseas and amateur stations using Racal equipment (and there are more of these than might be supposed)—but contacts are taken as they come, are always welcome, and acknowledged by QSL card.
NEW QTH'S

G2AQQ, R. Collins, 20 High Street, Upavon, Pewsey, Wilts. (re-issue).
G3XUT, R. L. Edmead, c/o H. C. Warner, Basseterre, St. Kitts, West Indies.
G3YIZ, J. E. Martin, Bonne Chance, Marais Lane, Vale, Guernsey.
G3YMRR, G. W. Rodgers, 51 Piper Hill, Colburn, Catterick Camp, Richmond, Yorkshire.
G3YOK, P. C. Brown, 6 Caiystane Road West, Edinburgh, EH10 6RS.
G3YRT, A. Simister, 28 Linley Drive, Oldham, Lancs.
G3YVZ, T. Gardner, 222 Grace Street, Byker, Newcastle upon-Tyne, NE3 5NN.
G3YWJ, A. F. H. Wood, 43 Douro Road, Basingstoke, Hants.
G3YXF, W. A. Harrison, 25 Wilmount Street, Woolwich, London, S.E.18. (Tel. 01-855 4437.)
G3YZI, J. E. Cummings, 77 Windermere Avenue, Scartho, Grimsby, Lincs.
G3YZL, L. B. Hooper, 8 Pitchcombe Gardens, Coombe Dingle, Bristol, BS9 2RH.
G3YZM, R. T. Jackson (ex-G8CRF), 29 Olivia Drive, Leigh-on-Sea, Essex, SS9 3EF.
G3YZX, H. Brindle, 4 Bowjey Terrace, Newlyn, Penzance, Cornwall.
G3YZY, H. D. Brindle, 4 Bowjey Terrace, Newlyn, Penzance, Cornwall.
G8CJ, J. W. Askew, 16 Pepper Street, Platts Common, Barnsley, Yorkshire.
G8DC, D. N. Wills, 271 Kempshott Lane, Basingstoke, Hants.
G8DE, R. H. Hodds, Holme Garth, East Gate South, Driffield, Yorkshire, E.R.
G8DVB, P. C. Thompson, 10 Faulkner Place, Bagshot, Surrey.
G8DH, M. J. Matthews, 54 Kennedy House, Ramsgate, Kent.
G8DFS, S. Rutherford, 7 Johnshill, Lochwinnoch, Renfrewshire.
G8DFX, J. Lincoln, St. Paul's House, Middle Green, Langley, Bucks.
G8DGA, C. J. Bourne, 111 Woodhouse Lane, Bishophill Auckland, Co. Durham.
G8DGX, J. Rolland, 4 Buxton Road, North Walsham, Norfolk.

CHANGE OF ADDRESS

G2FMO, A. L. Milnthorpe, 31 Park Crescent, Glen Gorse, Oadby, Leics., LE2 5YJ.
G3FN, A. H. B. Cross, 48 Summerfield Road, Dronfield, Sheffield, S18 6GZ.
G3HVA, D. G. Pinnock, 14 Mornington Close, Bungay, Basingstoke, Hants.
G3KCR, D. W. Payne, 107 Vale Road, St. Leonards-on-Sea, Sussex.
G3LGD, R. Collins, 38 Moorland View Road, Walton, Chesterfield, Derbyshire.

This space is available for the publication of the addresses of all holders of new U.K. callsigns, as issued, or changes of address of transmitters already licensed. All addresses published here are reprinted in the U.K. section of the "RADIO AMATEUR CALL BOOK" in preparation. QTH's are inserted as they are received, up to the limit of the space allowance each month. Please write clearly and address on a separate slip to QTH Section.
CREATE YOUR OWN REFERENCE LIBRARY

The "EASIBINDER" is designed to bind 12 copies of the Magazine as you receive them month by month, eventually providing a handsomely bound volume for the bookshelf.

No need to wait until twelve copies are assembled. As each copy is received, it is quickly and simply inserted into the binder. Whether partially or completely filled, the binder is equally effective, giving the appearance of a book, with each page opening flat.

Strongly made with stiff covers and attractively bound in maroon Leathercloth and Milskin, the binders have only the title gold blocked on the spine.

Price 14s. 6d. post free.

PUBLICATIONS DEPARTMENT
SHORT WAVE MAGAZINE
55 VICTORIA STREET
LONDON, S.W.1

Advertising in "Short Wave Magazine" guarantees the largest and most effective coverage of the U.K. radio amateur interest

Amateur Electronics G3FIK

AN APOLOGY

We very much regret that we find it necessary to curtail our advertising this month due to the fact that we are forced to restrict our trading activities temporarily due to somewhat extensive building alterations. We have been in our latest premises just over two years but these are now proving inadequate for the volume of business which has ensued and it is our hope that the extensions now under way will result in increased efficiency from the service and administrative point of view. As may be imagined we are suffering from some degree of disruption at the moment but hope to be in a position to resume our normal advertising in next month's issue.

