

# The SHORT WAVE Magazine

4/-

VOL. XXVI

JANUARY, 1969

NUMBER 11

## PERFECTION

by  
nova  
tech



### NOVA PAL

3-band R.D.F. 9 transistors

190-400 Kc. with rotating ferrite  
550-1600 Kc. antenna and connection  
1600-4500 Kc. for external  
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Units are completely portable and  
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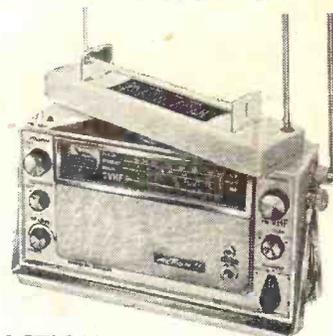
### AVIATOR II 4 Bands

VHF. 108-136 Mc. All the general  
Aviation Band.

Marine/Short Wave. 1.5 to 4.5 Mc.  
Ships, Coast Stations, Radio-Tele-  
phone.

Broadcast. 550-1600 Kc. Standard  
AM Stations for DF or Homing.

Beacon. 200-400 Kc. Low frequency,  
weather, Marine and Aircraft Beacons,  
Radio Range Stations. £53.10



### ACTION 5 Bands

VHF. 30-50, 150-175 Mc. All the  
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Marine/Short Wave. 1.5 to 4.5 Mc.  
Ships, Coast Stations, Radio-Tele-  
phone.

Broadcast. 550-1600 Kc. Standard  
AM Stations for DF or Homing.

Beacon. 200-400 Kc. Low frequency,  
weather, Marine and Aircraft Beacons,  
Radio Range Stations. £53.10

VISIT STAND No. UG8  
THE BOAT SHOW  
OLYMPIA  
1-11 JANUARY 1969

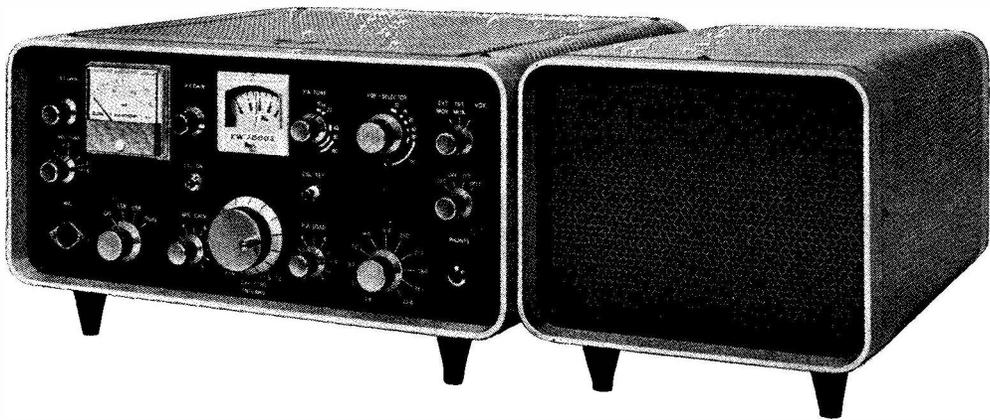
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# KW SSB EQUIPMENT

*for reliability*



### **KW ATLANTA KW 2000A**

HIGH POWER  
TRANSCIEVER  
500 watts PEP, 10-80  
metres; SSB, AM, CW.  
Built-in 100KHz  
crystal calibrator.

SSB TRANSCIEVER  
180 watt PEP, 10-160  
metres, complete  
AC psu, VOX,  
P.T.T.

### **KW VESPA Mark II**

TRANSMITTER FOR  
ALL H.F. BANDS  
220 watts PEP SSB,  
AM, CW.

### **KW 1000**

LINEAR AMPLIFIER  
1200 watts PEP with  
built-in psu and  
SWR indicator.

### **KW 201**

AMATEUR BANDS  
COMMUNICATIONS  
RECEIVER  
SSB CW, and AM;  
10-160 metres.



*Write for illustrated detailed specification on the above  
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## **K. W. ELECTRONICS LIMITED**

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Other KW Products : KW Antenna Switch (3 position), KW E-Z Antenna Match Unit, KW PEP Meter, KW Match SWR Indicator,  
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This edition of the Home Radio Catalogue is the result of eleven years of careful selecting, compiling and indexing. It is the finest, most comprehensive we have ever produced—it has 300 pages, over 8,000 items listed and over 1,500 illustrations. It is a must for anyone interested in radio and electronics. With each catalogue we supply our unique Bargain list, Book Mark giving Electronic Abbreviations, an Order Form, an addressed envelope, and 6 vouchers each worth 1/- when used as directed. All this for only 8/6 plus 3/6 post, packing and insurance. Send the attached coupon today, with your cheque or P.O. for 12/-.

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## J. & A. TWEEDY (ELECTRONIC) LTD.

SPECIALISING IN AMATEUR RADIO EQUIPMENT

We have pleasure in announcing that as from January 1969 we can offer full servicing facilities on all types of amateur radio equipment. Ring Chesterfield 4982 and ask for John Baker who will be pleased to attend to your enquiries.

**BRITISH**

|                         |          |                  |          |
|-------------------------|----------|------------------|----------|
| <b>EDDYSTONE :</b>      |          |                  |          |
| EA12 ... ..             | £195 0 0 | 840C ... ..      | £70 0 0  |
| EC10 ... ..             | £59 10 0 | Die cast boxes   |          |
| <b>KW ELECTRONICS :</b> |          |                  |          |
| 2000A ... ..            | £232 0 0 | Vespa ... ..     | £135 0 0 |
| 201 RX ... ..           | £111 0 0 | Accessories      |          |
| <b>CODAR RADIO CO.:</b> |          |                  |          |
| RQ10. Q Mult.           | £7 5 0   | RQ10X Q Mult.    | £8 17 6  |
| CC40 ... ..             | £6 15 0  | ATS Tx. ... ..   | £16 19 6 |
| T28 Rx. ... ..          | £15 17 6 | 12/MS P.S.U. ... | £11 10 0 |
| 12/RC ... ..            | £12 10 0 | 250/S P.S.U. ... | £8 10 0  |

**TAVASU (Chesterfield) :**  
**MOBILE**

|                    |                     |         |
|--------------------|---------------------|---------|
| 100" whip complete | 20 metre resonator  | £2 0 0  |
| with 50 ohm co-    | Chrome adaptor ...  | 6 0     |
| ax and base ...    | 160 metre resonator | £2 10 0 |
| 80 metre resonator | 40 metre resonator  | £2 5 0  |
|                    | 15 metre resonator  | £2 0 0  |

Packaged deal : Complete set one of each item, £12 10s., P. & P. 7/6.

**VHF**

|                     |         |                         |         |
|---------------------|---------|-------------------------|---------|
| 5 Element 144 mc/s. | £2 12 6 | 11 Element 144 mc/s.    | £5 19 0 |
| 4 metre and 70 cm.  |         | Specials made to order. |         |

**IMPORTED**

|                               |          |                 |          |
|-------------------------------|----------|-----------------|----------|
| <b>SOMMERKAMP :</b>           |          |                 |          |
| FTDX 500 ... ..               | £250 0 0 | FLDX 500 ... .. | £145 0 0 |
| <b>TRIO :</b>                 |          |                 |          |
| 9R59DE ... ..                 | £39 15 0 | JR500SE... ..   | £69 10 0 |
| TS 500 ... ..                 | £165 0 0 | PS500 ... ..    | £38 0 0  |
| VFO 5 ... ..                  | £28 0 0  | SP5D speakers   | £4 7 6   |
| <b>LAFAYETTE :</b>            |          |                 |          |
| HA600 ... ..                  | £45 0 0  | VFO, 80-10 ...  | £12 0 0  |
| (transistorised)              |          |                 |          |
| <b>INOUE :</b>                |          |                 |          |
| IC700R Rx. ... ..             | £85 0 0  |                 |          |
| <b>HANSON :</b>               |          |                 |          |
| SWR 3 Standing Wave Bridge .. |          |                 | £3 10 0  |

**USED EQUIPMENT**

|                  |          |                   |         |
|------------------|----------|-------------------|---------|
| Heathkit RAI ... | £28 0 0  | Heathkit RAI,     |         |
| Eddystone EC10   | £130 0 0 | calib. ... ..     | £32 0 0 |
| AR88D ... ..     | £37 10 0 | Panda Explorer... | £35 0 0 |
| Gonset Super-    |          | Heathkit DX40 ... | £25 0 0 |
| ceiver ... ..    | £10 0 0  | 52 set ... ..     | £9 0 0  |

**Components and Accessories**

Test meters, Panel meters, Morse keys, Valves, Transistors, components.

Please add for carriage or postage, any excess will be refunded.

HP TERMS AVAILABLE

PART EXCHANGES

**64 LORDSMILL STREET, CHESTERFIELD, DERBYSHIRE**  
Telephone Chesterfield 4982 or Holmewood 506 (Evenings)

# J. B. LOWE 50-52 Wellington Street, Matlock, Derbyshire

Tel.: Matlock 2817 (2430 evenings)

## HAPPY NEW YEAR

## SOMMERKAMP

## STAR

## INOUE

I doubt it will not be a very happy new year for Lowe Electronics—this 50% surcharge on imports has hit me and hit me real hard. Right where it hurts most, smack bang in the middle of my pocket!! It's making me grunt, boy, I'll tell 'ee! Still, if it gets the Country out of a mess, fair enough. I will have to economise a bit and not import so much. However, I will as far as I possibly can, keep prices stable and I will naturally continue to flog what I consider to be the best value for money on the market—Sommerkamp, Inoue and Star. I have tried other makes, checked performances with good test gear and every time I just have to come back to Sommerkamp, Inoue and Star. Maybe I'm stupid, I could make more money selling other brands, but I started this business with the object of giving best value for money and by golly, I'm going to stick to that principle, 50% surcharge or no 50% surcharge! I'll raise the money somehow. Those of you who know me and have dealt with me probably even believe this nonsense—those of you who don't know me most certainly won't believe it, so just think about the small ads. Not many Sommerkamp, Inoue or Star bits second-hand are there? And the very few that are for sale haven't dropped much from their new price, have they? Must be a moral somewhere! Maybe this crooked liar Bill Lowe isn't so far from the truth after all. Anyway, to get down to solid flogging—in the new line in stock at the time of writing I have the entire Sommerkamp line with the exception of the FT-250 which is expected any time and the price will be well under £200. Incidentally, last month I said I would be getting the kit version, but the additional cost of the built up version is so small that when I apply my standard of value for money, the built up version wins every time. Don't forget the built up version is tested before sale and carries a worth while guarantee, whereas the kit has neither, so in spite of the fact that the kit is a much more attractive profit maker from my point of view, I have to come down in favour of the built up version. Stupid honest idiot that I am! Also in the new line, Inoue of course—a complete rig for £180. Not only a complete rig, but a damn fine rig. Once again, top value for money. Also Star ST-700, SR-700 and SR-200. Being in a confidential and honest mood, let me warn you that in view of the 50% import surcharge, I am cutting imports of Star, so they will be scarce for a time. After the current batch are sold, there won't be any more till April or May. I don't know why I'm pushing this stuff—I just have to cut down on imports so everyone I import will be spoken for, so what's the point of advertising it. Let's push some of the smaller stuff and the second-hand stuff—get some loot in the bank so that I can import some more Inoue!

## SECOND-HAND RECEIVERS :

|                 | £   | s. | d. |                             | £  | s. | d. |
|-----------------|-----|----|----|-----------------------------|----|----|----|
| HR-22           | 80  | 0  | 0  | BRT 402E                    | 60 | 0  | 0  |
| EDDYSTONE 770U  | 60  | 0  | 0  | RME 4350, Amateur           |    |    |    |
| EDDYSTONE 740   | 15  | 0  | 0  | band                        | 45 | 0  | 0  |
| RA1             | 32  | 10 | 0  | SIEMENS 745                 | 60 | 0  | 0  |
| LAFAYETTE HA700 | 25  | 0  | 0  | HALLICRAFTERS               |    |    |    |
| KW201, mint     | 90  | 0  | 0  | SX140                       | 20 | 0  | 0  |
| HRO500, A1      | 350 | 0  | 0  | GELOSO G209                 | 30 | 0  | 0  |
| SOMMERKAMP      |     |    |    | HRO                         | 20 | 0  | 0  |
| FR-100-B        | 90  | 0  | 0  | HAMMARLUND                  |    |    |    |
| KW76            | 20  | 0  | 0  | SP600JX                     | 85 | 0  | 0  |
| TCS12           | 12  | 0  | 0  | SX29 (fault in xtal filter) | 12 | 10 | 0  |

NEW CODAR AT5's and p.s.u.'s now in stock.

## SECOND-HAND TRANSMITTERS :

|            | £   | s. | d. |               | £   | s. | d. |
|------------|-----|----|----|---------------|-----|----|----|
| HW32       | 50  | 0  | 0  | NATIONAL 200, |     |    |    |
| KW VALIANT | 20  | 0  | 0  | complete with |     |    |    |
| FT-100-B   | 165 | 0  | 0  | p.s.u. kit    | 185 | 0  | 0  |

## TEST GEAR :

|   | £  | s. | d. |
|---|----|----|----|
| Laboratory audio oscillator, a thing of beauty  | 25 | 0  | 0  |
| Taylor sig. generator, 100 kc/s. to 45 mc/s.    | 10 | 0  | 0  |
| Crystal activity tester, 193A                   | 3  | 10 | 0  |
| Solartron CD523S, D.C. to 10 mc/s. 'scope, mint | 45 | 0  | 0  |
| Cossor Ganging oscillator                       | 3  | 0  | 0  |
| Marconi TF885A video oscillator, mint           | 45 | 0  | 0  |
| Industrial Electronics 2300 'scope, tiny thing  | 15 | 0  | 0  |

## SUNDRIES :

|   |    |    |   |
|---|----|----|---|
| BC939 QRO ATU   | 15 | 0  | 0 |
| Plain Morse keys, polished brass with ball bearing pivots                               | 18 | 6  | 0 |
| C.W. practice sets, key plus buzzer   | 15 | 0  | 0 |
| G.D.O.'s, Tech TE18, 240v. A.C. 300 kHz-220 mHz   | 11 | 10 | 0 |
| S.W.R. bridges, Hansen SWR3, 50 or 75 ohm   | 3  | 10 | 0 |
| Bug keys  | 4  | 0  | 0 |
| Electronic keyers DA1   | 16 | 0  | 0 |
| Katsumi C.W. Monitors. High speed relay, built in with spare contacts for break-in C.W. | 7  | 15 | 0 |
| Headsets, low impedance, padded   | 2  | 2  | 6 |
| AR83 manual reprints  | 15 | 0  | 0 |
| VHF/UHF 50 ohm dummy loads  | 2  | 10 | 0 |

Tubular trimmers, 1/2-5pF or 3-15pF 1/- each or 10/- doz. Feed-throughs, 500v. 1000pF screw type 1/- each or 10/- a doz. Standard Belling Lee coax plugs, metal, 1/4, sockets 1/-, Octal, B7G or B9A plugs 2/6 each. SE-05 1000piv 500mA rectifiers, the ones you can trust, 4/6 each. Panel indicator lamps for standard lilliput bulbs, red or green, 2/6 each. Lilliput bulbs 1/- each. PL259 plugs 5/- each, reducers 1/3 each, sockets 5/- each. I have a very nice line in brand spanking new capacitors. Top quality at junk prices.

## ELECTROLYTICS :

Can type with mounting clips.  
100mF/350v. 5/6; 100-100mF/350v. 6/8; 100mF/450v. 7/2;  
40-40/500v. 7/3; 100mF/500v. 7/9; 100-100/450v. 13/2.  
Minute low voltage types:—  
16mF/16v. 8d. each, 7/- a doz.; 10mF/16v. 6d. each, 5/- a doz.;  
100mF/12v. 8d. each, 7/- a doz.; 1000mF/12v. 6d. each, 5/- a doz.;  
30mF/16v. 8d. each, 7/- a doz.; 100mF/16v. 1/- each, 10/- a doz.

## TANTALUMS :

4/20v., 4/38v., 8/9v., 8/20v., 10/12v., 16/20v. and 100/12v.—all at 1/6 each. Believe it or not, lads, these are normally around the 12/6 mark!

## DISCS :

·01/500v. 6d. each, 5/- doz.; ·001/500v. 4d. each, 3/6 a doz.; 50 volt types ·002, ·005, ·01 3d. each, 2/6 a doz.; ·02, ·05 4d. each, 3/6 doz.

## SWITCHES :

DPDT slide switches with centre off 2/-.

## KNOBS :

2 3/4" dia. fluted 2/-, AR88 type 1 3/8" 1/6, 1 3/8" 1/3.  
Crystal holders HC6/U 1/- each, 10/- a doz.  
75 or 300 ohm feeder good for 200W. 6d. a yard.

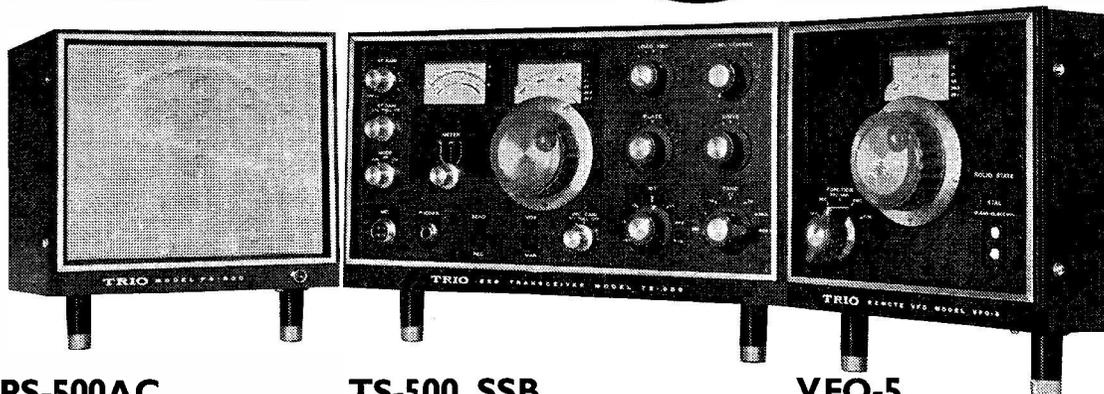
## WELLER SOLDERING GUNS :

|   | £ | s. | d. |
|---|---|----|----|
| "Expert"—dual heat 100/140W.  | 3 | 12 | 6  |
| "Expert"—kit with solder, spare tips, soldering aid, brush and spanner, in strong carrying case | 3 | 17 | 6  |
| "Marksman"—25W.   | 1 | 11 | 6  |
| "Marksman"—25W. kit with solder, 2 spare tips and soldering aid                                 | 2 | 1  | 6  |

Converters 21 or 28 mc/s. These are hot stuff—twin triode cascode r.f. amp, 12AT7 low noise mixer/xtal osc. and 6AU6 I.F. out. The output is 5-5.5 mc/s. (21 mc/s.) and 5-7 mc/s. (28 mc/s.). They require 6.3v. A.C. and 150-200v. D.C. and are excellent value at £7 10s.

All the lovely new stuff can also be inspected at Alan Whitford's, G3MME, 37, Chestnut Drive, Polegate, Sussex, evenings and weekends, for those who can't get over to Matlock, or who are scared they'll get trapped in a blizzard!! (We haven't dug 'em all out from last year yet!) If you can't get over to either Alan or myself, send me a s.a.e. and I'll send you my latest lists.  
POSTAGE: Please allow lots for postage. We will refund any excess.

# THIS IS THE GREAT NEW TRIO SYSTEM



## PS-500AC POWER SUPPLY [AND SPEAKER

● Utilizes a silicon voltage rectifier to supply the high 900v. requirements of the TS-500 transceiver ● B supply lines requiring 300v. and less are taken from the centre of the capacitor stack and voltage dropping resistors are used in series to form the 200v. and 150v. supplies ● A half wave silicon rectifier circuit is used to obtain block bias voltage of 120v. ● Two 12-6v. 3 amp. secondary windings supply heater voltages for the transceiver valves ● The primary windings are connected for operation from 230v. line sources ● The power supply jack incorporates speaker line terminals, as well as the power transformer primary connections so that AC power switching is made from the transceiver ● Incorporates specially designed 6in. communications speaker—frequency range 150-5000Hz. ● Size 7½ x 8½ x 11½in.

## TS-500 SSB TRANSCEIVER

● Precision, double gear tuning mechanism and linear tuning condenser provides 1kHz direct reading divisions on all bands ● Besides SSB, AM (A3H) and CW communication is provided ● Operates with a max. input of 200W. PEP on SSB and CW. ● Undistorted output more than 1W. ● Covers all amateur bands from 3.5 to 29.7 MHz with a 7 band tuning system in both transmitting and receiving modes ● Double conversion type superheterodyne receiver ● Solid state VFO circuitry assures high stability performance ● Receiver sensitivity 1µV 5/N 10 dB (14 MHz), Selectivity 2.7 kHz (-6 dB) 5.0 kHz (-55 dB) ● Xmitter audio freq. 300-3000 Hz (-6 dB) ● Uses 17 valves, 3 transistors and 15 diodes ● New Trio developed crystal sideband filter provides superior shape factor and clear, crisp SSB quality ● Highly effective AGC circuit prevents fading, permits easy reading of signals ● Built-in crystal calibrator circuit works with 500 kHz, 1 or 3.5 MHz crystals ● RIT circuit for fine receiver tuning ● Built-in circuits include VOX, PTT, ALC, RIT, CAL, RF-HV METER, connections for ext. VFO and ALC. ● Used with a remote VFO a special switching circuit permits, in effect, the operation of two transmitter/receivers. ● Power supply from sep. PS-500AC unit ● Size 13 x 8½ x 11½in.

## VFO-5 VARIABLE FREQUENCY OSCILLATOR

● Equipped with the same high precision double gear dial mechanism and linear variable frequency capacitor as the TS-500, enabling direct reading of frequencies at 1 kHz intervals ● Oscillator frequency range covers all the amateur bands, as the TS-500 ● Built-in crystal oscillator section assures crystal controlled transmitting/receiving ● Unlike ordinary VFO units, this VFO permits four different functions through the utilisation of a "criss-cross" function switching scheme ● Outstanding frequency stability due to cool operating all transistor circuitry, adoption of a Vaccar oscillator circuit and temperature compensation features ● Rugged LC box and solid construction throughout make this unit practically impervious to mechanical shocks. ● All power requirements are taken from the transceiver through a single connecting cable ● Uses 4 transistors and 2 diodes ● Size 7½ x 8½ x 6in.

**COMBINED PRICE £203.0.0**

**PRICE £32.0.0**

Illustrated technical information leaflets for these and other Trio models on request

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SW/169

# HEATHKIT for SW Receivers

## Professional 10 Band SW Receiver SB 310

### Kit SB-310

£138. 12. 0 P.P. 9/-

### Ready-to-Use A/SB-310

£168. 12. 0 P.P. 9/-

Our finest SW Receiver.  
The superb SB-310  
for the professional  
Short Wave listener.



SB-310

Heathkit's most professional SW Receiver—world-famous for its superb quality and styling. It is designed for the shortwave listener who wants a communications quality receiver, without a budget-breaking price. Just look at the features outlined below and see for yourself just why the SB-310 is acclaimed by professionals all over the world.

- Covers six shortwave broadcast bands (49, 41, 31, 25, 19 and 16 metres) . . . 80, 40 and 20 metre amateur bands . . . 11 metre CB ● 5 kHz crystal filter included for AM, SSB and SW listening ● Crystal-controlled front-end for same-rate tuning on all bands ● 1 kHz dial calibrations—100 kHz per dial revolution ● Bandspread equal to 10 feet per MHz ● Separate RF and AF gain controls ● Pre-built and aligned LMO ● Product detector for SSB ● Automatic noise limiter ● Calibrated "S" meter.

Certainly one of the finest values on the SW market today.

**SB-310 SPECIFICATION:** Frequency range (MHz): 3.5 to 4.0, 5.7 to 6.2, 7.0 to 7.5, 9.5 to 10.0, 11.5 to 12.0, 14.0 to 14.5, 15.0 to 15.5, 17.5 to 18.0, 26.9 to 27.4. Intermediate frequency (IF): 3.395

### CODE PRACTICE OSCILLATOR HD-16

Learn and practice morse code. Separate controls for tone-frequency and volume. Transistorised. Built-in speakers. Includes key. For battery operation.

Kit K/HD-16, £4.3.0. P.P. 3/-.

MHz. Frequency stability: Less than 100 Hz drift per hr. after 20 min. warm-up under normal ambient conditions. Less than 100 Hz drift for  $\pm 10\%$  line voltage variation. Sensitivity: Less than  $0.3 \mu\text{V}$  for 10 dB signal-plus-noise to noise ratio for SSB operation. Image rejection: 60 dB or better. Dial accuracy: ELECTRICAL: Within 400 Hz on all bands, after calibration at nearest 100 kHz point. VISUAL: Within 200 Hz on all bands. Antenna input impedance: 50 ohms, nominal unbalanced. Audio output impedance: Speaker, 8 ohms. matching headphones, high impedance. Power requirements: 105–125 or 210–250 volts AC, 50–60 Hz, 50 watts. Cabinet dimensions:  $14\frac{7}{8}$ "W x  $6\frac{5}{8}$ "H x  $13\frac{3}{8}$ "D. Net weight: 17 lb. Valve complement: 10 valves. Doide complement: 8.

### OPTIONAL EXTRAS ARE:

A CW crystal filter, model SBA-301-2 (400 Hz), £11. 16. 0.

SSB filter plus crystal (2.4 kHz–7 kHz), model SBA-301-1, £12. 10. 0.

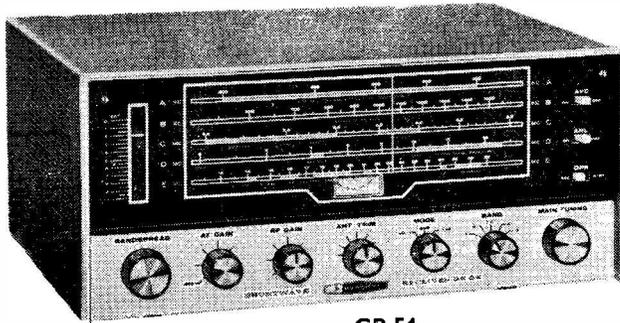
SSB filter plus crystal (2.1 kHz–5 kHz), model SBA-310-2, £20. 12. 0.

Also available for use with the SB-310 is the SB-600 matching speaker. Dimensions are 10"W x  $6\frac{1}{2}$ "H x  $10\frac{1}{2}$ "D. Cost ?—value at only £10. 2. 0, P.P. 4/6.

Low-priced Earphones, 5/SF-20. Suitable for all Heathkit SWL receivers, phone plug included. 2000 ohms impedance, £1. 10. 0.

SHOWROOMS: LONDON - Tottenham Court Road. BIRMINGHAM - St. Martins House.

# HEATHKIT for SW Receivers



GR-54

## De-luxe 5 Band Short Wave Receiver GR-54

Kit K/GR-54 £50.0.0 P.P. 9/-  
Ready-to-Use Price on request

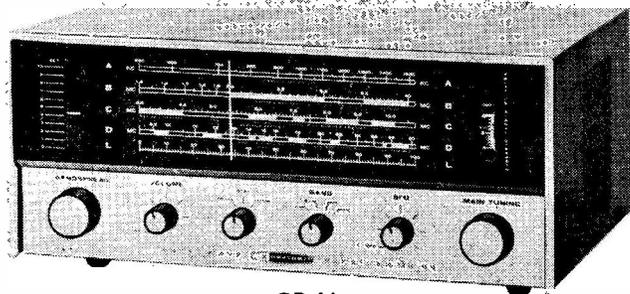
- 5 bands . . . 3 shortwave bands cover 2 MHz to 30 MHz, plus 550 kHz to 1550 kHz AM broadcast band
- Tuned RF stage for greater sensitivity
- Crystal filter for sharp selectivity
- Separate product detector for efficient SSB and CW reception
- Switchable upper or lower sideband mode position
- Built-in relative signal strength indicator
- Electrical bandspread tuning
- 6 tube—6 diode superhet

circuit plus 2 silicon diode rectifiers ● Built-in code practice monitor plus code key jack ● Automatic noise limiter, automatic volume control and antenna trimmer control ● "Velvet-touch" 16 revolution main tuning ● Built-in 4" x 6" PM speaker ● Built-in AM antenna plus external antenna terminals ● Standard jack accepts headphones or external speaker ● Safe transformer-operated power supply ● Sleek low-boy styling—Charcoal grey metal cabinet ● Antenna included.

Compare to sets costing very much more. Compare features like the crystal filter for extra-sharp selectivity . . . tuned RF stage for added amplification and image rejection . . . separate product detector for efficient SSB and CW listening, plus AM diode detector . . . switchable BFO control for upper and lower sideband tuning to eliminate "trial and error" SSB tuning . . . and complete controls for all functions. Assembles in 12 to 15 hours.

