

4/-

The
SHORT WAVE
Magazine

VOL. XXVII

FEBRUARY, 1970

NUMBER 12



WORLD WIDE COMMUNICATION

DESIGNED FOR EXPORT

NOW AVAILABLE IN UK THE KW ATLANTA



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

Write for full technical specification

Other KW Products

KW Antenna Switch
 (3 position) KW E-Z
 Antenna Match Unit, KW
 PEP Meter, KW Match
 SWR Indicator
 KW Low-pass Filters,
 KW Trap Dipoles, KW
 Balun, KW Dummy
 Load, KW Q Multipliers



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

K. W. ELECTRONICS LIMITED
 I HEATH STREET, DARTFORD, KENT
 TEL.: DARTFORD 25574. CABLES : KAYDUBLEW DARTFORD

**Your local
Eddystone
dealer is :**

Whole
"LISTEN TO THE WORLD WITH EDDYSTONE"

CHESHIRE

The Transistor Centre
(Wilmslow) Ltd
Green Lane
Wilmslow 24766

CORNWALL

S.S.B Products
7 Little Castle Street
Truro
Feock 575

DERBYSHIRE

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

DEVON

Graham Newbery
(Reg Ward G2 BSW) Axminster
Axminster 3163

ESSEX

F. E. Smith
184 Moulsham Street
Chelmsford
Chelmsford 54594

Unique Radio Ltd
6 The Facade, High Road
Goodmayes, Ilford
01-590 8277

HAMPSHIRE

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

ISLE OF WIGHT

Sherratt & Son
81-82-83 High Street, Newport
Newport 3358-9

KENT

G. T. & R. Wilson
12-14-16 Queen Street
Gravesend
Gravesend 63527/8

Percy Powell Radio Ltd
54 High Street
Tunbridge Wells
Tunbridge Wells 26534

LANCASHIRE

Stephens-James Ltd
70 Priory Road, Anfield
Liverpool L4 2RZ
051-263 7829

N.W. Electrics
52 Great Ancoats Street
Manchester M4 5AB
061-236 6276

Croftfilm Ltd
46 Friargate
Preston PR1 2AF
Preston 55244

LEICESTERSHIRE

A. K. Davey Ltd
New Street, Hinkley
Hinkley 2173 and 4288

LONDON

Imhofs (Retail) Ltd
112-116 New Oxford Street
W.C.1

01-636 7878

R. T. & I. Electronics Ltd
Ashville Old Hall
Ashville Road
Leytonstone, E.11
01-539 4986

MIDDLESEX

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

NORFOLK

The Record Shop
157 King Street
Great Yarmouth

NORTHUMBERLAND

Aitken Bros. & Company
35 High Bridge
Newcastle upon Tyne NE1 1EW
Newcastle upon Tyne 26729

NOTTINGHAMSHIRE

George Francis
93 Balderton Street
Newark
Newark 4733

SCOTLAND

L. Hardie
542 George Street
Aberdeen
Aberdeen 20113

Larg & Sons (Dundee) Ltd
16-24 Whitehall Street
Dundee
Dundee 26061/2/3

SURREY

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

SUSSEX

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

WALES

Holt High Fidelity
Picton Arcade, Swansea
Swansea 53254

Holt High Fidelity
8 Portland Street, Swansea
Swansea 41032

WARWICKSHIRE

Chas. H. Young Ltd
170/172 Corporation Street
Birmingham 4
021-236 1635

YORKSHIRE

Derwent Radio
28 Hillcrest Avenue
Scarborough
Scarborough 63982

Philip Cann Ltd
Chapel Walk, Fargate
Sheffield S1 1GJ
Sheffield 29225/6

Short Wave (Hull)
24a Newland Avenue
Hull, HU5 3AF
Hull 408953

"DX ZONE MAP"

In four colours, on durable paper for wall mounting, 35in. wide by 25in. deep. Giving essential DX information—bearing and distance of all parts of the world relative to the U.K., the 40 Zone areas into which the world is divided for Amateur Radio purposes, with major prefixes listed separately. Distance scale in miles and kilometres. Time scale in GMT. Marking of Lat./Long. close enough for accurate plotting. Hundreds of place names, mainly the unusual ones, and most of the rare islands. *Revised to September 1968*

Immediate delivery from stock

Price 14s. 9d.

including postage and special packing in postal tube to avoid damage in transit.

Publications Dept.

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

**RADIO COMMUNICATION
HANDBOOK**

New Fourth Edition of the
Original RSGB "Amateur Radio Handbook"

Price 69s.

(includes 6s. post and packing)

(Counter Price : 63s.)

Available from stock

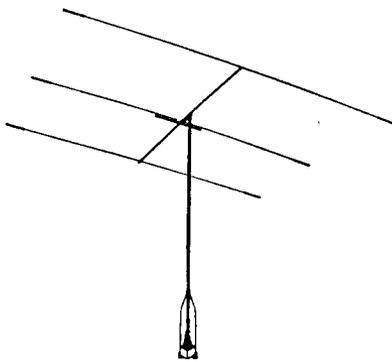
Order from :

**PUBLICATIONS DEPT.
SHORT WAVE MAGAZINE LTD.,
55 VICTORIA STREET, LONDON, S.W.1**



WE ARE THE ANTENNA PEOPLE

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



ELAN

Provides outstanding performance on 10 and 15 metres, coupled with light weight (17 lb.). All Alloy and stainless steel construction, exceptional broad band tuning, exclusive trap design, single coax feed point. Power rating 300 watts AM/CW, 600 watts p.e.p. SSB input to final. Forward gain up to 8dB. Maximum element length 20ft. 3in. Boom length 12ft.

MUSTANG
ELAN
TA-33 Jr.
TA-32 Jr.
TA-31 Jr.
V-3 Jr.
VTD-3 Jr.
TD-3 Jr.

DI-2
SWL-7
RD-5
A-315
A-215
A-310
A-210
TW-3X

Imported Antenna's

Classic-33	RV-4
A-203-C	Lancer Mobile
TA-36	A-92-S
TA-33 Snr.	TD-2
TA-32 Snr.	DI-10
V-4-6	R4-4RK

Rotators, Towers, Polythene cord and rope, Coax cable, Control cable, Twin feeder and many more Antenna accessories.

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



V-3 Jr.

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

Carriage and Insurance Extra

Telephone: Costessay 2861, orders only

Mosley Electronics Ltd. 40, Valley Road, New Costessay, Norwich, Norfolk Nor. 26K

EMSAC

2 METRE CONVERTER

- | | | |
|------------|---|-------|
| CNI | Low noise 2 metre converter with IF (output) of 23-30MHz for 144-146MHz input. Two 6CW4 Nuvistors in a cascode circuit provide the RF amplification. 12AT7 triode mixer and cathode follower for low impedance output. 12AT7 crystal oscillator/multiplier. Measured noise factor better than 3dB. Band width minus 4dB or better over band. The converter is complete with crystal (38-66MHz) and all plugs and sockets. The overall dimensions 6" x 4" x 4". (Other IF's available; please state requirements.) | 170/- |
| PSI | The matching power supply gives 25mA at 150v. and 1 amp at 6.3v. This is a separate item and may therefore be used with other equipment. It is connected to the CNI by a three pin connector and lead (supplied) | 60/- |
| CN2 | 2 metre converter as above with a power supply mounted in a cabinet, 8½" x 7" x 4½" (high), complete, immediate delivery. | 260/- |

Postage on the above 4/6

TUNING UNITS

- | | | |
|------------|--|-------|
| TU2 | Antenna tuning unit for receivers, 1.5-30MHz. Pie network. "In"—"Out" switch with position for "Cal" (or zero "S" meter) when output of tuner is earthed | 90/- |
| TU4 | Wide range transmatch, pie network. Full licensed power, 3.5-28MHz. Attractive cabinet | 237/- |

Postage on the above 4/6

STANDING WAVE INDICATORS, etc.

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

- | | | |
|--------------|---|-------|
| C3042 | Standing wave indicator, 52 ohms. SO239 input and output. Forward and reverse switch; sensitivity control. Calibrated directly in SVR, 1½" square meter. Detachable telescopic chromium plated 9" antenna for use as field strength indicator. Frequency range 3-150MHz. Dimension of case 2" x 6" x 2½" | 89/6 |
| C3005 | De-luxe standing wave indicator. SO239 coaxial sockets and two 1½" square meters enabling continuous and simultaneous monitoring of standing wave ratio and power. Impedance—52 ohms. Accuracy ± 5%. Power loss negligible. Frequency range 3-150MHz. Indicators—100 DC microammeter. Dimensions of case 4½" x 2½" x 2" | 126/- |

Postage on the above 3/-

BASIC ANTENNA SYSTEMS

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

MISCELLANEOUS

Nuvistor 6CW4, 16/- each, post free.
Xtals. 2 metre converter crystals 38-666MHz, type 2MMW, 30/-, post free.
These are brand new, especially made by Cathodeon crystals, and are as used in EMSAC 2 metre converter

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

G3RYV, 20 Allenby Road, Maidenhead, Berks. Tel. Maidenhead 22551, evening/weekends
SAE with enquiries please Callers welcome

G3IAR ELECTRONIC & MECHANICAL SUB-ASSEMBLY CO. LTD.
Highfield House, West Kingsdown, Kent. Telephone: West Kingsdown 2344

SSB

TRIO's TS-510 Bring Ultimate Performance



TRIO's TS-510 is the definitive instrument especially engineered for complete "SSB ERA" function. It's a high power, high stability product of imaginative design that fully lives up to the renowned "TRIO" name. Extremely stable VFO, a new development that is built around 2 FET's and 13 transistors, guarantees stable QSO's during entire use, an accurate double-gear tuning mechanism and a linear tuning capacitor produce a 1 kHz direct reading on all bands. There's easy tuning in of SSB signals because the TS-510's frequency coverage has been compressed to 25 kHz for one complete rotation of the dial. Sharp cutoff for both reception and transmission is achieved by a sharp factor frequency filter built just

for this 510 series model. Combined with the TS-510's superb features are the distinctive, top quality PS-510 (Power supply and speaker) and VFO-5D (Variable frequency oscillator). With an AC power supply that operates a built-in 16 cm speaker, the PS-510 has been created as an exclusive companion instrument for the TS-510. It can be installed at any location with the PS-510 because the power supply is regulated on or off at the TS-510. The VFO-5D can match the TS-510 in performance and design. Its reading accuracy is unusually high since a double-gear dial covering 25 kHz per revolution is also used, as in the TS-510.



the sound approach to quality—

TRIO

TRIO ELECTRONICS, INC.
TOKYO, JAPAN

TO: B.H. Morris & Co., (Radio) Ltd. SW
Send me information on TRIO COMMUNICATION
RECEIVERS & name of nearest TRIO retailer.