All enquiries received in the interim will, of course, be dealt with as promptly as possible and all service commitments with regard to equipment under guarantee met to the full.

518-520 Alum Rock Road, Alum Rock, Birmingham 8.
Telephone: 021-327 1497

Peter Seymour Ltd.

Communications Equipment Specialists

AND NOW A NEW RECEIVER, QUITE DIFFERENT, with the following specification:

L.W., M.W., Marine bands, 1.5 to 3.5 Mc/s, plus the 80 to 10 metre amateur bands, and separate S.W. broadcast bands, 15 in all, tuned on a coil turret. Also V.H.F., F.M. Variable selectivity, product detector, B.F.O., 2-speed A.G.C., treble and bass filters, built-in A.C. supply and battery compartment, twin speakers, telescopic antenna, ultra fine tuning for S.S.B., mesa transistors in front end, etc., etc. Size 12½" wide, 10" deep, 4½" high. Dual conversion on all bands above 3.5 Mc/s. 1Fs 2 Mc/s. and 460 Kc/s.

ASK FOR THE GLOBETRAVELLER AMATEUR
£83, carriage paid

410 Beverley Road, Hull, Yorkshire
Telephone: Hull 41938
Have you fully developed an equipment suitable for production at KW?

We are urgently looking for good designs of equipment of a professional standard for the Radio Amateur. Must be proven and employing modern techniques. We require Parts List, Circuit Details and a Working Model. Our Production Engineers and Drawing Office Staff could turn your design features into a saleable item and earn you extra cash. Initially send a written description of the equipment, brief specification and photograph, if available, to:

The Managing Director

KW ELECTRONICS LTD.,
1 HEATH STREET, DARTFORD, KENT

Telephone: Dartford 25574
FOR YOUR BOAT OR AIRCRAFT:

**BENDIX**:
- MN26 D.F. System, 12 or 24 volt.
- MN26 A.D.F. System, 12 or 24 volt.
- RTA1CB H.F. TX/RX 10 or 30 ch., 24 volt.
- NA3 (MN85) V.O.R. System, 24 volt.
- MN53 Market receiver 75 mHz, 24 volt.
- M132A Intercomm amplifier, 24 volt.
- M136 P.A. Amplifier, 115 or 24 volt.
- TA20B VHF TX 360 ch. 50 kHz, 24 volt.

**MARCONI**:
- AD7092 A.D.F. System, 24 volt.
- 1616 H.F. Receiver, 30 ch., 24 volt.
- Other equipment by AeroCom, Collins, Fitetrack, Gables, Murphy, Standard Telephones, SunAir.

**COSSOR**:
- 103E FM MOBILES TX/RX, 12 volt P.S.U. boot mounting.
- TX valvex: 6B6H, 6H6, 6AM5, 6AM6, 6AM5, QQV02-6, QQV03-20A, with control unit, mic., cables, speaker. Carr. 30/-...
- 103B, similar, dash mounting. Carr. 30/-...
- 102 FM WALKIE-TALKIE, will mod. for 2m. Carr. 10/-...

**COLLINS**:
- ART13 TX, 2-18.5 mc. 813 PA PP811 modulator, clipper, vfo or xtal, manual or auto. tuning. Size: 24 x 10 x 12. Carr. £2
- ARR15 RX. 1.5-18.5 mc. COLLINS PTO local oscillator and BFO. 500 kc IF. Size: 11 x 8 x 20. Carr. £1...
- COLLINS require P.S.U. for mains use, Size: PTO local or auto. tuning. Size: 24 x 10 x 12. Carr. £2
- MR820 2 metre mobile TX/RX, QQV03-10 driver and PA, 12 volt transistor P.S.U. Size: 5 x 8 x 14, supplied less xts and mic. Carr. 10/-...
- CR 100 Marconi RX. Carr. 30/-...

**PYE RANGER**:
- 15 2202 68 174 mc. AM 12 volt, boot mounting, 15 watts output, QQV03-20A PA, PP 6V6 mod. Less vibrator and accessories. Carr. 30/-...
- 103B FM MOBILES, TX/RX, 12 volt P.S.U. boot mounting. TX valvex: 6B6H, 6H6, 6AM5, 6AM6, 6AM5, QQV02-6, QQV03-20A, with control unit, mic., cables, speaker. Carr. 30/-...

**STANDARD TELEPHONES**:
- CR 100 Marconi RX. Carr. 30/-...

**COSSOR**:
- LECTROFLASH Capacitors, 250 mF, 500v., 8 x lain., 7s. 6d.; 100+, 200 mF, 275v., 44 x lain., 8 Ashfield Avenue, Morley, Leeds, LS27-0QD.

**PLESSEY**
- Electrolytic Capacitors, 2000 mF, 50v., 3 x lain., 7s. 6d.; 100+, 200 mF, 275v., 44 x lain., 8 Ashfield Avenue, Morley, Leeds, LS27-0QD.