## Journey into the exciting world of shortwave with this low-cost 4 Band Receiver, GR-64

Kit K/GR-64 £22.8.0 P.P. 9/-  
Ready-to-Use £29.8.0 P.P. 9/-



GR-64

## Improve your SW reception with a Heathkit Q Multiplier GD-125

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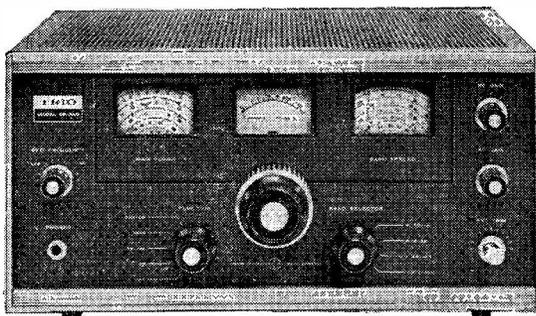
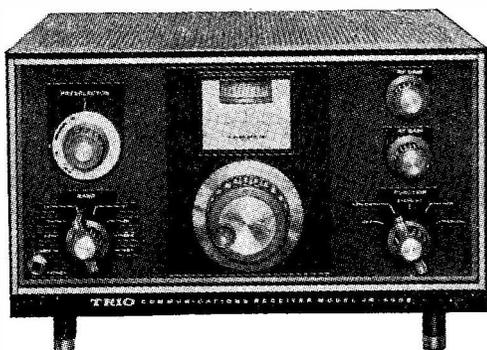
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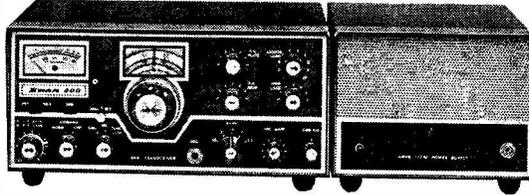
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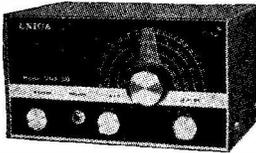
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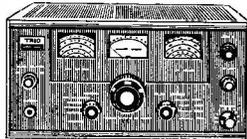


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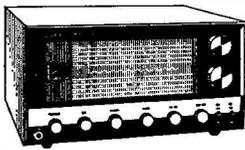
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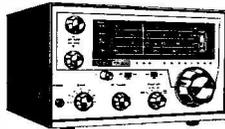
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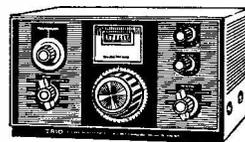
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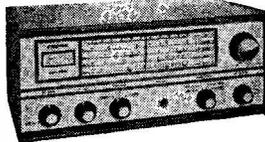
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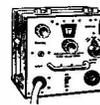
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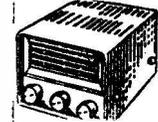


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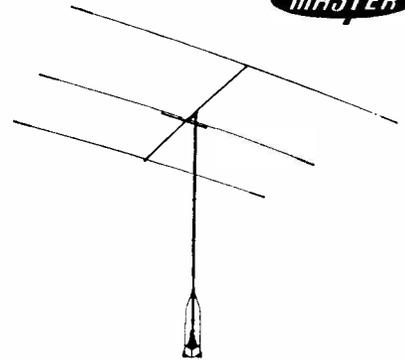
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# SHORT WAVE MAGAZINE

(GB3SWM)

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JANUARY, 1969

No. 303

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*The*  
**SHORT-WAVE**  
*Magazine*

E D I T O R I A L

**Prospects**

*One of the most encouraging phenomena in the world of radionics at the present time is the rising tide of "young interest" in Amateur Radio. From our general correspondence, it is easy to gauge these tendencies, and it is evident that a great many schoolboy-beginners are taking the Radio Amateurs' Examination in their stride, so to speak, with no immediate intention of coming on the air—this is something to be kept for "later on," which usually means when they have learnt enough Morse to pass that Test!*

*In the main, however, it is still from our army of SWL's (many of whom are very experienced on the receiving side) that newcomers are recruited to the ranks of radio amateurs, and it is these SWL's who need guidance and encouragement. It is here that local Club groups can do so much to help, advise and enthuse beginners—and it is to the credit of many Clubs, up and down the country, that they make special arrangements to cater for the needs of their SWL members. And this month is the tenth anniversary of our own "SWL" feature.*

*The coming year, with all the interesting and exciting prospects that it holds for radio amateurs—the improving DX conditions; the rise in the MUF; the availability of ten, six and four metres for inter-Continental and cross-band working; and the launching of the Oscars—means that 1969 will be outstanding in the memory of those radio amateurs fortunate enough to be able to join in all these activities.*

*And to all our readers and trade friends  
—at home and across the seas—  
Every Good Wish for the New Year*

*Austin Forster,  
G6FO.*

---

## TRANSCEIVER FOR THE LF BANDS

COMPACT DESIGN FOR /A  
WORKING, PORTABLE  
OPERATION, STAND-BY OR  
MAIN STATION

F. G. RAYER, A.I.E.R.E. (G3OGR)

**T**HE ease with which a transceiver can be used at an alternative address is a great advantage for anyone who takes equipment on holiday, or occasionally works /A. Everything is in one box. It is only necessary to plug in microphone, mains and some kind of aerial—probably a temporary, end-fed wire. The transceiver described here is for 10 watts input on 160, and 12 watts on 80 metres, but fits a case only 10 x 7½ x 7in., inside dimensions, and is thus a reasonable single-unit station to transport, or operate in any room at home.

The brief specification is as follows:

**Power Pack:** EZ81 supplying 300v. at 120 mA, and OA2 voltage stabiliser for the VFO.

**Receiver:** 6BA6 RF amplifier, ECH81 mixer, 6BA6 IF amplifier with double IFT coupling, 6AT6 for detection, AVC and audio amplification. Band-spread tuning of 160 and 80 metres. Panel aerial trimmer, RF gain and AF gain controls.

**Audio Amplifier/Modulator:** 12AU7 microphone amplifier, followed by 2/6BW6 for high-level modulation, or operating speaker at reduced power.

**Transmitter RF Section:** EF91 stabilised VFO covering 1.75-2.0 mc. EF91 buffer/doubler. 5763 PA with pi-tank.

**Metering:** 0.5 mA panel meter operating as S-meter on "receive," and reading 0-50 mA PA cathode current on "transmit."

This combination has been found very satisfactory. The receiver has good sensitivity and selectivity, while the transmitter output and modulation are fully up to the expected level. In terms of operating convenience and results, the transceiver has proved to be much more satisfactory than earlier transceivers having a mediocre receiver and other limitations.

### Constructional Points

Construction was on a *Home Radio (Mitcham)* "universal chassis" because side and rear members can be taken off to simplify wiring, and an extra 10 x 3in. runner can be bolted across to strengthen the whole and form compartments 10 x 3¼in. at the rear, and 10 x 3½in. at the front. The whole chassis is 10 x 7in. and 3in. deep. The panel is 7½in. high, supported by 4 x 5in. brackets bolted to panel and chassis.

The VFO box is made from a 6 x 2in. "universal chassis" runner. Each flange has a 90-degree

section removed 1¼in. from the end. Bending then produces a U-shaped box 1¼in. high, 2½in. wide and 2in. deep, the front and back of which can be closed by securing 2½ x 1¼in. plates with self-tapping screws.

A holder for the EF91 is bolted on top of the box. The front plate is fixed on and the VFO is wired up complete. Flying leads are provided, to pass through the chassis. These were white for heater, yellow for screen grid, and blue for anode. If necessary, a check can be made that frequency coverage will be satisfactory. The box is then bolted to the chassis by its flanges, and the back plate is screwed on.

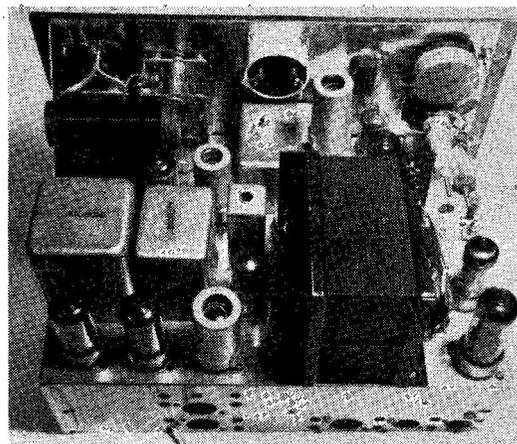
### VFO Calibration

To avoid experiment and allow suitable band coverage at once, the VFO has three 1% capacitors, and a ready-made coil. (This does not mean other coils could not be used, subject to the usual adjustment, if needed.)

Final calibration of the VFO is left until all construction is finished. The coil core is then rotated until coverage is from 1.75 mc to 2.0 mc, with a trifle to spare each end, and the core is locked with a 6 BA nut.

A receiver and 100 kc crystal marker were used for calibration. The transceiver "Net" switch is closed, the receiver is set at 2.0 mc with the aid of the crystal marker, then the VFO is tuned to zero beat with the crystal. VC1 is almost fully open for 2.0 mc. The procedure is repeated for 1.9 and 1.8 mc.

The receiver is then tuned to 3.5, 3.6, 3.7 and 3.8 mc, and the VFO calibrated at these points, by securing zero-beat with the 100 kc crystal harmonic. The 3.6 and 3.8 mc points will (or should) be the same as the 1.8 and 1.9 mc markings. The 3.7 point agrees with 1.85 mc or 1850 kc for Top Band, 1.95 mc being found at 3.9 mc on the receiver, but not of course being included in the 80-metre band markings. Intermediate markings can be estimated,



View inside the G3OGR Transceiver.

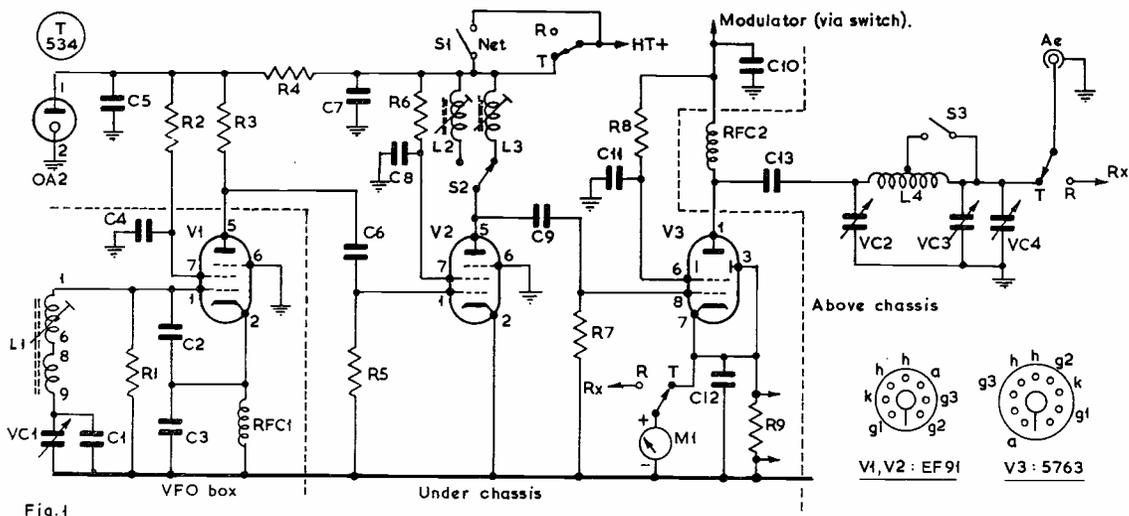


Fig. 1

Fig. 1. RF Section, Transmitter, G3OGR Transceiver.

or obtained by listening to higher harmonics of the VFO.

**Buffer Stage**

Closing the "net" switch (Fig. 1) applies HT to V1 and V2, with the transceiver on "receive." This allows netting the receiver on the VFO frequency by observing the S-meter.

The buffer anode switch S2, Fig. 1, selects L2 or L3. L2 was a *Denco* "Red" (oscillator) coil Range 2. The small winding is removed, and 28 turns are unwound from the larger winding, the end being re-soldered to its pin. With the VFO at about 3.65 mc, rotate the core of L2 until a meter temporarily between R7 and chassis shows maximum grid current. This should be around 2-3 mA.

L3 is the *Denco* "Blue" Range 2 coil, with the smaller winding removed. Its core is adjusted for maximum grid current at about 1.9 mc. These coils are mounted near V2 and S2, under the chassis.

**PA Stage**

Cathode and grid circuits are wired under the chassis, Fig. 1. A lead from tag 1 passes immediately up through a hole, so that RFC2, C13 and other tank circuit components are *above* the chassis. This ensures screening.

C10, C11 and C12 are taken directly from the points concerned to adjacent tags bolted to the chassis. Shunt R9 is of such a value that the meter reads 0-50 mA. It can be calculated in the usual way (meter coil resistance/N - 1, where N is the number of times the scale is to be multiplied) or found by trial. For the latter method, it is convenient to have power off. A testmeter, battery, and potentiometer can then be placed in series, and clipped from tag 7 of V3, to the chassis; R9 is then adjusted

**Table of Values**

Fig. 1. Transmitter RF Section, G3OGR Transceiver

|  |  |
|--|--|
| C1 = 150 $\mu\mu\text{F}$ , 1% silver mica   | R9 = meter shunt                               |
| C2, C3 = .001 $\mu\text{F}$ , 1% silver mica | L1 = <i>Denco</i> Yellow, Range 3              |
| C4, C12 = .01 $\mu\text{F}$                  | L2 = <i>Denco</i> Red, Range 2                 |
| C5 = .002 $\mu\text{F}$                      | L3 = <i>Denco</i> Blue, Range 2                |
| C6, C9 = 100 $\mu\mu\text{F}$                | L4 = 70t. 24g. enam., 1in. dia., centre tapped |
| C7, C8 = .01 $\mu\text{F}$                   | RFC1 = Min. cored 2.5 mH RF choke              |
| C10, C11, C13 = .001 $\mu\text{F}$ , mica    | RFC2 = 2.5 mH 60 mA choke                      |
| VC1 = 75 $\mu\mu\text{F}$ , var.             | S1 = toggle on-off                             |
| VC2 = 365 $\mu\mu\text{F}$ , or near         | S2 = 1-pole 2-way wafer                        |
| VC3, VC4 = 2/500 $\mu\mu\text{F}$ , BC type  | S3 = toggle on-off                             |
| R1, R5 = 100,000 ohms, $\frac{1}{2}$ -w.     | OA2 = voltage regulator                        |
| R2 = 47,000 ohms, $\frac{1}{2}$ -w.          | V1, V2 = EF91                                  |
| R3, R6 = 22,000 ohms, $\frac{1}{2}$ -w.      | V3 = 5763                                      |
| R4 = 15,000 ohms, 2w.                        |  |
| R8 = 6,800 ohms, 3w.                         |  |

until M reads 0-50 mA. Care is taken not to pass excess current through M when the shunt is disconnected.

The actual values of VC2 and VC3/4 are not important, except that larger values will match a greater range of aerials than smaller capacitors. VC3/4 can be a compact component with very close spacing, but a *miniature* condenser should not be used for VC2.

A tag strip supports RFC2. A lead from VC3/VC4 passes directly down to the transmit/receive switch, the nearest set of contacts being used.

**Speech Amplifier and Modulator**

Fig. 2 on p.672 is the circuit of this part of the transceiver. V1A and V1B are a 12AU7, connected so that cathode current flows through the

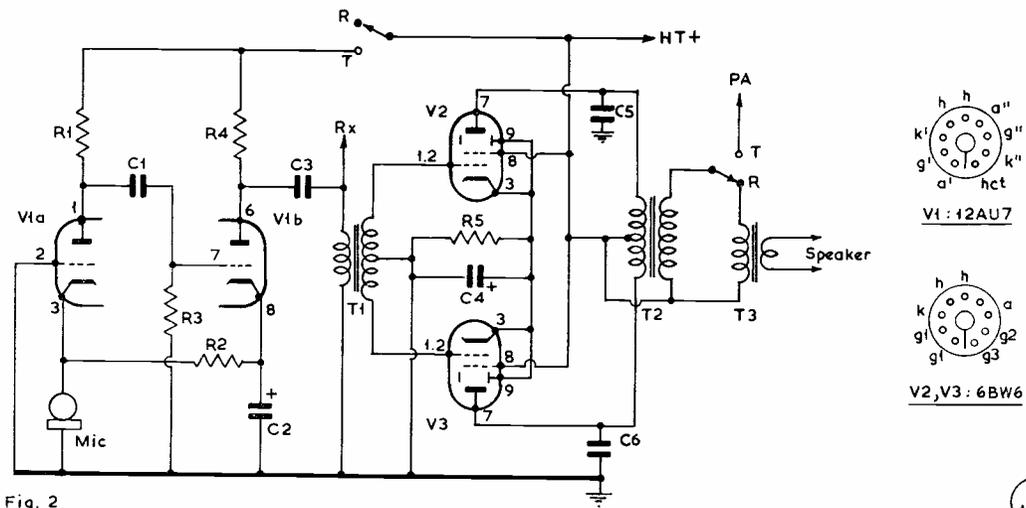


Fig. 2

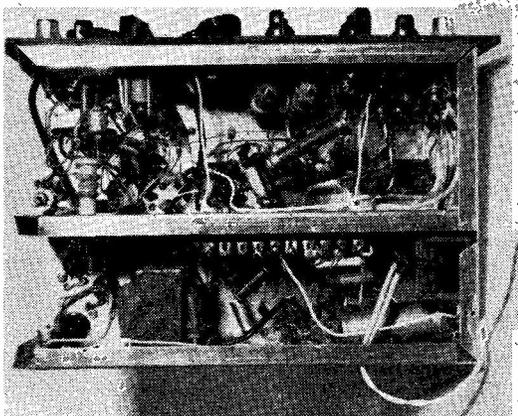
Fig. 2. Audio Amplifier and Modulator, Transceiver.

carbon microphone. (This was to suit a carbon mike it was wished to utilise.)

For a crystal microphone, a 12AX7 should be substituted, and connected as a conventional 2-stage audio amplifier. It has been found satisfactory to employ V1A with a 2.2 megohm grid resistor and cathode to chassis (contact potential bias), and have a 2.2K bias resistor for V1B. R1 and R4 are then 270K each. Grid circuits should be screened, and a 47  $\mu\text{F}$  capacitor placed across the crystal microphone co-axial socket.

HT is applied to V1A/V1B only on "transmit," as it was found unnecessary to have available further audio amplification, for reception.

T1 and T2 were actually surplus (ex-SCR522) transformers. The currently available Radiospares 1:3 intervalve type transformer is suitable for T1.



General arrangement under chassis.

### Table of Values

Fig. 2. Audio Amplifier and Modulator

|                                      |  |
|--------------------------------------|--|
| C1 = .01 $\mu\text{F}$               | V2, V3 = 6BW6  |
| C2 = 50 $\mu\text{F}$ , 12v.         | T1 - Push-pull input, ratio 3 : 1                                    |
| C3 = 0.1 $\mu\text{F}$               | T2 - Modulation xformer, ratio 1.5 : 1                               |
| C4 = 50 $\mu\text{F}$ , 50v.         | T3 - Speaker former ratio about 40 : 1 or 60 : 1 for 2-3 ohm speaker |
| C5, C6 = .001 $\mu\text{F}$          |  |
| R1 = 100,000 ohms, 1w.               |  |
| R2 = 1,000 ohms, $\frac{1}{2}$ -2.   |  |
| R3 = 470,000 ohms, $\frac{1}{2}$ -2. |  |
| R4 = 47,000 ohms, 1w.                |  |
| R5 = 470 ohms, 2w.                   |  |
| V1A, V1B = 12AU7 (see text)          |  |

In this case, an "artificial" secondary centre-tap (not shown in Fig. 2) could be provided by connecting two 270K 5% resistors in series across the secondary, their junction going to chassis. Various modulation transformers for a 5763 or similar PA, and able to handle 5 or 6 watts of audio (such as the Woden UM $\emptyset$ ), are also available for T2. T3 is a small receiver type 40:1 or similar speaker transformer, for speaker matching on "receive."

The amplifier can be tested by temporarily joining T2 and T3 as for receive and speaking in the microphone. The speaker must be well clear to avoid feedback.

### Receiver

Fig. 3 is the circuit of the receiver section. VC1 is a single-gang panel mounted capacitor, allowing correct aerial tuning or trimming with any aerial. VC2/VC3 are ganged, operated with a ball drive, for mixer and oscillator tuning.

L1, L3 and L5 are for the 80m. band, with L2, L4 and L6 for 160 metres. Experiments incorporating the PA tank coil for receiver aerial tuning, instead

of L1 and L2, gave much less freedom from 2nd channel interference, so this idea was not pursued.

L2 and L4 each have 32 turns removed from the tuned winding, the wire then being soldered to the pin. L6 has 20 turns removed. With suitable adjustment of the cores and T2 and T4, this allows the 160m. band to be covered with a little to spare. L1, L3 and L5 are not modified, and suitable coverage of the 80m. band is obtained by adjusting the cores and T1 and T3.

VR1 controls RF gain, while VR2 is the audio gain or volume control. AVC is applied to V1 and V3, and with the transceiver switched to "receive" the meter reads V3 cathode current, with meter shunt R15, Fig. 3. This resistor R15 is adjusted so that the meter shows full-scale with the aerial removed.

The six cores of IFT1, 2 and 3 are all peaked for optimum sensitivity, which is also maximum dip on the meter. VC1 can also be adjusted by the meter. Also peak L3 core around 3.6 mc, T1 at 3.8 mc, L4 core near 1.8 mc, and T2 on 2.0 mc.

By-pass capacitors (C2, C3, C4, C5, etc.) go directly from the points concerned to chassis. Condensers such as C1, C7 and C8 are taken directly from the valvholder tags to the nearer switch contacts. R1, R3, R5, etc., have short connections to the holder tags. R13 and C15 were close tag 1 of V4, with a screened lead from C15 to VR2.

One pole of the transmit/receive switch connects the aerial to the receiver section aerial circuit (L1

or L2). Another pole applies HT to the receiver section at "receive" only. C17 is permanently connected to the input transformer T1, Fig. 2.

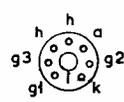
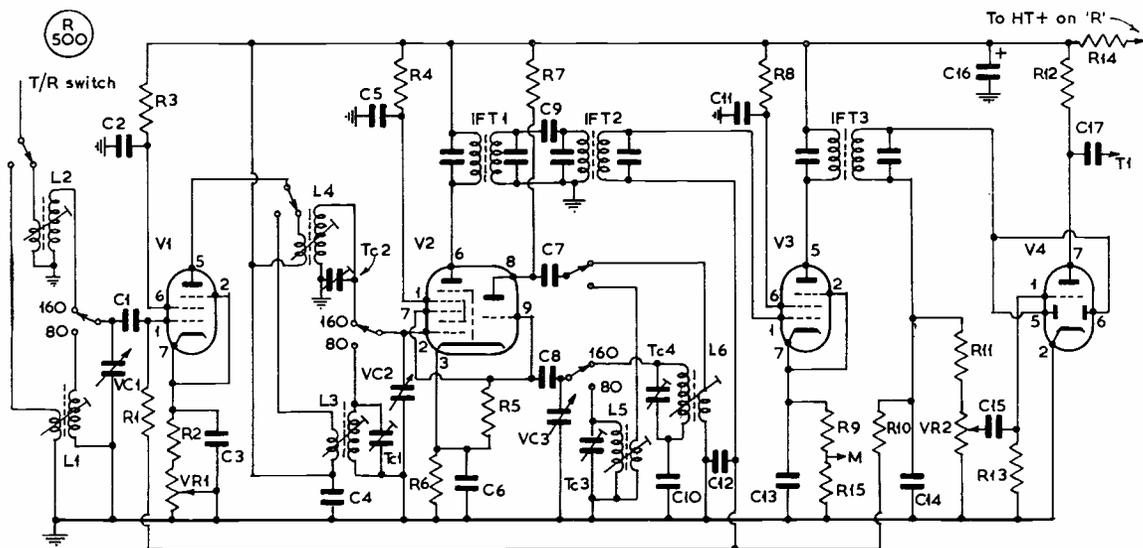
The receiver should be found to have quite a good degree of selectivity and sensitivity. As only a small loudspeaker is incorporated and the 2/6BW6 output stage can supply much more audio power than required, VR2 is generally kept turned well

**Table of Values**

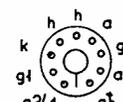
Fig. 3. Receiver section for the G3OGR Transceiver

|  |  |
|--|--|
| C1, C8 = 100 $\mu\mu\text{F}$                  | R1, R10 = 1 megohm, $\frac{1}{2}$ -w.        |
| C2, C3, C4, C5 = -05 $\mu\text{F}$             | R2, R9 = 68 ohms, $\frac{1}{2}$ -w.          |
| C6, C11, C12, C13 = 0.1 $\mu\text{F}$          | R3, R5, R7 = 47,000 ohms, $\frac{1}{2}$ -w.  |
| C7 = 500 $\mu\mu\text{F}$                      | R4, R8, R11 = 33,000 ohms, $\frac{1}{2}$ -w. |
| C9 = 10 $\mu\mu\text{F}$                       | R6 = 150 ohms, $\frac{1}{2}$ -w.             |
| C10 = 300 $\mu\mu\text{F}$                     | R12 = 220,000 ohms, $\frac{1}{2}$ -w.        |
| C14 = 200 $\mu\mu\text{F}$                     | R13 = 8.2 megohm, $\frac{1}{2}$ -w.          |
| C15 = -01 $\mu\text{F}$                        | R14 = 1,200 ohms, 1w.                        |
| C16 = 8 $\mu\text{F}$ , 350v.                  | R15 = meter shunt                            |
| C17 = -02 $\mu\text{F}$                        | VR1 = 1,000-ohm potentiometer                |
| VC1 = 50 $\mu\mu\text{F}$ , panel trimmer      | VR2 = 1 megohm log. potentiometer            |
| VC2, VC3 = twin-gang, 20 $\mu\mu\text{F}$      | V1, V3 = 6BA6                                |
| T1, T2, T3, T4 = Trimmers, 30 $\mu\mu\text{F}$ | V2 = ECH81                                   |
|  | V4 = 6AT6                                    |

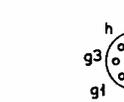
Coils, all *Denco* type. L1, Blue, Range 3; L2, Blue, Range 2; L3, Yellow, Range 3; L4, Yellow, Range 2; L5, Red, Range 3; and L6, Red, Range 2. IFT1 and IFT2, "1st IF" 470 kc type; IFT3, 470 kc, diode stage type.



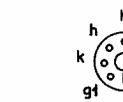
V1 : 6BA6



V2 : ECH81



V3 : 6BA6



V4 : 6AT6

Fig 3. Receiver Section, G3OGR Transceiver.



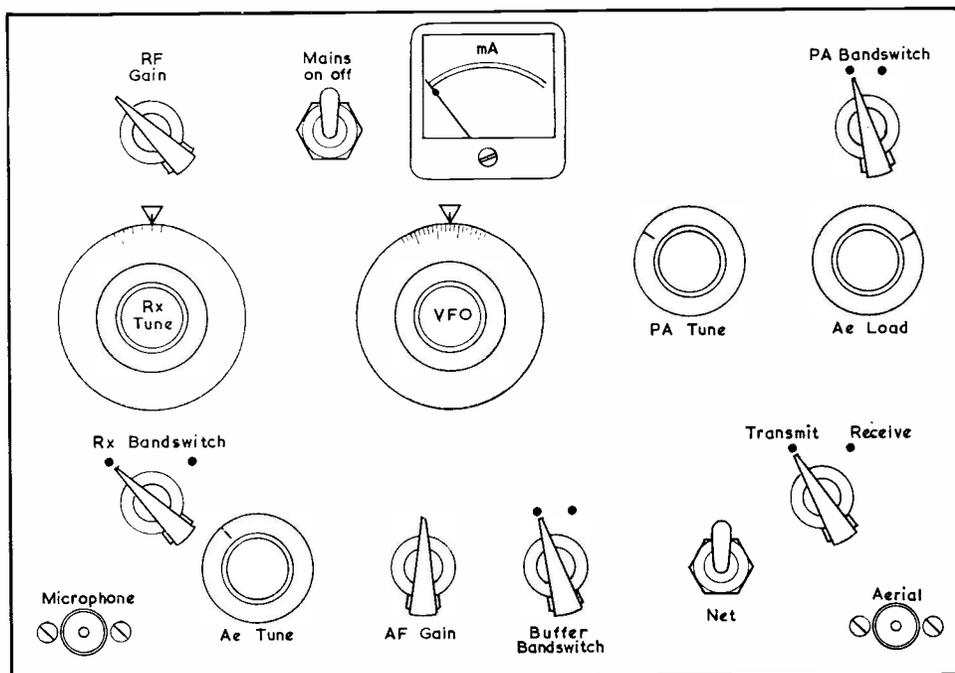


Fig. 6

Fig. 6. Panel Layout and Controls, G3OGR Transceiver.

On "receive" the following circuits are made:

- HT to receiver, Fig. 3.
- Aerial to receiver, Fig. 1.
- T2 to T3, Fig. 2.
- Meter to IF stage, Figs. 1 and 3.

The band switch had two wafers, each 4-pole 2-way. The front wafer was used for L1 and L2 circuits, and rear wafer for L3, L4, L5 and L6. It is helpful to put in coloured leads to identify these and other circuits, and to solder connections to the least accessible tags first. Some wiring is greatly eased by taking off the side members of the chassis.

S2 selects L2 for 80 metres, and L3 (Fig. 1) for 160m., while S3 shorts half of L4 for 80m. S1 applies H2 to V1 and V2, Fig. 1, with the T/R switch at "receive."

**Constructional Notes**

Figs. 5 and 6 give the panel and chassis layout. Various heater and other circuits need to pass through the 10 x 3in. runner which divides the under-chassis space. To allow for this, eight 1/4-in. holes were punched in its length, near the chassis, before bolting it in.

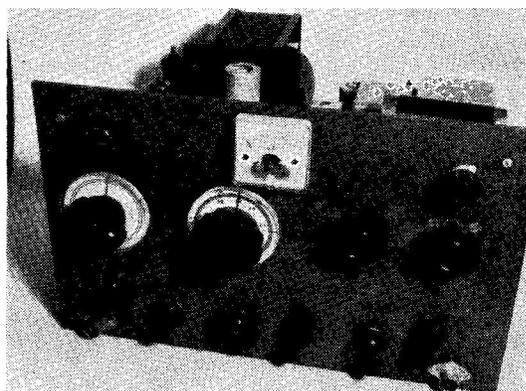
All the mains transformer leads pass through a single hole, fitted with a half-inch grommet. Small holes for other leads can be drilled as need arises.

The case probably depends on what is available or can be easily made. The one shown allows the transceiver to be inserted from the back, afterwards

closed by screwing on expanded metal. A small PM speaker fits near the OA2.

**Operating Details**

A station to be answered, or suitable spot for transmission, is found with the receiver. The buffer and PA bandswitches should be placed for the same band as that of the receiver, and with the "net" switch closed, the VFO can be adjusted to the same frequency. If another signal is not present, this can be done by watching the panel meter. The presence of a beating signal will also cause the usual



Panel view, showing general layout.

heterodyne.

With VC3/4 closed, switch to "transmit" and adjust VC2 (PA anode tuning) for a dip in cathode current. PA input is increased by opening VC3/4, re-adjusting VC2 for minimum current, in the usual manner. A first test is probably best made with an artificial aerial load. If a 15-watt 200/250v. household lamp is used for this purpose, it should light quite brightly with 10-12 watts DC input to the PA.

Since the meter switching places the instrument in the cathode circuit, the *total* cathode current is shown, not PA anode current alone. This can be allowed for by deducting a round figure of 10 mA, e.g., assume 40 mA cathode current will correspond to 30 mA anode current. Or preferably include a testmeter temporarily between RFC2 and T2, load into the 15w. lamp for the wanted anode current, and note down the cathode current, which will in future be the tuning up point for this input.

To place the meter in the PA anode circuit, the T/R switch would need an extra pole, and also break-

before-make contacts, and such a switch was not available.