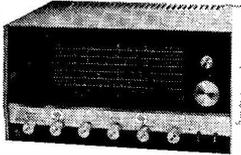
NAME: _____ AGE: _____

ADDRESS: _____

TRIO KENWOOD ELECTRONICS S.A. 160 Ave., Brugmann, Bruxelles 6, Belgium

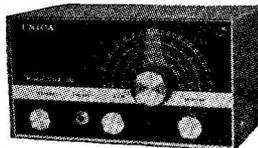
Sole Agent for the U.K. **B. H. MORRIS & CO., (RADIO) LTD.** 84/88, Nelson Street. Tower Hamlets, London E. 1, Phone: 01-790 4824

LAFAYETTE HA.800 SOLID STATE AMATEUR COMMUNICATION RECEIVER SIX BANDS 3.5-4, 7-7.3, 14-14.35, 21-45, 28-29.7, 50-54 Mc/s.



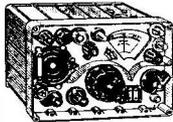
Dual conversion on all bands. 2 x 455 Kc/s. mechanical filters. Product detector. Variable B.F.O. 100 Kc/s. crystal calibrator. "S" meter. Huge slide rule dial. Operation 230v. AC or 12v. DC. Size 15" x 9" x 8 1/2". Complete with instruction manual, £57/10/-. Carr. paid (100 Kc/s. Crystal 39/6 extra).

TRIO TS 510 AMATEUR TRANSCEIVER with speaker and mains P.S.U. £212.
TRIO JR310 AMATEUR BAND 10-80 Metre Receiver, £77/10/-



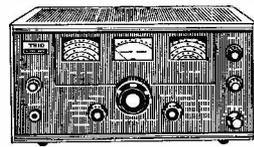
UNR-30. 4 BAND COMMUNICATION RECEIVER
Covering 550 Kc/s.-30 Mc/s. Incorporates variable BFO for CW/SSB reception. Built-in speaker and phone jack. Metal cabinet. Operation 220/240v. A.C., supplied brand new, guaranteed with instructions. £13/13/-. Carr. 7/6.

R209 Mk. II COMMUNICATION RECEIVER



11 valve high grade communication receiver suitable for optical use. 1-20 Mc/s. on 4 bands. AM/CW/FM operation. Incorporates precision variable drive B.F.O. Aerial trimmer, internal speaker and 12v. D.C. internal power supply. Supplied in excellent condition, fully tested and checked. £15. Carr. 20/-.

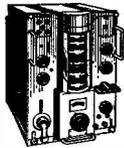
TRIO 9R-59DE
4 band covering 550 Kc/s. to 30 Mc/s. continuous and electrical bandspread on 10, 15, 20, 40, and 80 metres. 8 valve plus 7 diode circuit. 4/8 ohm output and phone jack. SSB-CW. ANL. Variable BFO. S meter. Sep. bandspread dial. IF frequency 455 Kc/s. audio output 1.5w. Variable RF and AF gain controls 115/250v. A.C. Size: 7" x 15" x 10" with instruction manual, £42. Carr. paid.



HAMGEAR PRESELECTORS
Mains operated 1.5-30 Mc/s., £7/10/-. P. and P. 4/-.

AR88 MAINS TRANSFORMERS
Brand new, boxed, 59/6. P.P. 5/-.

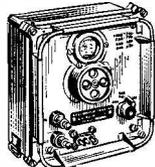
ADMIRALTY B.40 RECEIVERS



High quality 10 valve receiver manufactured by Murphy. Five bands 50 Kc/s.-30 Mc/s. 1/1F 500 Kc/s. incorporates 2 R.F. and 3 I.F. stages, band-limiter, crystal controlled B.F.O., calibrator, I.F. output, etc. Built-in speaker, output for phones. Operation 150/230 volt A.C. Size 19 1/2" x 13 1/2" x 16in. Weight 11.4 lbs. Offered in good working condition, £22/10/-. Carr. 30/-. With circuit diagram. Also available B41 L.F. version of above. 15 Kc/s.-700 Kc/s., £17/10/-. Carr. 30/-.

DUMMY LOAD RESISTORS
Carbon 30Ω 35w., 5/6. P.P. 1/6.

CRYSTAL CALIBRATOR No. 10

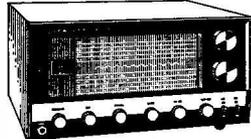


Small portable crystal controlled wavemeter. Size 7 x 7 1/2 x 4in. Frequency range 500 Kc/s.-10 Mc/s. (up to 30 Mc/s. on harmonics). Calibrated dial. Power requirements 300v. DC. 15mA and 12v. DC 0.3A. Excellent condition, 89/6. Carr. 7/6.

JOYSTICK AERIALS
Full range of Aerials and Tuners in stock.

TRIO COMMUNICATION TYPE HEADPHONES. Normally £5/19/6, our price £3/15/- if purchased with receiver.

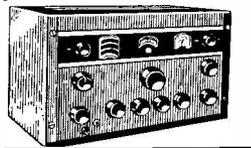
NEW LAFAYETTE SOLID STATE HA600 RECEIVER
5 Band AM/CW/SSB amateur and short wave 50 Kc/s.-400 Kc/s. and 550 Kc/s.-30 Mc/s. F.E.T. front end. 2 Mechanical filters. Huge Dial. Product detector. Crystal calibrator. Variable BFO. Noise limiter, S Meter. 24" Bandspread. 230v. A.C./12v. D.C. Neg. earth operation. RF gain control. Size: 15" x 9 1/2" x 8 1/2". Wt. 18 lbs. Exceptional value. £45. Carr. 10/-.



TRIO JR-500SE AMATEUR RECEIVER
Covers all the amateur bands in 7 separate ranges between 3.5 and 29.7 Mc/s. 7 valves, 2 transistors and 5 diodes plus 8 crystals: output 8 and 500 ohm and 5000 ohm phone jack. Crystal controlled oscillator. Variable BFO. VFO AVC. ANL. S meter. SSB-CW Stand-by switch. Special double gear dial drive with direct reading down to 1 kHz.



Remote control socket for connection to a transmitter. Audio output 1 watt. 115/250v. A.C. Mains. Superb modern styling. Size 7 x 13 x 10in. with instruction manual and service data, £69/10/-. Carriage paid.



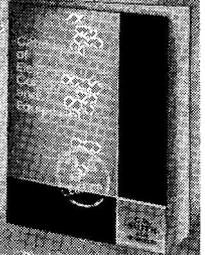
RCA COMMUNICATIONS RECEIVERS AR88D
Latest release by ministry BRAND NEW in original cases. 110-250v. A.C. operation. Frequency in 6 Bands. 535 Kc/s.-32 Mc/s. continuous output impedance 2.5-600 ohms. Incorporating crystal filter, noise limiter, variable BFO, variable selectivity, etc. Price: £87/10/-. Carr. £2.

CLEAR PLASTIC PANEL METERS
First grade quality, Moving Coil panel meters, available ex-stock, S.A.E. for illustrated leaflet. Discounts for quantity. Available as follows.

Type MR. 38P.	1 21/32in. square fronts.
1-0-1mA	27/6 150mA 27/6 750V DC 27/6
2mA	27/6 200mA 27/6 15V AC 27/6
5mA	27/6 300mA 27/6 50V AC 27/6
10mA	27/6 500mA 27/6 150V AC 27/6
750mA	27/6 3V DC 27/6 300V AC 27/6
1 amp	27/6 10V DC 27/6 500V AC 27/6
500μA	40/- 200μA 35/- 2 amp 27/6 20V DC 27/6 S meter 1mA
50.0-50.0μA	37/6 500μA 40/- 5 amp 27/6 100V DC 27/6 32/-
100μA	37/6 500.0-500μA 20mA 27/6 150V DC 27/6 VU meter 42/-
100.0-100μA	37/6 50mA 27/6 300V DC 27/6
35/-	1mA 27/6 100mA 27/6 500V DC 27/6

FULL RANGE OF OTHER SIZES IN STOCK. SEND S.A.E. FOR LEAFLET.

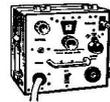
Latest Catalogue
The latest edition giving full details of a comprehensive range of H.F. EQUIPMENT COMPONENTS, TEST EQUIPMENT and COMMUNICATIONS EQUIPMENT. Nearly 200 pages, fully illustrated and detailing thousands of items - many at bargain prices. FREE DISCOUNT COUPONS VALUE 10/-



SEND NOW - ONLY 7/6 P&P!!

CLASS D WAVEMETERS

A crystal controlled heterodyne frequency meter covering 1.7-8 Mc/s. Operation on 6 volts D.C. Ideal for amateur use. Available in good used condition £5/19/6. Carr. 7/6. or brand new with accessories £7/19/6. Carr. 7/6.

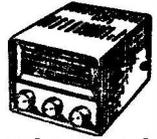


CLASS D WAVEMETERS No. 2

Crystal controlled 1.2-19 Mc/s. Mains or 12v. D.C. operation. Complete with calibration charts. Excellent condition, £12/10/-. Carr. 30/-.

LAFAYETTE DE LUXE V.F.O.

Five bands 80-10 metres. 10-20 volts output to drive most transmitters. Stabilised H.T. supply. Employs High Q Clapp oscillator. Size: 6 1/2" x 5 1/2" x 7 1/2". Operates 220/240v. A.C. Brand new with instructions. £13/19/-. Carr. 7/6.



HAMMARLUND SP600JX COMMUNICATION RECEIVER

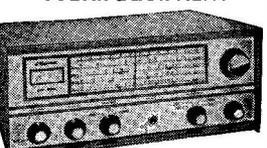
540 Kc/s.-54 Mc/s. Few only, £100.

HANSEN SWR-3 BRIDGE

Impedance 52 ohms. Also operates as field strength indicator, complete with telescopic aerial, 69/6 each, P.P. 3/6. PL259 plugs to suit 7/6 each.

EX-AM CONTROL BOX with two Lendox 7026 24v. D.C. Aerial Change-over Relays. New. 39/6. Carr. 5/-.

CODAR EQUIPMENT



	£	s.	d.
CR.70 Receiver ...	21	0	0
CR.45 Receiver ...	13	10	0
CR.45 Kit from ...	10	10	0
Pr.30X Preselector ...	5	19	6
PR.30X (Built in P.S.U.)	7	19	6
RQ.10 Q Multiplier ...	7	5	0
RQ.10X (Built in P.S.U.)	8	17	6
CC.40 Control Unit ...	6	15	0
AT.5 Transmitter ...	16	19	6
T.28 Receiver ...	15	17	6
12/M3 Mobile P.S.U. ...	11	10	0
12/RC Control Unit ...	2	10	0
AT.5 Mains P.S.U. ...	8	10	0
Mini Clipper Kit ...	2	9	0

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

3, LISLE STREET, LONDON, W.C.2 01-437 8204
34, LISLE STREET, LONDON, W.C.2 01-437 9155
311, EDGWARE ROAD, LONDON, W.1 01-262 0387

All Mail Orders to 147 Church Street, London, W.2

Open 9-6 Mon.-Sat. (half day Thurs. at Edgware Road)

plan for a prosperous New Year

**ELECTRONICS TESTERS
TEST TECHNICIANS**

starting
£19.16.0d. to
£26.11.0d.

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

Prosper in Harlow—a town for the family man—where housing and shopping facilities are outstanding, where schools are new and children's needs are well catered for.