**MARCH ISSUE**
- Appears February 27.
- Single-copy orders, 4s. 4s. 3d. “first-class” mail to reach us by Wednesday, February 25, for posting on February 26.—Circulation Dept., Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**TRADE**


**FOR SALE**: Meters, flush, 2-in. square 200 mA, 10s.; house, Godshill (606), Ventnor, Isle of Wight.

**WANTED**: Woden UM1 or UM2 mod. xformer.—FOR SALE: Meters, flush, 2-in. square 200 mA, 10s.; house, Godshill (606), Ventnor, Isle of Wight.

**FOR SALE**: Marconi RX. 30/-...


**FOR SALE**: Meters, flush, 2-in. square 200 mA, 10s.; house, Godshill (606), Ventnor, Isle of Wight.

**WANTED**: Woden UM1 or UM2 mod. xformer.—FOR SALE: Meters, flush, 2-in. square 200 mA, 10s.; house, Godshill (606), Ventnor, Isle of Wight.

**TRADE**


**FOR SALE**: Meters, flush, 2-in. square 200 mA, 10s.; house, Godshill (606), Ventnor, Isle of Wight.


**FOR SALE**: Meters, flush, 2-in. square 200 mA, 10s.; house, Godshill (606), Ventnor, Isle of Wight.


FOR SALE: Complete station, comprising National NCX-5 Mk. II transceiver, with mains PSU/speaker, K.W. Z-match, SWR Bridge, dummy load 80-10m., Hy-Gain 14-AVQ antenna with 100ft. coax, all in excellent condition. Price £105 all-in, or would consider selling separately—offers? Free delivery to 100 miles.—Ring Taylor, G3RDT, Bognor Regis, Sussex.


FOR SALE: Complete station, comprising National NCX-5 Mk. II transceiver, with mains PSU/speaker, K.W. Z-match, SWR Bridge, dummy load 80-10m., Hy-Gain 14-AVQ antenna with 100ft. coax, all in excellent condition. Price £105 all-in, or would consider selling separately—offers? Free delivery to 100 miles.—Ring Taylor, G3RDT, Bognor Regis, Sussex.


FOR SALE: Complete station, comprising National NCX-5 Mk. II transceiver, with mains PSU/speaker, K.W. Z-match, SWR Bridge, dummy load 80-10m., Hy-Gain 14-AVQ antenna with 100ft. coax, all in excellent condition. Price £105 all-in, or would consider selling separately—offers? Free delivery to 100 miles.—Ring Taylor, G3RDT, Bognor Regis, Sussex.

SALE: Surplus to requirements, 70 cm. J-Beams, 8-8 slot fed, 50s., and 14-element Yagi, 55s. Carriage paid, or W-H-Y?—Jones, GSZT, 3 Bircham View, Egguckland, Plymouth, Devon.

FOR SALE: Army No. 12 Sender, coverage 1 to 18 mc, runs 50 watts, few mods., offers? Also No. 31 transceiver, as new, with handset and cables. £4. WANTED: Two-metre transceiver, cheap.—Moore, GBKDG, 6 Ava Street, Ormeau Road, Belfast, BT7-3BS, Northern Ireland.

SELLING: BC-342 Rx, in very good condition and appearance, complete with all accessories and spare valves, at £15.—Pitt, 13, Commander Close, Love deer, Portsmouth, PO8-BL, Hants.

FOR SALE: Lafayette KT-320, with speaker and home-built 1 mc xtal calibrator, together with two-month-old standard Joystick and Type 3A Tuner; price £20 or nearest offer.—Thompson, 42 Birch Road, Runcorn (541B), Cheshire.

SALE: Commercial television studio video monitors, cost about £385 new, bargain at £10 and £5 depending on condition, but all working.—Jones, G6MB/T, 3 Bircham View, Austin Crescent, Egguckland, Plymouth. (Tel. 76552.)

FOR SALE: R.C.A. AR88LF, in good condition, price £25, buyer to collect.—Hamar, 43 Scaresdale Street, Dinnington, Sheffield, Yorkshire.

SELLING: Eddystone 888A receiver, in first-class condition, price £65—photographic equipment accepted in part exchange.—I. P. Cross, Ltd., 18 Gloucester Road, Bristol, 7. (Tel. 40440.)

SALE: R.C.A. AR88D, in very good condition, £35. B.40, with crystal, air-tested, £15. WANTED: Information Wavemeter W.1631, and 70 cm. Converter.—Rawlinson, GB8JR, QTHR.


SELLING: Type RX-80 short-wave receiver, with headphones, also Morse records, The Lot for £25, buyer to collect.—Hamar, 43 Scarsdale Street, Dinnington, Sheffield, Yorkshire.

OFFERING: Complete station in mint condition: Heathkit SB-101 with 2:1 kc and 400-cycle filters; HP-23 PSU; SB-600 speaker unit; Collins SM-1 dynamic microphone; HM-15 SWR bridge; price all-in £195 cash. Test sked on 80 metres.—French, Post Office, Groomsport, Co.Down, Northern Ireland.