Aerials can be of usual type—probably an 80m. dipole, or end-fed wire. The latter can be employed on both bands. Many good contacts have been obtained with quite short and low aerials, but QSO's over 100 miles or so have generally resulted when using a wire at least approaching a half-wave on 80m.—that is, some 120ft. or so. Should a temporary aerial not allow satisfactory loading of the transmitter, the simplest immediately available cure is to insert a loading coil between transmitter and aerial lead. This coil can be pile-wound with single flex, if necessary. About 30 turns 2in. or 3in. in diameter can be tried for 80 metres and 50 or 60 turns for 160m. This may well bring the feed impedance within the range of the transmitter output, or the loading coil may have to be modified until this is found to be so.

For regular use at the fixed QTH, a reasonably effective aerial is best erected, with an aerial tuner if the aerial needs this.

## MORE ABOUT SIMPLIFYING RTTY CONTROL

### IMPROVING THE LOCAL FACILITIES

J. D. HECK (G3WGM)

THE writer was very interested to see G8LT's article on RTTY Station Control in the November SHORT WAVE MAGAZINE. Readers may be interested to know of the variations that exist between G8LT's system and the arrangement adopted at G3WGM, in use for some time, which in many respects is otherwise quite similar.

There are two main differences. These are:

- (1) Send/receive switches are fitted to all sources generating a signal in the loop, *i.e.*, teleprinter keyboard, auto-transmitter, and terminal unit.
- (2) Two completely separate loops are available, the inter-connection between the loops and the various pieces of RTTY equipment being effected by means of close-circuit jack sockets.

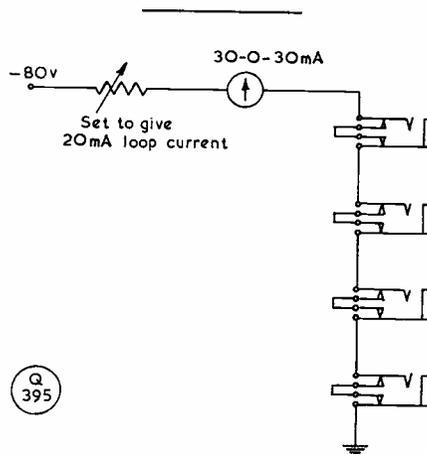
The first difference means that when changing from one signal source to another, no additional switching is necessary apart from stopping the tape in the auto-transmitter, or switching off the signal from the terminal unit. It is also possible to have any number of signal sources plugged into a loop at any one time.

The second difference provides a very much more flexible arrangement for operation of the equipment. It is not normally necessary, however, to change any of

the plugs during a contact, as they are set up at the start of the QSO for whatever mode required, *e.g.*, simplex, half-duplex, or full-duplex.

A typical loop is shown in the diagram. When no-signal is applied to it, *via* one of the jacks from the keyboard, auto-Tx, or the terminal unit, it is kept in the "mark" condition by the -80 volts to prevent the teleprinter from racing.

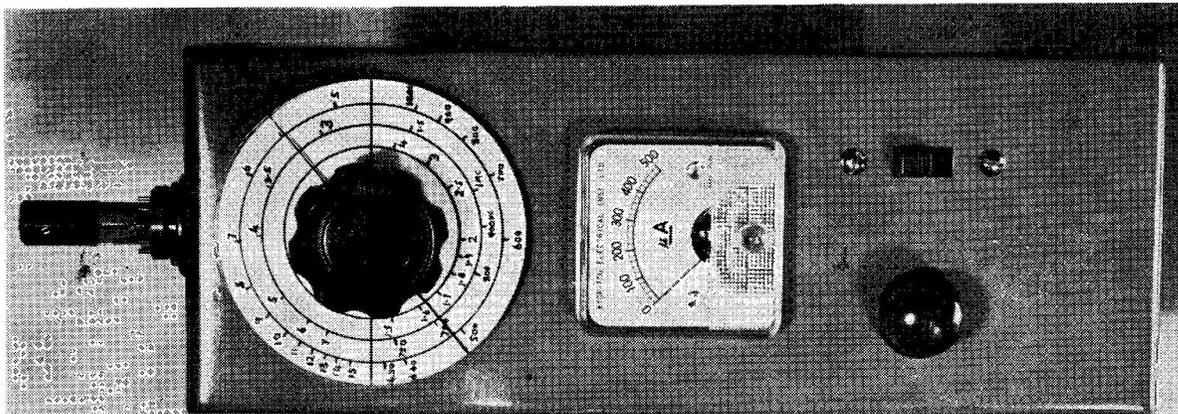
This arrangement provides very good facilities for duplex operation. On half-duplex, local copy is taken on the same teleprinter on which copy from the distant station is received, and hence it is not possible to receive copy while actually depressing a key. However, since no switching whatsoever is required between "transmit" and "receive," instantaneous break-in is possible. With two completely separate loops the station can be operated on full-duplex, during which no local copy is taken (or if it is, on a separate teleprinter). In this case,



one loop is used for "transmit" and the other for "receive."

The availability of two loops also opens up a very convenient facility for "off-line perforating." In this process, paper tape is punched with the RTTY signal to be transmitted, while the incoming message is being printed out from the distant station. Thus, when the other station passes transmission over, the pre-punched tape can be put into the auto-transmitter and sent off

at fully RTTY speed, equivalent to 66 w.p.m. by hand sent Morse! With two loops it is possible to use one for the incoming signal and the other for perforating the reply, using a reperforator. The advantage of this method of off-line perforating is that the keyboard of the main teleprinter is available for keying the reperforator, and thus it is very much easier to keep an eye on the incoming copy—first, to read it, and secondly to make sure that it is still printing correctly.



Above is the Instrument described in the text following

## A GATE-DIP OSCILLATOR

USING A FIELD-EFFECT  
TRANSISTOR

R. J. HULBERT (G3SRY)

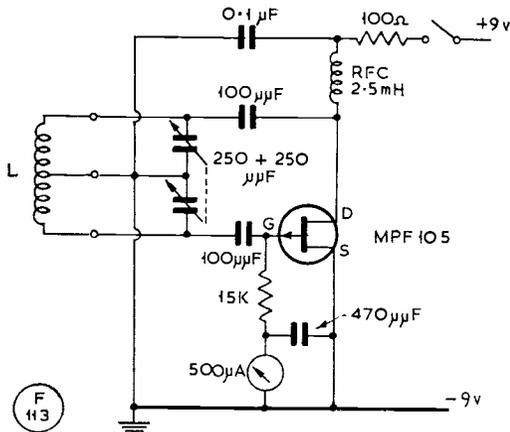
THE writer had been quite satisfied with the performance of his valved GDO, in use for some years, but was finding its weight, and the necessary mains lead, embarrassing. The business of trailing out a long extension mains lead, merely to check the resonant frequency of a new aerial, /M whip or whatever had become pointless in this age of semiconductors.

At the time when the unit shown here was conceived, some samples of *Motorola* MPF105 field-effect transistors were available. These had been obtained for use in a

new VFO (for a Mobile transmitter) and greatly encouraged by success, the devices were tried in a number of development circuits. The first approach to a gate-dip oscillator was to remove the valve from the existing equipment, and wire in the FET. After slight modifications, and the addition of a 9v. battery, the GDO was switched on, with immediate results, the oscillator's behaviour being almost identical with that of the valved version.

Since the original case was rather large, due to containing a mains power unit, a completely new instrument was constructed. Originally, a variable resistor was included, in series with the meter. This has since been found to be unnecessary, and has therefore been deleted from the circuit. In the absence of this component, the new GDO fits into a standard 6 x 3 x 2 inch aluminium housing.

[over



Circuit of the FET gate-dip oscillator

### Circuit Description

The FET used is an inexpensive audio type. Therefore it is hardly surprising that the indicated gate current falls off above 15 mc. The frequency coverage of this instrument is 450 kc—15 mc, in five overlapping bands. The circuit operates as a Colpitts oscillator on the two HF ranges, but is modified on the three LF ranges by centre tapping the coils. This increases the feedback on these bands. The transistor used is the *Motorola* MPF105. This is an inexpensive, plastic-encapsulated "n" channel field-effect transistor, intended for audio applications.

In this circuit, the oscillator behaves very well up to 15 mc, and will continue to oscillate to over 100 mc. The use of an FET intended for HF or VHF would undoubtedly improve matters. It must be remembered, however, that VHF operation primarily of this circuit will not be satisfactory, largely because of the wide capacity swing of the condenser. (A gang-capacitor with a smaller swing would be useless at low frequencies.)

The oscillator is surprisingly tolerant of voltage changes, frequency shift being only a couple of kc for a reduction of 3 volts. It is recommended that the battery be changed when the 6-volt point is reached, since below this voltage there is insufficient meter reading. The battery is a small PP3 type, and can be contained within the case.

### Coil Details

The coils are wound on Denco  $\frac{3}{8}$  in. diameter polystyrene plug-in coil formers. These formers are fitted with a B9A base, which conveniently plugs into a standard valve socket. The correct Denco is fitted to the three HF coils. In the case of Range 3, the slug is screwed fully home, then backed off to reduce the meter reading, and the frequency coverage is adjusted to that stated. The odd behaviour of this coil is explained by the fact that, at this frequency, the oscillator cannot decide whether the circuit is Hartley or Colpitts! The slug is controlling the Hartley feedback element, since it varies the inductance ratio of the two halves of the coil. Once set, the coil is removed, and the slug locked by pouring a small quantity of polystyrene varnish down the inside of the former. Ranges 4 and 5 also have

slugs, but these are screwed fully home and locked. It is permissible to adjust these slugs for frequency coverage, if required, since the meter reading will not show the large variations of Range 3. After the coils are wound and varnished, the polystyrene nuts are removed, and the threaded portions sawn off, complete with the threaded brass slug support (where fitted). The GDO can be calibrated by the usual means.

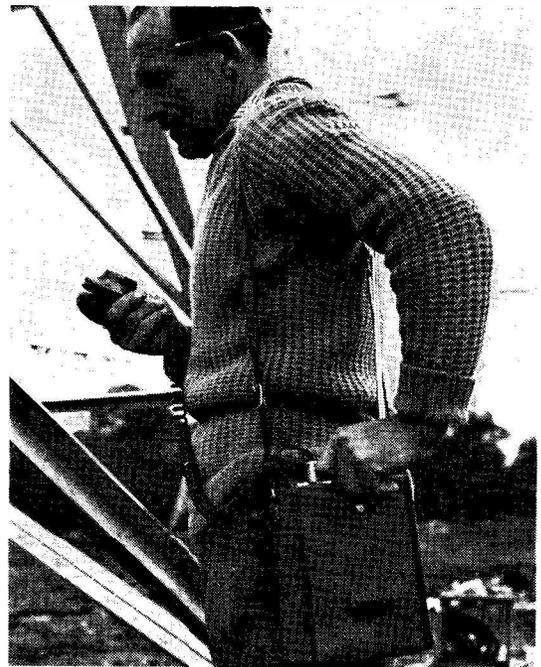
### Conclusion

This GDO represents a real improvement over the old valved model; it is light, portable, and ever ready. The low frequency ranges have proved most useful in identifying odd coils and IF transformers of unknown origin. Finding the resonant frequency of a mobile whip can now be carried out quickly, without the bother of long extension mains leads.

### TABLE OF COIL DATA

- Coil 1 — 450 kc to 1.0 mc, 200 + 200 turns 35g. enam. in two piles  $\frac{1}{8}$  in. wide, with  $\frac{1}{8}$  in. gap between sections.
- Coil 2 — 750 kc to 1.5 mc, 120 + 120 turns 35g. enam. in two piles  $\frac{1}{8}$  in. wide,  $\frac{1}{8}$  in. gap between sections.
- Coil 3 — 1.5 to 4.0 mc, 110 turns 37g. enam., close wound and centre-tapped, with slug.
- Coil 4 — 3.0 to 7.0 mc, 52 turns 32g. enam. close-wound, on slugged former.
- Coil 5 — 5.0 to 15 mc, 30 turns 28g. enam. close-wound, slugged former.

All coils are wound on  $\frac{3}{8}$  in. diameter Denco polystyrene formers, standard B9A base. Variations of coil dimensions would be possible for other frequency ranges.



The Burndep battery-operated VHF walkie-talkie, specially designed for communication where mains are not available for battery charging. The BE.347 consists essentially of a microphone/speaker unit and a Tx/Rx working on the UHF "business radio" band, using standard Ever-Ready U2 cells which will give from 35 to 50 hours of operation, depending upon how much "transmission" is involved. Complete in its carrying case, the weight of the Burndep BE.347 is only 55 ounces.

# VHF BANDS

A. H. DORMER, G3DAH

NOT altogether unexpectedly, this month has not produced very much in the way of an opening on any of the VHF bands. Pressure stabilised at just under 1020 mB from November 10 till November 25, when there was a drop to 1000 mB, followed by a slow rise to 1020 mB again, which has continued until the time of writing, December 12. Pressure changes need associated temperature and humidity changes to produce good propagation at VHF and these we have not had. Poor conditions and lack of activity characterised the Four-Metre Contest on December 1, and these factors contributed to the general comment heard on the band that the contest was very much inclined to drag towards the end, when operators were really scratching around for new stations to work. The impression gained was that these "local" contests are too long and would be better confined to a Sunday morning, say from 9 a.m. to 1 p.m., which would also meet the limitations imposed upon some operators in certain parts of the country, who have considerable TVI problems on 70 mc.

Monday, December 2 saw a bit of a lift on all VHF bands with the major DX axis again North/South, although EU contacts were made from the South and the Midlands on

both 70 cm. and two metres. PAØKWY was an outstanding CW signal for some time late in the evening, and ON4HN was very good on 70 cm. phone earlier. Conditions remained "on the verge of being good" for the next few days, but it was not until Sunday, December 8 that an EU opening occurred, with DJ/DL at reasonable strength for two hours or so around 1900z. Several stations in the Midlands had a contact with DC6QP, one of the stronger signals, but very few managed it with DL8KV/M who was mobile with four watts of SSB on Two from "EK01b." One of the lucky ones was G8BNR (St. Albans) who got a 5 & 4 report for a QSO of around the 360 mile-mark at 1835z. These contacts had all the marks of ducting, since the far end was confined to the Aachen area, with the exception of DL8KV/M, and even he was on the same relative bearing from the Midlands. Signals were certainly better north of London than they were in the South and East.

\* \* \*

There appeared to be no repetition of the October 31/November 1 auroral activity after a 28-day interval although WWV issued an Ionospheric Warning on December 5 and there was a fade-out on the HF bands at that time. However, disturbed conditions are predicted for the next week or so and who knows, we may be lucky.

An interesting callsign which has appeared on two metres several times recently has been that of WA1JZB/AM who has been putting in 5 & 9 signals over much of the country, from Cornwall to Norwich and the Midlands. Those operators with a VFO have had an advantage here as the airborne receiver was only tunable over a limited range, although several transmitting frequencies appeared to be available. It is understood that these flights are likely to be fairly regular, and with an antenna at several thousand feet, most of us should have a chance!

Another aerial at several thousand feet was that of the latest in the ARTOB series, which was launched from Hanover on November 11 and was aloft until around 1200z on that day. PAØ, DJ/DL and HB9 were heard taking advantage of the

path, but no G contacts seem to have been made although the transponded signals at the top end of the two-metre band were quite strong.

Changes have become necessary in the arrangements for the launching of these balloons. Hanover is no longer to be the only launching site and ascents will be made from other areas according to the prevailing wind conditions, so that the landings should always occur in the Hanover region. Longer flights will be possible for the 1969 series, of which ten are planned, by arranging that, at a height of 15,000 metres, gas will be released from the balloon so that a slow descent is achieved. Warning of the launchings will still be given by DLØDN and DLØDA on 80m. and by DL3YBA on 145.5 mc on Friday evenings. In the event of unfavourable weather conditions, the start will be postponed for one week. A translator for 70 cm. to 144 mc with an output of one watt is under construction and will be launched from the Munich area. The ARTOB team is prepared to launch apparatus constructed by other agencies, so here is a possible Club project.

## VHFCC Awards

All Tables have been compiled again this month to show the latest claims by band and *in toto*. In spite of the fact that the closing date for these Awards has been announced each month with the Tables, enquiries are still being received, the answer to which is that the Tables do *not* close with the next issue of SHORT WAVE MAGAZINE but on December 31, 1968. Claims should be sent in promptly after that date so that the final results can be determined in time for publication in the February, 1969 issue. The new Tables start again on January 1 on the same basis as heretofore.

Awards this month go to G3FVC, G3UIK and G3NLR, all for two-metre operations. Congratulations!

G3FVC, located at Maidenhead in Berkshire, first started on two metres in January 1966, on the insistence of one of the locals, G3MEV, and since then has had 230 individual contacts on the band. His interests are not confined to two metres as he is a keen CW man on the HF bands also, but the previous QTH in the West Country

did not lend itself too well to efficient VHF working. The present set-up is a 6CW4/ECC84 cascode into a Command receiver tuning 4-6 mc, and ten to twelve watts to a QQV03-10 into an 8-ele Yagi at 24ft. Best DX is to the Pyrenees and two contacts with OK, which is not bad going with fairly low power! Eight countries and thirty-five counties have been worked to date. Future plans include the construction of an FET converter to feed into the station main receiver, a Drake 2B, although this will mean sacrificing the self-contained compactness of the present installation. Eric finds VHF a pleasant relaxation after "... the bad manners on the HF bands which make my blood boil," and enjoys local or semi-local contacts free from QRM and the weird noises to be heard elsewhere, but puts in a plea for more CW operation on the bands, particularly when phone conditions are not all that good. He holds two other licences in addition to his own—G3WKX on behalf of the Maidenhead & District Amateur Radio Club, of which he is the hon. secretary, and G3XPL for the Slough College of Technology, where he is a lecturer in geography.

Oliver Heggs, G3NLR, operates from Wilmslow in Cheshire and runs an 829B with an input of 50/60 watts to a five-element Yagi at 38ft. The QTH is 180ft. a.s.l. The modulator is a pair of 807's with a crystal mike and the receiving set-up uses a grounded-grid RF stage into a three-stage tunable converter covering an IF of 16-18 mc into an AR88D. This gear is also used for satellite tracking work on 136-137 mc in conjunction with a 9ft. diameter dish, which was to be used to follow the *Apollo 8* vehicle due for launch over the Christmas period. Oliver's interest is not confined to VHF as he also operates Top Band.

John Young, G3UIK, operates from London and is another multi-licence holder as he has the City University licence, G3UCU, and is indeed honorary president of their Amateur Radio Society. He first became interested in Amateur Radio while still at school at Paisley and passed the R.A.E. in 1948 while studying electrical engineering at Glasgow University. He recalls

that he was the only candidate on that occasion and shared the examination room with a gentleman who was answering a paper on theoretical plumbing—an obvious starter for the high-power, two-metre linear stakes! It was not until the radio

club at the University was formed in 1965 that John got down seriously to the business of absorbing Morse to get his licence, since when he has been exclusively on Two. The transmitter runs 15 watts input to a QQV03-10, plate-and-screen modu-

### THREE-BAND ANNUAL VHF TABLE

January to December, 1968

#### SCORES BY BANDS

| FOUR METRES   |          |           |       |
|---------------|----------|-----------|-------|
| Station       | Counties | Countries | Total |
| G3OHH ... ..  | 48       | 7         | 55    |
| G3LAS ... ..  | 41       | 5         | 46    |
| G3DAH ... ..  | 26       | 2         | 28    |
| EI6AS ... ..  | 17       | 7         | 24    |
| G2AXI ... ..  | 18       | 2         | 20    |
| G3COJ ... ..  | 10       | 3         | 13    |
| G3FIJ ... ..  | 3        | 1         | 4     |
| TWO METRES    |          |           |       |
| Station       | Counties | Countries | Total |
| G3DAH ... ..  | 52       | 15        | 67    |
| G3LAS ... ..  | 51       | 15        | 66    |
| G8BBB ... ..  | 53       | 13        | 66    |
| G3COJ ... ..  | 44       | 9         | 53    |
| G8AAZ ... ..  | 38       | 8         | 46    |
| G8BNR ... ..  | 35       | 6         | 41    |
| G8BJK ... ..  | 33       | 6         | 39    |
| G8AEJ ... ..  | 32       | 7         | 39    |
| G2AXI ... ..  | 34       | 4         | 38    |
| EI6AS ... ..  | 32       | 6         | 38    |
| G8APZ ... ..  | 33       | 5         | 38    |
| G8AUE ... ..  | 33       | 4         | 37    |
| G8AUN ... ..  | 26       | 8         | 34    |
| G3AHB ... ..  | 28       | 5         | 33    |
| G2AIW ... ..  | 27       | 4         | 31    |
| G8APJ ... ..  | 20       | 4         | 24    |
| G8BJC ... ..  | 16       | 4         | 20    |
| G3FIJ ... ..  | 16       | 3         | 19    |
| G3FXW ... ..  | 15       | 4         | 19    |
| G8APX ... ..  | 16       | 2         | 18    |
| GC8AAZ ... .. | 14       | 4         | 18    |
| G8AYN ... ..  | 13       | 1         | 14    |

| SEVENTY CENTIMETRES |          |           |       |
|---------------------|----------|-----------|-------|
| Station             | Counties | Countries | Total |
| G8AEJ ... ..        | 37       | 8         | 45    |
| G8BBB ... ..        | 32       | 6         | 38    |
| G8AUE ... ..        | 29       | 3         | 32    |
| G3COJ ... ..        | 22       | 3         | 25    |
| G3LAS ... ..        | 17       | 3         | 20    |
| G3FIJ ... ..        | 17       | 2         | 19    |
| G8AAZ ... ..        | 16       | 1         | 17    |
| G3XFW ... ..        | 11       | 2         | 13    |
| G8APX ... ..        | 11       | 2         | 13    |
| G3DAH ... ..        | 10       | 2         | 12    |
| G3AHB ... ..        | 7        | 2         | 9     |
| G8APZ ... ..        | 8        | 1         | 9     |
| G8APJ ... ..        | 6        | 1         | 7     |
| G8AYN ... ..        | 5        | 1         | 6     |
| G2AXI ... ..        | 5        | 1         | 6     |

lated by two 6AQ5's. The receiver is a G3HBW-type FET converter tuning 28-30 mc, into an AR88D and the beam a six-over-six slot at 35ft. Best DX to date has been to OZ and this on phone. John is looking for GM, his native country, but has been unlucky so far. The score stands at 352 stations in 37 counties with a QSL return rate of just under 50%. Portable operations have included the trip to Gleniffer Braes last summer and, once the locals had got used to hearing an S9 signal one megacycle lower than usual, many enjoyable QSO's resulted. A return trip is planned over this Christmas, and for those interested, the frequency will be 145.8 mc. Future intentions include a PA stage with a QQV06-40 for Two and a sideband filter-type exciter for the HF bands, with the intention of playing this into a transverter at a later date. A useful addition to the station is a recording barograph which is conscientiously rewound, recharted and reinked every Monday morning and by means of which openings are confidently predicted—occasionally, he says, with success!

For those who are interested in these Awards, details can be found in the April and May 1968 issues of SHORT WAVE MAGAZINE.

#### SSB VHF

The RSGB Lecture Meeting on November 15 was devoted to a review of SSB systems used on VHF with emphasis on the need to minimise the radiation of unwanted signals both within and outside the band. The aim is to see that in-band signals are at least 90 dB down on the wanted signal.

Just how the average amateur with no laboratory equipment can measure 90 dB down is the big question, but by following certain broad lines in the design and operation of the apparatus it is possible to go quite a long way towards ensuring that the output of spuri approaches this figure without the need for precise measurement. It is, in any case, a figure at which to aim and not a hard-and-fast specification. Among amateurs, the more usual method of producing SSB on two metres is by means of the transverter or translator principle, whereby an SSB signal is taken from a commercial or home-constructed prime mover and mixed with a locally generated oscillation to give a sum product of around 145.4 mc. The choice of injection and signal frequencies has an important bearing on the purity of the output signal. For example, there is a very good case against using 29 mc as the

sideband drive frequency since not only does its fifth harmonic come out in the band, but also most HF /SSB transmitters tend to have a higher level of spurious products in their outputs when operating on this frequency, due to reduced selectivity in their internal tuned circuits compared with, say, 14 mc. Agreed, the use of a 29 mc SSB input means that the final local oscillator frequency becomes 116 mc and therefore easier to discriminate against in subsequent tuned circuits than would be the case if 14 mc and 131 mc were used. But by having a carefully adjusted balanced mixer (unbalanced mixers are definitely *not* to be recommended) and a minimum of four tuned circuits between the mixer and the aerial it should be possible to come very near to the target of 90 dB down. This assumes that the tuned circuits are not all capacity coupled. If they are, a great deal more protection will be required. The ideal would be to couple them inductively and use an efficient filter tuned to the oscillator injection frequency. Inevitably, the mixer will introduce some unwanted products of the frequencies applied to it, but by operating it as nearly as possible under Class-A conditions, and by filtering its output and the output of the prime mover, much can be done to clean up the radiated signal.

The fundamental frequency chosen for the crystal oscillator is also important, since the use of the usual 6 or 8 mc xtals means that harmonics at these frequencies can reach the mixer and produce a plethora of spuri at the output unless very careful design precautions are taken to suppress them. It is best to use a frequency for the oscillator which is not harmonically related to the SSB injection frequency, and is not below about 30 mc. The frequency of 58 mc either as a fundamental or harmonic, should be avoided since the second and third harmonics of that frequency beating with the 29 mc SSB injection will produce an unwanted, in-band signal. There is much to be said for introducing the SSB signal at the grids of the balanced mixer in push-pull, as this will ensure some cancellation of even order harmonics which are likely to be present in the output of the HF rig, with the local

oscillator frequency in push-push or parallel, either on the grids or on the cathode of the mixer, since the subsequent suppression of harmonics at this higher frequency is then comparatively simple to achieve.

Another prolific source of unwanted products at the anode of the mixing stage is the unscreened dummy load and/or power attenuator at the output of the prime mover. These devices should always be very well screened and should incorporate the appropriate filter to ensure that only the required SSB frequency reaches the transverter. Direct or capacity coupling here is also to be avoided wherever possible. One disadvantage of using 14 mc as the SSB injection frequency may well be that many commercial HF equipments are restricted to amateur band coverage, *i.e.*, 14-14.4 mc, and that complete coverage of the two-metre band is not then directly possible—but it only requires the use of four, or at most five, switched xtals in the transverter to overcome this objection. In any case, it is quite rare to hear an SSB station operating far from the calling frequency, and initially, one crystal channel should suffice. Split-frequency working then provides the answer to the reception problem unless one is a complete co-channel devotee.

To sum up, then, it looks as if our SSB rigs should take this sort of shape in the future: Filtered and screened output from the prime mover on 14 mc injected as a push-pull signal into the grids of a balanced mixer, with the local oscillator injection frequency derived from a crystal with a fundamental above 30 mc (avoiding 58 mc) applied in parallel. The output of the balanced mixer to pass through four, inductively-coupled circuits before reaching the antenna, and a filter to remove the crystal injection frequency. A bandpass filter in the aerial to pass only in-band signals is also an advantage. Oh well—back to the drawing board!

#### News Items

There have been several British/French contacts recently on 1296 Mc (23 centimetres) notably those with FIGG/P at Mont des Avalloirs and FIRJ/P at Mont Canisy. These

have, for the most part, not been pre-arranged skeds and it is very encouraging to see such activity among, at least on the French side, relative newcomers to UHF. It will be recalled that the F1 operators correspond to our G8/3's. An interesting series of tests has been completed recently between F9XG, operating portable in the Pyrenees and F9BG (Toulon), over a 150-mile path. Out of 23 days of tests, signals were exchanged at good strength on 15 of them. No details of the equipment used are available, but FIGG and FIRJ both have 4ft. parabolas and varactors.

The French Amateur Radio Society, R.E.F., are sponsoring

tests to establish the pattern of the incidence of Sporadic-E propagation on 144 mc. To this end, the beacon at Lannion (F3THF) will in future radiate an unmodulated carrier on 144.010 mc every day between 9 a.m. and 2 p.m. (Universal time.) The beacon QRA is "YI13d" and the exact position 03° 27' 12" W, and 48° 45' 28" N. The 220ft. high, nine-element Yagi antenna will beam East, but signals should be received quite well in this country, certainly in the South, as are those transmitted on the present F3THF frequency of 144.073 mc. It is perhaps of interest to recall that one of the first authenticated instances of Spor-E propagation on two metres

### THREE-BAND ANNUAL VHF TABLE

January to December, 1968

| Station | FOUR METRES |           | TWO METRES |           | 70 CENTIMETRES |           | TOTAL pts. |
|---------|-------------|-----------|------------|-----------|----------------|-----------|------------|
|         | Counties    | Countries | Counties   | Countries | Counties       | Countries |            |
| G3LAS   | 41          | 5         | 51         | 15        | 17             | 3         | 132        |
| G3DAH   | 26          | 2         | 52         | 15        | 10             | 2         | 107        |
| G8BBB   | —           | —         | 53         | 13        | 32             | 6         | 104        |
| G3COJ   | 10          | 3         | 44         | 9         | 22             | 3         | 91         |
| G8AEJ   | —           | —         | 32         | 7         | 37             | 8         | 84         |
| G8AUE   | —           | —         | 33         | 4         | 29             | 3         | 69         |
| G2AXI   | 18          | 2         | 34         | 4         | 5              | 1         | 64         |
| G8AAZ   | —           | —         | 38         | 8         | 16             | 1         | 63         |
| E16AS   | 17          | 7         | 32         | 6         | —              | —         | 62         |
| G3OHH   | 48          | 7         | —          | —         | —              | —         | 55         |
| G8APZ   | —           | —         | 33         | 5         | 8              | 1         | 47         |
| G3FIJ   | 3           | 1         | 16         | 3         | 17             | 2         | 42         |
| G3AHB   | —           | —         | 28         | 5         | 7              | 2         | 42         |
| G8BNR   | —           | —         | 35         | 6         | —              | —         | 41         |
| G8BJK   | —           | —         | 33         | 6         | —              | —         | 39         |
| G8AUN   | —           | —         | 26         | 8         | —              | —         | 34         |
| G3XFW   | —           | —         | 15         | 4         | 11             | 2         | 32         |
| G8APJ   | —           | —         | 20         | 4         | 6              | 1         | 31         |
| G8APX   | —           | —         | 16         | 2         | 11             | 2         | 31         |
| G2AIW   | —           | —         | 27         | 4         | —              | —         | 31         |
| G8AYN   | —           | —         | 13         | 1         | 5              | 1         | 20         |
| G8BJC   | —           | —         | 16         | 4         | —              | —         | 20         |
| GC8AAZ  | —           | —         | 14         | 4         | —              | —         | 18         |

Scores are from January to December. Position overall is shown by the total in the last column. This Table closes for the year 1968 on December 31. All claims up to that date should be sent in by January 11, for the final placings to appear in the February, 1969 issue. The Table opens again *v.e.f.* January 1st, 1969, and claims for the new listings should be made as they accrue.

occurred on June 14, 1959, when many British stations were able to contact Yugoslavia and Italy, the first reported contact with the latter being between G5NF (now alas QSY to GW and an impossible VHF DX site) and 11KDB. Again on July 4, 1965, U.K. operators were in 2m. contact with south-eastern Europe, stations in the west of France, with Poland and the Ukraine, and Mediterranean coastal stations with Scandinavia. It was quickly shown that a build-up of Sporadic-E over Western Germany was the reason for this astonishing phenomenon. A strange facet of this occurrence was that the German stations could only work on normal tropospheric modes at the time.