We will help you to find housing and assist you in moving to the area. Please fill in the coupon below.

COSSOR

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

Name _____

Address _____

Experience _____

Fast Mail Order for the Amateur Radio Enthusiast!

AERIAL EQUIPMENT

TWIN FEEDER. 300 ohm twin ribbon feeder similar K25, 8d. per yard. 75 ohm twin feeder, 8d. per yard. Post on above feeders, 2/- any length.

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

VARIABLE CONDENSERS. "Raymart" 250 pF, 8/6 each, 2/- P. & P. **EDDYSTONE 817.** 240 pF .024 spacing, 24/6, P. & P. 2/6.

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

2 METRE BEAM, 5 ELEMENT W.S. YAGI. Complete in box with 1" to 2 1/2" masthead bracket. Price: £3 7s. Carriage 5/-.

SUPER AERAXIAL, 70/80 ohm coax, 300 watt very low loss, 2/3 per yard. 50 ohm 300 watt, 2/6 per yard. P. & P. 2/6.

TOUGH POLYTHENE LINE, type ML1 (100lb.), 2d. per yd. or 12/6 per 100 yds. Type ML2 (220 lb.), 4d. per yd. or 25/- per 100 yds., ML4 (400 lb.), 6d. per yd. Ideal for Guys, L.W. Supports, Halyards, etc. Postage 1/6 on all line.

"RAYMART" SUPER BANDCHECKER

This instrument is an adaptation of the simple Absorption type wavemeter and by utilizing a diode and a sensitive meter its application is considerably widened.

In addition to the familiar use of checking output frequency the increased sensitivity enables it to be used for many other applications such as:

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

Price £4.4.0 (3-5-35 Mc/s.) or, including 160 Metre Band £4.10.0. P. & P. 3/-.



"RAYMART" TRANSISTORISED SHORT WAVE RECEIVER KIT

- Uses plug-in coils.
- 5 ranges available.
- Kit supplied with Range 3 coil 1.6-5.3 mc/s.

Full instructions supplied.

Cost of kit £8 (less speaker and battery).

Extra coils 11/- per range.

P. & P. 4/6.



The Widest Range of Components in the Midlands

★ HIRE PURCHASE
★ PART EXCHANGE

CHAS. H. **YOUNG** LTD.

At your service G2AK, G3LAY, G3VVF

Please print your address. No C.O.D. under £1.

phone 021-236 1635

170-172 Corporation Street,
Birmingham 4

R. T. & I. ELECTRONICS LTD.

where equipment is fully overhauled

EDDYSTONE 830/7 few weeks old (in ctn.)	£260 (Free)
HAMMARLUND HQ180	£140 (30/-)
GEC BRT 400-K	£115 (40/-)
KW 1000 Linear Amp.	£115 (60/-)
KW 2000 & A.C. psu	£180 (60/-)
GEC BRT-402-E	£85 (40/-)
CODAR CR70A	£17 (10/-)
SOMMERKAMP FT-DX 400/500 transceiver	£195 (60/-)
SOMMERKAMP FT-200B transmitter	£100 (40/-)
LAFAYETTE HE-60	£125 (30/-)
LAFAYETTE HE-80	£48 (25/-)
LAFAYETTE HA-500	£38 (25/-)
NATIONAL HRO-500	£450 (40/-)
EDDYSTONE EA12 amateur band receiver	£150 (30/-)
EDDYSTONE 770R, 19-165 mc/s., AM/FM	£125 (30/-)
EDDYSTONE 940	£115 (30/-)
EDDYSTONE 840C	£48 (25/-)
EDDYSTONE EC10	£40 (20/-)
EDDYSTONE 840A	£35 (25/-)
RCA AR88D	£65 (40/-)
HAMMARLUND SP600-JX6	£125 (40/-)
HAMMARLUND HQ-170	£110 (30/-)

WE CAN ALSO SUPPLY ANY MAKE OF NEW EQUIPMENT—and have pleasure in giving a few examples which are mainly in stock:—

AVOMETERS, Model 7, Mk. 2, £31/3/6; Model 40, Mk. 2, £31/3/6; Model 8, Mk. 3, £33/16/6; Model 9, Mk. 2, £33/16/6; Multimeter, Mk. 4, £11/9/6 (free)

S.G. BROWN'S HEADPHONES, Type "F," 120 ohms, 2,000 ohms, 4,000 ohms, £4/14/6 (3/6). Earpads for same, 9/- per pair. Type 3/C1100 noise excluding (with superb fitting), high quality, electro-dynamic, £7/4/6 (3/6).

KW EQUIPMENT. KW Atlanta transceiver, £250. Vespa Mk. 2 transmitter with A.C. p.s.u., £135. KW-201 amateur band receiver, £111. Also Calibrator, £6; "Q" mult., £8/10/-; KW-2000-B Transceiver, with A.C. p.s.u., £240; D.C. p.s.u., £42. KW-1000 Linear, £135. KW-600 Linear, £115. KW E-Z match, £12/16/-; KW Match, £8/14/6. Antenna switch, £3/3/-.

CODAR, A.T.S. £16/19/6; 250S, £8/10; T28, £15/17/6; PR30X, £7/19/6; CR70A, £21; 12/MS, £11/10/-; 12/RC, £2/10/-, etc., etc.

PARTRIDGE "Joystick," "Joymatch," etc. Lists and details on request **TRIO EQUIPMENT—**Transceiver, TS-510 c/w A.C. p.s.u. and spkr., £212 (40/-); VFO-5D for TS-510, £32 (10/-). Receivers, JR310 bandspread, £77/10/- (20/-); JR-500-SE, bandspread, £68/- (10/-); 9R59DE, 540 kc/s.-30 mc/s., £42/10/- (10/-); 9R-59, 540 kc/s.-30 mc/s., £34/13/- (15/-). Loudspeaker, SP-5D "Speaker-mate" to match trio receiver, etc., £4/7/6 (7/6). Headset HS4, £5/19/6. Write for special offers.

Our latest list of over 50 receivers, and many other interesting items sent free upon receipt of your s.a.e. CARRIAGE for England, Scotland and Wales shown in brackets. TERMS: C.W.O., Approved Monthly Accounts, Hire Purchase and Part Exchange. Special facilities for export. Enquiries invited.

R. T. & I. ELECTRONICS LTD.

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

- ★ We offer on any new or secondhand equipment.
- ★ Full H.P. facilities.
- ★ Part exchanges.
- ★ First-class overhaul and alignment service.
- ★ We also purchase for cash.

OFFICIALLY APPOINTED

EDDYSTONE

AGENTS

Come and see EDDYSTONE

... in LEYTONSTONE!

	£	s.		£	s.	d.
830/7	275	0	Edometer ED902 Mk. 2	27	10	0
EA12	195	0	AC Mains Units 924	6	15	0
940	153	0	Receiving Aerial 731/1	4	16	0
EC10Mk. 2	69	10	Plinth Speaker 906	4	5	0
EB35 Mk. 2	64	10	General Purpose			
	(plus PT)		Speaker 935	3	7	6
EC10	59	10				

LOWE ELECTRONICS

**Wellington Street
Matlock
Derbyshire
Matlock 2817 (2430 after 6)
Bill G3UBO**

**4 Southwick Street
Southwick
Brighton
Southwick 4887
Alan G3MME**

**19 Ellismuir Road
Baillieston
Nr. Glasgow
No phone yet
Sim G3SAN**

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

If you're in the market for a bit of new gear, bear in mind we almost invariably have all the Sommerkamp and Inoue range in stock and although I say it myself you get, price for price, a bit more with these than comparable rigs. That's why I sell 'em. Look at the FT-500—there isn't a cheaper 500 watt rig on the market and yet you get everything which on other rigs, even much more expensive rigs, are optional extras. Same with the FT-250—at £160, less p.s.u. it is a remarkably low price to pay for Sommerkamp quality and performance. Even with the £45 p.s.u. it's still top value. Thinking of mobile? Then it has to be the FT-150. (Maybe I shouldn't say "has to be"—but, in its class, if you think about it you have no choice really.) In the no compromise market the FR and FL-500 are still a best buy for the man who wants separates. I must also mention the Inoue—at £180 complete it represents very fine value indeed—I'm not going to push it because I'm not sure what the delivery position will be by the time this appears in print. All I say is—if you're going to lash out a large dollop of dough, you should at least try all the possibilities first and be sure you're spending it wisely. Anyway, enough of this—I think we're all agreed you can't go far wrong with this gear, it's just that I have to keep reminding you every month!

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

Rx's

EA12 £130. HRO Bandsread coils £20. Hallicrafters SX101A £75. BRT-400 £65. Collins 75S1 £175. Lafayette HA-350 £55. KW-77 £75. AR88's from £25-£50.

Tx's

Star ST-700 £95. Vanguard £30. Heathkit Apache/SB10 combination £60. DX100U/SB10U combination £50. Sommerkamp FL-200B £95. FL-500 £110.

Transceivers

KW2000 £135. KW2000A £175. Drake TR3 £200. Anglian 1000 £230.

Test Gear

Marconi TF144G £15. Marconi No. 13 signal generators £10. Bendix I-130-A 100-150 mc/s £12 10s. Test sets TS13/AP UHF £12 10s. Noise generators CT82 £12 10s. Telequipment D52 £45. Cossor 339 £12 10s. Wavemeter Class "D" mint and operational 240v. AC £7 10s. BC221 mint £20. TE18 GDO's £11 10s. New. TE65 VTVM with AC/DC and RF probes £16 10s. New.

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

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

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

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

73 de Bill

VE8DP/G3UBO

RADIO SHACK LTD.

LONDON'S AMATEUR RADIO STOCKISTS

Used Equipment

	£	s.	d.
KW Vespa 2 transmitter and p.s.u. ...	105	0	0
PYE Ranger transceivers, low band ...	10	0	0
DRAKE MN-4 matching network ...	35	0	0
HEATHKIT RA-1 receiver, immaculate	30	0	0
HEATHKIT SB-401 transmitter, as new, all crystals	175	0	0
MARCONI TF-340 audio wattmeters...	3	10	0
SWAN 410 VFO and adaptor	40	0	0
HAMMARLUND HQ 110 amateur receiver 160—6 metres	65	0	0
EDDYSTONE 840 C receiver...	45	0	0
HARTLEY CT-436 dual trace oscillo- scope	85	0	0
CROSSHATCH generator for colour TV	45	0	0
JOHNSON Ranger Mk. 2 AM/CW transmitter	65	0	0
HEATHKIT OS 12 oscilloscope	20	0	0
SWAN 500 transceiver and p.s.u./ speaker	250	0	0
DRAKE R-4A receiver, excellent	175	0	0
DRAKE T-4X transmitter and p.s.u. ...	200	0	0
LABGEAR twin transmitter and p.s.u.	16	10	0
GALAXY F-3 CW filter for Galaxy transceivers	8	10	0
HEATHKIT HW-32A transceiver AC and DC power supplies	60	0	0
EDDYSTONE 770-U/2 150—500 mHz receiver	125	0	0
Eddystone EC 10	45	0	0

New Equipment

JOHNSON Matchbox 600 W model with SWR meter	55	0	0
JOHNSON Matchbox 2000 W model with SWR meter	115	0	0
JOHNSON TR switch... ..	19	10	0
COPAL digital 24-hour clocks, 201 model	14	0	0
COPAL digital 24-hour clocks, 601 model with day and date	21	0	0
RADATEC police radar detector, to clear	11	0	0
KOYO AM/SW/FM/aircraft/VHF re- ceiver, to clear	39	10	0
CDR rotators, ham/M	70	0	0
CDR TR-44	40	0	0
CDR AR-22R	25	0	0
CDR AR-10	18	0	0
KW Atlanta transceiver and p.s.u. ...	250	0	0
KW 2000B transceiver and p.s.u. ...	240	0	0
KW 1000 linear	135	0	0
TRIO JR-310 amateur receiver	77	10	0
TRIO JR-500 SE amateur receiver ...	69	10	0
TRIO TS-510 transceiver and p.s.u. ...	212	0	0

Full range of Drake, Hy-Gain, Shure and Swan in stock

RADIO SHACK LTD.