FOR SALE: Lafayette KT-320, with 2.1 kc and 400-cycle filters; HP-23 PSU; SB-600 speaker unit; Collins SM-1 dynamic microphone; HM-15 SWR bridge; price all-in £195 cash. Test sked on 80 metres.—French, Post Office, Groomsport, Co.Down, Northern Ireland.

QALE: R.C.A. AR88LF, in very good condition, £35. B.40, with crystal, air-tested, £15. WANTED: Information Wavemeter W.1631, and 70 cm. Converter.—Rawlinson, GB8JR, QTHR.


SELLING: Type RX-80 short-wave receiver, with headphones, also Morse records, The Lot for £25, buyer to collect.—Hamar, 43 Scarsdale Street, Dinnington, Sheffield, Yorkshire.

OFFERING: Complete station in mint condition: Heathkit SB-101 with 2:1 kc and 400-cycle filters; HP-23 PSU; SB-600 speaker unit; Collins SM-1 dynamic microphone; HM-15 SWR bridge; price all-in £195 cash. Test sked on 80 metres.—French, GB8JR, QTHR.

FOR SALE: Lafayette KT-320, with 2.1 kc and 400-cycle filters; HP-23 PSU; SB-600 speaker unit; Collins SM-1 dynamic microphone; HM-15 SWR bridge; price all-in £195 cash. Test sked on 80 metres.—French, GB8JR, QTHR.

QALE: R.C.A. AR88LF, in very good condition, £35. B.40, with crystal, air-tested, £15. WANTED: Information Wavemeter W.1631, and 70 cm. Converter.—Rawlinson, GB8JR, QTHR.
WANTED: Heavy Post Office type straight key, or ring 01-455 8831. £6 10s., carriage extra.—Michaelson, G3RDG, QTHR, 19 Theydon Avenue, Woburn Sands, Bucking. £65.

FOR Rx tuning 300 to 600 mc, or 600 to 1000 mc, requires attention, £20. Vibroplex key, £6; Avometer Model 7, £10; Medico LPF, 60s. Delivery carriage free; prefer inspection.—Groves, G3UXM, 3 Halsey Drive, Hitchin, Herts.

EXCHANGE: Fm crystals for "G2DAF" Mk I SSB Tx. Filter Type MF 455, prefer with USB crystal. £50 or near offer.—Brown, G3NTM, 80m., with TT2AU PA, BK keying and electronic switching. Price £15 only (gone transceiver). Delivery 50 miles, Somerset.—Box No. 4866, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

FOR Rx tuning 165 mc to 19 mc, modified £195.0.0d. For world-wide reception modes CW, MCW, AM and SSB. FSK adaptor available as an extra £15. Preferred for sale £120/150.—Jesson, 181 Kings Acre Road, Blackburn (56567), Lanes.

EXCHANGE or SELL: Eddystone 770R Mk. II VHF receiver, covering 19 mc to 165 mc, in very good condition, price £120 or near offer. £6; Tefen 402, £45 or near offer. £5; Pritty 165, £50; Jones 151, Kings Acre Road, Hereford. (Tel. 0432 3227, evenings.)

SELLING: Codar CR-70A Rx, with PR-30 RF preselector, in excellent condition, price £15. Prefer buyer collects. £82.4.9d.—Phipps, Kings Paddock, West Winterslow, Wiltshire.

RTTY: Selling Terminal Unit ATW FSY-1-1 (10P/16142-AP.100386), complete with relay, £65; added operator extra.—Michaelson, G3RDG, QTHR, or ring 01-455 8831.

SALE: Eddystone 888A receiver, in immaculate condition, complete with S-meter and mounting blocks, £95 or near offer. £15; Heap, G3NCZ, The Gables, East Park Road, Blackburn (56332), Lanes.

SSELLING: Eddystone EC-10 Mk II receiver, brand new, complete with unregistered guarantee, manual and batteries, price £35.—Bradley, 6 Linden Grove, Folkestone Street, Hull, HU5 1BP, East Yorks.


FOR SALE: Home-built 1000-watt transmitter, rack mounted, will run 300w. AM/CW, with PSU and high-level modulator (pair 611) complete and tested, excellent PA requiring no further assembly. Ideal for the constructor, £14 or near offer.—Abel, GC8VE, 9 Grove Terrace, Malby, Rotherham, Yorkshire.


OFFERS Invited for Racal RA-17 receiver, in perfect condition. Continuous coverage 1-0 to 30 mc, crystal synthesizer, 23 valves, 7 crystals, film scale tuning, etc., with handbook. (London).—Box No. 4814, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SELLING at half-list prices: Racal digital frequency meter Type SA520 (list £140); Advance AC valve millivolt meter (£40); Levell transistor tester (£25); Multirad attenuator, 75-ohm, £16. All items in mint condition. For sale by: EDE YOUNG, 31 Hyde Rd., London, S.W.1.

FOR SALE: Galvanised lattice steel mast, similar to BIX, triangular, telescopes from 42ft. to 25ft., two winches, takes Ham-M rotator, ball races, etc., in very good condition, price £45. Jackson Vee-Vee Beam for 15-20mc, on 24-in. aluminium boom, consistent with VK/ZL, £15. Either available May/June. Any demonstration, photographs.—Lee, G5HF, QTHR.