A further instance of Sporadic-E propagation on two metres occurred on June 17, 1967, when, among other records, the PAØ-YU "first" was set-up. It is noteworthy that these occurrences were all at weekends—indeed, the July 1965 occasion coincided with the IARU Contest—and it is therefore very likely that the great number of stations active at the time dis-

closed the condition, and that other instances have occurred on weekdays and have therefore gone unobserved or unreported. They also occurred at periods of maximum insolation (exposure to sun). While it is unlikely that the French beacon will assist amateurs in this country to any great extent to observe instances of Sporadic-E on Two, the fact that there is now a Centre for the reception and correlation of reports means that British stations can usefully participate in this investigation, which is being undertaken on the academic front by Professor Jean Mevel, the ionospheric expert at the University of Rennes. Reports should be sent to M. Serge Canivenc, F8SH, 6 rue de Pont-Hele, Kervoalen, 22-Perros-Guirec, France, as expeditiously as possible.

Turbulence in the lower ionosphere is believed to be the cause of VHF scatter propagation. This turbulence is produced by temperature inversions and other causes of pressure fluctuations in the E-layer. In this disturbed region, variations of electron density occur and these

induce corresponding changes in the electric gradient, which in turn alter the effective refractive index of the region. There is also some evidence that the presence of an aurora is significant in propagation by this mode. The most effective frequency range for Sporadic-E transmission to DX lies between 30 and 50 mc, although good results have been obtained on commercial and military circuits operating as low as 25 mc and as high as 60 mc, while ZB2VHF has amply demonstrated the possibilities on 70 mc. Considerable power and aerial gain are required for high reliability of up to 99%.

Unfortunately, the formation of the patches of intense ionisation required for even 4-metre contacts by this mode is quite unpredictable, as the location and periodicity seem random. It can only be said that in our latitudes suitable conditions are more likely to be found in the summer months and over areas to the South. Only a small variation in the electronic density is required to produce the results. A turbulent region some 200 yards square and an r.m.s. fluctuation of the electronic charge density of the order of 1 in  $10^4$  is sufficient to account for Sporadic-E disturbances. Occurrences on 144 mc are rare, as already noted, but may not be quite as rare as we have hitherto imagined.

\* \* \*

The South East UHF/VHF Group held their December meeting in Keynes College, University of Kent, Canterbury, on the 6th when a combined team comprising G3FZL, G30OU and G3XFT reviewed progress in UHF/VHF techniques. Bob Burns, G30OU, was showing some home-built equipment which included a transistor 1 mc oscillator with dividers to 5 kc, effective up to 70 cm., which looked like filling a long-felt want for an accurate signal on UHF/VHF. The next meeting of the Group is scheduled for January 24, 1969, when Tom Douglas, G3BA, will be speaking about VFO's. All interested amateurs are welcome to attend these meetings and details of the full programme for the coming year can be obtained from the hon. sec. G3DAH, QTHR. This column will be very pleased to print details of forthcoming meetings of similar



"... Suppose I could try it on Two ..."

VHF Groups in other parts of the country, as well as reports of meetings, on receipt of timely notice.

From GC8AAZ, Jersey, comes news that the GC net on Two on Sunday evenings is becoming more popular than ever before. Operations start at 1830z and participants include GC2FMV, G3CLFJ, GC8CEY, GC8ADW and GC8AAZ himself from Jersey, and from

Guernsey GC2FZC, GC3KAV, GC8BMO, GC8BNV and GC3OBM —so those who still need the Channel Islands may care to note this, as most of the stations will be looking towards us from about 1930z onwards.

Forthcoming contests are the *First Two-Metre (SSB)* event on January 13, 1969, and the *Second Two-Metre (CW)* contest on January 25, 1969.

### Deadline

That wraps it up for this month apart from wishing you all the best for 1969. Deadline for the next issue is **Saturday, January 11** which will give a little more time for the preparation of claims and so forth than was possible this month. Address is "VHF Bands," **SHORT WAVE, MAGAZINE, BUCKINGHAM.** Cheers for now and 73 de G3DAH.

## FRINGE AREA HARMONIC FILTERS

### NOTES ON DESIGN, FOR HOME CONSTRUCTION

G. ELLIS (G3LFZ)

WITH the increasing number of new licences being issued, it is obvious that sooner or later a high percentage of these newcomers will find themselves faced with the ever-present problem of Television Interference Suppression. Whilst in former years many excellent articles have appeared on the subject of diagnosing, filtering and suppressing TVI, every decade or so the need arises to re-activate some of this information for the benefit of our more recent brethren who do not possess these past publications (many out of print), and to revive interest amongst those of our number who require an occasional stimulant. For every amateur using a Class-C PA who wishes to work the HF bands during TV hours, the possession of a low-pass filter is a "must." It is the purpose of this article to outline the major problems where harmonic interference is concerned and to detail the design and construction of such a low-pass filter, tailor-made to suit individual cases. (A bibliography of some past articles has been appended to save hours of fruitless searching for those who possess or have access to them.)

The writer lives on the South Coast in an area which is considered "fringe" for both Crystal Palace Ch. I and Rowridge Lo.W. Ch. III, and hopelessly out of range of a low-powered slave at Brighton on Ch. II which, at his QTH, is constantly QRM'd by co-channel interference, but which is known to be used by some locals whose geographical situation denies them the use of Channels I or III (and fortuitously screens them from the co-channel interference).

The aim to produce an interference-free amateur-band transmitter in spite of the prevailing low TV field strengths led the writer to peruse many articles on TVI-proofing, some by authors whose names have become synonymous with TVI suppression. A desire

to work 21 and 28 mc without recourse to the *Radio Times* (to find out what popular programmes were on!) was going to require the absolute maximum attenuation of the second harmonic from each band, and it soon became certain that no single low-pass filter would fulfil both conditions adequately. It was decided therefore to embark upon a mathematical expedition with the object of determining (a) The actual values of capacity and inductance needed for Channels 1 and 3, and (b) The values typically required for other channels and feeder impedances so that a reasonable idea of component tolerance might be obtained.

These results have been tabulated (Table 2) to enable the reader to form his own conclusions and to see at a glance the design which suits his particular circumstances best for the more common coaxial feeder impedances, without recourse to mathematics already covered by the author. The basic formulae and mathematical examples are given later to guide readers who wish to design filters to work at impedances or frequencies other than those given here.

### Construction

The only major "tools" used in the manufacture of the filters actually constructed were a multi-channel TV set, a reliably calibrated AR88, a home-built Grid Dip Oscillator (probably the most important item), and an assortment of *Radiospares* 1% tolerance capacitors from 22  $\mu\text{F}$  to 120  $\mu\text{F}$ , plus a few 0.5  $\mu\text{F}$  tolerance capacitors in the 2-20  $\mu\text{F}$  range. The station transmitter was also used to produce harmonics of calculated frequency in the TV bands to provide markers against the GDO beat.

The close-tolerance capacitors were used to calibrate required capacities from less precise capacitors at hand, which were better suited to the requirements voltage and current-wise, as follows: A coil of some 15 turns of 16g. enamelled wire was tightly wound on a  $\frac{1}{2}$ -inch former and fixed (with glue, nail varnish or *Araldite*) as a precaution against variation of inductance whilst in use. The tails of the coil were bared and terminated within an inch of the coil on to a tagstrip with double lugged tags, so that subsequent reterminating on the other lugs of the tags would not interfere with or disturb the coil. The close-tolerance capacitors were then assembled with short leads to represent the required capacity and

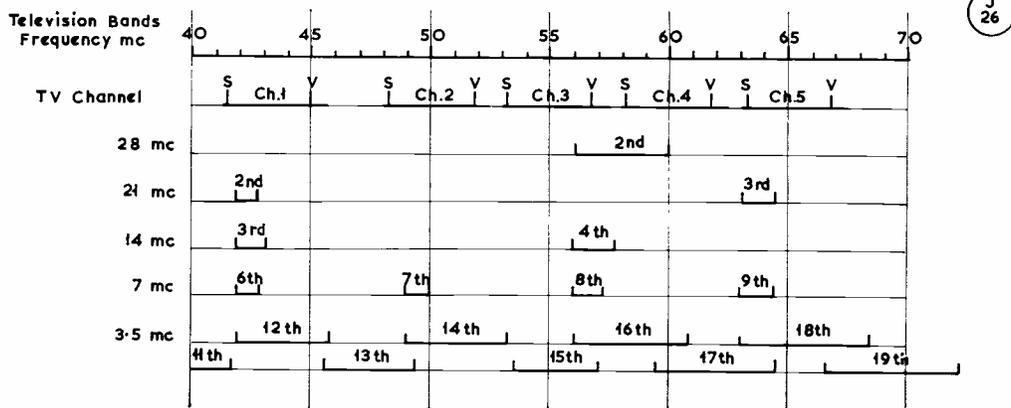


Fig. 1. Disposition of TV channels in Band I, showing their harmonic relationship with five amateur HF bands.

TABLE I

| Television Channel No. | Prime Channel |             | F(osc) mc | Second Channel |             |
|------------------------|---------------|-------------|-----------|----------------|-------------|
|                        | F(sound) mc   | F(video) mc |           | F(sound) mc    | F(video) mc |
| (Standard IF)          | 38.15         | 34.65       | —         | —              | —           |
| 1                      | 41.5          | 45.0        | 79.65     | 117.8          | 114.3       |
| 2                      | 48.25         | 51.75       | 86.4      | 124.55         | 121.05      |
| 3                      | 53.25         | 56.75       | 91.4      | 129.55         | 126.05      |
| 4                      | 58.25         | 61.75       | 98.4      | 134.55         | 131.05      |
| 5                      | 63.25         | 66.75       | 101.4     | 139.55         | 136.05      |
| 6                      | 176.25        | 179.75      | 214.4     | 252.55         | 249.05      |
| 7                      | 181.25        | 184.75      | 219.4     | 257.55         | 254.05      |
| 8                      | 186.25        | 189.75      | 224.4     | 262.55         | 259.05      |
| 9                      | 191.25        | 194.75      | 229.4     | 267.55         | 264.05      |
| 10                     | 196.25        | 199.75      | 234.4     | 272.55         | 269.05      |
| 11                     | 201.25        | 204.75      | 239.4     | 277.55         | 274.05      |
| 12                     | 206.25        | 209.75      | 244.4     | 282.55         | 279.05      |
| 13                     | 211.25        | 214.75      | 249.4     | 287.55         | 284.05      |

Note: Only the transmitted Prime Channel frequencies are stable. Due to incorrect setting and thermal drift, oscillator and second channel frequencies may vary from those above by many tens of kc.

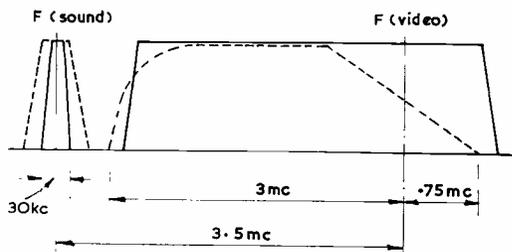


Table I. The carrier frequencies do not represent actual band edges, and the receiver sound IF bandwidth may be greater than 100 kc to overcome oscillator drift.

— 405 line sound and video bandwidth as transmitted.  
 - - - 405 line television receiver response (ideal).

placed in parallel with the coil. The GDO was then used to dip the frequency of the resonant circuit thus formed, and the AR88 tuned to that frequency to mark it for the next stage of the operation. The close-tolerance capacitors were then replaced by a fixed condenser in parallel with a small variable, and the assembly tuned by the variable capacitor to resonate at the frequency "marked" by the AR88, again using the GDO. Thus, for example, a 126  $\mu\mu\text{F}$  capacitor may be constructed from a 20% tolerance 100  $\mu\mu\text{F}$  capacitor (on the heavy side), and a 25  $\mu\mu\text{F}$  variable adjusted to the required capacity in the manner indicated. Connections must be kept to the absolute minimum length during this operation.

The coils were made from 16g. enamelled copper wire, first drawn taut to remove any bends and then wound under 30 or 40 lbs. tension on to a  $\frac{1}{2}$ -inch mandrel (for this purpose the composition sleeve of a P.O. type jack plug served as an excellent mandrel). Each inductor was produced separately and the

"tails" were cut and shaped with long nosed wiring pliers, according to the particular position it was required to occupy in the filter. The approximate number of turns needed for a given inductance was estimated by reference to Table 3, applied to the filter, and the coil then compressed, contracted or pruned to the correct value to resonate at a calculated frequency when placed in parallel with a known capacitance. The tolerance of the inductance thus produced was comparable with that of the capacitance, and very much closer than any guesswork. It is stressed that this adjustment must take place in the filter, using the capacitors mounted permanently in the filter, and once set must remain undisturbed.

**Mounting**

A well constructed and compartmented metal box complete with overlapping lid must be used to accommodate the filter and, ideally, should be copper or brass with soldered or brazed joints—but if this is impracticable a tinplate or aluminium equivalent will suffice. A sufficiently strong tinplate box with soldered joints and inter-compartment screens can be produced from a couple of larger size *Ovaltine* tins if intercepted before they reach the dustbin. If the housing is manufactured from aluminium, or otherwise not soldered, a minimum of two nuts and bolts per joint per side between case and ends or screens is recommended, and shake-proof washers are a "must," particularly where earthing tags or coaxial connectors are involved. The compartments should be  $1\frac{1}{2}$ - $2\frac{1}{2}$  inches cube, and be sufficient in number each to accommodate one inductance. However, two coils may be placed in one compartment provided they are mutually disposed at right-angles. The author used the diecast chassis of old "AP 56152 Filter Unit Des. 12in. stripped of their former circuitry, and with JS-1-PF (10H/4953) type coaxial connectors fitted in lieu of the original. This type of connector has been found to give far more positive and reliable contact than its more common type TV counterpart, and is more robust and much less liable to distortion when subjected to the heat required to solder two 16g. wires to it, although if a heat shunt is used, this problem is not insuperable.

A close examination of the design, construction and alignment of a representative low-pass filter will show in detail how a highly efficient device can be evolved from a few facts, formulæ and figures.

In Fig. 2 a low-pass filter is shown split into the basic elements from which the final design will emerge. Technically, the arrangement comprises two constant-k "T" centre sections, terminated with *m*-derived end sections in which the series tuned circuits  $L_x/C_x$  resonate to provide the maximum amount of attenuation in the region of the design frequency. It should perhaps be mentioned here that as many or as few "T" centre sections may be included as desired. Two *m*-derived end sections without intermediate sections may be used directly back-to-back where TV signals are locally strong, or the required degree of attenuation slight, so long

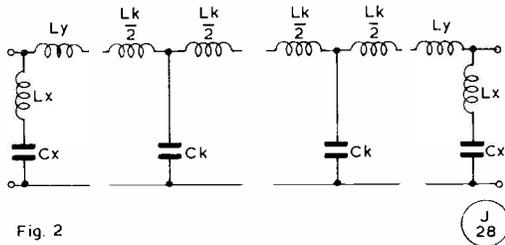


Fig. 2

Fig. 2. The Elementary Filter, and Formulae

$$\begin{aligned}
 (1) \quad Lk &= \frac{R}{\pi \cdot Fc} & (2) \quad Ck &= \frac{10^6}{\pi \cdot Fc \cdot R} \\
 (3) \quad Ly &= \frac{m \cdot Lk}{2} & (4) \quad Cx &= \frac{m \cdot Ck}{2} \\
 (5) \quad Lx &= \frac{1-m^2}{2m} \cdot Lk
 \end{aligned}$$

where R is in ohms

C is in  $\mu\mu\text{F}$

L is in  $\mu\text{H}$

Fc is in Mc and is 0.8 Fx.

$$m \text{ is } 0.6 \text{ (derived from } m = \sqrt{1 - \left(\frac{Fc}{Fx}\right)^2} \text{),}$$

and is the optimum value for good impedance matching characteristics).

**Notes**

(1) Mathematically "correct" answers to nearest  $\mu\mu\text{F}$  or 0.005  $\mu\text{H}$ .

(2) Once calculated, series inductances may be added together to form one inductor equal to the sum of the two individual inductances, e.g.:

$$\frac{Lk}{2} + \frac{Lk}{2} = Lk, \quad Ly + \frac{Lk}{2} = La.$$

TABLE 2

| T.V. Channel | Fx    | Fc<br>(m - 0.6) | Lx      | Cx         | Ly      | $\frac{Lk}{2}$ | Ck         | $\frac{La}{Ly + \frac{Lk}{2}}$ | Lk      | R<br>(Zo) | A.T. Band Harmonic*          |
|--------------|-------|-----------------|---------|------------|---------|----------------|------------|--------------------------------|---------|-----------|------------------------------|
| —            | Mc    | Mc              | $\mu$ H | $\mu\mu$ F | $\mu$ H | $\mu$ H        | $\mu\mu$ F | $\mu$ H                        | $\mu$ H | ohms      | —                            |
| 1            | 42    | 33.6            | 0.38    | 38         | 0.215   | 0.355          | 126        | 0.57                           | 0.71    | 75        | 6 x 7 mc                     |
|              |       |                 | 0.25    | 57         | 0.14    | 0.235          | 190        | 0.375                          | 0.47    | 50        | 3 x 14 mc<br>2 x 21 mc       |
| 2            | 49    | 39.2            | 0.325   | 33         | 0.185   | 0.305          | 108        | 0.49                           | 0.61    | 75        | 7 x 7 mc                     |
|              |       |                 | 0.215   | 49         | 0.12    | 0.205          | 162        | 0.325                          | 0.41    | 50        |                              |
| 3            | 56    | 44.8            | 0.28    | 28         | 0.16    | 0.265          | 95         | 0.425                          | 0.53    | 75        | 8 x 7 mc                     |
|              |       |                 | 0.19    | 43         | 0.105   | 0.18           | 142        | 0.285                          | 0.36    | 50        | 4 x 14 mc<br>2 x 28 mc       |
| 4            | 58.25 | 46.6            | 0.27    | 27         | 0.155   | 0.255          | 91         | 0.41                           | 0.51    | 75        | 2 x 28<br>(above 29 mc only) |
|              |       |                 | 0.18    | 41         | 0.10    | 0.17           | 137        | 0.27                           | 0.34    | 50        |                              |
| 5            | 63.25 | 50.6            | 0.25    | 25         | 0.14    | 0.235          | 84         | 0.375                          | 0.47    | 75        | 9 x 7 mc                     |
|              |       |                 | 0.165   | 38         | 0.095   | 0.155          | 126        | 0.25                           | 0.31    | 50        | 3 x 21 mc                    |

TABLE 2. Component values for low pass filters designed for Band I Channels 1-5 and transmitter feeder impedances of 50 and 75 ohms. See Fig. 2 for circuit.

\*Note: Harmonics of 3.5 mc not shown since all channels are affected. See Fig. 1 for details.

as the simple rules of "filtery" are observed. Obviously, the more "T" centre sections included, the greater will be the losses at the pass frequencies as well as the desired attenuation in the TV portion of the spectrum—so, by way of a compromise, two

intermediate sections have been chosen in the design of these filters.

The initial facts to ascertain in the design of a tailormade filter are (a) the local TV channels in Band I, (b) The HF amateur bands to be used, and (c) The impedance of the transmitter feeder. By reference to Fig. 1, the likely effect of radiated harmonics on local Band I TV transmissions can be estimated for the amateur bands likely to be used. For example, Channels 1, 3 and 5 areas suffer greater problems than Channels 2 and 4 areas, and should Channel 4 area amateurs forego operation above 29 mc in the ten-metre band, they should encounter no low order harmonic problems on any band from Forty to Ten, and only the 16th and 17th harmonics from frequencies in the 80-metre band.

TABLE 3

| Inductance Range | Approx. no. turns<br>16g. 1/2-in. diam. |
|------------------|---|
| up to 0.1        | 3                                       |
| 0.1 — 0.15       | 4                                       |
| 0.15 — 0.2       | 5                                       |
| 0.2 — 0.3        | 6                                       |
| 0.3 — 0.35       | 7                                       |
| 0.35 — 0.45      | 8                                       |
| 0.45 — 0.5       | 9                                       |
| 0.5 — 0.6        | 10                                      |
| 0.6 — 0.7        | 11                                      |
| 0.7 — 0.8        | 12                                      |

Table 3. For estimating number of turns of 16g. enam. to half-inch diameter required for a given inductance. The number of turns finally needed—see text—will also be influenced by the inductance of the "tails."

(To be concluded)

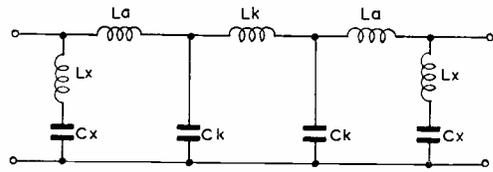


Fig. 3

Fig. 3. Circuit for completed Filter—see Tables 2 and 3. Note that  $La = Ly + \frac{Lk}{2}$ . To change the circuit to a balanced configuration, the coils La and Lk should be halved in value and inserted in each leg. The inductors should be independently screened.

### DEFINITION—TECHNICIAN ENGINEERS

The Institution of Electrical and Electronics Technician Engineers (which is what they call themselves), is a comparatively new organisation which offers membership under somewhat easier conditions than the qualifying requirements for the I.E.E. or the I.E.R.E. (the old Brit.I.R.E.). A lot of Service signals types became "A.M.I.E.E., M.Brit.I.R.E." on the nod just by completing the circular that came round about 1944—all that was required was to be engaged on "signals duties" in the rank of major (or equivalent) and above, and have the form counter-signed by the CSO of the Hq. Unit. Coming down to the present time, following is the definition of the Technician Engineer:

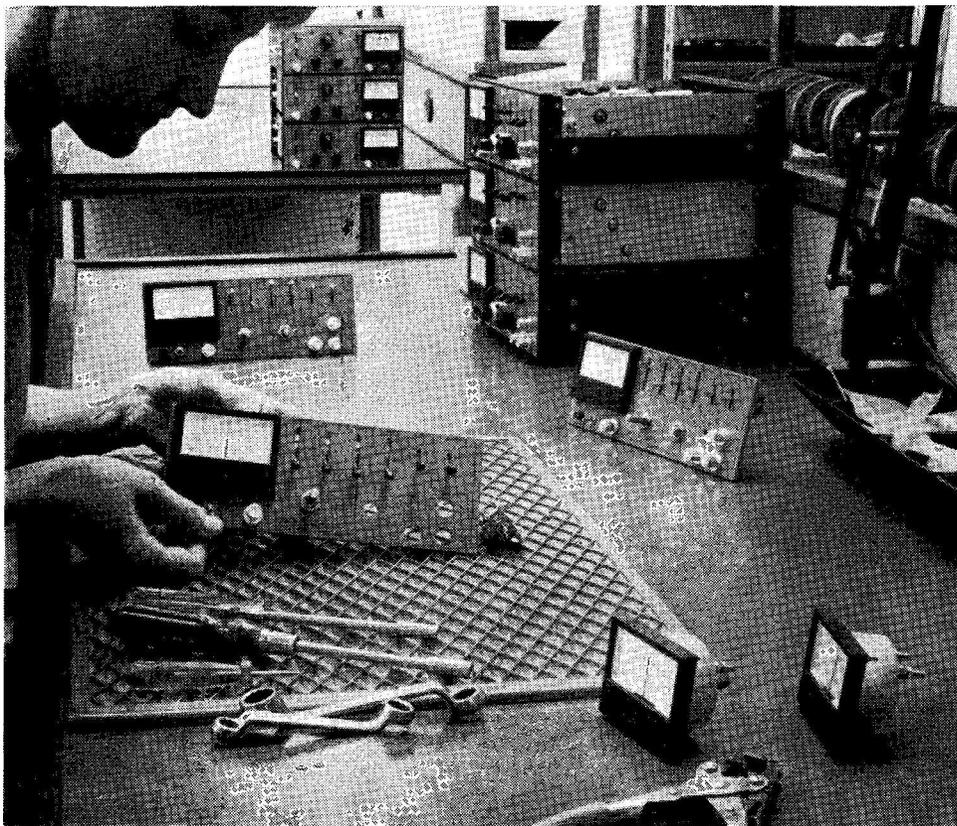
The technician engineer is competent by virtue of his education, training and subsequent experience to exercise independent technical judgment in and assume personal responsibility for duties in the engineering field.

His education and training is such that by the

application of general principles and established techniques, he is able to understand the reasons for and purposes of the operations for which he is responsible.

The technician engineer may perform technical duties of an established or novel character and may carry technical and managerial responsibility either independently or under the general direction of a chartered engineer or scientist. His work is at a higher level than that of the technician and is not supervised in detail. He requires the personal quality of leadership and the power of logical thought.

The technician engineer requires an education and training appropriate to the above work. This should lead to the award of a Higher National Certificate in Electrical and/or Electronic Engineering, a Full Technological Certificate for Electrical, Electronics or Telecommunications Technicians of the City and Guilds of London Institute, or a comparable qualification.



Sifam meters being fitted to a new type of unit designed to detect and measure signals buried in the background noise. Said to be the most sensitive of its type now extant it is one of a series of modular research instruments manufactured by Brookdeal Electronics (London), with the capacity to recover a signal which is 3000 times below ambient noise. The Brookdeal Type 411 phase-sensitive detector has applications in all aspects of research, including measurements concerned with space satellite communication and laser experiment.

# COMMUNICATION and DX NEWS

*E. P. Essery, G3KFE*

THIS is the time for New Year Resolutions, and in accordance with current practice, here are a few thoughts on the subject. For the dyed-in-the-wool CW man: Try a little SSB now and again. For the violently anti-CW type: Try a little key work, and keep in practice. For the DX-chaser: Try to have a rag-chew once in a while—some of the DX is getting bored with the mob of number-swappers. For the rag-chewer: Try a few snappy contacts in a contest. To all of them: Try a bit of constructional work. And may all of those who adopt these resolutions, find that the result is a new dimension in their hobby.

OK, what's the confession to make behind all this moralising? Well, E.P.E. had a SSB rig a couple or more years ago and was so fascinated by the difference between SSB and AM as a way of getting at the stuff that he has not used much else since. But a few days before writing this piece it was demonstrated that the right wrist needed exercise to complete repairs, and what more obvious exercise than paddling a key? GM3KSU was the unfortunate victim of the first essay, and the QSO was not completed. The "Chinese Morse" was too much of a good thing; between glass elbow and the wrist there was hardly a word without an erasure! But G3KFE has been using CW to a greater or lesser extent most of his amateur career, and can still read it as well as the next man; how much worse would the situation be for a chap who suddenly found his particular specialty removed from him by injury or illness; without it he may as well give up if he has shut out all other Amateur Radio angles. And if G3KFE were ever tongue-tied for some reason he would a darn sight sooner be all-CW than QRT! So it is as well for us all to adventure a little in the direction of adding another mode of transmission to the gear in the coming year, or another aspect which

is either new or been dropped for years.

Changing tack rather, back to the recent discussions on TVI, and its baleful effect on the majority of operators, there are a few points which are worth considering. If the low-pass filter in the transmitter output is designed for a 75-ohm unbalanced line, it needs to be connected into a line which is just that. *But* a dipole is a balanced aerial, and should not be fed with coax, but with balanced feeder. To connect the balanced feeder into coax, one must use a balun if RF is not to appear on the outside of

the coax and flow round instead of through the filter. The same argument seems to hold good for the TV aerial, and a balun on the feeder at the aerial will give the high-pass filter installed at the TV set end a sporting chance of doing its duty. As for how to make the balun, there are several 1 : 1 ratio schemes, and commercial baluns are available for the TV aerial, although those for transmitting aerials are usually designed to be relatively narrow-band.

What about the effect on other parameters of the gear? Well, there will be no increase in gain on

SIX-BAND DX TABLE  
(All-Time Post War)

| Station | Countries | 28 mc | 21 mc | 14 mc | 7 mc | 3.5 mc | 1.8 mc |
|---------|-----------|-------|-------|-------|------|--------|--------|
| W6AM    | 348       | 131   | 140   | 347   | 116  | 54     | 7      |
| G2DC    | 335       | 169   | 307   | 327   | 165  | 109    | 20     |
| G3DO    | 334       | 192   | 231   | 327   | 90   | 83     | 9      |
| G3NOF   | 311       | 162   | 207   | 295   | 34   | 39     | 2      |
| G3LZQ   | 254       | 138   | 155   | 201   | 72   | 38     | 8      |
| G3IAR   | 219       | 120   | 158   | 191   | 87   | 71     | 12     |
| G3IGW   | 204       | 123   | 152   | 167   | 122  | 86     | 42     |
| G8DI    | 187       | 80    | 132   | 164   | 77   | 46     | 8      |
| G3KOR   | 163       | 40    | 57    | 135   | 52   | 39     | 23     |
| G3PQF   | 153       | 93    | 42    | 84    | 84   | 49     | 11     |
| G3NYQ   | 147       | 35    | 70    | 107   | 40   | 30     | 21     |
| G3VDL   | 137       | 51    | 100   | 100   | 45   | 22     | —      |
| G3SED   | 126       | 20    | 18    | 61    | 43   | 34     | 37     |
| G3IDG   | 122       | 74    | 89    | 55    | 27   | 19     | 11     |
| G3MDW   | 115       | 46    | 66    | 82    | 20   | 15     | 7      |
| G3EJA   | 106       | 100   | 23    | 51    | 22   | 12     | 2      |
| G3VPS   | 105       | 16    | 28    | 81    | 50   | 34     | 14     |
| G3WJS   | 57        | —     | 8     | 46    | 35   | 36     | 12     |
| G3WPO   | ?         | 11    | 9     | 40    | 28   | 20     | 20     |

Note: Placings this month are based on the "Countries" Column.

receiver or Tx, but it is quite on the cards that the noise in the area through which the feeder has to pass between aerial and shack will be picked up less by the modified arrangement, and it may indeed be the answer to the problem of HF operation in a high-noise district.