182 Broadhurst Gardens, London, N.W.6

Just around the corner from West Hampstead Underground Station

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

52 GT. ANCOATS STREET

MANCHESTER 4

061-236 6276

G3MAX**EDDYSTONE RECEIVERS AND BOXES**
JACKSON, DENCO, REPANCO, etc.

R209 Mk. II Portable/Mobile Receiver. 1 to 20
Mc/s. 12 volt DC operation. AM/CW/FM. Internal
speaker. Ideal for Caravan or small boat enthusiast.
Checked and tested before despatch, £15 Carriage
10/-.

Pye 25 Watt Base Station TX/RX. 70 to 100 Mc/s.
Set. Tunes to 4 metres. Xtal freq. X6. Less xtal.
As new in plywood case, £25 Carriage £1.

Hammarlund SP600. Excellent condition. 540 Kc/s.
to 54 Mc/s., £95 Carriage £1. Table Top Case.

Vibrators. 12 volt synchronous. Type No. 12SR7,
10/- each. Special offer 3 for £1. Postage 2/6.

Cathode Ray Tube. Brand new. 5FP7A, 25/-
Post 4/6.

Transistor Board. 2/6 Post 1/6. 8 boards £1 Post
free. With: 3-GET 872, 1-GET 875, 3-GET 872B,
9-OA5, 3-OA10, 4-min. pot cores., caps. and res.

Geiger Counter. New in carrying case, £3 Post 10/6.

Table Top Unit. 18 x 10 x 10" 20 to 80 Mc/s. with
plug in coils. 6 valves. MU14 807 O/P VR66-SP42.
EL32. DD41. 10mA meter. Transformer 375-0-375
120mA. 6V. 2A. 4V. 2A. 4V. 1-5A. Circuit on
lid. Useful for Tx. conversion. £4. Carriage £1.

Business hours : 9 a.m.—6 p.m. Tuesday-Saturday**CLOSED ALL DAY MONDAY**

SPECIAL OFFER FROM HEATHKIT

You can save up to £10

BUY YOUR HP-23A POWER SUPPLY AT THE
SAME TIME AS YOUR TRANSCEIVER

DE-LUXE ALL BANDS 80-10M. TRANSCEIVER, SB-101

Normally Kit K/SB-101, £200 14s. Carr. 9s.
Normally Kit K/HP-23A, £30 18s. Carr. 11s.

SPECIAL PRICE **£222** Carriage 20s.



ECONOMY ALL BANDS 80-10M. HW-100

Normally Kit K/HW-100, £137 8s. Carr. 11s.
Normally Kit K/HP-23A, £30 18s. Carr. 11s.

SPECIAL PRICE **£159** Carriage 22s.

SINGLE BANDERS HW-12A, 22A, 32A

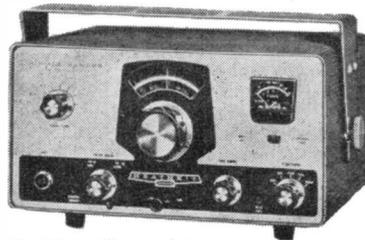
Normally Kit K/HW-12A, £62 4s. Carr. 11s.
Normally Kit K/HP-23A, £30 18s. Carr. 11s.

SPECIAL PRICE **£83** Carr. 22s.

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

SPECIAL PRICE **£86.16.0** Carriage 22s.

SEND FOR SPECIFICATIONS



Credit
Terms
Available

To **DAYSTROM LTD., Dept. 5672, Gloucester, GL2-6EE**
 Please send me full details of Heathkit Transceivers
 NAME _____
 ADDRESS _____



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

TRANSISTORY

ABC of Transistors	21s.
Electronic Transistor Circuits	25s. 9d.
FET Principles, Experiments and Projects	41s. 6d.
49 Easy Transistor Projects	17s.
Practical Design with Transistors	43s. 6d.
Practical Transistor Theory	21s.
Transistor Fundamentals: Basic Semiconductor and Circuit Principles	36s. 6d.
Transistor Fundamentals: Basic Transistor Circuits	36s. 6d.
Transistor Fundamentals, Volume 1, 2 and 3 (each)	36s. 6d.
Transistor Fundamentals: Student's Workbook	36s. 6d.
Transistor Transmitters for the Amateur	22s.
Using 'Scopes in Transistor Circuits	33s. 6d.

(The above prices include postage and delivery is from stock)

Available from **SHORT WAVE MAGAZINE**

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

(Counter Service, 9.30-5.15, Mon. to Fri.) (Nearest Station: St. James's Park)
(GIRO A/c. No. 547 6151)

CQ-CQ-CQ de G3VQM/KW

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

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

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

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

KW ELECTRONICS LTD
1 HEATH STREET, DARTFORD, KENT
Telephone : Dartford 25574

Peter Seymour Ltd.

Communications Equipment Specialists

SOMMERKAMP FRDX 500. As new, with 160 metres.	£100
COLLINS 32V3. This is possibly the best AM/CW transmitter ever produced	£65
KW 2000B. New with P.S.U.	£240
KW VESPA. Mark II. Complete with P.S.U., 160 to 10 metres	£140
TRIO JR500SE. As new	£55
COLLINS 75A4 with two mechanical filters. Mint	£250
COLLINS 75S3, as new	£225
BRT 400. 150-380 Kc/s. and 560 Kc/s.-31 Mc/s.	£65
SHURE 201 microphones	£5 10
EDDYSTONE EA 12	£125
MULTIBAND DIPOLE TRAP SETS, with full instructions, fully encapsulated, per pair 80-10 metres	£2 10
AR88 SPARES, logging dials,	5 0

FULL H.P. FACILITIES ON EQUIPMENT OVER £35.
ONE THIRD DEPOSIT, UP TO 24 MONTHS TO PAY.

LET US KNOW YOUR REQUIREMENTS

410 Beverley Road, Hull, Yorkshire
Telephone : Hull 41938

INDEX TO
ADVERTISERS

	PAGE
Amateur Electronics (G3FIK)	776
Amateur Radio (C. H. Young)	778
Belding & Bennett (Morse)	784
Burns Electronics	777
Cossor Electronics, Ltd. ...	725
Daystrom	729
Derwent Radio	784
Echelford Communications	783
Eddystone Agents... ..	721
Emsac	722
G. Francis (G3TWW) ...	779
Glasgow Electronic Services	780
Grigg	780
G.W.M. Radio	782
Hamgear Electronics ...	732
Henry's Radio	781
Imhof	781
K.W. Electronics <i>inside front cover,</i> 730, 777	
Laskys Radio, Ltd.	779
Lowe Electronics	727
Minitenna	780
Mosley	722
N.W. Electrics	728
Partridge Electronics ... 777, 780	
Partridge (G3PRR)	780
Peter Seymour <i>back cover,</i> 730, 776	
Radio Shack	728
R.T. & I. Electronics, Ltd.	726
Small Advertisements ... 778-784	
Smith, G. W. (Radio)	724
Spacemark, Ltd.	784
SSB Products	782
Stephens-James, Ltd.	732
S.W.M. Publications <i>inside back cover, back cover,</i> 721, 730, 732, 776	
Symbol Books	777
Taurus Electrical Services... 783	
Telecomms (G3SED)	777
The Amateur Radio Shop... 777	
Trio	723
Wemscot	777

SHORT WAVE MAGAZINE

(GB3SWM)

Vol. XXVII

FEBRUARY, 1970

No. 316

CONTENTS

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

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

Advertising: Maria Greenwood

Published at 55 Victoria Street, London, S.W.1, on the last Friday of the month, dated the month following. Telephone: ABBey 5341/2 (STD 01-222-5341)

Annual Subscription: Home: 45s. (48s. 1st class) post paid
Overseas: 45s. (\$6.00 U.S.), post free surface mail

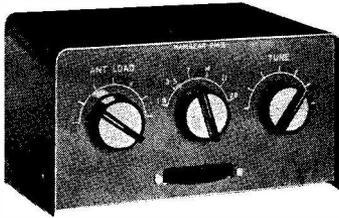
Editorial Address: Short Wave Magazine, BUCKINGHAM, England

AUTHORS' MSS

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

© Short Wave Magazine Ltd.

HAMGEAR ELECTRONICS



Try this preselector on your communication receiver, a pentode amplifier with built-in antenna coupler covering from 1.8 to 32 mc/s completely. A gain of up to 25 Dbs, improving image rejection and low level signals. A new low line case blue silver with ultra modern controls. Mains powered. Price £7.16. 0. send for details.

29 CARLYLE ROAD, NORWICH

CALL BOOKS

- INTERNATIONAL: RADIO AMATEUR CALL BOOK (Winter Edition)**
 "DX Listings" 45/6
 "U.S. Listings" 69/6
 The two together, covering the World £5/10/0
 "G's" only (1969/1970) 7/3

MAPS

- AMATEUR RADIO MAP OF WORLD**
 Mercator Projection—Much DX Information—in colour. Second Edition 9/-
- DX ZONE MAP (GREAT CIRCLE)**
 In colour with Country/Prefix Supplement Revised to September, 1968 14/9
 Black and White only 5/6
 (plus 9d. with Country/Prefix Supplement)
- RADIO AMATEUR MAP OF THE U.S.A. AND NORTH AMERICA**
 State boundaries and prefixes, size 24" by 30", paper 8/9
- RADIO AMATEUR'S WORLD ATLAS**
 In booklet form, Mercator projection, for desk use. Gives Zones and Prefixes 16/-

- QRA LOCATOR MAP (R.S.G.B.)** 9/-

LOG BOOKS

- Standard Log 7/9
 Log and VHF Contest Log 7/9
 Receiving Station Log 7/3
 Spiral bound (A.R.R.L.) 12/-
 Minilog, 4" by 6" (A.R.R.L.) 5/6
 (The above prices include postage)

MORSE COURSES

G3HSC Rhythm Method of Morse Tuition

- Complete Course with three 3 speed L.P. records with books 84/-
 Beginner's Course with two 3 speed L.P. records with book 60/6
 Single 12" L.P. Beginner's with book 50/-
 Single, 12" L.P. Advanced with book 50/-
 Three speed simulated GPO test. 7" d.s. E.P. record 15/-
 Plus 5% for postage and insurance

Available from

SHORT WAVE MAGAZINE

Publications Dept., 55 Victoria Street, London, S.W.1 01-222 5341
 (Counter Service, 9.30-5.15, Mon. to Fri.)
 (Nearest Station: St. James's Park)
 (GIRO A/C No. 547 6151)

G3LRB

G3MCM

STEPHENS-JAMES LTD.