WANTED: JXX 4-metre Converter, 4 mc IF preferred, but others considered. Also Electromonics coils BF29, XO53, XO54, XO55, XO56.—Loveland, 1 I.W.M. Street, Hardley, St. Marks Road, Hove, Sussex.

MARCH Issue ‘Short Wave Magazine’ due out February 27. Single-copy orders 4s. (or 4s. 3d. ‘first-class’) post paid, to reach us by Wednesday, February 25, for delivery on Thursday, February 26. These copies are sent flat in an envelope.—Orders, with remittance, to: Circulation Dept., Short Wave Magazine Ltd., 55 Victoria Street, London, S.W.1.

FOR SALE: Small and compact AC mains receiver, 1 W/MW/SW, 25. (Transistorised UHF/VHF con-

verter, 10s. American VHF Rx, tunable 80 to 150 mc, with PSU/speaker, £15. Carriage extra; s.a.e. with enquiries.—Hayward, Sunnyfields, Lighthouse Road, St. Margaret’s Bay, Nr. Dover, Kent.
OFFERING: DC power supplies, 12-volt, for SSB transmitters—transformers, components and complete modules up to 450v. p.e.p. send s.a.e. for details. Also an Eddystone 880 professional Rx, in excellent order, at £85. Precision one-megacycle oscillator with temperature controlled oven, mains 7 transistor design, as new and tested to U.K. Each. Many assorted components, s.a.e. for list.—Sandall, G5LJK, 38 Moorland View Road, Walton, Chesterfield, Derbyshire.

SALE: R.C.A. AR86D Rx, perfect, £42. Car radio, SW/MW/LW coverage, £8. Also components, PSUs, preselectors, magazines, etc., etc.—Thompson, Thursley Cottage, 1 Church Road, East Molesey, Surrey. (Tel. 01-979 9103.)

WANTED: In perfect order and appearance, Collins 516F-2 AC/PSU or K.W. Viceroy Mk. IV with extra lattice filter; also Shure 444 microphone.—Brindle, G3VYX, 4 Bowley Terrace, Newlyn, Penzance, Cornwall.

FOR SALE: Somerkamp FR-500 Rx, coverage 10 to 160m., and FL-500 Tx, 10 to 80m., both as new, £150 each. A.R.E. pair, no offers.—R. Raffe, G3KZW, 63 Leyland Green Road, Ashton-in-Makerfield, Wigan, Lancs.

WANTED: QVQ03-20A valves, must be as new. Offering QVQ06-40A's or 6146's (new and boxed) in one lot.—Box No. 4873, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

WANTED: SSB Transceiver, must be in good condition, cash waiting. FOR SALE: Solartron stabilised PSU, good condition, cheap. (Midlands).—Box No. 4874, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

WANTED: Brand new and unused valves: Four 611A's; Two matched 6140A's, 4X150A (7084). Also Johnion Matchbox Model 250-3, in mint condition; Collins 4-0 kc bandpass filter F455FA-40, also 6-0 kc bandpass filter F455FA-60; Collins 312B-5, 75A-4, and 415-1; must be in as-new and mint condition.—Box No. 4875, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

WANTED: Oscilloscope with DC and AC amplifier, state details and price, please.—Turner, 15 Egghill Lane, Northfield, Birmingham, 31.

FOR SALE: Codar CR-45K, with speaker, little used, price £5.—Fraser, Churcher's College, Petersfield, Hampshire.

OFFERING: Heathkit DX-100U, in very good condition; best offer over £20, plus carriage, securities.—Kemsley, G3FUN, 1 St. Mary's Road, Faversham (2008), Kent.

SALE: Heathkit SB-401 Tx, professionally wired and as new, £120. R.C.A. AR86D, with manual and spare valves, in mint condition, £50 or near offer. Hy-Gain tower Type HT-18, in good condition, £50. G. & D. Linear, 500-watt, new valve, £30. Two 813's, unused, 40s. each. Professional Vortezian Recorder, WVB/5, as new, £75 or offer.—Menzies, GM3GNE, 60 Beech Avenue, Newton Mearns, Renfrewshire, Scotland. (Tel. NEW 2392.)

SOLD: Heathkit SB-401 Rx, in good condition, price £85. Mosley TA-33 3-element beam, near-new condition, £15.—Smith, 21 Manor Road, Eastwood, Nottingham.

SALE: Ideal for young SWL, H.A.C. two-valve three-coll (9 to 170m.) Rx, 60s. Johnsons 2-4m. two transistor VHF Rx, 40s., built up and with full instructions.—Whitworth, 94 Pine Hill, Epsom (5525).


Echelford Communications
32 FELTHAM HILL RD., ASHFORD, MIDDX.
Ashford (MX) 55265 any time up to 9.30 p.m

SECOND-HAND ITEMS
The following items are offered, subject to being unsold, in good working order unless stated.