### The Tables

This month sees the last *entry* of the 1968 Tables; so for next time the Tables will have been brought up to date. March issue will contain the first display of the 1969 Tables, which should give about six weeks to get things organised and the entries in. The Six-Band Table, and Zones and Prefixes carry on as usual, but the Top Band Tables go on as detailed in this piece last month, on page 626.

### Contests and Awards

There are of course contests and contests; and there are the long-term exercises which provide a sustained target to go at over a period of months, quite apart from the run-of-the-mill sheepskins the object of which is to make certain stations more interesting to the DX. Geoff. Watts, who puts out the invaluable *DX News Sheet* (from 62 Belmore Road, Norwich NOR-72T) each week also does the hard work for the Islands-on-the-air Award (IOTA). This one is also a contest, in that there is a handsome prize to go to the top scorer each year in the transmitting and SWL categories. In addition, there is more silverware to be had by the chap who can collect all twelve IOTA categories. Incidentally, the rules have recently been changed somewhat for some of these. Four IRCs, or six if air-mail is desired, will bring all the dope and the Directory-of-Islands; one IRC is enough to obtain replacement pages for an existing Directory. Doubtless, as with the News-sheet subscription, there are varieties of "pounds, shillings and pence" which are acceptable from G stations applying, at the usual rate.

Results of the 1967 Tops CW Club Contest are to hand. Out of 169 entries in the single-operator class only one was a G—G3LP, at 27th. In the multi-operator category there is only G3KMI, at fifth place. Just goes to show how contest-minded the G's are

—but when the results are so slow coming through in the major shindigs it is still hardly surprising. Tops are "scrubbing round" the 1968 affair, while the 1969 one will be at the end of the year.

For the RTTY lads, the Italian *CQ Elettronica* magazine is sponsoring a "quickie" from 1400 to 2200 GMT on February 15 and 22. The 3.5 to 28 mc bands inclusive are usable, the contest exchange being RST plus the Zone Number. Stations in one's own Zone are good for three points, while those in other Zones score as the exchange-table wills. Multiplier for each country worked (ARRL country-list) on each band, other than one's own. The contest is open also to SWL's equipped with RTTY tackle. Logs are to contain QSO number, date, time, call signs, countries, and of course the numbers exchanged and points claimed; and should be posted to *CQ Elettronica*, Via C. Boldrini, 22, 40121 Bologna, Italy to arrive before March 20, 1969. Prizes go by way of awards, gold medals, and free subscriptions. Further details can be obtained from the address quoted.

A couple of bits of interest connected with *CQ* next. First, results of the 1968 *CQ* WW WPX Contest, where G3NMH placed in the Top Teh—eighth to be precise. Against a winning score of 1,291,680 by ET3FMA, Hal racked up 807,275 points, which is a sight nearer the top than the scored position would indicate. A good show, and our congratulations. Our only other representative in the results sheet—which is not to say the only other U.K. entry!—is G3SZG, who placed second on Eighty in the single-band category at 28,090 points, and was followed home at fourth position by GM3VTB on 14,784 points. Again, congratulations are due.

A final reminder for the Top Band *CQ* WW Contest—starting 0001z Saturday January 25, and carrying on through to 1500z on Sunday, January 26. As W1WY points out, the problem of U.S. QRM in the "DX Alley" around 1825-1830 kc lies largely with the DX (us!) and will be kept within bounds only if the W's who call in that area are *not* worked but ignored. Let them call in the bottom end of the band, as in previous years. If we don't, the

W QRM will result in wholesale loss of QSO's.

### Top Band

Having shifted from his old place to Portchester, and got himself "spliced"—our congratulations—G3SED has now, after a year's absence from the world of Amateur Radio, reappeared on the bands. Three weeks after moving into the new place, he had an inverted-Vee going which has already hooked VO1FB, PJ0CC, W1, W2, W3, W4, W9 and W1FZJ/KP4, all during the *CQ* WW DX Contest, in which it was noticeable that far more G's than usual were in their battle array. Mike reports on the conditions for the first 160-metre Trans-Atlantic Tests: Propagation quite reasonable and many more stations on from this side than of late years, with the usual calls appearing in the lists of W's, plus KV4FZ—which is the new guise of W0VXO. In the way of other news, G3SED mentions that EP2BQ is already hearing G's from 2200z onwards and will shortly have a crystal to make him operational on Top Band. Towards the end of the season and for next season some EU/JA Tests are being set up, with the help of W1BB, and indeed DL9KRA has already been having a few "eyeball QSO's" with the JA chaps to get things teed up.

From G2DC (Ringwood) comes the comment that there is not a lot of great DX interest on 160m. unless one is prepared to sit up late at nights or get up early. Nonetheless, Jack hooked all UK and EI,

### ALL-BAND ZONES AND PREFIXES TABLE

Starting date: January 1, 1968

| Station | Zones | Prefixes |
|---------|-------|----------|
| G3IAR   | 40    | 392      |
| G3LZQ   | 40    | 382      |
| G3WSL   | 33    | 335      |
| G3PQF   | 31    | 240      |
| G3SED   | 27    | 134      |
| G3VPS   | 26    | 240      |
| G3AAQ/M | 26    | 239      |
| G3IDG   | 24    | 118      |
| G3WPO   | 23    | 196      |
| G3WJS   | 19    | 216      |



The neat modern station of Giovanni Lanzony, I1LAG, Via Comelico 10, Milan 20135, who became interested in Amateur Radio in 1958 and obtained his licence in November 1964. During the ruinous floods in Italy in 1966, I1LAG acted as national master-control station for the amateur emergency working and, keeping on the air for 15 days, handled more than 10,000 messages relating to relief and rescue. He is a keen DX man and takes part in most of the international contest events.

OH2HZ, HB9QA, DL9KRA, a horde of OK's, and VO1FB.

Ted, G2HKU (Sheppey) found the static quite troublesome—"quite like summer till one looks out of the shack window!"—but managed SSB QSO's with GW3UCJ, GW3UCB, GW3SRG, PAØPN and PAØSE. On the key, EI9J, GC3SVK (Guernsey), OK1ATP, OK1AES, and other OK/OL/OM stations, plus OH2KH and DL3FF, all fell into the bag, while it was pleasant to hear HB9YL back on again.

As far as your scribe was concerned, filling up the G counties list has gone on very successfully, plus the horried CW QSO already mentioned with GM3KSU, and a near miss with G13OQR who put quite an enormous signal in one evening, but "went" while the receiver and transmitter were being warmed up for battle.

Our changes in the Tables for

1969 are queried by G3IDG (Basingstoke) who wants to know if the disqualification is to be permanent when applied. Definitely not, but it is intended, as remarked last time, that the tables should reflect *current activity*—so if you come back on the band, you can re-enter your scores. Allan would be greatly helped in this respect if certain stations in Angus, Cambridge, Alderney, and the Scillies would see fit to come across with the cards for QSO's made with them.

Cards are also the theme with GM3UVL (Glasgow), who finally received — from G3WGD — a Leicester QSL, but still awaits one for Sark.

On to G3WPO (Burgess Hill) who worked W2RAA, PX1AN, OH2KH and an "9H1AS" who sounded suspiciously like a phoney, at S9 plus key-clicks, plus a good assortment of EU/DX and G3KFE on

SSB. Tony has certain alterations to his already potent aerial system in train which he calculates should result in a signal a couple of S-units stronger over a given path, and so make the DX a little easier to work.

Remember the Broadstairs Publicity Tour last year? This time they are out on January 13-18, and G3RAD will be part of the entourage—and signing G3RAD/M in the process. Dick says they will be covering Bedford, Northampton, Watford and High Wycombe this time, which gives the chance of four counties in a rather different manner.

#### Forty and Eighty

From Frank Hattemore, G3WSH (Bristol) comes news of a prize specimen of the genus pirate—this one has been around on Eighty, calls himself Mario, and persists with the call "PX1GS." However, just to add insult to injury, this

monster has been telling all and sundry to "QSL via G3WSH" with the result that Frank has to shovel the things out of the way every time the postman calls. Incidentally, longer-memoried readers will remember G3WSH in his earlier guise as 6Y5FH, and, before that again, as SWL Hattemore who rarely missed out on anything.

G3VPS (Hailsham) seems to have another dose of that 70 mc mobile disease, which has reduced his activity somewhat, but he reports a couple of new countries worked on Eighty CW, in the QSO's with W1DW and a UQ2; the former made a very pleasant form of nightcap before going to bed!

A positively unique aerial has come into use in Sidcup—an RF-energised cherry-tree owned by G3FWI. Bill has been away from the HF-bands for *eighteen years*, no less, and for the past five has been a strictly Top Band Phone operator. A certain hesitation, a cynical smile, and down went the key on to 80 watts RF, which produced an enthusiastic 599 response from OK on 14 mc and proved Bill could still read the stuff at a respect-

able speed. Since that first experiment, which has brought old fascinations to the fore, Bill has not looked back. In the LF band context Forty was worked, producing a quite splendid QSO with CT3RX, and various interesting Russian prefixes which Bill had never met before.

On to G3WSL (Chandlers Ford) who has drifted from 14 to 21 and 3.5 mc. On the former band a dipole has been erected in the roofspace, and for Eighty it has been driven as a Marconi with both legs of the coax strapped and loaded against earth. In this rather odd configuration for a 15-metre dipole, 24 countries have been worked on 80m. over the past month, including several W's.

As far as G2HKU was concerned there was nothing outside Europe to report, although an interesting one heard on Eighty was WA1JGO /LA/P, on Sideband. For 7 mc the report simply says "Nowt!"

A rather pleased G2DC has more to say about Forty and Eighty than most, and indeed Jack is coming round to the view that Forty could well be one of our best DX allocations. The reason is not far to seek, in that with a score like the G2DC one it is not so easy to find new ones—but this month has seen PJØCC on both Forty and Eighty, plus PYØDX on Forty, to lift his band scores a bit. Other CW DX worked included, on 3.5 mc, KV4FZ, UF6CR, ZL3FZ, ZL4IE, all W call areas apart from 6 and 7, and the first three VE call areas. Forty yielded CR3BH, JA6YCU, KV4FV, PY's, all W call areas, VE1-7, VK1-3, 5A1TY, 4S7DA and ZL4BO.

#### Here and There

As far as G3IDG was concerned, his QSO-of-the-month was with a Novice W on 21 mc. Nothing unusual in that, you may say. But there was—it was not only that novice's first G, but his *first* QSO ever! That lad was ten years of age, and one can imagine what his pleasure and excitement must have been. Allan even had to tell him what country the prefix G stood for!

One of the snags about using a transceiver for DX-chasing is the requirement for split-frequency working; and it is believed the main reason so many of the top-flight DX-chasers use American gear is nothing more nor less than the presence of

the "external VFO" unit, which gives the facility at the touch of a switch and without any need for modification to the transceiver. On the other hand, one wonders whether a better solution is to use a separate receiver as well as the transceiver to give full split-working facilities and BK. This latter approach seems to be a natural, and one can then enjoy the advantages of using British gear, with AB1 PA stages, which in themselves may be enough, with no other changes, to get rid of TVI—thus two birds with one stone! Seriously though, one would be interested to hear how the transceiver merchants are getting round the difficulty.

VK3AMM (who is Arthur Edwards, G6XJ, on holiday in Australia—see p.564, November) is now to be found in the CW areas of the 10-15-20m. bands most days, during the period 0700-0900z. He welcomes U.K. contacts on the key.

#### Ten and Fifteen

Bashing a key after all these years has proved to be absolutely fascinating for G3FWI, and Bill has tried just about every band other than 160 (from which he is a fugitive) on his bit of wire-energising-a-cherry-tree aerial. As far as Ten was concerned, it all added up to a crop of U.S. contacts, and more and more of the Russian prefixes—and a darned good time!

Now to G3WSL, who seems to have put in most time on Fifteen, coming out of the fray with ZE, ZS, VE6, VE7, CR6GO, CX1JM, VS6AA, and a few JA's, worked on CW.

G2HKU's reference to his 40-metre results applies, it would seem, also to Fifteen; but as far as the 28 mc attempts went, things looked to be rather better, with SSB accounting for Europeans, and CW for HZ1AB and 9F3USA, with PJ1CC(?) as a gotaway.

Ten to G3VPS meant KZ5 and VK5 on CW, plus ZS, using SSB. However, the VK5 came in a rather roundabout way: seems Peter got up early to work VK and possibly a first ZL on Twenty—but by 0900z it was pretty obvious that he was out of luck—so he went down to Ten and promptly hooked VK5EK first try!

G3EJA (Reading) wrote in to

#### TOP BAND LADDER

(G3V-- and G3W-- stations only)

| Station | Counties | Countries |
|---------|----------|-----------|
| G3VMW   | 97       | 21        |
| G3VGR   | 94       | 16        |
| G3VYF   | 92       | 19        |
| G3WUD   | 92       | 14        |
| G3WQQ   | 87       | 16        |
| GW3VPL  | 85       | 18        |
| G3VLX   | 85       | 12        |
| G3WDW   | 83       | 9         |
| G3WPO   | 82       | 18        |
| G3VLT   | 80       | 16        |
| GI3WSS  | 78       | 10        |
| G3VMK   | 74       | 19        |
| G3VMQ   | 73       | 16        |
| GW3WWN  | 67       | 8         |
| G3VES   | 63       | 16        |
| G3VOK   | 61       | 15        |
| G3WJS   | 55       | 10        |
| G3VPS   | 50       | 14        |
| G3XTL   | 44       | 7         |
| G3VWC   | 40       | 8         |

## Reporting the HF Bands

adjust his Table scores; it rather looks as if the meat of his energies have been directed at Ten, as he goes up by seven, the contacts being with SVØWE, EL8J, 9L1KZ, UD6BR, UJ8KAJ, ZS3LU and HL9US—which make a pretty little collection raising the 28 mc score to a round hundred.

For a long while now there has been a deafening silence from GM3JDR (Golspie), which we now find has been partly due to a major rebuild into a new shack outside—which itself had to be built—plus a distressing habit of being QRL when the letter came to be written! Nonetheless, it is a pleasure to hear once again from Don; his first bit of news is that from January he will once again be the only Sutherland station on, as GM3KGT is going to VS6. GM3JDR stuck in the main to 21 mc, and on CW his catch included HI8IBC, HK3RQ, 4A1JJD, ZS5DC, CR6GO, CX1JM, 9Y4LA, 9J2CL, TJIQQ, YV, VK, KG6, PY2SO, UA9's, GC4LI(!), KV4FZ, U1A, UL7HA, ZS6MM, PYØDX, all W call areas, VE1-7, UL7KAA, YV5AZG, JA's, UI8AX, KZ5 and KP4. On the other hand SSB produced HL9TS, assorted JA's, KG6AAY, KØILI/KG6, ZL, UW9, HC2HM, 9X5IH, VS6AL, UP2A, U1A, PY, YV, CX, PJØMM, HI3ABB, ZF1ET, 4UØTIC, UD6BR, HR2WTA, W1-O, VE1-7, 5A3TW, VP7DL, CR8AH and VK's. Incidentally, the HR2WTA and KZ5DV contacts were followed up smartly by direct air-mail QSL cards—a nice courtesy indeed in these discourteous times.

Off-times when G3KFE and Justin Cooper were nattering of our respective columns over a pint, J.C. would comment that a certain SWL should soon be thinking about getting a ticket—then it was R.A.E. done and Morse to come—later still, Morse passed so watch out for him hitting the bands—and then lo! G3XYP burst on the scenery from Navenby. At the time of writing, David had five weeks of operating under his belt, and had

amassed sixty countries, over 28 Zones, and a total of 24 of the U.S. states, on the three HF bands. The gear is a Swan 350, and a TA-33Jr rotated by a TR-44. Interestingly enough, the beam is mounted on a crankover tower based quite closely on the 9L1HX design described in SHORT WAVE MAGAZINE for August 1966, with modifications to cope with climatic and availability conditions. Ten-metre contacts were made with HS1AF, HS3VV, MP4BGX, TJ1AU, VP2AW, 5A3TW, 7Q7WW, 9Q5DS and 9J2WR, to make a good start on the band; 21 mc was not neglected but of course there is always the matter of *time*—none-the-less all W call areas (other than W7) PY, XW8BX, and JA's have been booked in.

From a new one to an old-timer; G2DC has worked just about all there is to be worked on the key in Lord-knows-how-many years at the game from all sorts of places. Jack puts his list down to show how it all is done, by way of CE1AD, CR4BB,

CR6GO, HP1AC, HK4ALE, PJØCC, PJ2VD, TI2PZ, UH8AE, UF5GAE, UVØKUV, VP8HJ, ZD8J, ZS5DC, ZS5XA and 9Y4LS, all worked on Fifteen, plus, for Ten, EP2BQ, LU1BB, UD6AM, UH8AE, UI8AI, VS6AA, VK's, VE's, all W call areas, ZE's, ZS's and 9J2.

From G3NOF (Yeovil) comes a gloomy assessment of the bands that could almost be summed up as "Fine—when I'm elsewhere!"—but Don rang the bell on Ten with CR2AA, PYØSP, VK2AXB, VK5DE, VK6KL and VU2GGB, plus of course the usual crop of W's. Fifteen never does make a large contribution to the G3NOF log, thanks to the gogglebox, but VK's have been heard, long-path and complete with echo, around 0800, followed by the SP opening at 1100. A good check on things, Don remarks, is to listen on 21380 kc for the VK2FA crowd in their net, which is often joined by VK9's and 9M2.

### Twenty

Here let G3XYP open the scoring. David spent his evenings in this area mainly, as the morning sessions have been still dark. VK, ZL, all W call areas, including the first W7 in Montana, CO2FA, FM7WV,



Station of Bob Hooper, G3WEV, 8 Pitchcombe Gardens, Coombe Dingle, Bristol, who comes from South Africa. Main interest is on the LF bands, for which he runs a Codar A.T.5 and Heathkit RA-1, with Q-multiplier and preselector. His younger brother Jeremy is also licensed, as G3XEI —and he has another brother coming on!



G5ACX, on microphone, with G3PLY, operating GB3JOA from Wokingham, Berks., during the recent Scout DX event. They used a Heathkit SB-300/SB-400 combination, into a Mosley TA-33Jr. aerial, making 78 contacts in 42 countries in all continents.

FY7YK, HK0BMO, KR6FC, KX6FN, PY0OK, VK0JW and VQ9GA have been worked. All that, taken into account with the activity on other bands already mentioned, adds up to a pretty fair start.

G3VPS is another old "SWL" correspondent. Peter tends to hide his light, and in any case operated the LF bands for quite a while with a 19 Set, so one is quite startled to find his Six-Band Table score sitting at 105 countries worked. This month's catch include (CW) 9H1, PJ0CC, ZB2 and JX, while SSB accounted for 9J2, 9H1, VK6, ZB2 and CT2. Thus over the month the countries total continued its steady rise, with four more countries added in.

A cracking signal from Gozo into the G2HKU headphones was 9H1M, worked on SSB around 0700z, as were ZL2KP, ZL3JQ, ZL3SE, ZL2AVY, ZB2A, VK7WH, KL7GME, SV1BN and EL2BC (who gave QTH as Box 251, Monrovia, Liberia).

G3FWI has been somewhat puzzled, as have so many more, by

the special OM prefix used temporarily by the OK's this autumn; this was fairly well advertised in all the right places but for some reason caused, and continues to cause, quite a bit of bewilderment. Bill had a gotaway on 14 mc in the form of F6ABP/FC, heard at 1048z; and one suspects that if he had totalled up his workings on the band the result would be quite a fair old total.

Naturally, if there is anything doing on Twenty, one normally expects G2DC to be on to it in short order. Jack has been told that the Pacific stuff is "there" at around 0500z, but he says that "a combination of old age and the screws" has prevented him from taking more than academic interest. He should worry—wild horses wouldn't drag G3KFE out of bed at that time! There are times when the delights of DX are in the abstract, and this is one of them! However, to be serious for a moment, G2DC's takings this month include a daily WAC but not much else—or so he says.

As the bands open up at daybreak it is now possible, thanks to our

enlightened masters, to go to work in an office too early for the band opening—which is just dandy if you've got TVI!—but G3NOF seems to have hung on until things got going, and as a result has observed that the UA's herald the start of the dawn chorus, followed by Central Europe, JA and VK, in that order; often the Central EU's are so loud as to drown out the VK's. And note you this, gentlemen—it is these same Central EU's whose time is being foisted off on to us. A deep-laid plot against the DX! G3NOF raised CR6GA, DU1UP, ET3REL, FO8BS, FR7ZG, HL9US, a collection of JA's, KV4FZ (who must be the original sleepless wonder), OY7ML, PJ0CC, PY0OM and PY0SP, SV0WN, VE7's, VK0JW, UA0NM, VP2VW, VP8KD, VP9K, VS9MB, ZL's, ZS3AP, ZS3LU and 9Q5EJ.

#### Bits and Pieces

Reverting to our note on VS9MB operation, a new operator has appeared, John, who is giving G3KDB as his QSL address, whereas

#### TOP BAND COUNTIES LADDER

| Station             | Confirmed | Worked |
|---------------------|-----------|--------|
| <i>Phone and CW</i> |           |        |
| G2NJ                | 98        | 98     |
| GM3UUVL             | 97        | 98     |
| G3APA               | 95        | 96     |
| G2HKU               | 90        | 94     |
| G3WPO               | 78        | 84     |
| G3WQQ               | 74        | 87     |
| G8HX                | 72        | 81     |
| G13WSS              | 66        | 78     |
| G3VLX               | 63        | 85     |
| G3IDG               | 55        | 61     |
| G3WJS               | 40        | 78     |
| G3VPS               | 27        | 50     |
| G3XGD               | 25        | 54     |
| <i>Phone only</i>   |           |        |
| G2NJ                | 98        | 98     |
| G3VGB               | 81        | 90     |
| G3WPO               | 62        | 70     |
| G3PQF               | 52        | 76     |

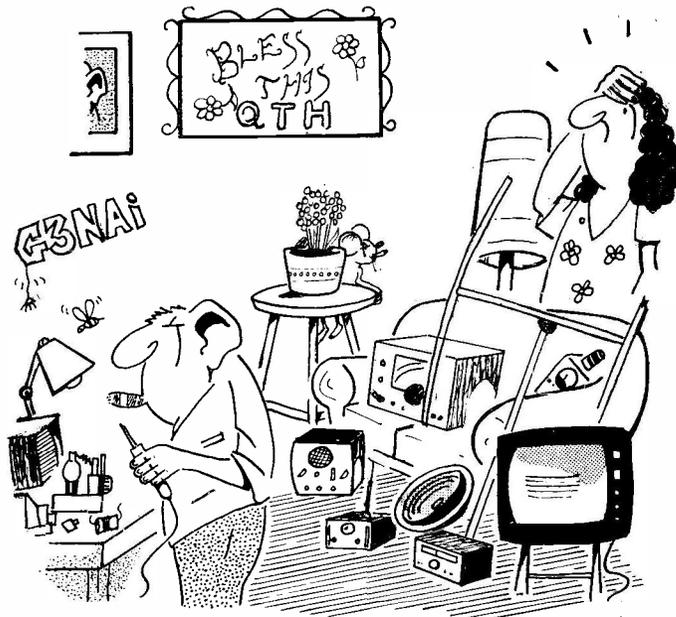
(Failure to report for three months entails removal from this Table. Claims may be made at any time.)

Colin was showing W2CTN, as mentioned last time. VS9MB is in the Maldiv Islands, Gan, Zone 39. 8QALK, 8QAWA, and 8QAYL are all in Malé, in the main Maldiv group, on the other side of the Equator and so in Zone 22, and indeed there are rumours that this may have separate country status. As a matter of interest, the first call belongs to VU2OLK, ex-GM3OLK, and the latter to 4S7WA and his XYL, 4S7YL, who are both now resident in Malé.

When you hear, or can work, 70IAE, he will be quite legit, and all in order, the QTH being: Ian Dunbar, Telcomms. Dept., BP Refinery (Aden), Ltd., Box 3003, Aden, South Yemen.

One is perpetually being confused by the I prefixes. The old I1 seems to have burst out into I2, I3 and so on, over the past few months with no apparent rhyme or reason. Now, it is believed the whole thing is to be rationalised, along the lines of I1 for specials, the Islands as before (IS1, IT1, and so on) I2 Milan, I3 Venice, I4 Bologna, I5 Florence, I6 Bari, I7 Naples, I8 Reggio Calabria, I9 Piedmont, and I0 for Rome.

The objection to having YB amateurs working W's seems to have been overcome as far as the Indonesian authorities are concerned,



and so it is understood that ere long action will be taken to take YB off the American "barred" list.

So there, for the month, and for the year, you have it; let us hope and pray that 1969, both in the national context and by way of Amateur Radio, will be happier

and more successful; sensible politicians(!), more DX, and no phoney DX-peditions, lids or pirates to take the taste out of our little triumphs.

Deadline for the February piece is first post Monday, January 13, addressed as always: CDXN, SHORT WAVE MAGAZINE, BUCKINGHAM. Till then, 73 es HNY.

### SAFETY IN THE AMATEUR STATION

The mains, and any apparatus connected to them, can be lethal unless proper precautions are taken—a statement of the obvious, maybe, but it does need re-emphasising from time to time. The first safeguard is to sort out N, L and E ("neutral," "live" and "earth") on the mains side, and keep them sorted all through the station wiring. This means using three-pin plugs throughout, even if a two-pin connection is wanted—in the sense that when several connections are made to one socket adaptor, the "neutral" and "live" sides are always correctly joined.

Secondly, all chassis should be solidly grounded, to a good earth connection separate from the mains "E" lead. (It is a good habit always to make the earth connection first when wiring in gear.) Power packs should, of course, be fully protected (by covers or separate housing) and all HV feed points properly insulated; it is as well to fit protective terminals and to make HV connections with heavy rubber-covered cable, as used for car plug leads (these connectors and the cable can be obtained from any good service garage).

All major items of equipment should be separately controlled on the mains side through double-pole switches (these can be mounted on a separate panel, and individu-

ally labelled). The appropriate switch should be at "off" when the interior of the apparatus is being explored for any reason. When adjustments have to be made with power on—as of course is often the case—use *one hand only* (keep the other in a pocket), and have rubber mats about the place on which to stand when working on the gear.

Finally, and most important, have one large double-pole switch, which can be reached quickly, to cut power to the *whole station* in an emergency. And every member of the family should know where this switch is, and what it is for. (It is no use your young brother trying to pull you off a 2.5 kV circuit with the power still on.) The whole theme of the station layout, as regards all mains and HT circuits and connections, should be *safety*—your own, and that of others. If the correct and reasonable precautions are taken, there need never be accidents.

### W. D. CLAGUE, G2BSA

The death of Douglas Clague, G2BSA, of Looe, Cornwall, at the age of 71, was reported in the *Magazine* for October 1968. He was a retired chemist and his estate has recently been proved at £106,175 on which the duty paid was £44,068. At the time of his death, G2BSA was president of the R.A.I.B.C.

# THE TWENTY-THIRD MCC

## *The Magazine Top-Band Club Contest November 9-10, 1968*

ANY handicapping system is at the mercy of the unpredictable—and the one used for MCC as much as any. None of the invigilators would have said that Top Band was in especially good fettle on the evening of November 9, or even on the following day, but there is not much doubt that conditions for GDX were good enough to upset the applecart and put the Southerners out of the running.

The winners for 1968, *Moray Firth*, GM3TKV, scored 825 points; this compared with a winning score of 641 in the 1967 MCC (for *Burslem*) with almost the same number of logs entered, and compares also with a score 227 points lower for *Moray Firth*, enough to take them into second place in 1967.

As for the runners-up, it was touch-and-go whether it would be *Manchester University* (G3VUM), who eventually got the verdict with 698 points, or *Kirkcaldy*, who took third place with 695, signing GM3PFQ. For the record, *Manchester University* placed thirteenth last year with a score of 482 and *Kirkcaldy* held third with 580 points.

Down at the other end of the Table, the records show the wooden-spoon score to have been 46 last year, and so, oddly enough, it was this year, too. However, it could be said that any Club which equalled last year's score this year could expect to go down the Table, give or take a little, by about *twenty* places!

A word about the logging and invigilating: As ever, there were quite a few invigilators listening in various parts of the country (sometimes in landline contact with each other with reference to a particular station) *plus* the cross-check on information given by the logs themselves, which are gone through pretty closely, with of course the check logs. This year we received one from GM3RCS, *Radio Club of Scotland*, because they didn't think it good enough for a formal entry (they would have been far from disgraced if they had put it in!) but it served well as a check. Then of course, we had "the institution," which comes in each year from D. L. A. Law of Leicester, who rarely misses what goes on during MCC.

As far as the entered logs were concerned, the situation was not as good as it should have been. One of the leading stations took an awful pasting in the checking, and fell by 32 points; all the first three claimants lost points. Sometimes, this was because of nothing more than bad handwriting. Then there were the errors that need not have appeared had the logs been carefully checked before sending, such as mistakes in the Club coding, obvious by looking at the logs for each day. The number of these mistakes far out-numbered the errors of inability to copy Morse.

Each year the faces change, and absentees are noticed. During the Contest period itself one was aware of the absence of last year's winner, *Burslem*. And of G3BMY from the single-pointers—although the mystery of where *he* was hiding was easily solved by listening to a certain Club call rather carefully! When the entries come in, there is always the feeling of surprise that calls one heard "going like a bomb" in the Contest have failed to come up with a log; two such were *East Barnet*, G3RPB, and *Marconi Apprentices*, G3JTW, both of whom seemed to be heading for high scores during the battle.

Single-point contacts can often make a big difference to the final placings, and quite a few calls were noted as making a serious attempt to work a lot of the Clubs: G3LIQ, G3IAR, G3VLX, GM3OOK all were noted in several logs, as was G3ABG, with a sprinkling of OK, OM, OL, PAØ, 3AØ, and DL stations. An interesting one was G3VFA in *Broadstairs*, who seemed to be laying down a pretty hefty signal all over the country—and who could be expected to have been using a "Joy-stick," considering it is the *Partridge Electronics* call-sign.

Several groups—including one of your invigilators and SWL Law—got all tangled up in the mess of *Beastly Summer Time versus GMT*. This meant that beady eyes were cast on the band a few minutes before the start, to note how things were going on. Apart from a few stations getting well and truly muddled up over time, one noted here and there the odd "CQ MCC" launched before the starting time and carried on till after, so as to monopolise a clear frequency. At least one such was quite definitely able to listen-through but did not answer until "time" was called.

### Quality of Signal

As always, there were a few notes that were less than perfect, and here and there one heard the odd prize out-and-outer. But it must be said that although, for example, GM3TKV was criticised early on by one invigilator (for "Baghdad Morse"), he was heard later with a clean signal by another, and certainly he was getting T9 all the time. G3XNS/A sounded very rough at one stage, but cleaned up later on. And comments about the G3JTW signal by one were not borne out by another, and could probably have been purely proximity effects. So it can be said that there was nobody operating with a deliberately dirty note, and those who may have had them took appropriate action to clear things up.