KW Atlanta. Transceiver	£250	Trio 9R59DE. Receiver	£42.10
KW 200B. Transceiver...	£240	Trio Headphones	£5.19.6
KW Vespa. Transmitter	£135	Trio SP5D Speakers	£4.7.6
KW 201. Receiver	£111	Lafayette HA600. Rx	£45
KW 1000. Linear	£135	Lafayette HA800	£55.10
KW E-Z Match	£12.10	Eddystone EA12. Receiver	£195
KW Balun	£1.15	Eddystone 940. Receiver	£153
KW Antenna switch	£3.3	Eddystone EC10 Mk. II Receiver	£69.10
KW Low Pass Filters	£4.14		
Trio TS510. Transceiver	£12		
Trio JR500. Receiver	£69.10		
Trio JR310	£77.10		

Superior performance mobiling with the G-WHIP range of antennae. Lightweight design. Helical wound. "Ranger 160m." £7.10. 160/80m. duo-bander, £9. Tribander 10-15-20m., £9.9. Basemounts, £1.9.6. Full details sent on request. New Multimobile self selecting 5 band without coil changing. Luxury mobiling.

Hi-Gain Antenna Range

Verticals:	
12AVQ 10-15-20m...	£17.10
14AVQ 10-15-20-40m.	£26.10
18AVQ 10 through 80m.	£44
Beams:	
TH3MKC Tribander	£90
TH2MK Tribander	£60
TH3Jnr. Tribander	£60
Hansen 50 ohm SWR Bridges	£3.10
Hansen FS Meters	£2.15
TTC RF Meters, tunable	£3.19.6
High Pass Filters	£1.7.6
Semi-automatic Bug Keys	£4.10
PL259 Plugs	6.0
PL259 Cable Reducers	1.6
PL259 Sockets	8.0
TECH 15 G.D.O.	£11.10

Second-hand Equipment

Swan 500 A.C. p.s.u. and Vox Unit	£260
Swan Mobile p.s.u.	£40
NCX5 A.C. p.s.u.	£220
KW Vespa Mk.II	£95
KW500 Linear	£55
Lafayette HA350	£90
Lafayette HA600	£37
Sommerkamp FTDX500	£210
Panda PR20 Tx	£20
Inouhe IC700 Rx	£70
Star 165 Rx	£15
NC190 Rx	£40
Heathkit Speaker	£1.10
VHF Skymaster	£17
AR88LF	£30

Codar Equipment

ATS. 160/80 Transmitter	£16.19.6
AT5 A.C. p.s.u.	£8.10.0
D.C. Mobile p.s.u.	£11.10.0
PR30X Preselector	£7.19.6
T28. 160/80m. Receiver	£15.17.6
RQ10 "Q" Multiplier	£8.17.6

Garex Equipment

2m. 28-30m. Converter	£10.7.0
2m. 10 watt Tx	£8.17.6
TV Phase II Transverters	£69
Phase II matching p.s.u.	£34
2. Tx kit	£6.17.6
2m. Tx Transmitter	£14.10.0

Complete range of Eddystone and Datum diecast boxes now in stock. "Stella" cabinets, chassis, panels. Full details for S.A.E.

300 ohm twin feeder, yd.	7d.	"Interceptor" 8 band transistor portable	£48
75 ohm twin feeder, yd.	7d.	R4B receiver	£240
Dipole "T" pieces	1/6	T4B Transmitter	£250
Ceramic Insulators	1/-	TR4 Transceiver	£315
50 ohm co-axial cable yd.	1/9	VHF Beams and Rotators.	
Eddystone 898 SM dial	£6.6.9	All RSGB publications in stock.	
Jackson SM dial	£1.4.0	ARI58 Transistor Receiver. 6 band AC/DC	38 gns.
Eddystone speaker	£2.7.6		
WIEN aircraft radio	£11		
TTC C3005 SWR meter	£6.6.0		
24 hour Digital Clocks	£14 and £21		

H.P. and Credit items arranged on all orders over £35. Part exchanges welcome. Carriage/postage extra all items. S.A.E. enquiries please.

70 Priory Road, Anfield, Liverpool 4

Tel. 051-263 7829. Half day Wednesday. No parking problems.

We are approximately 1/2 mile from the Liverpool and Everton Football grounds.

The
SHORT WAVE
Magazine

E D I T O R I A L

Change *The next issue of SHORT WAVE MAGAZINE starts a new volume—our 28th in this long series devoted to Amateur Radio. Not only shall we be changing the colour of the cover but also as usual each copy will contain, as a free loose supplement, an index to the volume now concluding.*

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

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

Anyway, the change will be gradual, and made as easy and as painless as possible in the interests of all concerned—our older readers need not fear that they are in for a period of bafflement!

*Austin Forster,
G6FO.*

DESIGN AND CONSTRUCTION OF A LOW-PASS FILTER

STEP-BY-STEP APPROACH AND THE CALCULATIONS

I. E. HILL (G6HL)

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

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

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

Having regard to the fringe TV signal condition, the proximity of TV receivers, the use of a vertical ground-plane radiating system and the desire to make it good while one was about it, the decision was to develop a low-pass filter with more attenuation than really necessary. The preferred solution was for a filter having two constant-K end-sections with M-derived end and centre sections, as shown in Fig. 1. Though each section is shown individually, in practice coils of adjacent sections would be

combined, and Fig. 2 represents the filter actually to be constructed.

Availability of coax dictated that the load resistance should be 52 ohms. Most of the G6HL operating is CW in the LF areas of the bands, so 42 mc was selected as F_{∞} , the frequency for maximum attenuation and 36 mc as a reasonable cut-off frequency, F_c . With these parameters and assuming a coil of Q-100, the calculated performance of the filter approximates to Fig. 3. This gives attenuation of 100 dB around 42 mc and not less than 58 dB anywhere above 40 mc.

In the pass-band, the calculated attenuation was 0.14 dB at 3.5 mc, 0.16 dB at 14 mc, 0.19 dB at 21 mc and 0.31 dB at 30 mc. The actual model as constructed did not quite achieve this expectation, but was not worse than 0.5 dB at 21 mc and below, and 0.75 dB in the 28-30 mc band. This was considered to be acceptable—in fact, the figures are good for a home designed and built unit.

Design Procedure

(a) First determine parameters. In this case

$$F_c = 36 \text{ mc}$$

$$F_{\infty} = 42 \text{ mc}$$

$$R_L = 52 \text{ ohms}$$

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

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

$$L = \frac{R_L}{\pi F_c} = 0.46$$

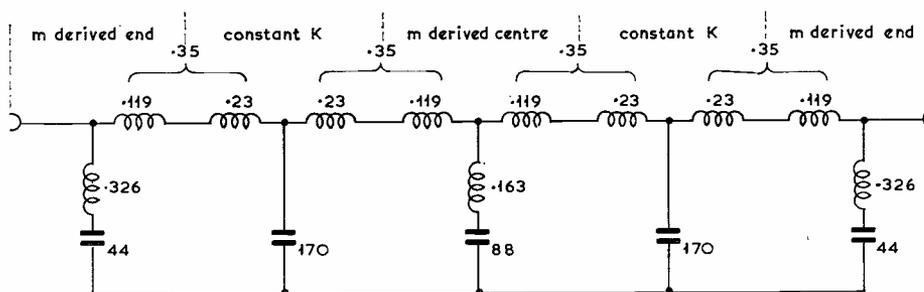


Fig. 1

Fig. 1. Complete Low-Pass Filter, in sections.

Q
404

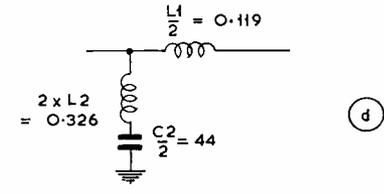
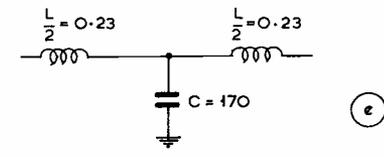
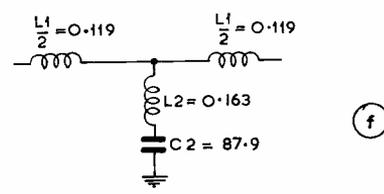
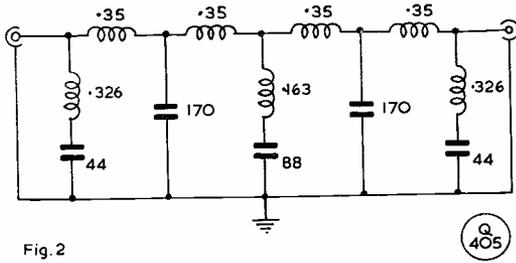


Fig. 2. Finalised Low-Pass Filter—Cut-off frequency, 36 mc; maximum attenuation at 42 mc; load impedance, 52 ohms.

$$C = \frac{1}{\pi F_c R_L} = 170$$

$$m = \sqrt{1 - \left(\frac{F_c}{F_\infty}\right)^2} = 0.517$$

(d) Calculate the end-section values

$$L1 = m.L = 0.238$$

$$L2 = \frac{1 - m^2}{4.m}.L = 0.163$$

$$C2 = m.C = 87.9$$

(e) Calculate constant-K section values.

(f) Calculate M-derived end sections.

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

Construction

The coils should be wound using 12 or 14g. enamelled to 1/2 in. dia., spaced to 8 turns per inch. Coil sizes in the actual design shown here are: End sections, 5 1/2 turns; centre section, 3 1/4 turns; intermediate coils, 6 turns.

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

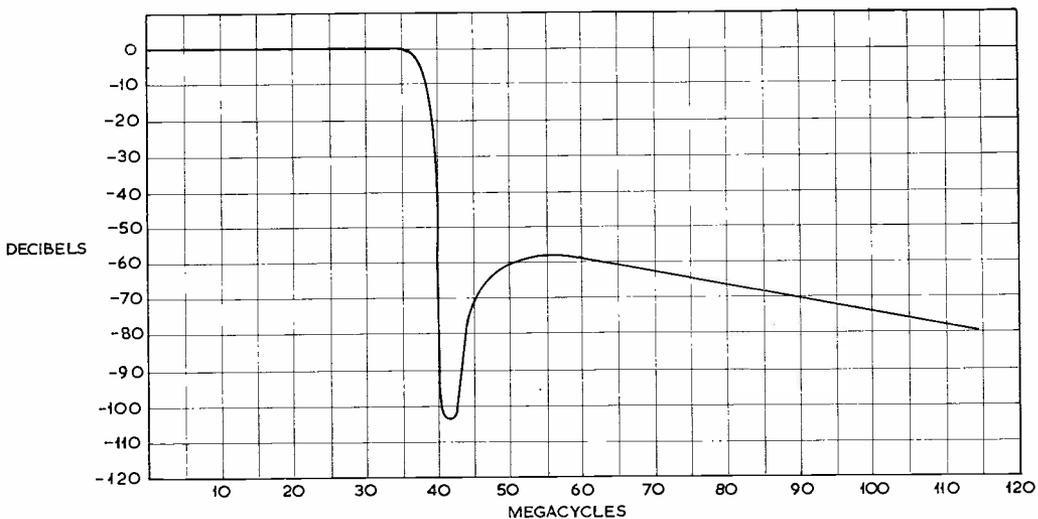


Fig. 3 CALCULATED PERFORMANCE OF FILTER

Fig. 3. Calculated performance—see text.