Lafayette "Precon" type HE73 an HF converter with output between 3-5 and 5 MHz.
Mains powered .................................................. £15 0 7/6

Lafayette SW receiver type KT120, general coverage SW receiver.
Mains powered .................................................. £22 10 10

Veritone SW receiver type CR150, a simple general coverage receiver; ideal for beginners.
Mains powered .................................................. £17 0 10

BC-38GL receiver, with separate mains PSU.
A good general coverage receiver, few mods. .................................................. £16 0 15

S44 Mk 4 metre transceiver with mike and cables, no mods. carried out, full details of ESG mods. included .................................................. £8 0 15

Home-brew NBFP/CF transmitter. Covers 7, 14, 21, 28MHz; 30W O/P mains powered, well built. Well worth more than Minimitter HF bridge transmitter; complete with PSU, not working and weighs a ton .................................................. £9 0 40

EII Laboratory voltmeter Model 28, mains powered .................................................. £20 0 20

Avo R/C bridge, mains powered, useful bit of gear .................................................. £10 0 7/6

B44 4-M frequency meter. Less PSU .................................................. £15 0 15

Standard rack width, good for break-up of receiver .................................................. £3 0 25

Cadar PR30X mains powered pre-selector .................................................. £7 0 4/6

Hours of business:
Monday, Tuesday, Thursday, Friday, 9.00 a.m.-6.00 p.m.
(Closed for Lunch 1-2 p.m.)
Saturday, 9.00 a.m.-5.30 p.m.
CLOS ED ALL DAY WEDNESDAY

A. G. WHEELER, ECHELFORD COMMUNICATIONS

TAURUS ELECTRICAL SERVICES

LOOK
CSE 2AR all Silicon Solid State Top Band Receiver.

LIST PRICE £64.00

OUR PRICE £29.10.0 Air Tested

650M Amplifiers. 19" rack mounted. Mains supply. £3.
Transistorised Morse Oscillator Modules. Will drive speaker or phones, 18/9, post paid.
New Unijunctions P-N-Planar UT46 with full information. 8/-, post paid.
New and Boxed Mains Relay, 2 pole 2-way metal base, 17/6, post paid.
New Jack Plugs 2/6; Jack Sockets, 2/9 or 3'/5' pair, post paid.
Tank Aerials. Three 4- sections making 12', 8/6.
Transistorized Morse Oscillator Modules. £25.00.
Xtal Insets to fit above Breast Sets, 7/6, P. & P. ½.
CM70 Xtal Stick with Accessories, L2/7/6, post paid.
CM20 Xtal (plastic), 9/6, post paid.
Tank Aerials. Three 4-sections making 12', 8/6.
Top Band Receiver.

CSE 2AR all Silicon Solid State Top Band Receiver.
FOR SALE: K.W. Vanguard, Mk. II, 10 to 80m., in good working order, price £30, delivery West Midlands area.—Holt, G5PTS, 39 Dovehouse Lane, Solihull, Warwickshire.

DISPOSING: SHP general coverage base Rx, tuning 500 to 3000 mc, R.A.F. type R.1294, 8 valves, meter, BFO and handbook, requires only simple PSU, price £15 (this is a rare one). Type TG-10 auto Morse paper tape keyer, U.S. Army model, 115v. mains input, 7 valves and P-E cell, variable speed tape drive, with circuit, £10. Class-D Wavemeter, unmodified, £4. FL-8 audio frequency filter, £5. FL-8C QSW?, 500 ma, cat. no. 900, Heath xtal calibrator, internal mains PSU, smart job, £4. R.1147 receiver, coverage 180 to 220 mc, £5. Pye Reporter PTC-110, for four metres, 12v. and mains inputs, £10s. ARRl, "Handbooks" for 1945, '46, '47, '49 '51 and '56. 7s. 6d. each. All post or carriage extra. Prefer buyers to collect R.1294 and TG-10.—Cockie, 14 Leewood Way, Effingham, Leatherhead, Surrey, (Tel. Bookham 5439.)

WANTED: Eddystone EB-35 or similar; must be good, cash awaits best offer.—Ring 01-989 4210.

SALE: Eddystone 940, powerful communications receiver, with plinth speaker, headphones, Joy-stick aerial and matching unit with P.E. cost £12; my price £7. Also a B.44 transceiver, all mods., for 4 metres done, and in good working order, £7.—Watmough, G3WXB, 128A Baldwins Lane, Croxley Green, Watford (2124).—Box No. 4876, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

FOR SALE: Radatec radar detector, in mint condition (this has saved me from five police radar traps, no longer required, £15), my price £7. Also a B.44 transceiver, all mods., for 4 metres, £10. JXK T1588A fct. SW-1. OFFERING: Collins 75A-3 receiver, in immaculate condition, with accessories, £35, or offer. Both these with carriage paid.—McAlister, G3YGS, 3 Jackson Court, Brading Crescent, Wanstead, London, E.11. (Tel. 01-989 3275.)

CULLERS only for an SX-28 at £16.—De Courcy, 27 Highbury Avenue, Salisbury, Wiltshire.