### Equipment Used

Here one must first of all think in terms of Aerials,

because it was by these that the Big Boys produced their signals. For instance, GM3TKV had a choice of three: A 96-foot vertical base loaded; a folded dipole coax fed at 45 feet; and a horizontal dipole at 96 feet, also coax fed, each lined up to cover different parts of the country. Runners-up *Manchester University* had their half-wave aerial no less than 160 feet in the air at one end! Against this, a dipole at 35 feet seems so modest—all the more credit to *Kirkcaldy*, GM3PFQ, for such a fine score. *Spenn Valley*, G3VMW, ran an inverted-Vee with the apex at 80ft., worked against an earth-mat of

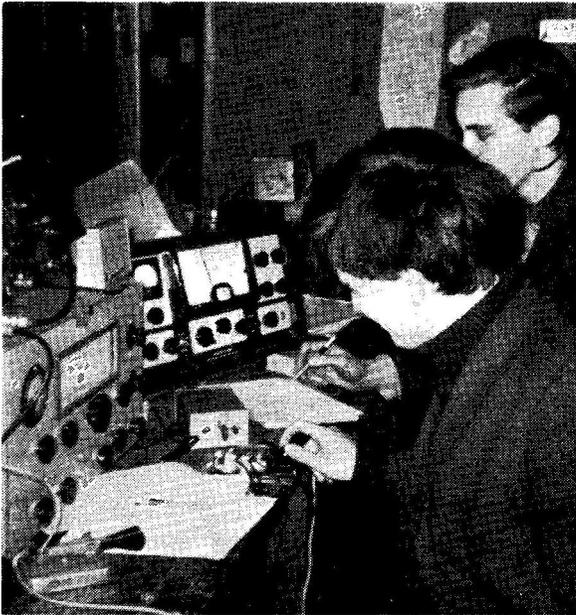
no mean size. Keele's dipole was 75 feet high—no wonder these chaps, signing G3UOK, got S9 from all over the country.

On the other side of the coin, knowing how important the aerial is to the Big Signal, one was saddened to hear some of the back-markers putting up a bleat about "excess power." The mathematics show that, providing you have an aerial system that will get you out, there is very little difference between 10 watts and 100 watts, on any band.

In the way of ingenious improvisation, one was

TABLE I  
Positions and Scores, Twenty-Third MCC

| PLACE | CLUB                   | CALL   | REGION | POINTS | PLACE | CLUB                      | CALL   | REGION | POINTS |
|-------|------------------------|--------|--------|--------|-------|---------------------------|--------|--------|--------|
| 1     | Moray Firth            | GM3TKV | GM     | 825    | 51    | Echelford 'B'             | G3JUL  | S      | 330    |
| 2     | Manchester University  | G3VUM  | N      | 698    | 52    | Mid-Sussex                | G3BZO  | S      | 329    |
| 3     | Kirkcaldy              | GM3PFQ | GM     | 695    | 53    | Manchester University 'B' | G3VDB  | N      | 313    |
| 4     | Spenn Valley           | G3VMW  | N      | 661    | 54    | Grimsby                   | G3VIP  | M      | 312    |
| 5     | Stourbridge            | G6OI   | M      | 608    | 55    | Nailsworth                | G3VVV  | S      | 311    |
| 6     | Keele University       | G3UOK  | M      | 604    | 56    | Brighton Tech. Coll.      | G3TCB  | S      | 309    |
| 7     | Verulam 'B'            | G3NOH  | S      | 599    | 57    | East Cheam                | G3MEH  | S      | 308    |
| 8     | Kings Norton           | G3GVA  | M      | 596    | 58    | Wirral                    | G3NWR  | M      | 304    |
| 9     | Maidstone              | G3TRF  | S      | 594    |       | Salisbury                 | G3FKF  | S      | 304    |
| 10    | West Riding Contest    | G3VTY  | N      | 583    |       | Crystal Palace            | G3VCP  | S      | 303    |
| 11    | Govt. Comms. H.Q.      | G3SSO  | S      | 575    | 60    | Crawley 'B'               | G3TNO  | S      | 303    |
| 12    | Sheffield              | G4JW   | N      | 559    | 62    | Fareham                   | G3VEF  | S      | 298    |
| 13    | Surrey                 | G3SRC  | S      | 558    | 63    | Farnborough               | G3XCH  | S      | 294    |
|       | Stockport              | G6UQ   | M      | 558    | 64    | Chippenham                | G3VRE  | S      | 289    |
| 15    | Woking                 | G3POI  | S      | 552    | 65    | Gosport                   | G3RQK  | S      | 279    |
|       | Oxford                 | G3RBP  | S      | 552    | 66    | Crawley 'C'               | G3PHG  | S      | 265    |
| 17    | South Manchester       | G3FVA  | N      | 520    | 67    | Painton                   | G3PHC  | M      | 259    |
| 18    | Leicester              | G3LRS  | M      | 505    | 68    | Ampfield Contest          | G3JFY  | S      | 258    |
| 19    | Leyland Hundred        | G3GGS  | N      | 486    | 69    | Conway Valley             | GW3HGL | GW     | 257    |
| 20    | Coventry               | G2ASF  | M      | 482    | 70    | Lincoln                   | G3IXH  | M      | 252    |
| 21    | STC, Harlow            | G3NIS  | S      | 463    | 71    | Bishops Stortford         | G3RGA  | S      | 233    |
| 22    | Torbay                 | G3NJA  | S      | 461    | 72    | University Coll. Bangor   | GW3UCB | GW     | 230    |
| 23    | Hallamshire            | G3KVG  | N      | 446    |       | Reigate 'B'               | G3XOQ  | S      | 230    |
| 24    | Luton                  | G3XZD  | M      | 442    | 73    | Echelford 'A'             | G3UES  | S      | 229    |
| 25    | Staffs. Coll. of Tech. | G3VZI  | M      | 435    |       | Greenford                 | G3VMD  | S      | 229    |
| 26    | Liverpool              | G3AHD  | N      | 433    |       | Isle of Wight             | G3SKY  | S      | 227    |
| 27    | Salop                  | G3SRT  | M      | 429    | 76    | Southdown                 | G3WQK  | S      | 227    |
| 28    | Leyton & Walthamstow   | G3WHY  | S      | 427    |       | Jersey, C.I.              | GC3DVC | GC     | 227    |
| 29    | Crawley 'A'            | G3WJC  | S      | 425    | 79    | Wessex                    | G3WGV  | S      | 220    |
| 30    | East Surrey            | G3OVL  | S      | 422    | 80    | Verulam 'A'               | G3VER  | S      | 217    |
|       | Stoke-on-Trent         | G3GBU  | M      | 422    | 81    | Sheffield University      | G3UOS  | N      | 214    |
| 32    | Nottingham             | G3EKW  | M      | 416    | 82    | Macclesfield              | G3LDT  | M      | 212    |
| 33    | Edgware                | G3ASR  | S      | 406    | 83    | Clifton                   | G3GHN  | S      | 197    |
| 34    | Hereford               | G3WNO  | M      | 405    | 84    | Rugby                     | G3BXF  | M      | 194    |
| 35    | Cambridge              | G6UW   | M      | 403    | 85    | Mansfield                 | G3GQC  | M      | 192    |
| 36    | Vange (Basildon)       | G3PRU  | S      | 402    | 86    | Bromsgrove                | G3VGG  | M      | 185    |
| 37    | Chesham                | G3MDG  | S      | 385    | 87    | Purley 'A'                | G3FTQ  | S      | 184    |
| 38    | Reigate 'A'            | G3REI  | S      | 378    | 98    | Bradford G.S.             | G3MHB  | N      | 181    |
|       | Chester                | G3GIZ  | M      | 378    | 99    | Purley 'B'                | G3XMW  | S      | 172    |
| 40    | Ealing                 | G3UUP  | S      | 377    | 90    | Bangor                    | G13RXQ | GI     | 161    |
| 41    | Crawley 'D'            | G3XNS  | S      | 372    | 91    | Mid-Herts                 | G3WGC  | S      | 147    |
| 42    | Cardiff Contest        | GW3XEJ | GW     | 364    | 92    | Shefford                  | G3ROL  | M      | 142    |
| 43    | Nuneaton               | G3XJU  | M      | 363    | 93    | Blackwood                 | GW6GW  | GW     | 136    |
|       | Otley                  | G3XNO  | N      | 355    | 94    | Barking                   | G3XBF  | S      | 129    |
| 44    | Cheshunt               | G3TZZ  | S      | 355    | 95    | Worthing                  | G3WOR  | S      | 127    |
|       | Stevenage              | G3SAD  | S      | 355    | 96    | Newark                    | G3ELJ  | M      | 104    |
| 47    | Worcester              | G3GJL  | M      | 346    | 97    | Yeovil                    | G3CMH  | S      | 95     |
| 48    | Wimbledon              | G3WIM  | S      | 343    | 98    | Pudsey                    | G3XEP  | N      | 66     |
|       | Norfolk                | G3PXT  | M      | 343    | 99    | R. Aux. A.F. Northwood    | G3RVH  | S      | 46     |
| 50    | Bristol University     | G3KAC  | S      | 342    |       |                           |        |        |        |



The Cambridge Group entry for MCC, with G3VNO on the key and G3UEW logging. Signing G6UW, the old University callsign, a score of 403 points put them into 35th place. Their other operators were G3WUW, G3VCR and G3RCB.

amused at the East Cheam crowd, who operated from a site normally only used for VHF *chez* G3MEH. To get going on Top Band, they lifted the mast, complete with beams, on to a lump of plastic, disconnected the VHF feeders at the shack end, and fed the mast *via* a loading coil against earth; it was good enough to make the locals complain of receiver-blocking. They scored 308 points.

Turning to the station end of the equipment used, by far the most noticeable thing was the acceleration in the trend to employing transceivers on the one hand, and on the other, the virtual disappearance of the good old HRO, which not so many years ago was by far the most popular receiver in this Contest. *Moray Firth* were all home-brew, with a 6BW6 PA stage, keyed by grid-blocking, and alongside it GM3UKG's version of the G2DAF receiver, *plus* a double-conversion job by GM3KHH. *Manchester University* used a KW-2000A with a Q-multiplier. *Kirkcaldy* had a 2E26 in the PA, driven by EF91-EF91 in the exciter for transmission, with an Eddystone S.750 to do the receiving job. At *Spen Valley*, transistors were used to drive a 5763 PA, while the receiving side was taken care of by an Eddystone 888A and an AR88D. *Keele University* (who seem to have had some of the operators from last year's winning Burslem side) had KW2000A-*plus*-Drake R4A tackle to run up their score—and in that context it is perhaps interesting to note that a Burslem operator was at the sharp-end for *Manchester University*, second in the final placing.

Lower down the tables, a variety of gear was used, mainly KW-2000A transceivers, a couple of Project '66 transceivers cross-coupled at Kings Norton (G3GVA)

and another at Staffs. College of Technology (G3VZI), the latter backed up by an RA-1 receiver, and a reserve station consisting of Eddystone 880/2 and K.W. Vespa. Receivers ranged from the AR88, HRO, through several Drake types (R4A, R4B, 2B), Sommerkamp FR-100B, Eddystone EA-12, through to Racal RA-17 and Collins 75A-4. Transmitters included quite a crop of home-built (mostly keyed by grid-blocking) together with the odd all-transistor job, Codar AT-5's and K.W. Vespa and Vanguards.

### Operating Techniques

Like the curate's egg—good in parts, but always sporting. Quite a lot of Clubs were pretty obviously netting to the *wrong* side of zero-beat from the crystal peak at the other end—how many times have we all done it in the heat of the moment, especially on an unfamiliar rig—and quite a few operators using the KW-2000 forgot just how one goes about (a) Sending a clean CW signal, and (b) How to net dead on the other chap's frequency. Often there were aberrations, such as the odd call 500 cycles *off* the correct frequency. This year, the invigilators gained the impression that MCC was spread out more than previously, up to as high as 1890 kc. As usual, there was far too much use of BK as a substitute for a callsign, rather than in its correct form, meaning that "I am equipped for listening-through." This misuse resulted in several points being written down for QSO's which appeared in three, or even four, logs as a claimed contact!

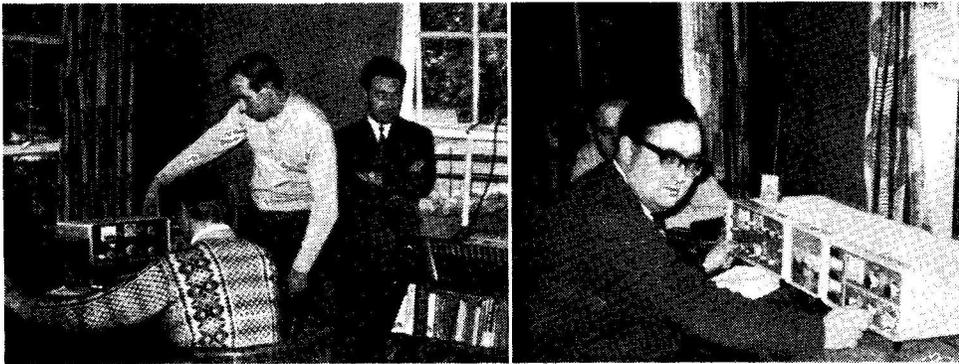
### The Scoring System

It is by now understood that as well as being a battle for the Top Spot, MCC is intended to give the regions a chance to compete internally, one Club against another. But it seems desirable at this point to discuss in some detail the way in which the present scoring balance and multipliers are calculated.

TABLE II

#### Top Scorers in the Regions

|                 |                                   |     |     |
|-----------------|-----------------------------------|-----|-----|
| <i>Southern</i> |                                   |     |     |
| 1               | Verulam 'B' (G3NOH)               | ... | 599 |
| 2               | Maidstone (G3TRF)                 | ... | 594 |
| 3               | Govt. Communications (G3SSO)      | ... | 575 |
| <i>Northern</i> |                                   |     |     |
| 1               | Manchester University (G3VUM)     | ... | 698 |
| 2               | Spen Valley (G3VMW)               | ... | 661 |
| 3               | West Riding Contest (G3VTY)       | ... | 583 |
| <i>Scotland</i> |                                   |     |     |
| 1               | Moray Firth (GM3TKV)              | ... | 825 |
| 2               | Kirkcaldy (GM3PFQ)                | ... | 695 |
| <i>Midland</i>  |                                   |     |     |
| 1               | Stourbridge (G6OI)                | ... | 608 |
| 2               | Keele University (G3UOK)          | ... | 604 |
| 3               | Kings Norton (G3GVA)              | ... | 596 |
| <i>Wales</i>    |                                   |     |     |
| 1               | Cardiff Contest (GW3XEJ)          | ... | 364 |
| 2               | Conway Valley (GW3HGL)            | ... | 257 |
| 3               | University Coll., Bangor (GW3UCB) | ... | 230 |
| <i>G1/GD</i>    |                                   |     |     |
| 1               | Bangor (G1BRXQ)                   | ... | 161 |
| <i>GC</i>       |                                   |     |     |
| 1               | Jersey (GC3DVC)                   | ... | 227 |



Not actually an MCC picture, but an impression of the two stations put on for J-O-T-A under callsign GB3GP, Gilwell Park, the Scout Hq. in East London. On right, G3TZZ operating the HF station, and at left G3SVK busy at the LF position, with G3VUE and G8BAM. On 160m. WIBB/1 was worked and, all in all, some 395 contacts were made, in 55 countries, half of which were with Scout stations.

If one thinks about it, a station in the South of England can start by working off other Southerners in the early part of the time allocated, and, as the 160-metre band changes fully over to "night-time" conditions, will hear and go after the DX. Now, the Scottish stations (in particular those in the Far North), have to contend with different time conditions as far as the onset of DX working is concerned—as much as a couple of hours up in Shetland—plus the fact that they cannot do much in the way of peeling off the locals (because in GM there are not many Top Band locals) while they wait for the band to open to the South in anything like a big way. Four hours is just about the shortest time that gives the Southern stations a chance to work 'em all, while not

being long enough to let the GM's make full use of their multiplier and score a runaway victory. If conditions are bad, then a Southerner should win—recall Racal and Maidstone in 1965?—while average conditions make it an open guess. But if the band is in very good shape the Scots have the edge.

However, there is another factor in the equation, and that is the *desire* to win, come hell or high water. It does seem as though a far larger proportion of the dour Northerners and Scots enter the Contest seriously than do the folk down South; and often the effort which could have placed a southern Club high in the lists is dissipated in running another station and hence generating local QRM—well, it's just a thought. [over

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For MCC, the Kings Norton group operated as G3GVA/A, placing 8th with 596 points. Operators were G3GVA, G3RGD, G8AX and G3GBS (who took the picture). Oddly enough, Kings Norton also came 8th in the 1967 MCC, but then with 523 points—even the increase of 73 pts. this time did not improve their position, showing that there was a larger entry and even hotter competition this year.

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The Leyland Hundred (a district of Lancashire) entry for the 1968 MCC signed G3GGS, making 486 points for 19th place (last year they were 10th, with 504 pts.). Operators seen here, left to right, are: G3RFN, G3RFT, G3GGS and G3AZI. Their gear consisted of a Command Tx, BC-348 receiver and a 272ft. wire, centre-fed, at 35ft.

For Bishops Stortford, the station signing G3RGA scored 233 points, for 71st position out of the 99 MCC entries this year. The other operators were G3VWC and G3XYI, the G3RGA gear being a KW-2000A (on the QRP notch) coupled through an ATU to a half-wave aerial at 40ft.



### The GD<sub>X</sub> Entries

Quite a few of interest appeared in the logs. A noticeable one was GC3DVC/A, giving J01 as identification, and putting a very good signal all over the country, but being somewhat overlooked in the welter of S9 stuff. As a matter of interest, the Jersey entry was signed, and some of the operating done, by that old Coventry stalwart Bert Chater, GC2LU as he now is.

Both Jersey and the Isle of Wight, G3SKY, intend to be in there again next year and to improve on this

year's score. They share 76th place.

Unlike previous years, when the EI/GI representatives have been noticeable by their absence, this time they were quite definitely present and dishing out reports: Ballymena, G13FFF, appeared in many logs, as also did Bangor, signing G13RXQ and getting pretty well all round the country.

From Wales, MCC operation was going on at GW6GW, Blackwood; GW3UCB, University College of Wales, Bangor; GW3HGL, Conway Valley; and Cardiff Contest, who signed GW3XEJ.

The Bangor (Northern Ireland) Club station signed G13RXQ for MCC, and the chaps making their 161 points for Ulster were, left to right, G12FHN, G13OLJ and G13TLT. They ran a home-built Tx with TT11 PA, and as Rx a "Commander." They had a 300ft. vertical aerial supported by balloons for the first session on November 9 (which must have been a lot of fun for everybody!) but for the second day went on to a dipole at 35 feet.



#### Some of the Comments

Plenty of these, some grave, some light-hearted . . . Cannot put in an entry—aerials wouldn't work (*Radio Club of Scotland*) . . . Morale crashed after two hours of the worst conditions ever known here (*Moray Firth*) . . . Must get the centre up another ten feet for next year and do a little better (*Kirkcaldy*) . . . Operating done by

G3XAQ while I was soothing irate parents suffering from TVI for some reason (*Spen Valley*) . . . Only three QSO's within 20 miles (*Keele University*) . . . Rotatable half-wave dipole at 45 feet (*Verulam*) . . . MCC is always the next event of note after Bonfire Night! (*Kings Norton*) . . . Lots of people don't know what "ner" means (*West Riding Contest*) . . . Highlight, working



The Torbay chaps signed G3NJA/A during MCC, those concerned being, left to right: SWL Mike Weston, G3LHJ, G3GDW and SWL David Weston. Their very creditable score of 461 points got them into 22nd place in the field of nearly 100 MCC entries.

with unusual ease, 3A0AG, Monte Carlo, who sounded genuine (*Govt. Communications, Cheltenham*) . . . Such big aeriels are used these days that distance is no disadvantage (*Stockport*) . . . We were often confused with G3RPB (*Oxford, G3RBP*) . . . Thanks for such a wonderful contest (*South Manchester*) . . . Hope the present formula is retained; it seems an ideal compromise (*Leyland Hundred*) . . . Like the scoring system, keep it as it is! (*Torbay*) . . . A transceiver minus the tuning knob is not the best of tools (*Hallamshire*) . . . marvelled at times at some of the signal strengths heard (*Crawley*) . . . Relay trouble made us QRT for 1½ hours on Saturday (*Nottingham*) . . . Frustrating intermittent fault on the Saturday rather held us back (*Hereford*) . . . Trouble with our own keys—nobody could use anyone else's! Then great difficulty in getting replies when using the straight key (*Cambridge*) . . . Bug key failed us too! (*Vange*) . . . Still a number of keys with surplus dits! (*Reigate*).

One signal sounded like a Class-D into an 813 (*Stevenage*) . . . A multiplier of 1.5 to 1.7 would be fairer to us (*Norfolk*) . . . Unfortunately, I lost one of the scraps of paper, and with it about six QSO's—three operators in a shack four by four by six!! (*Bristol University*) . . . Most of the operators should be out of hospital in time for next year's event! (*Mid-Sussex*) . . . Never operate T/B from home; all that wire *appals* me! (G13VDB, for *Manchester University "B"*) . . . Still don't like the scoring system (*Grimsby*) . . . Pride of place to G3BVM's El-Bug; it involves fourteen valves (*Gosport*) . . . All the Painton Club members involved enjoyed the contest, and will be there again next year (*Painton, Northampton*).

#### The Training Aspect

There seem to be three approaches to MCC: either an all-out attempt to win, an entry for amusement only, or an entry with a view to "bleeding" operators for other battles. We have discussed the first alternative before, and the second needs no comment, but the "training" concept is rather more important. In the first place a successful contest operator will usually be a good operator under normal conditions, and hence cause less QRM on the bands. In addition, his reflexes, his Morse speed, and his concentration, all will be improved, the shortcomings of the gear will be noticed, and the logging problem will be realised. This is where the old hand steps into the picture, to show how the paperwork can be organised, what can be done to the rig, and so on; but the youngsters should be made to do the operating themselves, and never allowed to just sit back and watch, because unless they take part it is highly unlikely they will benefit.

And talking of benefits, most of the competitors would have gained a lot by a close study of SWL Law's check-log. Not only was it a model of readability and accuracy, but he had time to note the odd aberration and to see the funny side of a situation—such as two stations on top of each other sending CQ, and using

BK—but not hearing each other till they went over, the follow up QSO being 599 both ways! Incidentally, SWL Law is the first person ever to remark (to this writer's knowledge), on the undoubted fact that a good check on the well being of an HRO receiver is given by lifting the lid and sniffing the innards for a snug and comfortable smell, which instantly changes if the receiver ails.

And there you have the story for the 23rd MCC. In the Tables may be seen the scores, the regional winners and runners-up. Our thanks to all who took part and submitted Logs. We hope to repeat the event in twelve months' time. From your "Club Secretary"—every good wish for the New Year.

#### SPECIAL PREFIX FOR WALES?

In connection with the Investiture, later this year, of H.R.H. Prince Charles as Prince of Wales—the 21st in the direct line since 1301 A.D.—it has been suggested that a special prefix (temporarily to take the place of GW) should be available to Welsh amateurs to mark the occasion. Of course, in the current atmosphere of half-baked "Welsh nationalism and protest" to which we are now being subjected, there will be those who would regard any such suggestion as "an insult to the Welsh nation." Never mind—we understand that the matter of a special prefix for Wales to mark the Investiture is under consideration—we are sure that the great majority of GW's will be proud to use it, if they are fortunate enough to have it granted.

#### CITY & GUILDS COURSE IN COMPUTER PROGRAMMING

We are informed that the City & Guilds of London Institute will shortly be introducing a syllabus leading to a certificate of national standard in Computer Programming. It seems that the "private education" in this esoteric field has been (to put it at its lowest) somewhat uneven and not altogether satisfactory. Because there has been no accepted national standard, the shortage of properly qualified computer-programming staff has become severe. A City & Guilds Certificate in the subject will put it on a rational basis.

#### SCIENCE MUSEUM, GB2SM—RTTY

We are asked to say that the working Amateur Radio station at the Science Museum, signing GB2SM and regularly operational on the HF bands under the direction of Geoffrey Voller, G3JUL, is now fitted for radio teletype (RTTY). Normally, activity periods for GB2SM are 1030-1100 and 1500-1530z, Mondays to Fridays, on any band 28 to 3.5 mc, depending on conditions and what happens to be going. Stations able to work in the RTTY mode are invited to write for skeds—which may be possible outside the times mentioned—to The Assistant Keeper, Radio Collection, Science Museum, South Kensington, London, S.W.7. (Tel: 01-589 6371).

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## • • • SWL • • •

SHORT WAVE LISTENER  
FEATURE

THE TENTH YEAR OF "SWL" — MANY  
LICENSED AMATEURS OF TODAY NURTURED  
ON THIS FEATURE — SOME TECHNICAL NOTES  
— READERS' NEWS, VIEWS AND COMMENTS  
ON HAPPENINGS ROUND THE AMATEUR BANDS  
— THE HPX LADDER

By Justin Cooper

HELLO again! And it's a very special greeting this time, in that this is the tenth anniversary of the first appearance of the "SWL" feature in the *Magazine*, during which it has had three conductors. Over the decade something like 500 readers have made the transition from SWL to licensed amateur, and the vast majority have proved the adage that a good apprenticeship in the SWL game is the way to get the best out of operating on the bands. Those ex-readers of this column worked by your scribe in their early days have been noticeably more confident in their procedure than the chaps who have come straight on the air from R.A.E. and Morse with no serious listening-time during their learning. It was always the intention that this piece should be of practical service to Amateur Radio, without in any way plugging the licence theme.

The idea of "SWL" as a regular *Magazine* feature was first proposed by the late Tommy Thomas, G6QB (for many years a valued member of the SHORT WAVE MAGAZINE organisation) and it was he who wrote the original "SWL" contributions. They were an immediate success and, at that time, brought us a circulation increase of nearly 16 per cent, representing about 4,000 new readers. Over the years, we have tried to keep to his formula—which was, simply, to give SWL's what they wanted to read about, in the way of the technique of listening on the amateur bands. This takes a great deal more know-how than may be supposed and your present scribe would be the first to admit that he is still feeling his way.

\* \* \*

Now, to a survey of matters technical—something we have not done for a considerable time.

A. Vest (*Durham*) has first pick, with his remark that he finds his CR-100 not too good for receiving SSB; he seems to feel that the answer is a product detector. Not necessarily so, as if the receiver itself is not capable of "cleaning up" a sideband signal, the product detector will not solve the problem by itself. What is usually lacking is BFO injection, but adding more coupling is often only to make the BFO pull badly. A good way to deal with this difficulty is to inject the BFO signal into an earlier stage in the IF strip, in exactly the same manner

as is done on the last IF stage at present. If an SSB signal will not resolve easily, and there are others on the band that will, then it is a pretty fair bet that either the RF/IF gain is set up too high for the signal, or that the signal itself is poor. A big, clean, signal resolves perfectly, but the chap with the bad SSB signal is often extremely difficult to sort out—and usually all that is the matter is that he needs to back off the microphone gain or talk more quietly!

How to make aerials stay up in a breeze when the far end is attached to a tree is a regular problem. There is a solution, which is to have a pulley at the top of the tree, through which the halyard runs. Instead of tying the downhaul to the tree somewhere, tie it to a bucket of stones or other suitable weight, which hangs free, so that as the tree waves about the tension on the aerial is constant and only the bucket goes up and down. Another way, if the aerial wire is relatively thin, is to use the nylon-cored and PVC coated lacing-twine, such as *Suflex*, as the halyard with a good length between the aerial insulator and the point to which the lower end is belayed, to take advantage of its elasticity. A third point to remember is that if the wire has a bend in it, through an insulator, it should be firmly attached to this insulator, and not allowed to run freely; quite apart from the flexing at the bend, the mechanical stresses at this point can be very high indeed, as a consideration of the parallelogram of forces will show. N. Taylor (*North Wembley*) mentions this problem in his letter, and as a result has an aerial with a large number of joins! Yet another method is to introduce, into the aerial support lines, one or two of those "bungy" cords, as used for strapping luggage. A common source of supply is the local Woolworth's.

It is really quite surprising how many folk, your conductor included, who were fooled into thinking the receiver had packed up by the wipe-out in conditions at the end of October; however, G. Dover (*Nottingham*) has a different kind of problem, in an untunable teletype interference which troubles him on Fifteen and Twenty mainly, and which is cured by the use of an aerial tuner. The receiver is not mentioned, but one could hazard a guess that it is either breakthrough at the IF of signals picked up on the aerial, or malalignment. The former

condition is often a design failure, as for instance in the IF breakthrough noticeable on Top Band with receivers of some types having 1.6 mc IF's. Any signal on the aerial terminal at 1.6 mc will be passed through the RF and mixer stages to appear as a signal at 1.6 mc in the IF, because there is not much attenuation of 1.6 mc signals by 1.8 mc tuned circuits; in most receivers of this type a suitable trap has to be engineered into the front-end to make sure the 1.6 mc signal which may appear on the aerial cannot get into the receiver, and in general-coverage receivers there is always a gap in the tuning around the IF, for the same reason.

From *S. Culnane (Harrow)* we gather he was pushed into SWL by the interest of his friend, Neil Taylor. Steve has a problem with the CR-45K receiver he uses, in that the BBC Radio 1 and Radio 4 signals are plastered all over Top Band and Eighty. The answer to this could well be the use of an ATU, and if that is not enough, a wave-trap at each of the offending frequencies will help.

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A justifiably pleased *Stewart Foster (Lincoln)* writes in to bring his HPX ladder total up to 1013, which looks like something near a record. Unlike previous correspondents who have reached the thousand and then bowed out, Stewart intends to carry on for a while, albeit not so intensely, and wait for some competition. However, his two friends from the Lincoln group who looked to be the most likely competitors have both bowed out—*David Rollitt (Navenby)* has now become G3XYP and already has VK/ZL, W6, and a lot of other DX booked into the log, and *Bill Felton (Lincoln)* also made the grade, in his case the call being G3XZF. To all three, our congratulations.

Another one to deserve praise is now the holder of G8CEF—*D. Walsh*, who writes in from *Ingatestone*, although his previous reports came in from Carrick-on-Suir in EI-land. Des seems to have settled down and is on the look-out for VHF gear of a price appropriate to his pocket; a Pye Ranger or similar for a start, and as soon as he can he intends to try and persuade some of the crowd back home to come on the two-metre band for a QSO. Des would like to get in touch with any of the local SWL or licensed types; his address is Sedan, Stock Lane, Ingatestone, Essex.