Q 406

inductance and turns for self-supporting coils wound to half-inch diameter and spaced at 8 turns per inch.

Capacitors

When the transmitter is correctly adjusted and working into the intended load—in this case 52 ohms—the voltage will be low but under possible temporary mis-match conditions and perhaps during Tx adjustments, the voltage may rise to high values. For the usual amateur power levels the condensers should therefore be rated 750/1000v. Lead inductance should be at a minimum (short and direct wiring) and the capacitors of the type capable of handling RF currents. For these reasons, the choice must be air-spaced types (preferably), ceramic or silver mica, in that order of preference. For the prototype, which has worked out so successfully, capacitors were built up using fixed plates on 1/8 in. spacer washers. This produces condensers capable of handling RF powers up to one kilowatt.

Screening

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

Assembly and Adjustment

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

Fit the coils in each of the M-derived sections, earth the end remote from the capacitors and, using a reliably-calibrated GDO, adjust the coil turn-spacing until the

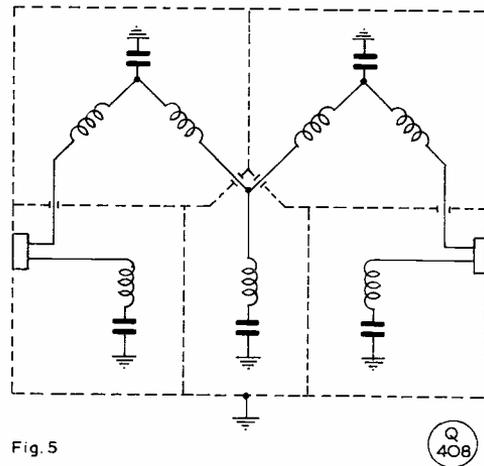


Fig. 5

Fig. 5 Suitable layout for the Low-Pass Filter, showing screening.

section is resonant at F_{∞} , in this case 42 mc. Take off the earth and fit the remaining inductances.

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

Following the Design

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

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

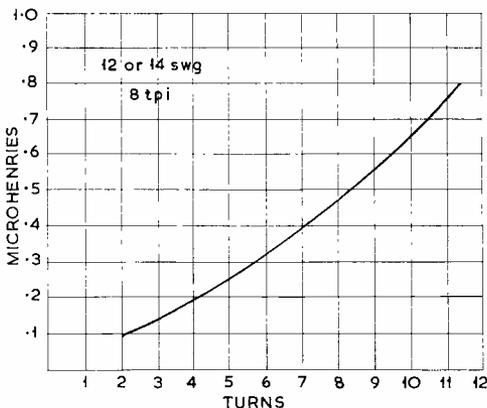


Fig. 4 COIL DATA

Fig. 4. Graph for Coil Data

SOME R.A.E. STATISTICS

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

THE LINEAR AMPLIFIER STAGE IN SSB WORKING

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

E. P. ESSERY (G3KFE)

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

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

Advent of the 6146

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

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

Getting More Power

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

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

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

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

Suitable Types

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

tion. The 6HF5 is one of the worst offenders in this context.

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

Operating Factors

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

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

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

Parallel Pairs

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

Cooling

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

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

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

Tuning Up

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

Assuming the rig is switched on but at “receive,” switch to “tune,” and detune the PA tuning condenser. Insert a whiff of carrier and peak the PA grid or pre-selector control till the anode current starts to rise. Peak the anode current by tuning the PA grid, the while holding the anode current down by simultaneous adjustment of carrier insertion to as low a level as possible. If standing current is 25 mA without drive, it should be possible to achieve the peaking without at any time exceeding 50 mA, and in a time of less than one second. Once satisfied that a true peak has been achieved, reduce carrier insertion to zero. With PA connected to dummy load through VSWR indicator, switch the indicator to “forward current”; insert a shade of carrier and peak the PA-tune condenser for a maximum forward current, still maintaining anode current below 50 mA absolute

TABLE I

Operating Conditions—TV Sweep-Tube Service

Valve	Vh	Ih	Anode Diss. (watts)	Va	Vg2	Bulb Temp. (deg. C)
6DQ5	6.3v.	2.5A	24	990v.	190v.	220°
6GB5 (PL500)	6.3	1.38	17	700	275	
6GE5	6.3	1.2	17.5	770	220	200°
6HF5	6.3	2.25	28	900	190	225°
6JS6	6.3	2.25	28	990	190	225°
6KD6	6.3	2.8	33	990	250	225°
6LQ6	6.3	2.3	30	990	220	250°

maximum by carrier insertion control. Swing the carrier insertion up to full and back to zero rapidly, and note at what current it peaks. This value should be the current to which the transmitter is loaded according to the handbook, *e.g.* for the Vespa Mark II, 130 mA. The value can be noted, by one swing of the carrier insertion control up and back. If it is correct the transmitter is now properly loaded into the dummy load. If not, and it "flattens" either above or below 130 mA, alter the setting of the PA-load control, repeat the PA-tune condenser at low level, as before, and again swing the carrier insertion right up and back. By doing this, the PA is never at "full bore" for more than a fraction of a second, or at low level more than a second, at a time.

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

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

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

TABLE II

Typical Operating Conditions, Linear Service. (Single Valve)

Valve	Class	Mode	Va	Vg2	Ia
6HF5	AB1	normal	800v.	230v.	25mA
6LQ6	AB1	normal	800	230	25
6LB6	AB1	normal	850	180	25
6LQ6	B	grounded-grid	1200	0	20
6JE6	B	grounded-grid	1200	0	20
6KD6	AB2	grounded-grid	900	0	25

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

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

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

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

INTERNATIONAL INSTRUMENTS, ELECTRONICS AND AUTOMATION EXHIBITION

This large and important exhibition will be held at Olympia, London, during the period May 11-16. It will emphasise the growth of the radio-electronics industry, and its large and expanding export potential.

ANOTHER TOP BAND AERIAL LAYOUT

FOR RESTRICTED SPACE
OPERATION

D. W. BLACKFORD (G3NPB)

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

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

Practical Considerations

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

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

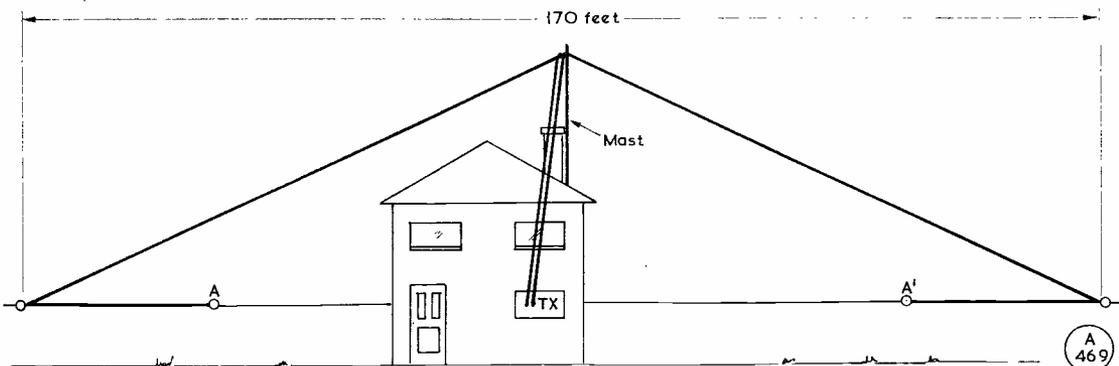
The aspect from the side is a triangle with a gap in the base, the gap being beneath the current anti-node.

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

Results

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

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



Top Band half-wave, say 250 feet, A'-A, fitted into a ground space of 170 feet and off-centre fed, as used by G3NPB (St. Ives, Cornwall)—see text.

To ensure a regular copy, become a Direct Subscriber—45s. (or 48s. "first class") post free year of twelve issues, starting any month.

EXPLAINING BINARY CODES

STRAIGHT AND BINARY CODED DECIMAL

P. R. CRAGG (G3UGK)

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

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

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

10^3	10^2	10^1	10^0	—Base line
(1000)	(100)	(10)	(1)	
1	2	3	4	—Digit line

This tells us that we have one " 10^3 ," two " 10^2 's," three " 10^1 's" and four " 10^0 's." We are working to a *base of 10*, and have 10 digits to use in each position before we must carry over to the next. Note that any figure to the power of "0," as " 10^0 ," equals 1.

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

10^3	10^2	10^1	10^0	—Decimal
(1000)	(100)	(10)	(1)	
2^3	2^2	2^1	2^0	—Binary
(8)	(4)	(2)	(1)	

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

like this:—

2^3	2^2	2^1	2^0
(8)	(4)	(2)	(1)
1	0	1	0

We are saying that we have one " 2^3 " no " 2^2 's," one " 2^1 ," and no " 2^0 's." Stated more simply, we have one "8" plus one "2," $8 + 2 = 10$.

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

1024	512	256	128	64	32	16	8	4	2	1
1	0	0	1	1	0	1	0	0	1	0

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

Our binary number will usually be written simply as 10011010010.

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

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

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

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

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

89 is an <i>odd</i> number, so following Rule 1, put down a "1" in the lowest position.....	1
Divide by 2. $89/2 = 44\frac{1}{2}$. Round off downwards, as in Rule 3, to 44, which is <i>even</i> , so put down a "0" as in Rule 2.....	01
$44/2 = 22$, which is <i>even</i> , so put another "0".....	001
$22/2 = 11$, being <i>odd</i> , so put a "1".....	1001
$11/2 = 5\frac{1}{2}$. Round off downwards = 5, which is <i>odd</i> , so.....	11001
$5/2 = 2\frac{1}{2}$. Round off downwards = 2. 2 is <i>even</i> , so.....	011001
$2/2 = 1$. Follow Rule 4. The final binary number is.....	1011001

To check, use the table:—

64	32	16	8	4	2	1
1	0	1	1	0	0	1
$64 + 16 + 8 + 1 = 89$						

Computer Binary

This form of binary representation is known as "straight" or "pure" binary. A more commonly used form, in computer technology, is known as "Binary

Coded Decimal," or BCD. It works like this:—

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

1	2	3	4
8 4 2 1	8 4 2 1	8 4 2 1	8 4 2 1
0 0 0 1	0 0 1 0	0 0 1 1	0 1 0 0

or, 0001001000110100 in BCD. (Compare with 10011010010 in straight binary.)