OFFERING: Collins 75A-3 receiver, in immaculate condition, with auto-xformer, spares and manual, offers? Also a 100-watt modulator for QRO two-metre, £2.60. In Class-B, with UM3 mod. xformer, built-in PSU, metered £10. JXK T1586A FET-two metre converter, IF 28-30 mc, hardly used, £12. Also a B.44B receiver, £15 or offer. Both these with carriage paid.—Clouting, G3YGS, 3 Jackson Court, Brading Crescent, Wanstead, London, E.11. (Tel. Bookham 5439.)
Technical Books and Manuals

AERIAL INFORMATION
ABC of Antennas ........................................... $17.00
Aerial Handbook .......................................... $15.00
Amateur Radio Antennas (Hooton) ....................... O/P
Antenna Handbook, Volume 1 .......................... $33.00
Antenna Round-Up, Volume 1 .......................... $27.00
Antenna Round-Up, Volume 2 .......................... $33.00
Beam Antenna Handbook .................................. $33.00
Ham Antenna Construction Projects .................... $27.00
Quad Antennae ............................................. $26.00
S9 Signals .................................................... $9.00

BOOKS FOR THE BEGINNER
Amateur Radio (Rayer) ..................................... $26.00
Basic Mathematics for Radio and Electronics ........... $18.00
Beginners Guide to Radio................................ $15.00
Beginners Guide to Electronics ......................... $16.00
Beginners Guide to Colour TV ........................... $15.00
Better Short Wave Reception ............................ $27.00
Course in Radio Fundamentals ........................... $11.00
Dictionary of Electronics .................................. $8.00
Foundations of Wireless .................................. $23.00
Guide to Amateur Radio .................................. $6.00
How to Become a Radio Amateur ........................ $11.00
How to Improve Short Wave Reception ................... $20.00
Learning Morse ............................................. O/P
Morse Code for the Radio Amateur ...................... $2.00
Learning the RT Code .................................... $4.00
Novice Handbook, Tx & Rx ............................... $25.00
Radio, by D. Gibson ...................................... $13.00
Radio Amateur Examination Manual .................... $5.00
Short Wave Listening .................................... $16.00
Short Wave Listener's Guide ............................ $13.00
Short Wave Receivers for the Beginners ............... O/P
Understanding Amateur Radio ............................ $26.00

GENERAL
Official (I.T.U.) Chart of International Frequency Allocations ..................... $35.00
CQ Anthology 1952-59 .................................... $27.00
Eliminating Engine Interference ......................... $17.00
Guide to Broadcasting Stations ......................... $6.00
How to Listen to the World .............................. $26.00
Introduction to Valves .................................... $9.00
Radio Experiments (Rayer) .............................. $17.00
RCA Silicon Power Circuits ................................ $30.00
RCA Receiving Tubes Manual ............................ $23.00
RCA Transmitting Tubes ................................ $15.00
Radio Astronomy for Amateurs .......................... O/P
Soldering Handbook ....................................... $22.00
Shop & Shack Shortcuts ................................... $34.00
Television Explained ...................................... $26.00

HANDBOOKS AND MANUALS
Amateur Radio DX Handbook ............................ $42.00
Electronic Circuit Handbook, Vol. 1 .................... $27.00
Electronic Circuit Handbook, Vol. 2 .................... $27.00
Mobile Handbook, CQ .................................... $27.00
Mobile Manual, ARRL .................................... $27.00
New RTTY Handbook ..................................... $35.00
New Sideband Handbook, CQ ............................ $28.00
Novice Handbook Tx & Rx ................................ $25.00
Radio Amateur Handbook (ARRL) 1969 Edition ........ $50.00
Radio Communication Handbook (RSGB) ................ $68.00
Radio Handbook, W.I. Orr ................................ $88.00
Surplus Conversion Handbook ........................... $26.00
Transistor Radio Handbook ................................ $0.00
Transistor Substitution Handbook ....................... $17.00

USEFUL REFERENCE BOOKS
Amateur Radio Techniques ............................... $14.00
Amateur Radio Construction Projects .................... $21.00
Amateur Radio Circuit Book .............................. $11.00
Elements of Radio Engineering .......................... $16.00
Guide to Amateur Radio ................................... $6.00
Engineers' Pocket Book .................................. $15.00
Hams' Interpreter .......................................... $9.00
Hints & Kinks, Vol. 6 (ARRL) ............................ $11.00
Radio Amateur Examination Manual .................... $5.00
Operating an Amateur Radio Stat. ....................... $2.00
Radio Amateur Operator's Handbook ..................... $6.00
Radio Valve Data ........................................... $11.00
Radio Data Reference Book .............................. $14.00
Radio Engineer's Pocket Book ............................ $12.00
Service Valve & Semiconductors Equivalents ........... $5.00
(Amateur) SSB Radio Guide .............................. $31.00
Single Sideband for the Radio Amateur (ARRL) ......... $26.00
Surplus Schematics (CQ) .................................. $23.00
Q & A on Audio ............................................ $10.00
Q & A on Electronics ..................................... $10.00
Q & A on Transistors ..................................... $10.00