Once again a letter without a name on it anywhere other than "Brian," and so once more a dive into the archives to find out who it might be—*B. Geary (Leicester)*, who has been laid up for a while and so has time to spend listening and doing his paperwork. Brian wants to know if there is a DX club in the area which he can join; there is the Leicester Radio Society and there are quite a few DX-types in the gang.

Back in December 1964, G3HTA did an article in the *Magazine* on a receiver which became very popular as a basis for home-construction, indeed one of the most popular designs ever to appear in SHORT WAVE MAGAZINE. *P. Gould (Tiptree)* uses such a one, home built, and backs it up by a Star SR-40 for general-coverage working. Aerials are a 100 foot end-fed and, for 21 mc, a groundplane. This gear brings him into the ladder at 211 for a first entry.

Now on to *C. Ekberg (Grimshy)* takes up on the remarks last time about Morse, naturally enough, as he is hoping to pass the last hurdle himself and be on the air by the time the next piece appears. Charles is a little troubled that he should be advised to keep away from the key until so late a stage in his learning, and wonders whether he has not helped himself by using the key so much while teaching himself the Code. It need not necessarily do damage to one's "fist"—but, if one is sending on the oscillator at an early stage, it should always be taped and listened to very critically indeed on the playback, so that any incipient bad faults of character-formation or "swing" in the sending can be noted and corrected. It is worth while to learn to send Morse in the manner in which the good Samuel intended. Quite apart from anything else it is far easier to read at higher speed than poor Morse, and will improve one's return in contacts over the air.

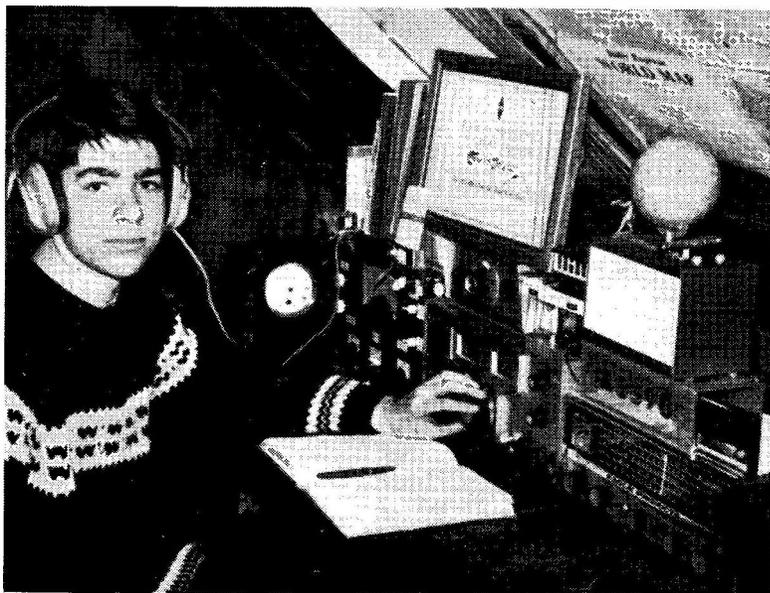
Incidentally, while on the subject of Morse, the lads with the good fists all send in the correct manner. The trick is to imagine the key-knob and the elbow as a couple of supports, and to key by depressing the wrist, rather than to operate with a stiff plank of arm from the elbow paddling the key up and down with the fingers. One can imagine the right way as being rather as though one has no use of fingers or elbows other than as pivots; it feels a little unnatural at first, but goes a long way to make possible sending clearly and rapidly without fatigue.

Possibly the longest-surviving entrant on the HPX Table is *A. W. Nielson (Glasgow)* who explains that his own idleness has resulted in a twelve-foot air gap in the feeders since last January, and an intermittent fault in the receiver for at least the last couple of years. But, and here is the interesting point, analysis of his results in the CQ WW Contest shows that listening over the same number of hours produced comparable results when taken over the five bands, allowing for the inevitable difference in conditions from band to band. What is the explanation? One would suspect that, for a starter, QRM under the contest conditions would ensure that any signal which was weak enough to be near the receiver's bottom limit would be sunk without trace anyway. Secondly, there is a factor of increasing ability with experience, and thirdly, on some bands at least, the stump-end of aerial may actually prevent losses by being a better match to the receiver, and hence passing on a larger proportion of what it itself picks up! And, of course, there is the last one that SWL Nielson remarks on—the rising tide of assorted noises of every sort which seem to surround his shack and blot out desirable DX; weaker signals, and a larger proportion of the aerial sitting in the noise field around the house add up to a situation where AGC and noise limiter are having harder and harder work to do, and fall down on that work more often.

*Mrs. G. E. Austin (Bearsted)* makes another large leap in the ladder; she mentions a QSO in which a VE7/YBI was explaining the trials and tribulations involved in getting his licence, including birth certificate and just about everything bar the kitchen sink!

Having decided not to bring the receiver up to his digs. in Morecambe, *J. Fitzgerald (Gt. Missenden)*

The SWL station operated by Robert Dinning, Bloakholms Farm, Dunlop, Ayrshire, Scotland. Bob first became interested in Amateur Radio at the age of 13, when he made contact with local GM3NZC. Running a HA-350 with PR-30X and RQ-10, 200 countries have been heard, favourite bands being 10 and 15 metres. His aerial system includes two dipoles for 20m., a Joystick and a 350ft. Vee 50 feet high, all fed into the Rx side through Z-match units.



succumbed to temptation and did just that; so now he has Forty, Twenty, and Eighty to amuse himself with. A new list is not worth starting as it rather looks as though his next term of training will take him to Ashton-in-Makerfield.

#### R. A. E. Point

A nice shiny AR-88 graces the shack table of *T. Walsh (Elland)*, and, indeed, nearly covers it completely. Tony wonders what proportion of amateurs who pass R.A.E. actually go the whole hog and get a ticket of one sort or another. Difficult to say, but about half those who start the course for R.A.E. never get as far as the exam. Of those who take the exam, rather more than half pass; of those who pass R.A.E., one would estimate that rather less than half actually come up with a call within a period of, say, three years. What it all means is that for every hundred who take the trouble to start on a course, only about a dozen can be expected actually to come up on the bands—and about a third of *them* will be G8-type calls! Very frustrating, this, for the chap who is the course lecturer!

*D. Palmer (Fareham)* has tuned up his Pye Ranger on 144.7 mc, and erected a five-element Yagi, but has, as yet, heard nothing. The reason, he thinks, is that his battery is flat, and no charger is available. If one is prepared to "float" the battery across the charger on a near-permanent basis, one can get away with relatively low charging rates, and indeed your scribe remembers a trickle-charger made up by series'ing heater windings, using a single GJ5M as the rectifier, with the bits all loose in an old shoe-box, that did yeoman service for a couple of years or more! And nowadays one can get low-rate chargers quite cheaply, often from Woolworth's.

The use of the RF-24 Unit for conversion of the 21 and 28 mc bands to a range the surplus-type receivers can cope with is a good idea. *S. Haseldine (West*

*Bridgford)* has done just this, and a crystal-controlled conversion at that. The cost of the exercise is claimed to be under a pound; and Steve has copies of the details and circuit changes available to anyone who cares to send him an s.a.e., at 31 Ellesmere Road, West Bridgford, Notts.

*R. C. Waterman (Aberlady)* no sooner said, in the last piece, that he had more time, than his teachers thought otherwise, and pushed his nose firmly back to the grindstone, so firmly indeed that his life for the next couple of years has been programmed into eating, sleeping, studying, and a little SWL'ing in the odd corners! A small query on prefixes is best answered by pointing out the number of TJI's in the current *Call Book*. They are certainly valid.

Last time out Tony Walsh was wondering how many people take R.A.E. by self-training in one manner or another. *R. Hyde (Oakham)* is one of these, in his case because of his job; in the RAF they have a nasty knack of posting you just after you have completed arrangements to sit the exam and have done half the classes! So, for Roger it is hard work and study in his spare time, and we wish him every success in his efforts.

*R. Allisett (Guernsey)* has persuaded his father to make him a nice bench which is being installed in a well insulated (sound- and heat-insulated) shack up in the loft, where he can play wireless to his heart's content. Not a bad idea, at that, since Dick likes to listen to all the noises on Forty, and pick out the DX calls from the bathwater-imitations.

\* \* \*

As usual, there is quite a batch of HPX queries, some of which have already been dealt with. However, U1A seems to have stirred up interest in so many letters it would be impossible to mention all the names. This one



But, to be fair, there is a vast difference between, say, an AR88 and the GR-64, in that the latter is quite firmly built down into the lower-price range, whereas up to very recent years the AR88 was always regarded as the Rolls-Royce of receivers.

Quite simple equipment and aerials often give very good results at VHF. This has been the experience of *R. Walters (Etwall)* who recently bought a 144 mc converter and a five-element beam; so far he has heard stations out to 120 miles, with G3COJ as best DX.

*S. M. Phillips (Dukinfield)* is strictly limited to AM reception by his receiver, but by the use of an external oscillator coupled into the front-end is managing to resolve SSB quite well on 80 and 40 metres. For some reason is it not quite so effective on 14 and 21 mc but should nonetheless produce quite a large improvement in the score shown in future months.

Moving house is always a chore for anybody, and particularly an amateur. Things are damaged, new aerials do not work out as planned, TVI rears its ugly head, and the XYL *always* wants something doing just when one is sneaking away to the shack! This being the common experience, we can sympathise with *C. R. Adams (Cheadle)* who is recovering his breath after such a move. To make the situation even more trying, the local Technical College lost Colin's R.A.E. application, and he had to go there and do personal battle with them about it.

Which seems as good a point as any to wish success to all those who sat the R.A.E. in December, with the hope that none of them have chewed their fingers down too far waiting for the results! (Those fingers will be needed to pass the Morse test!)

### Sign-Off

And there you have it. Lots of other letters came in with entries for the HPX Table and general chat. They could not be discussed due to the pressure on space, but all HPX claims have been taken in. Thus we acknowledge letters and cards from: *J. Singleton (Hull)*; *R. C.*

### SLANT ON THE QSL

The circulation of QSL cards has been a prime interest in the Amateur Radio context for more than 40 years—and G2UV (Wembley, Middx.), who was first to think of sending a printed card in confirmation of a contact, is still actively on the air. But in recent years, the QSL card has become a somewhat exaggerated and not-always-wanted manifestation of goodwill. It has been calculated that the total number of QSL cards now being circulated through the QSL bureaux of the world cannot be much less than *ten million* a year! Many of these cards are originated by eager SWL's—and, regrettably, numerous of them are of no interest or value to the recipient. To take a practical example: About a month or so ago, a batch of 22 cards arrived for a reader through the QSL bureau. They covered DX working

### SWL's PSE NOTE !

Closing date for the next "SWL," in our March issue publishing on February 28, is January 17. This may seem early but it is in fact the latest date we can allow, having regard to all the other work that has to be done in preparing each issue. For every appearance of "SWL" (which comes out in alternate issues), a certain number of letters come in too late for coverage. This is as much a disappointment for us as it must be for the correspondents concerned. So, if you miss January 17—and, really, there is no reason why you should!—the next date after for "SWL" (in the May issue) will be March 14, and surely there is no reason why you should miss that! The address is simply: "SWL," Short Wave Magazine, Buckingham.

*Ray (Bushey Heath)*; *L. Harwood (Wirral)*; *T. Bucknell (St. Albans)*; *N. Crampton (Romford)*; *J. Marchant (Sharnbrook)*; *D. Reynolds (Dudley)*; *A. Pyne (Budleigh Salterton)*; *C. Shearing (St. Agnes, Cornwall)*; *D. Moule (Frinton-on-Sea)*; *J. Seddon (Manchester)*; *R. Bence (Cardiff)*; *R. Woods (Slough)*; *T. W. Hyder (Hythe, Southampton)*; *K. Haywood (Manchester)*; *D. Robinson (Birmingham, 26)*; *D. Whalley (Corsham)*; *W. Moncrieff (Hampton)*; *D. Porter (Harrow)*; *C. Morgan (Wallsend)*; *N. and D. Henbrey (Northiam)*; *M. Broadway (Chelmsford)*, *C. Burrows (Romford)*; *D. Fromberg (address not given)* and *K. Plumridge (Eastleigh)*.

To all our readers we wish the very best for the coming year—and let us hope that, for all of us, it may be an improvement on the terrible year of 1968, both on the bands and off them. Your letters and Table entries for the next piece should be posted to arrive by **January 17, 1969**, addressed as ever to "SWL," SHORT WAVE MAGAZINE, BUCKINGHAM. We look forward to hearing from you all.

on CW over a period of three years, 1965-'68, and included two duplicates. Six of these cards were from EU/SWL's who, in spite of the fact that the contacts reported were being made at DX on the 7 and 14 mc bands, evidently thought that a return-card would be justified. Of course, it is not. Apart from the waste involved in responding to QSL's in such circumstances, it would merely clutter up the bureaux and prostitute the whole idea of QSL card exchange—which is to send a card when it is wanted.

### JOIN YOUR LOCAL CLUB

In practically all populous districts of the U.K. there is usually an active Amateur Radio club locally—in some places, like Bristol, Birmingham and Manchester, two or three. Any SWL, and particularly beginners,

*"Short Wave Magazine" was established in 1937, is still entirely independent, enjoys the support of radio amateurs throughout the U.K., and goes to all English-speaking countries overseas.*

should always at least investigate the possibility of becoming a regular member of the local Club. It is the easiest and pleasantest way of making progress, because the more experienced members are usually only too glad to pass on their knowledge and expertise. To find out if there is a Club within reach of where you live, look over the Panel of Club Secretaries, which appears in the "Month with The Clubs" feature in every issue of SHORT WAVE MAGAZINE (except in January, when we are reporting MCC). Not all active Clubs are covered each month—it is a matter of checking over the Club Secretary list in three or four recent issues to see if there is one in your neighbourhood. Then, it is just a matter of writing to the honorary secretary, to introduce yourself and ask for details of meetings, subscription and so forth. This is one of the purposes of the Club Secretary panel we publish monthly in the *Magazine*.

#### CORRECTION—"RTTY STATION CONTROL"

In Part II of his article appearing in our December issue, G8LT points out that in the circuit of Fig. 6 on p.610, the value of current to the right of resistor R should be adjusted to 10 mA, and not as shown. Similarly, the balancing current in the other winding ought to have been given as 20 mA. And the 1st line of the paragraph above the picture on p.609 should read "If this is, say, 10 mA to the right . . ."

#### PICTURES FOR PUBLICATION

In any issue of SHORT WAVE MAGAZINE, we use a good many photographs—hence, we are always in the market for pictures of radio amateur interest. Prints (and they should be prints and *not* negatives) are preferred, of about post-card size, and must be of good quality—dim or smudgy reproductions are of no use. The details relating to the picture should be on a *separate sheet* and not scribbled on its back—there are "technical reasons" for this. The professional way to send in a picture is to attach the data sheet lightly to the back of the photograph, so that it can be detached easily. All pictures we can use are paid for, immediately on publication. They should be addressed: Editor, SHORT WAVE MAGAZINE, BUCKINGHAM, and packed to avoid crumpling in the post. A cardboard stiffener is advisable, and the envelope should be marked "Photograph—Please do not bend or fold."

#### ROYAL SIGNALS AMATEUR RADIO SOCIETY

All three Services have internal radio amateur organisations of their own, offering membership to anyone interested in Amateur Radio having affiliations within the orbit of the Service concerned. One such is the Royal Signals A.R.S., the recent AGM of which discloses some interesting facts: First is that they have received an *ex-gratia* payment of £200 from Signals Corps funds; that membership has been stabilised at 550, following "a rather drastic pruning to produce a keener and more

virile membership" (now standing at 450 paid-up); and that the current balance sheet shows a loss on operations of £116. This heavy deficit, and that foreseen, is found to be largely due to (a) The cost of producing *Mercury*, the journal of the Royal Signals A.R.S., and (b) What is known as their Awards Scheme, under which an (expensive) plaque and certificate could be gained for operating proficiency; this cost the Society about £80 in their last financial year, and is now being revised to make it more financially viable. To cover the deficit on *Mercury*, some increases have had to be made in membership fees—all of which illustrates that, these days, anything worth having has got to be paid for, somehow. There is no such concept as "it costs you nothing" (unless you are already paying a big subscription for all the "privileges of membership"). The treasurer and field secretary of the Royal Signals Amateur Radio Society is Capt. and Quartermaster R. A. Webb, R. Signals (G3EKL), 30th Signal Regt., Blandford Camp, Blandford Forum, Dorset.

#### MAGAZINE MAILING

Now that the two-tier system has settled down, it would seem from surveys we have made that, in the main, direct subscribers are getting their copy by the Saturday—posting being on Thursday morning, as usual. This is in accordance with the Post Office undertaking about the delivery of what they are pleased to call "second-class mail." Any direct subscriber who receives his copy later than Saturday is advised to take the matter up immediately with his local head postmaster, showing the wrapper, untorn, as evidence—it will be post-marked with the Thursday date. As we have explained from time to time over the years, it is the addressee who should lodge the complaint, as this enables the Post Office to check back through the system to the point of despatch.



"... say they want their goal posts back when we QRT..."

Advertising in "Short Wave Magazine" guarantees the widest possible coverage of the Amateur Radio field in the U.K.

## THE R.A.E.—QUESTIONS AND ANSWERS

### FOR THE NEWCOMER TO AMATEUR RADIO

*The treatment here is of the Radio Amateurs' Examination for May 1968, by way of guidance for the next R.A.E., to be held in May this year. Note that both Part I questions are always obligatory—and can be answered easily if the Licence Regulations have been studied carefully. Though in Part II there is a choice of six out of eight questions, here all have been answered to illustrate how they can be tackled. For 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. Some*

*otherwise well-prepared candidates lose marks through misuse of English, or vague phrases; all abbreviations and approximations should be identified, and formulae quoted accurately. Candidates should follow the instructions on the Paper carefully; answering more than the required number of questions does not produce more marks. In brief, what a candidate has to do is to show the Examiner that the questions chosen are fully understood, and could be enlarged upon if necessary. Long and detailed explanatory answers are not usually required. 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 AT-station licence in the U.K.—Editor.*

#### PART I

*Qu. 1| What are the conditions of the Amateur (Sound) Licence as regards:*

- (a) Frequency control and measurement,*
- (b) The entries to be made in the log,*
- (c) The classes of emission permissible in the amateur bands between 3.5 mc and 29.7 mc,*
- (d) The maximum DC input power permissible in these bands? (15 marks)*

#### Answer (1)

(a) A satisfactory means of measuring frequency is required so as to ensure that the signal transmitted is always within the amateur band; in addition, a satisfactory method of stabilising the frequency of the transmitter is called for. Thus, the accuracy tolerance on frequency measurement required varies from band to band, and on whether one is at the middle of a band or at its edges.

(b) Entries are to be made in a station log, not of loose-leaf construction, indelibly, showing: Date, time in GMT of every call (including interference tests, made from the station) the callsign of every station called or contracted, time of closing down the station in GMT, and the address if operating from a temporary or alternate location. In addition, if the operator is not the licensee, then the operator must sign his full name and callsign (or serial number of his amateur certificate).

(c) The classes of emission permitted in the bands 3.5 mc to 29.7 mc, are as follows: A1, A2, A3, A3a, A3h, A3j, F1, F2, and F3, where these symbols have the meaning attached to them by the Telecommunications Convention.

(d) The maximum DC input to the anode circuit of the last stage of the transmitter (the PA), shall not be greater than 150 watts.

*Qu. 2| Describe two types of spurious emissions, which can be emitted by radio transmitters. Explain how they can be suppressed to such a level that they cause no undue interference with any other wireless telegraphy. (15 marks)*

#### Answer (2)

Harmonics of the transmitted frequency are an inevitable result of the use of a PA stage running in Class-C, and appear at the output terminals as signals of multiples of the transmitted frequency; they may be reduced by correct design of the PA tank circuit, and by operating the latter into a properly matched transmission line through a low-pass filter. In addition, extensive screening and filtering of all leads (other than the aerial) entering or leaving the enclosure around the transmitter, is required.

Parasitic oscillations may be defined as unwanted oscillations at frequencies which are widely different from the transmitted frequency, usually at VHF or very low frequencies. The former are suppressed by careful attention to layout, and by fitting anode and/or grid "stoppers." These usually comprise a few turns of wire wound round a low-value resistor of suitable wattage, which are wired in series with the relevant pin of the valve, as close to the pin or top cap as may be. Occasionally, the stoppers used are ferrite beads slipped over the offending leads at the valve end. Low-frequency parasitics are usually noted as rough signals spaced a few kilocycles away from the carrier; they may be caused by shock excitation due to transients of modulation, by the use of RF chokes of similar characteristics in both grid and anode circuits, or by parasitic oscillation of the modulator. Over-modulation is to be avoided anyway, but the grid and anode RF chokes should be of different type even though of similar value electrically, so that any internal resonances may be of different frequencies for grid and anode. The modulator may be dealt with by good layout, and by the fitting of grid and anode stoppers, low value resistors in grid and anode circuits right at the valve pin. Taming parasitics is mainly a matter of defining the type of oscillation and experiment with values of stoppers for a particular combination of layout and components. [over

## PART II

Any six questions to be answered in this Part.

*Qu. 3| Describe the construction of a triode thermionic valve. Explain how the anode current is controlled by the potential of the grid with respect to the cathode, assuming that the anode potential remains constant.*

*What is meant by the mutual conductance of the thermionic valve. (10 marks)*

## Answer (3)

Fig. 1 shows the construction pictorially. Within the evacuated glass envelope, we see a cathode, which surrounds a wire which is arranged to be heated sufficiently to raise the cathode to such a temperature that electrons are emitted. The heater is insulated from all other electrodes as well as the cathode. Around the cathode but separate from it are the mesh of wires called the grid, and around this again the anode. Above the structure, within the envelope, may be seen the "getter," an element which is made to absorb any included gas after the envelope has been sealed, by "firing" from

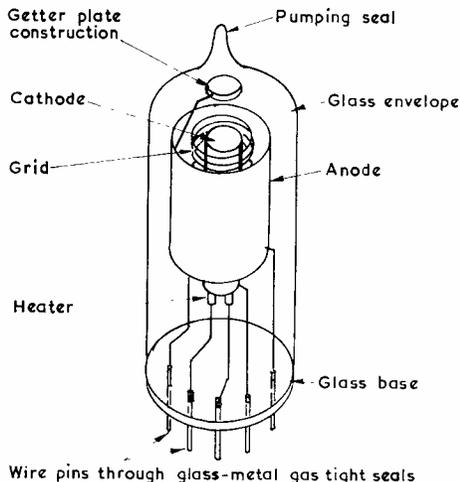


Fig. 1

Q  
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outside the envelope—the result being the silvering which can be seen on part of the envelope. Thus, electrons emitted by the cathode have to pass the grid on the way to the anode. The working may be considered as follows: Electrons are of negative charge, by definition. The grid normally is held negative and the anode highly positive. If the grid potential is around zero with respect to the cathode there is very little restriction of the flow of electrons from cathode to anode. As the grid is made steadily more negative with respect to cathode, so the influence of the negative grid upon the negative electrons tends to increase and repel them back into the "space charge" around the cathode. Still further increase in the negative voltage on the grid increases the effect until a situation is reached where the path from

cathode to anode is completely blocked by the grid, a condition where the valve is said to be "cut off," and no anode current flows. Thus, anode current is controlled by the grid; but as electrons do not fall into the grid, due to the repulsion of like forces, no current flows in the grid, unless and until the latter is driven positive. Thus, under the normal state there is only voltage and no current at the grid, and so it uses no power in its control of the anode current.

Mutual conductance can be defined as the ratio of change of anode current for change of grid volts, and is measured in milliamps per volt; typical values for valves found in the radio amateur station would be in the range from about 1.5 to 20 ma/V.

*Qu. 4| What do you understand by the flow of electric current in a circuit? State and define the practical units of (a) quantity of electricity, (b) current flow of electricity. A current of 250 mA flows in a circuit. What quantity of electricity will pass a given point in 10 seconds?*

(10 marks)

## Answer (4)

The flow of electric current can be regarded as the enclosed movement of electrons around the circuit.

The unit of quantity of electricity is the coulomb, which is approximately equivalent to the charge on  $6 \times 10^{18}$  electrons.

The unit of current flow is a quantity of electricity flowing in unit time; one ampere being equal to one coulomb per second.

If 250 mA flows for ten seconds we have a quantity of  $.25 \times 10$  coulombs, i.e. 2.5 coulombs.

*Qu. 5| What is meant by the piezo-electric effect of a quartz crystal?*

*With the aid of a circuit diagram explain the action of a crystal oscillator. (10 marks)*

## Answer (5)

Quartz has the property of developing a voltage across the faces of a crystal under mechanical deformation, or of deforming when a voltage is applied across the faces. When placed in a suitable circuit, the crystal can be made to behave as a resonator of extremely high "Q" due to this property; either the series or the parallel resonance mode may be used, depending on the type of crystal and circuit.

A simple crystal oscillator is diagrammed at Fig. 2, known as the Pierce-Colpitts oscillator. A resistor is sometimes used as the anode load, but is bad practice due to the risk of spurious outputs caused by the crystal having more than one resonant frequency, and so a tuned circuit is preferable; this may also be used to obtain output at a harmonic of the crystal frequency by tuning to the latter frequency. The crystal operates at a frequency just below its parallel resonance, and its equivalent inductance resonates with the anode-to-grid and grid-to-ground capacitances. Thus, when voltage is applied to the valve, the crystal vibrates and feeds

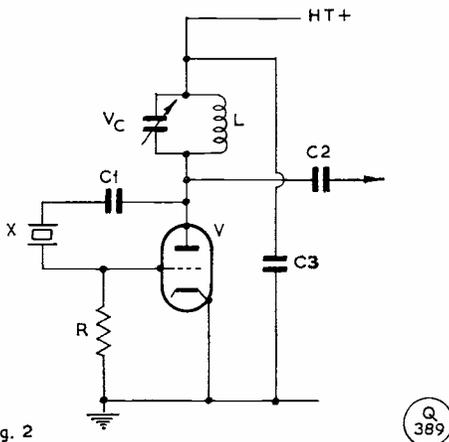


Fig. 2

Q 389

energy to the grid, as long as the anode load is resistive or slightly on the low-capacity side of resonance. Should the high-capacitance side of resonance be selected, the phase of the feedback will be reversed and oscillation will stop. In practice, to obtain good starting the low-capacitance side of resonance is always tuned, just sufficiently to start the crystal and get adequate output. This circuit should only be used with X-cut or similar crystals, and never with AT- or BT-cut types, or the crystal will surely be damaged.

Qu. 6/ Describe how the impedance of a parallel tuned, or rejector, circuit, varies with frequency near resonance. Sketch a curve to illustrate your answer.

What is the dynamic resistance (impedance) offered by a rejector circuit at resonance if the circuit consists of a capacitor of  $50 \mu\mu F$  and an inductor of  $10 \mu H$  which has an RF resistance of 10 ohms? (10 marks)

Answer (6)

On either side of the resonance point the impedance of the circuit is complex, and comprises a resistive and

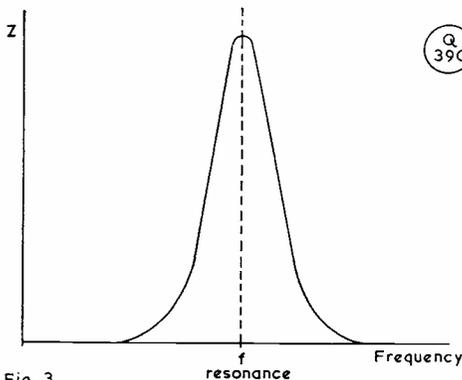


Fig. 3

Q 390

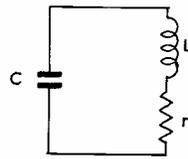


Fig 4A

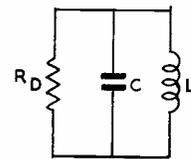


Fig 4B

Q 391

reactive component. Near resonance, the reactive components due to capacitor and inductor become almost equal in magnitude and at resonance do indeed cancel completely; thus, at resonance the circuit displays a high resistive impedance, which becomes complex and lower on either side of the resonance. The height of the peak as shown in Fig. 3 depends on the amount of resistance present in the practical circuit to cause losses, and in a perfect circuit would be infinite. A measure of the "goodness" of the circuit in this context is "Q" which is defined as the ratio of reactance

to resistance, i.e.:  $\frac{\omega L}{R}$  or  $\frac{1}{\omega C R}$  in the case of the capaci-

tor, where F is the frequency.

The parallel-tuned circuit given has resistance in series with the inductor; by a transform this can be made to look like an equivalent resistance  $R_D$  in shunt with a perfect coil and capacitor, where  $R_D$  is known as the dynamic resistance—see Fig. 4A and 4B. It is now required to find the value of  $R_D$ .

Now, at resonance,  $\omega L = \frac{1}{\omega C}$ , by definition.

$$\text{Therefore, } R_D = \frac{L}{C r} = \frac{10 \mu H}{50 \mu\mu F \times 10} \text{ ohms}$$

$$R_D = \frac{10 \times 10^{-6}}{50 \times 10^{-12} \times 10} = \frac{10^6}{50} = 20,000 \text{ ohms}$$

Qu. 7/ Describe with the aid of a circuit diagram the action of the output stage of a receiver.