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

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

"MOHICAN AS STATION RECEIVER"

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

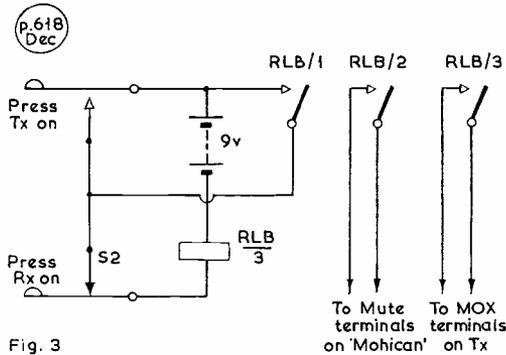


Fig. 3

THE 1970 RADIO AMATEUR'S HANDBOOK

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

"ECONOMICAL AM PHONE ON TWO METRES"

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

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

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

PLEASE NOTE !

— That we cannot accept small advertisements dictated over the phone. They must be written in, with remittance (or a blank cheque for filling to the required amount) addressed to Advertisement Dept., Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

— That likewise any technical queries, or enquiries for the Editorial Dept., should be put in writing, with an s.a.e., and that all such correspondence should be addressed to The Editor, SHORT WAVE MAGAZINE, BUCKINGHAM.

— When sending in an entry for the "New QTH" page, please do not fail to make it clear whether or not you are a direct subscriber. This is only to save office-time in checking the card index which records our direct subscribers. We accept entries for "New QTH's" from any licensed U.K. amateur, including those who are not even readers of the Magazine.

— If you want to offer an article for publication, please do not try to get in touch with the Editor on the telephone. Because we deal with our readers in print, and it is print that we have to make ourselves understood, such matters can only be discussed in writing—and the address is as before: Editor, SHORT WAVE MAGAZINE, BUCKINGHAM.

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

VFO CONTROL ON TWO METRES

DISCUSSING A PRACTICAL DESIGN

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

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

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

The circuit described here is the result of some research

Table of Values

Fig. 1. Circuit of the VFO/Transverter Unit

C1, C3,	R4 = 1,000 ohms
C4, C5,	R5 = 100 ohms
C8, C9,	R6 = 47,000 ohms
C12, C14 = .001 μ F	R7, R8 = 10,000 ohms
C2, C7 = 18 μ F	R9 = 100 ohms, 1w.
C6, C10 = 15 μ F, var.	M1 = 0-50 mA meter
C11 = .003 μ F	ZD1 = Zener diode, 25v.
C13 = 8 + 8 μ F, split stator	X1 = Xtal, 58 mc
R1 = 56,000 ohms	V1 = ECL80
R2 = 100,000 ohms	V2 = EF80
R3 = 22,000 ohms	V3 = QQV03-10

TABLE OF COIL DATA

- L1 — 15 turns 22g. on $\frac{1}{2}$ in. diameter former.
- L2, L3 — Two turns 16g., air-wound, adjust for resonance (see text).
- L4 — 33 turns 22g. on $\frac{1}{2}$ -in. dia. former, with one-turn link.
- L5 — Four turns 14g., $\frac{5}{8}$ in. dia. self-supporting, with pick-up loop.

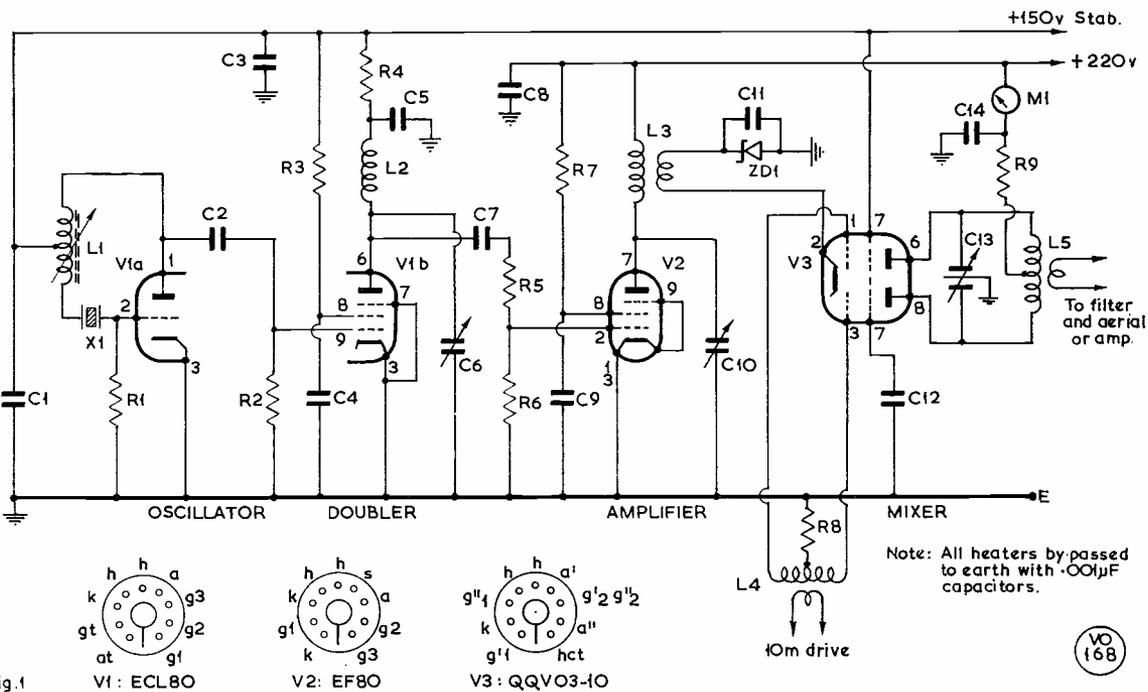


Fig. 1

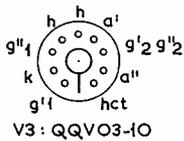
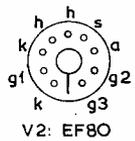
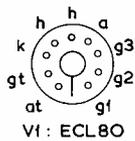


Fig. 1. The Oscillator-Mixer Unit for the Transverter.



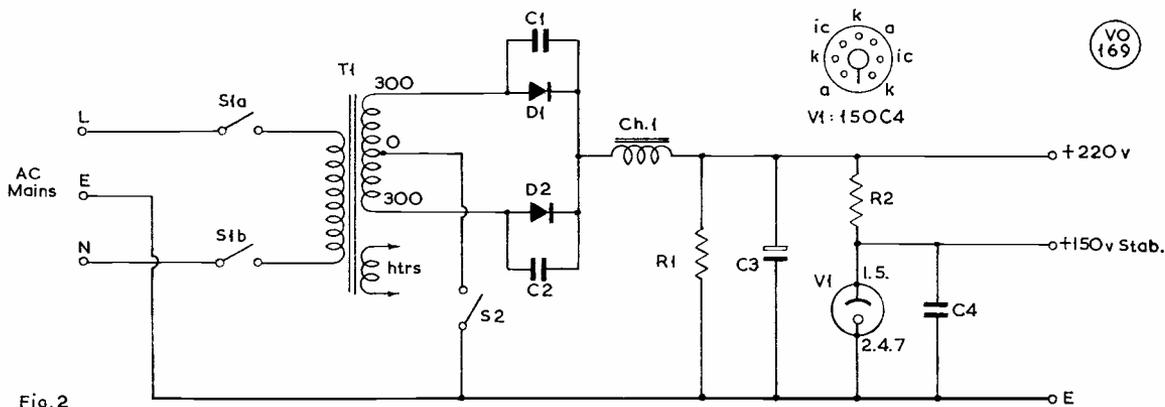


Fig. 2. Suitable Power Supply for the Transverter.

at G3YUA in an attempt to get good frequency stability coupled with true VFO operation over the entire two-metre band.

Circuit Design—See Fig. 1, p.743

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

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

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

This completes the construction of the crystal-controlled injector stages, and they can now be set up and tested. With the power applied, and with no crystal in place there must be no output from any stage, whatever the settings of the tuning capacitors. Any output will indicate parasitics and these could be reproduced in the two-metre band, or interfere with important out-of-band services. Normally, this type of instability can be cured by good screening and 100-ohm grid stoppers. It is most important that these stages be made "clean." With the crystal in place (when oscillation should occur) peak all

Table of Values

Fig. 2. Suitable power supply unit

C1, C2,	Ch = 5 Hy, 100 mA
C4 = .01 μ F	V1 = 150C4
C3 = 16 μ F	D1, D2 = BY-100
R1 = 27,000 ohms, 10w.	S1 = DPST
R2 = 1,200 ohms, 5w.	S2 = SPST
T1 = 300-0-300v., 6-3v.	

stages for maximum output, using an absorption wavemeter. Initially, a grid dip oscillator is helpful in making sure that the tuned circuits are resonating at the required frequency.

Mixer Section—V3

Valve V3 is the mixer, and uses for its bias a 25-volt zener diode, dispensing with the need for a separate bias supply unit. It is important that the diode be correctly by passed, as the top end of the diode must be at zero RF potential. The injected RF is link-coupled from the anode coil of V2 to the cathode of the mixer, with a one-turn link. The coupling should not be too tight, otherwise there will be some difficulty in tuning the anode of V2. The control grids of the mixer are tuned to 29 mc with 33 turns of 22g. on an unslugged $\frac{3}{16}$ in. former, no capacity being used to tune this circuit, and it is made self-resonant with the valve capacities. A point worth noting is that no tuned circuits in this unit should be checked with a grid dip oscillator until all the valves are in place, with heaters running, otherwise the circuits will all appear to be tuned far too high in frequency.

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

frequency driver, the mixer current will increase, but it should not be allowed to go higher than 45 mA.

Output

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

The 116 mc RF is of course the crystal-controlled injection frequency.

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

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

SOLID-STATE CRYSTAL SWITCHING

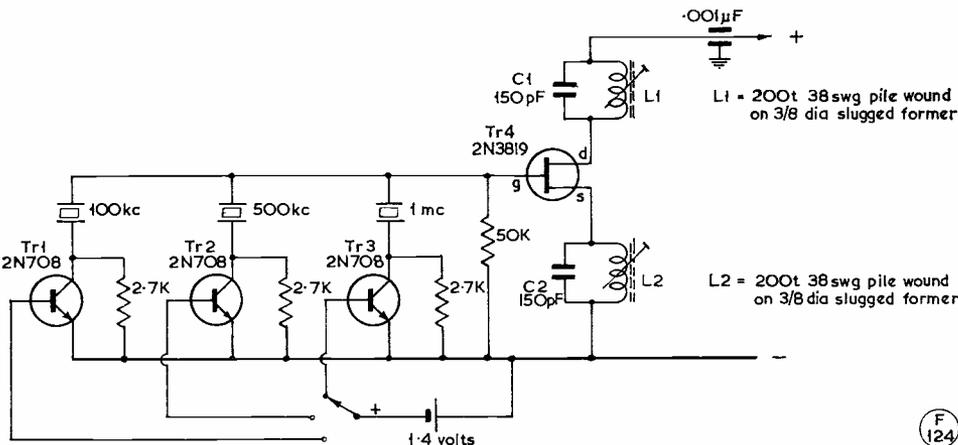
B. A. PICKERS, B.Sc. (G3YUA)

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

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

In the diagram is the circuit for a small crystal calibrator housed in a die cast case, 4 1/4 x 2 1/4 x 1 1/4 in. The crystals are mounted on an external surface.