VHF PUBLICATIONS
VHF Handbook, Wm. I. Orr .............................. $39.00
VHF Manual (ARRL) ...................................... $26.00
VHF for the Radio Amateur .............................. O/P
VHF/UHF Manual (RSGB) ................................ $23.00

The above prices include postage

Available from SHORT WAVE MAGAZINE
Publications Dept., 55 Victoria St., London S.W.1. 01-222 5341
(Counter Service, 9.30-5.15, Mon. to Fri.) (Nearest Station: St. James's Park)
(GIRO A/C. No. 547 6151)
WORLD RADIO/TV HANDBOOK 1970

The World's only complete reference guide to International Radio & Television Broadcasting Stations. It includes: Frequencies, time schedules, announcements, personnel, slogans, interval signals and much more.

Lists all International short-wave stations, including frequencies for each country, foreign broadcasts, long and medium wave stations (AM broadcast Band), TV stations and domestic programmes. Lists all national Radio & Television Broadcasting Stations. Known the world over as the CALLBOOK, this comprehensive reference lists about 300,000 licensed radio amateurs in the United States Directory and 160,000 or more in the rest of the world (contained in the "DX Section"). The entries grow with every issue! In the U.S. Section, licence classifications are now shown. Each issue is an entirely new book with revised listings of new licences, names and addresses. The CALLBOOK also includes much incidental DX information. Every amateur operator and SWL needs the latest CALLBOOK to get the most out of Amateur Radio.

DX Listings 45/6 US Listings 69/6
The two together, covering the World, £5/10/0

Price, same as last year (no increase!) ... ... 43/6

PLEASE ORDER YOUR COPY EARLY!

All available from:

SHORT WAVE MAGAZINE
55 Victoria Street, London, S.W.1

“CALLBOOK” WINTER EDITION
Limited Quantity Only

Please order your copy early

Known the world over as the CALLBOOK, this comprehensive reference lists about 300,000 licensed radio amateurs in the United States Directory and 160,000 or more in the rest of the world (contained in the "DX Section"). The entries grow with every issue! In the U.S. Section, licence classifications are now shown. Each issue is an entirely new book with revised listings of new licences, names and addresses. The CALLBOOK also includes much incidental DX information. Every amateur operator and SWL needs the latest CALLBOOK to get the most out of Amateur Radio.

DX Listings 45/6
US Listings 69/6
The two together, covering the World, £5/10/0
Post free

Available only from
Publications Dept.,
SHORT WAVE MAGAZINE
55 Victoria Street, London, S.W.1
01-222 5341

Short Wave Listening
PHILIPS PAPERBACK

SHORT WAVE LISTENING by J. Vastenhoud. Size: 8½”x5¼”.
Price 16s.

This book is intended as a guide for the benefit of the increasingly large numbers of regular listeners to short-wave transmitting stations and also for radio amateurs who are interested in short-wave listening.

The first group includes many emigrants who in their new country are anxious not to lose touch with their homeland, and those who are intending to emigrate and will thus in future have to do much of their listening on short waves.

The second group is of those enthusiasts who regard short-wave radio as an indispensable medium for the exchange of information internationally in the broadest sense and employ it in order to widen their knowledge of other countries.

The book, which deals with the possibilities and problems of short-wave reception on the level of popular science will enable the reader to discover a whole new world of his own.

CONTENTS

Short Waves
The Principles of Short-Wave Transmission
Practical Short Wave Transmitting
Short Wave Prediction
Sources of Interference
The Aerial
The Correct Choice of Receiver
Communications Receivers

Available from stock:

PUBLICATION DEPT.
SHORT WAVE MAGAZINE
55 VICTORIA STREET, LONDON, S.W.1

Peter Seymour Ltd.

Introducing the NEW SWAN DE-LUXE CYGNET
Model 270

SPECIFICATIONS :
Power Input : 260 watts P.E.P. in SSB voice mode, and 180 watts in CW mode.
Frequency Range : 3-5-40 mc, 7-0-7.3 mc, 14-0-14.35 mc, 21-0-21.45 mc, 28-0-29.7 mc.
C.F. Networks : Crystal Lattice Filter. Same as used in the Swan 500C. 2.7 kc band width at 6 dB down. 1-6 kc wide at 60 dB down. Ultimate rejection exceeds 100 db.
Grid block CW keying with off-set transmit frequency. Solid state VFO circuit temperature and voltage stabilized.
Receiver sensitivity better than ½ microvolt at 50 ohms for signal-plus-noise to noise ratio of 10 dB.
100 kc Crystal Calibrator and dial-set control. S-meter for receiver, P.A. Cathode meter for transmitter tuning.
Sideband selector.
Voltage input : 200/240 volts 50 cycles, 12-14 volts DC.
Dimensions: 5½in. high, 13in. wide, 11in. deep.
Net weight: 24 lb.

Tel. : Hull 41938