Explain how the audio output impedance of the stage is matched to the impedance of the loudspeaker. (10 marks)

Answer (7)

See Fig. 5 (p.712). AF input is fed to the stage across the ends of the potentiometer  $V_R$ , and a proportion taken off to the grid of the valve; thus the potentiometer, which is of logarithmic law, is being used as a volume control. The signal at the grid is found to control the flow of current in the anode circuit, which is a transformer, the secondary of which is coupled to the loudspeaker. Output pentodes and tetrodes are usually so designed that the screen can be connected directly to the HT line as shown, and as the grid is tied to the ground, the required grid bias is given to the grid by lifting the cathode above earth; the level of bias is the average voltage drop across the cathode resistor,  $R_K$ , the resistor

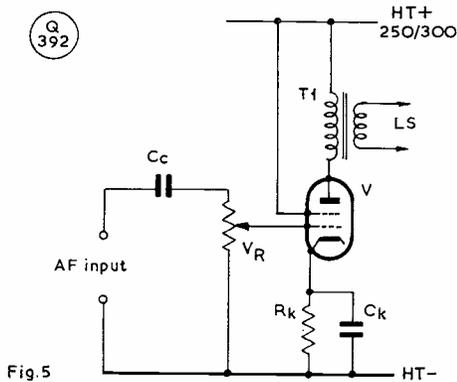


Fig. 5

being decoupled by a capacitance  $C_K$  having low reactance to audio frequencies; typically  $C_K = 50 \mu F$  and  $R_K = 300$  ohms. The value for the optimum load is found from the tables or calculated and the transformer turns-ratio is selected to match this to the loudspeaker impedance. The turns-ratio will be given by

$$N_p / N_s = \sqrt{Z_p / Z_s}$$

For example, if the optimum load impedance is 5000 ohms and the loudspeaker a 5-ohm component, then the turns-ratio will be

$$\sqrt{\frac{5000}{5}} = 31.6 \text{ to } 1, \text{ say, } 32 : 1.$$

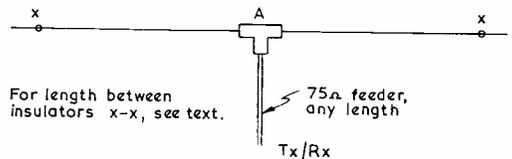
*Qu. 8/ What ranges are normally obtainable in winter when using an amateur transmitter in daylight on (a) 1.9 mc, (b) 7 mc, (c) 14 mc? What differences would you expect to find in summer? (10 marks)*

**Answer (8)**

It is difficult to give any precise answer to this question, as the normal range on any given band will depend to an enormous extent on the location and the aerial system. However, certain basic trends may be described. On 1.9 mc, the normal daylight range will be that obtainable from the ground-wave, of the order 30-100 miles. On 7 mc, coverage will be given of most of the U.K. and Europe; skip-distance will be non-existent in many cases, so that as the ground-wave signals come to their end a first indication of high-angle skywave reception appears, with consequent tendencies to fading when more distant signals are steady. Behaviour is to a great extent modified by the state of the sunspot cycle; at its trough, the band may well have the occasional trans-continental signal audible. However, normally the long-distance signals would be looked for on 14 mc, where there will usually be quite a marked skip zone, with ground-wave giving reception out to a few miles, then a gap until the first-hop signals

appear from distances up to 2000 miles or so. Signals from greater distances will be multi-hop paths, being reflected from the ionosphere to ground several times *en route*. Thus, coverage of the whole world may well be seen in the course of a day with a good aerial system.

Summertime will see, in general, a decline in the maximum usable frequency, with resulting possible lack of signals at 14 mc when the trough of the sunspot cycle is reached. In addition, noise will often be more of a problem; thus the pattern would be, with 14 mc "dead," 7 mc and 1.9 mc relatively unaffected but communication distances restricted by high noise levels swamping the weaker signals, the latter effect being more pronounced in tropical areas.



For length between insulators x-x, see text.

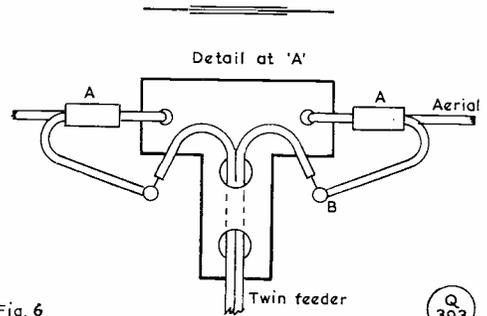


Fig. 6

Q 393

*Qu. 9/ Describe carefully, with diagrams, the construction of a dipole aerial and feeder for the 7 mc band. How would you ensure the dipole acted as an effective radiator? (10 marks)*

**Answer (9)**

The length of a half-wave aerial or dipole for a given frequency is given by the formula length equals  $468/F(\text{mc})$  in feet. For a design frequency of 7050 kc this would give a length overall of 66ft. 4in. This length of heavy—say, 14g. hard-drawn copper wire—will be measured out, and a couple of feet over allowed for making off to insulators. It should then be accurately divided into two equal pieces. One end of each piece of wire thus obtained is made off to an insulator of a type suitable for attachment to a halyard running over the pulley at the top of the mast. We now have the problem of connecting the wire to the feeder, which will be of low-impedance *twin* construction. Although coaxial

cable of the correct value impedance is often used, it is not strictly correct to feed it directly on to the aerial proper without interposing a balance-to-unbalance transformer (*balun*), even if often done with no ill-effects observable. Perhaps the best way of securing the feeder to the two arms of the dipole is by use of a tee-piece, as shown in Fig. 6. Feeders should hang at right angles to the line of the aerial (vertically downwards) as far as possible, before turning away to take their route into the room where the apparatus is installed.

In order to make the aerial as effective as may be, it should be erected as high as possible (not less than one half-wave if that can be achieved) and in any event as clear of obstructions, buildings, telephone and power wires, metalwork and so on as is possible. Should there be such disturbing elements in the vicinity, the characteristics of the aerial may change markedly, and attention may have to be given to the *length* until the dipole is resistive at the design frequency; the feed impedance may also fall to a level which results in measures having to be taken to reduce standing waves. The end insulators have to be of high quality, as they are at points of high voltage as well as high mechanical stress; the centre insulator is not so important from the electrical point of view, because a dipole is fed at low impedance, but it is of the utmost importance that construction be such as to take all mechanical stress and strain off the soldered connections (which should have a coat of paint over them), and above all to prevent the moisture getting to the open ends of the feeder. After a liberal coating with a moisture sealant, it is as well to tape over the whole centre joint to ensure good sealing, with particular reference to points A and B in Fig. 6.

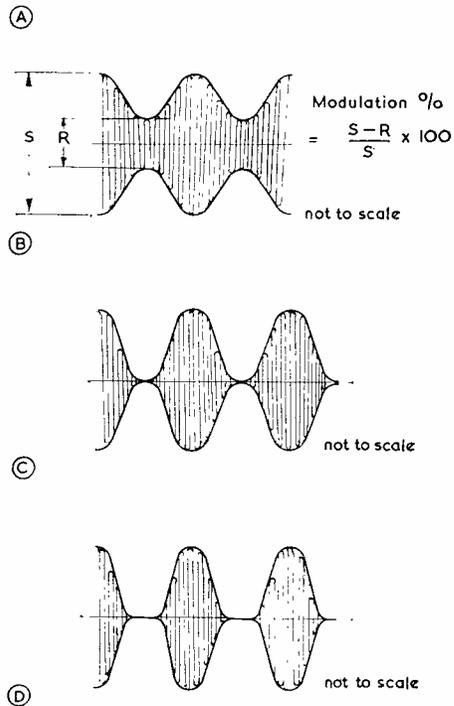
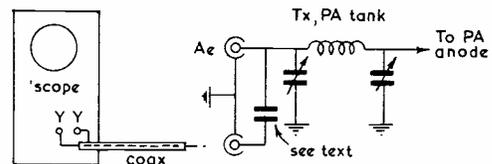


Fig 7

Q 394

Qu. 10| Describe the use of a cathode-ray oscilloscope as a modulation monitor for a radio-telephony transmitter. Show with the aid of a block diagram how the oscilloscope is coupled to the transmitter. Sketch the wave-forms you would expect from a double-sideband amplitude modulated wave (A3) with (a) 70% modulation, (b) 100% modulation, (c) over 100% modulation, when modulated with a sine wave. (10 marks)

Answer (10)

The exact approach to be adopted is the same in each case, but is modified in detail depending on whether the Y-amplifier of the 'scope is capable of dealing with the frequency of the transmitter RF output. Assuming that it is, all that is needed is to provide a coaxial connector near the output tank circuit, or, possibly more conveniently, in the aerial coupler. A coaxial connection is then made from the connector to the oscilloscope. Switching on the 'scope and setting up the Y-amplifier will show whether enough signal can be obtained to deflect the trace when a short pick-up wire inside the transmitter is connected and brought near to the tank coil. If the response of the 'scope is such that this gives no result, the connection will have to be made *directly* to the Y-plates; in this case, the pick-up wire may have

to be connected directly to the tank circuit by a capacitor of suitable size and rating. A block diagram appears at Fig. 7A. A sine-wave modulating signal injected into the AF stages would then modulate the carrier as shown in Fig. 7B, 7C, and 7D. It will be found that the average amateur oscilloscope will need to be connected directly to the Y-plates, with the possible exception of monitoring 1.9 and 3.5 mc signals; if the direct connection is used, it is essential to consult the circuit diagram to ensure no risk of damage to the scope or user occurs. Answers to (a), (b), (c) are as B, C and D above.

Note: Copies of the R.A.E. Question Papers for the years 1966-'67-'68 are available as one set, price 2s., and the syllabus for Subject No. 55 is 1s. 6d., all post free, from the Sales Section, City & Guilds of London Institute, 76 Portland Place, London, W.1, quoting "Subject No. 55." Following is a suggested list of books, obtainable from us, suitable for

R.A.E. study or reading: *Amateur Radio* (26s. 6d.); *Guide to Amateur Radio* (6s. 7d.); *Radio Amateur Examination Manual* (5s. 9d.); *Short Wave Radio and The Ionosphere* (11s. 9d.) and—for a standard text—the *Radio Communication Handbook* (69s.). Prices quoted are post free, from stock for immediate delivery, and orders with remittance should be sent to: Publications Dept., Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

#### “U.K. CITIZEN BAND SOCIETY”

We are informed that a body under this title is campaigning actively for the introduction of a U.K. “Citizens’ Radio Service,” all-same the Citizens’ Band facilities which have for long been available in the United States—and in the same frequency area, 27 mc, just LF of our 10-metre band. Our information is that the U.S. Federal Communications Commission (F.C.C.), the controlling authority over there, now wishes the idea of a Citizens’ Band had never been thought of—the on-the-air abuses in America have become a by-word. However, there is always something to be said for any extension in the context of communication, personal or within a community, by radio or any other means. The contact-man in connection with the U.K. Citizen Band Society is K. Gates, G3PHS, 253D Coulsdon Road, Caterham, Surrey.

#### “THE OTHER MAN’S STATION”

This has always been a popular *Magazine* feature—indeed, it was started in our pre-war days, under the same title. What we require is, first, a good photograph in black-and-white, and secondly, a description of the station, its history in the Amateur Radio context, and such personal notes about the operator himself as are of interest for publication. If preferred, all this can be “in own words,” as we write the story to fit the space. All offerings for “The Other Man’s Station” are paid for at full rates immediately on appearance. Material for this feature should be addressed to: Editor, SHORT WAVE MAGAZINE, BUCKINGHAM. (Add “England” if you are writing from outside this country.)

#### SMALL ADVERTISEMENT COLUMNS

These continue to be of widespread interest and each month there is a large carry-over of readers’ notices received too late for the current issue. For years now, the Reader Small Advertisement section of SHORT WAVE MAGAZINE has been the medium through which—by the natural law of supply and demand—the second-hand value of a wide range of equipment has become established. In other words, whether you want to buy, sell or exchange, you cannot do better than use our small advertising columns, disposing of £1,000’s worth of apparatus each month. While we cannot guarantee results, what we do say is that advertising in SHORT WAVE MAGAZINE ensures the widest possible coverage of the Amateur Radio interest in the U.K. Rates for reader advertising—which have remained unchanged for the

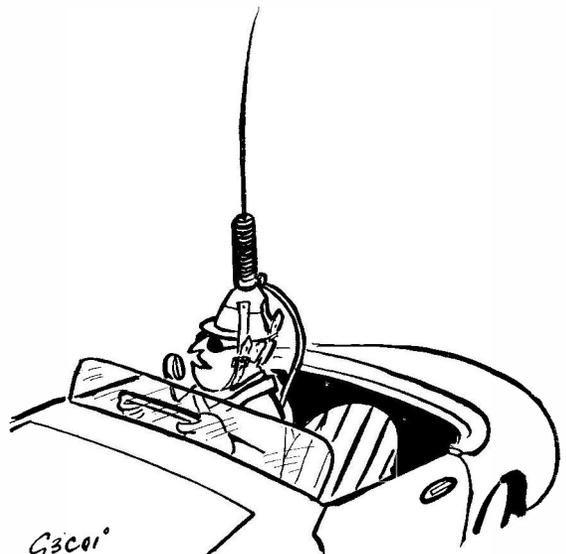
last two decades—are nominal and nowadays barely meet the cost of processing and setting in print. The minimum charge is 5s. (allowing 20 words, to include QTH), and 3d. a word thereafter. If **bold face** (like this) is required, add 25% to the total. For a box number, the additional charge is 1s. 6d. (which, these days, hardly pays the postage on replies!). Small advertisements should be carefully drafted (to save our space and your money), using the accepted abbreviations. If there is any doubt about the wordage to charge, we can be trusted to fill in a blank cheque for the correct amount—extraordinary as it may seem, many people *do* leave this to us! (It is advisable to endorse and initial the cheque “not over 20s.,” or whatever maximum amount seems reasonable.) We can *not* accept small advertisements over the telephone—they should be sent in, with remittance, to: Small Advertisement Dept., Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1—and as early in the month as possible “for the next issue.”

#### MOBILE RALLY DATES — 1969

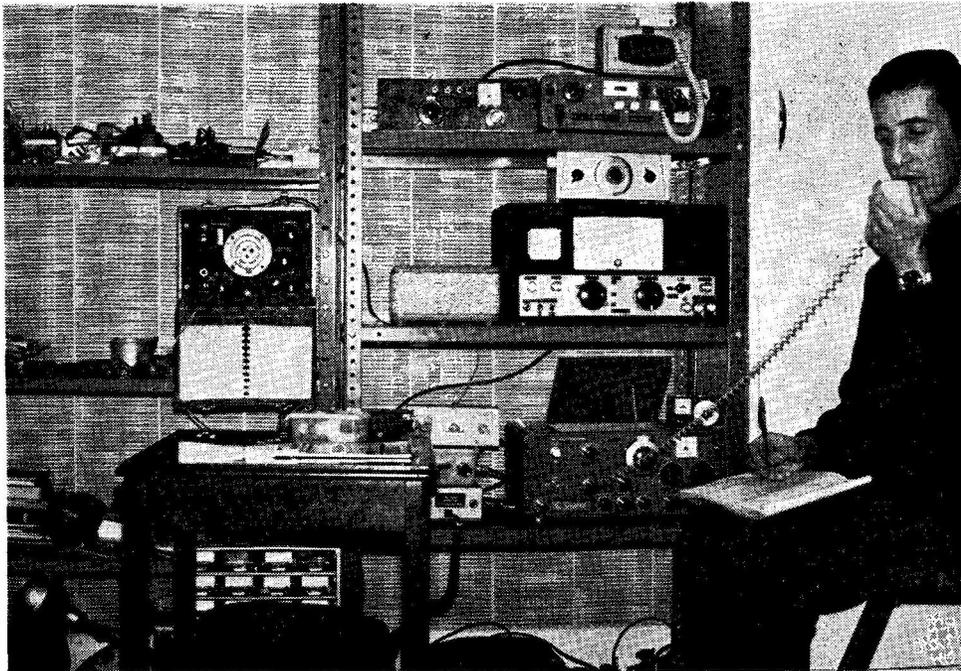
For the information of those organising Mobile Rallies, following are the dates for some of the principal meetings, as already notified to us:

*April 20*, Midlands Rally at Drayton Park, Staffs.; *May 18*, Northern Mobile Rally; *June 1*, Amateur Radio Mobile Society (A.R.M.S.) Rally; *June 29*, West of England Rally at Longleat, Wilts.; *July 6*, South Shields, Co. Durham; and *August 17*, Derby Mobile Rally.

We can only list meetings as notified to us direct. To avoid clashing, they should be arranged and sent in as soon as possible.



“... Well, I didn't want to make holes in the body...”



## ***THE OTHER MAN'S STATION***

**G3RJI**

AS in the example of modern buildings, the need to conserve space often discourages a table-top lay-out, and there is an increasing tendency nowadays to build "upwards" in the amateur station, utilising the versatile *Dexion* framework.

This is well illustrated by the layout of G3RJI, owned and operated by Alan Paul, at 9 Dale Gardens, Woodford Green, Essex. At present, interest is centred primarily on Top Band Phone, and a lusty signal is radiated by the "Sphinx" Sideband transmitter, seen in use. This, coupled with a half-wave end-fed aerial means there are few parts of the British Isles in which G3RJI's penetrating voice—usually reckoned as worth another stage of audio!—has not been heard. The best DX so far is to ZC4.

The Eddystone S.640 has been extensively rebuilt on modern lines, and now bears little resemblance to the original. Alterations entailed a very necessary product detector, no less than five IF transformers in cascade,

and a half-lattice crystal filter with shunt crystals. The receiver is stabilised by series-connected zener diodes, and incorporates fast or slow AGC, and, of course, selectable USB or LSB. The addition of a Q-multiplier gives selectivity more than adequate for CW working.

Being very much an outdoor man, almost as much operation is done as G3RJI/M, or /A from some suitable high location, as from the shack. For this purpose a converted HP-18 in conjunction with a mini-halo gives a good account of itself. Having respect for his car, G3RJI fixes the halo to the roof with an outside ceramic magnet which lives up to its limpet-like reputation.

As mobile activity on 160 metres is high, a start has been made on a solid-state transmitter, and it is hoped ultimately to run the full permitted power. The prototype can be seen on the top shelf, next to the HP18.

All in all, G3RJI is marching with the times, and he is usually in on the ground-floor with the latest techniques.

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*More than 80% of licensed U.K. amateurs are regular readers of "Short Wave Magazine" — which is independent and unsubsidised and was established in 1937.*

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# NEW QTH's

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.

- G3VAA**, A. Wang, 69 Cole Park Road, Twickenham, Middlesex. (Tel. 01-892 4843.)
- GM3VAA**, A. Wang (*ex-GM8AHP*), 66 St. Andrews Drive, Glasgow, S.1. (Tel. 041-427 0298.)
- G3WRV**, A. C. Tabberer, 32 Russell Road, Liverpool. L18 1EA.
- G3XRS**, Leicester Royal Signals Amateur Radio Club, c/o K. G. Sullivan, 930 Regional Troop, Royal Signals (V) T & AVR Centre, Brentwood Road, Leicester. LE2 6AE.
- GW3XRZ**, W. Mawston, 95 Baring-Gould Way, Haverfordwest, Pems. (Tel. Haverfordwest 2241 or 2744.)
- G3XSN**, B. Donn, 7 Thurne Way, Liverpool. L25 4SQ.
- G3XSV**, A. F. Hydes, 6 Glenbrook North, Cotswold Way, Enfield, Middlesex.
- G3XTD**, H. F. Speight, 44 Lockers Park Lane, Hemel Hempstead, Herts.
- G3XTV**, C. D. Parker, 15 Hill Avenue, Grantham, Lincs.
- G3XUD**, P. Kirby, 10 St. James Drive, Horsforth, Leeds, Yorkshire. LS18 5QX.
- G3XUH**, R. E. Pearson, 24 St. Saviours Close, Bamber Bridge, Preston, Lancs. PR5 6AH. (Tel. Preston 36063.)
- G3XUR**, C. T. C. Foster, 46 Laxton Road, Taunton, Somerset.
- GM3XUW**, R. Johnston, 236 Telford Road, Edinburgh 4.
- G3XVA**, D. A. Pickles, 15 Durham Terrace, Bradford 8, Yorkshire.
- G3XVL**, C. J. McCarthy, 387 London Road, Westcliff-on-Sea, Essex. (Tel. Southend-on-Sea 42430.)
- G3XVS**, R. C. Kitching, 20 Adel Park Gardens, Leeds 16, Yorkshire. (Tel. Leeds 673836.)
- G3XVU**, M. E. Garner, 13 Kingsdale Avenue, Drighlington, Bradford, Yorkshire.
- G3XWG**, D. R. Glover (*ZL2AYI*), 39 St. Albans Road, Upper Fulwood, Sheffield 10, Yorkshire.
- G3XWH**, R. Horton, 14 Stoney Lane, Lightcliffe, Halifax, Yorkshire. (Tel. Halifax 22602.)
- G3XWP**, J. Dobie, 1 Tudor Close, Chessington, Surrey. (Tel. 01-397 5552.)
- G3XWS**, C. W. Stedman, 10 Wychwood Avenue, Luton, Beds. (Tel. Luton 27789.)
- G3XXC**, K. G. Rigelsford, 67 Fillebrook Road, Leytonstone, London, E.11.
- G3XXX**, J. F. H. Dark, 12 Stocks Green Road, Hildenborough, Kent.
- G3XXQ**, L. Dixon, 41 Heathwell Road, Newcastle - on - Tyne, Northumberland. NE15 7UQ.
- G3XXR**, R. Higton, 5 Brian Avenue, Dalton, Huddersfield, Yorkshire. HD5 8DX.
- G3XYB**, G. Maitland, 2 Alresford Road, Shanklin, Isle of Wight.
- GM3XYG**, M. George, 100 Redford Loan, Edinburgh, 13.
- G3XYL**, Mrs. Barbara Janes, M.A., Hillside, Bushcomb Lane, Woodmancote, Cheltenham, Glos. GL52 4QL. (Tel. Bishops Cleeve 2229.)
- G3XYV**, I. G. Cooper, Wingrove House, Dispensary Street, Alnwick, Northumberland.
- G3XZF**, W. Felton, 4 Eastfield Close, Welton, Lincoln.
- G8BTR**, J. K. Law, 6 Dale Croft Rise, Allerton, Bradford, Yorkshire. (Tel. Bradford 41252.)
- G8BWE**, J. Reeves, 9 Tudor Close, Walton, Stone, Staffs.
- G8BWG**, N. Toovey, 11 Broad Hey, Romiley, Cheshire. (Tel. 061-430 2482.)
- G8BXR**, R. Bickley, 11 Red Bank, Market Drayton, Shropshire.
- G8BZN**, D. V. Goadby, 9 Beechwood Avenue, Burbage, Hinckley, Leics.
- G8BZQ**, S. V. Davis, 3 Hay Hill, Orchard Hills, Walsall, Staffs.
- GM8BZX**, F. D. Hall, 45 Priory Cottages, Lunanhead, by Forfar, Angus.
- G8CEX**, B. J. Turner, 225 Westborough Road, Westcliff-on-Sea, Essex.
- G8CEZ**, R. A. Fuller, 45 Marleyfield Way, Cheltenham Road, East, Gloucester. GL3 1JW.
- G8CFI**, J. X. Downs, Alpha, Woodside, Duxbury, Chorley, Lancs. (Tel. Chorley 3175.)

## CHANGE OF ADDRESS

- G3FQN**, R. F. Gilding, B.E.M. No. 1 Flat, 64 Regency Square, Brighton, Sussex. BN1 2FF.
- G3IZK**, A. J. Hagon, 13 Byron Drive, Wickham Bishops, Essex.
- G3MOO**, J. L. Franklin, 62 Moorcroft Crescent, Ribbleson, Preston, Lancs.
- G3NUE**, D. Thom, 6 Bracken Close, Copthorne, Sussex.
- G3NRB**, N. H. Kempt, Pinnocks Mead, Throcking Road, Cottered, Herts.
- G3NUE**, G. Tibbetts, Spinney Cottage, Tunnel Hill, Upton-on-Severn, Worcester. (Tel. Upton 2766.)
- G3POY**, H. E. Smith, Gowles, Long Mill Lane, Crouch, Borough Green, Sevenoaks, Kent. (Tel. Borough Green 3485.)
- G3RKF**, T. Reeves, 10 Northcourt, Heath Road, Leighton Buzzard, Beds.
- G3RNL**, B. A. Watling, 280 Clay Hill Road, Vange, Basildon, Essex.
- G3SED**, M. Devereux, 36 Pentland Rise, Portchester, Hants.
- G3SID**, M. P. Fox, 43 The Avenue, Kew Gardens, Richmond, Surrey.
- GW3TCE**, A. H. Howard, 36 Mold Road, Hawloe, Deeside, Flints. (Tel. Hawarden 2839.)
- GW3TSH/A**, R. J. Wilcox, c/o Students Union, Coleg Brifysgol, Parc Singleton, Abertawe, Sir Morgannwg.
- GM3UCI**, G. McCallum, 5 Law Hill Road, Law, Carlisle, Lanarks.
- G3VND**, R. Stevenson, 7 Gloucester Gardens, Cockfosters, Herts.
- G3WBP**, J. D. Broadley, 4 Yeo Road, Chivenor, Barnstaple, N. Devon.
- G3XNE**, A. F. Smyth (*ex-DL5YY*), 339 S.U., R.A.F. Digby, Lincoln, Lincs.
- G8BFM**, A. J. Whittaker, 7 Chatsworth Court, Hucknall, Nottingham. NG15 7NS.
- G8DH**, A. D. McKenzie, 58-A Elderton Road, Westcliff-on-Sea, Essex.

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**FOR SALE:** Mosley Commando SSB Tx, at £70. AR-22 rotator, with etceteras, £20. M. & G. Transceiver for 20-80-160m., £45. Heathkit GR-54, £30. Heathkit Type OS-2 'Scope, £20. Olympic Z-match, £10.—Worthington, G3COL, Foxhills, Orton Lane, Penn, Wolverhampton, Staffs. (Tel. Wombourn 2288.)

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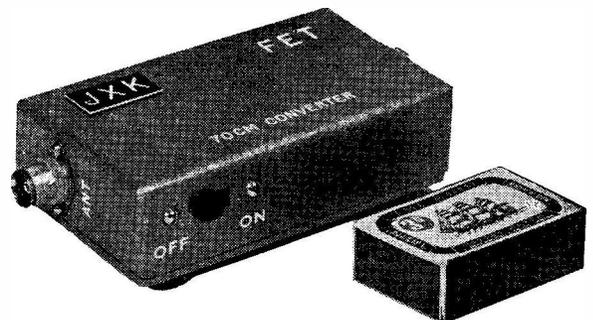
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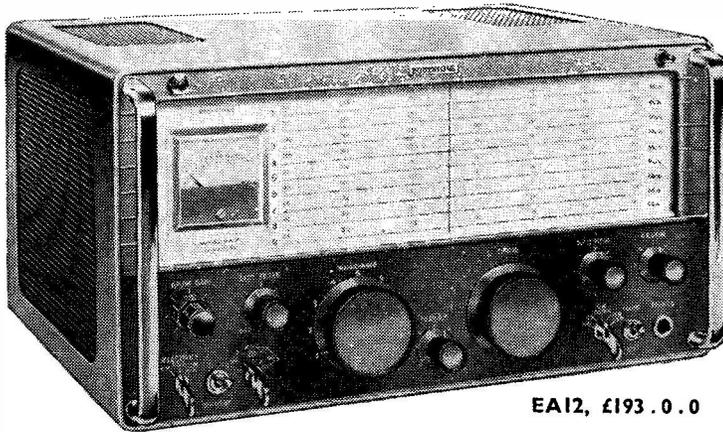
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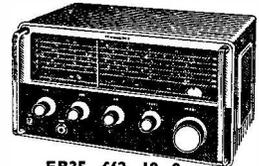
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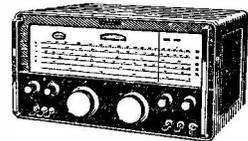


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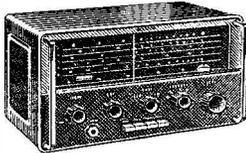
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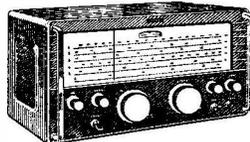
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| CHANNELMASTER BEAM ROTATORS   | 13 13 0 |
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| ECHELFORD 4M Tx mains PSU (SAE for details)   | 30 0 0  |
| RSGB Call Books, 1969 Edn. (post paid)  | 7 3     |
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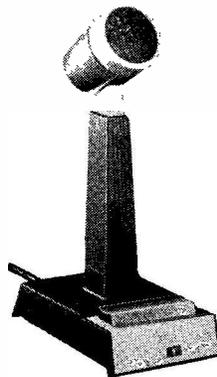
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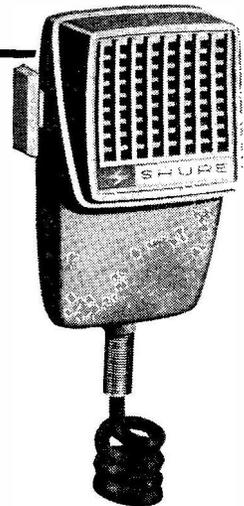
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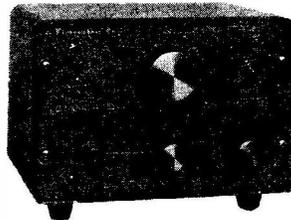
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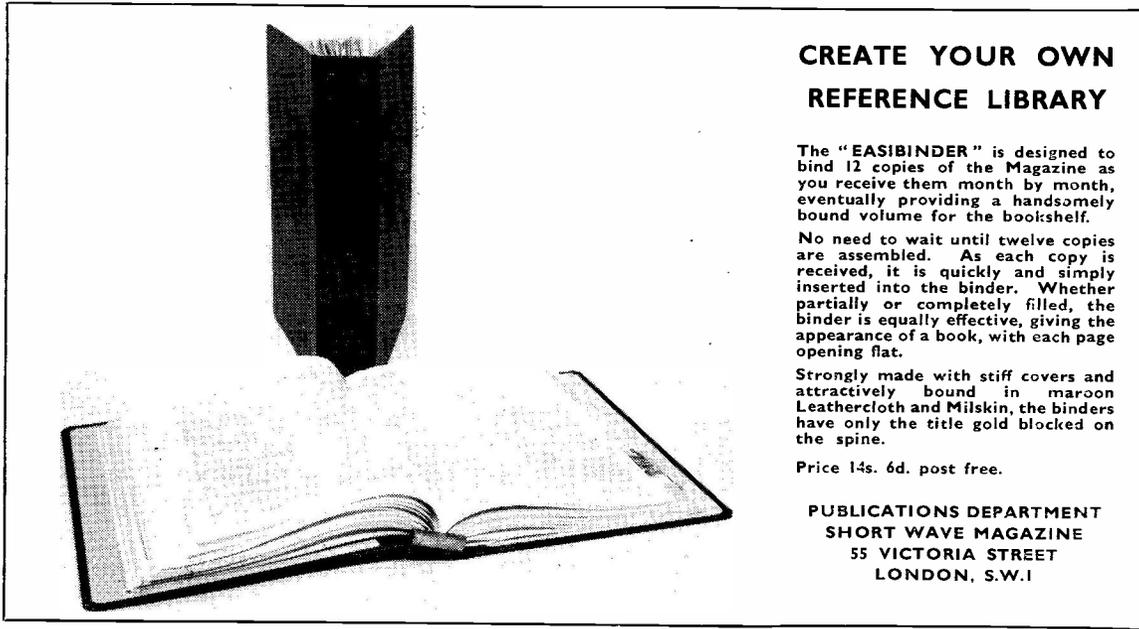
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