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



MOBILE RALLY DATES

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

May 10: Rally arranged by Ealing & District Amateur Radio Society, at Hanwell Community Centre, London, W.7.

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

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

June 21: University College of Swansea Amateur

Radio Society's Rally, Singleton Park, Swansea.

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

Organisers who want publicity for their events are reminded that they should send information in to us well in advance. Address is: SHORT WAVE MAGAZINE, BUCKINGHAM.

Become a Direct Subscriber

HIGH IMPEDANCE RF PROBE

USEFUL ADDITION FOR THE
MULTIMETER

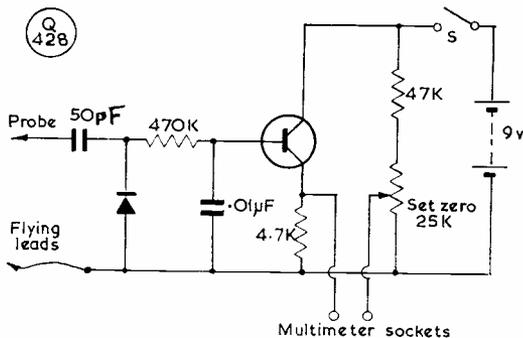
R. C. WHELAN (GW3PJT)

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

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

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

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



Circuit of the RF probe—see text.

MW CAR RADIO AS IF/AF AMPLIFIER

FOR TWO-METRE CONVERTER

M. J. MARSDEN (G8BQH)

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

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

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

(1) The broadcast breakthrough that one would expect on medium-wave is overcome immediately a car radio is used, especially *in* a car. Car radios require an external aerial, no internal device being used, and are usually in a metal case to eliminate interference, which also acts as screening to the RF stages; the body of the car, if it is metal, acts as a further screen around the set. Hence, breakthrough is reduced to a minimum. The author's rig has a small slider switch on the underside of the car set, enabling switching between the normal aerial and the converter output. The small capacity across this switch does give rise to just detectable breakthrough when one is near a strong broadcast transmitter, but this can be checked out by operating the switch to the aerial position to see if it is a broadcast station or a weak 2-metre station. If the car aerial is retracted the breakthrough is completely eliminated.

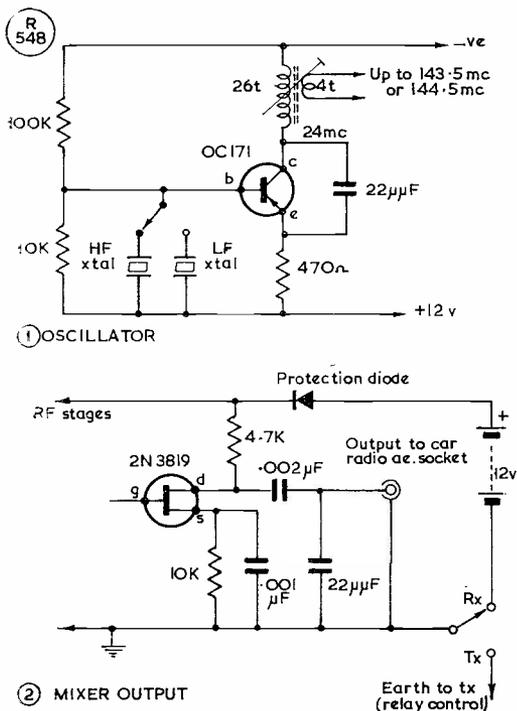
(2) The range of most medium-wave receivers is 600 to 200 metres, that is 500 kc to 1.5 mc. Hence, only 1 mc of bandwidth is possible. Because the 2-metre band is 2 mc wide, the oscillator chain in the converter will have to be capable of giving two different frequencies into the mixer, these being 1 mc apart, so that the band can be covered by two sweeps of medium-wave. This can be done by switching between two crystals in the oscillator stage of the multiplier chain. G8BQH chose to use crystals around 8 mc frequency and multiply up eighteen times, although any starting frequency can be

DETAILS FOR THE TWO CRYSTALS USED

	"LF" Xtal (for lower half of the band)	"HF" Xtal (for higher half of the band)
Frequency Type	7.981.25 mc HC6U	8.038 HC6U
Multiplier Chain O/P.	143.66 mc approx.	144.5 mc approx.
. . . IF Tunes	144.16 mc-145.16 mc	145-146 mc
2nd Channel	143.16 mc-142.16 mc	144-143 mc

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

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



used as long as the correct frequency appears to the mixer. The two frequencies needed in the mixer are 143.5 mc, enabling 144-145 mc to be tuned, and 144.5 mc, for coverage 145-146 mc. Obviously the portion of the 2m. band tuned is determined by which crystal is switched to the oscillator.

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

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

(4) The bandwidth of the converter output itself is 500 kc to 1.5 mc, hence a tuned circuit in the output of the mixer stage cannot be used unless its tuning is ganged to the tuning of the car radio. The tuned circuit can be replaced by a 4.7K resistor and the IF output taken

off through a .002 μF capacitor and a filter to remove any signals above 1.5 mc. The filter simply consists of a 22 μF capacitor across the output socket of the converter. In the G8BQH/M version the noise due to the front-end of the converter is constant when tuning across medium-wave, except there is a very slight decrease in level between about 1.3 mc and 1.5 mc, but this in no way degrades reception in this range.

It can be seen from the table that just one crystal, the "LF," would be sufficient for a station in the south of England, since the majority are below 145.16 mc. In fact, G8BQH/M survived on just the one crystal for several months. Also, it will be noted from the table that the multiplied output of the "HF" crystal appears on Two. The frequency it comes out on is in the section of the band not tuned when using the "HF" crystal, hence no trouble will be suffered by "birdies" on the band. The G8BQH/M converter is free of any spurious signals.

The Main Rx

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

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

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

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

RADIO AMATEUR CAMPANOLOGISTS

During the Swindon Mobile Rally last August, a team composed entirely of radio amateurs rang a quarter-peal of Grandsire Doubles on the bells of Lydiard Tregoze Church. Those involved were: G3FHL, ringing treble; SWL Peet, on the second; G2FIX, on the third; G3UHO, taking fourth; G3NFT, conductor, from the fifth; and G3WJJ, ringing tenor. Time taken to complete the peal was about 50 minutes. This is almost without doubt the first time that a team of radio-amateur campanologists has successfully rung a recognised programme for church bells. Nice work!

ANOTHER BREAK-IN SYSTEM

FOR QUICK AND QUIET OPERATION

A. G. F. DUTTON (G3TIE)

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

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

- (1) *Silent Make:* The Rx must have time to lose sensitivity before getting the fairly strong signal which will leak through the T/R switch,
- (2) *Silent Break:* The rate at which the Rx recovers must be controlled if there is a Q-multiplier or crystal filter near the front-end. If not, there may be a horrid crack on key-up,
- (3) *VFO:* Unless the VFO is completely inaudible during listening periods it will prove most distracting. Even with a mixer-VFO it has been found that leakage can occur.

The most attractive circuits (on paper) are those which are entirely electronic and generally the muting has to be on the AGC line. Apart from a time-constant

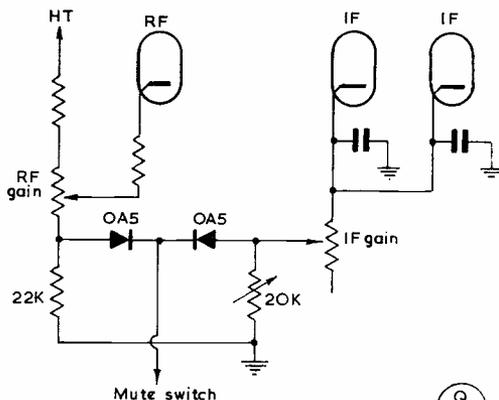


Fig. 2

Q 422

Fig. 2. Suitable receiver front-end modification, applying full mute to the RF stage—see text.

that can make recovery irritatingly slow, muting is necessarily simultaneous with transmission, and this the writer finds unacceptable.

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

Practical Arrangement

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

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

RLA1 is slugged by a 250 μF capacitor C, so that it holds-in between letters and delays the recovery of the Rx until the high voltage that has built up across the crystal filter (or Q-multiplier) has had time to discharge.

While RLA is held in, the reed relay (RLB) will follow the key up to very high speeds quite silently, and the VFO will run continuously, although full BK will allow listening between dots. This can be distracting and therefore a disadvantage, whereas listening between words would be perfectly acceptable, and indeed desirable.

Initially, Relay 1 (RLA) was a dry-reed switch but it was found to give insufficient delay between "make" and "break," so a miniature 2-pole change-over relay

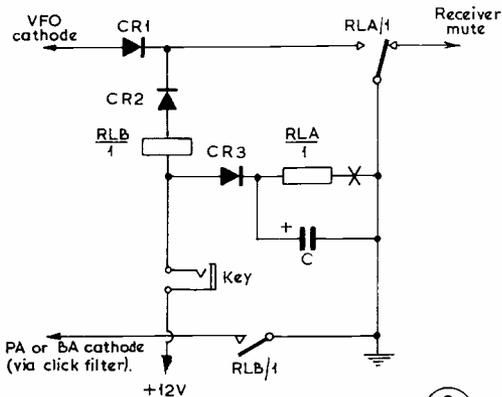


Fig. 1

Q 424

Fig. 1. Circuit of the change-over system for quiet break-in. Values are: C, 250 μF, 12v.; CR1, CR2, OA5; CR3, BY-100; RLA, miniature change-over, 400-ohm (see text); RLB, "Radio-spares" Type 6RSR, dry reed. A resistor can be inserted at point X if necessary to adjust the resistance of RLA.

was substituted (S.T.C. Type 24, 130 ohms). A 220-ohm resistor was wired in series to slow down the action of this relay and to reduce the discharge rate of the slugging capacitor.

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

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

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

COMMUNICATION and DX NEWS

E. P. Essery, G3KFE

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

The Tables

As promised, some changes. The existing Six-Bander, and the Top Band Ladder will remain as they are. However, a Five-Band Table, excluding 1.8 mc and starting from *January 1, 1970*, will also appear in future.

In addition, we will have a "Counties and Countries on Top Band" Table, covering a period of up to one year of operation on Top Band. This is primarily for First-Year operators, who should specify the date of first licensing in the initial entry. There will be a "place of honour" at the top of the Table, in which will go the callsign of the station which has turned in the best score in a period of one year and the score he actually made in the specified period of one year. New licensees go in from the date of first QSO, and come up for consideration for the place of honour one year from that date. Owners of old calls may not come into the Table proper, but

may be considered for the place-of-honour on the basis of their score taken over any period of exactly one year, which must commence on or after January 1, 1969, and be specified. The Table will be in two sections, CW/Phone, and CW Only, and there will be a seat of honour for each section. Since it is hardly likely that anyone can work all 98 counties and also make a score better than W1BB's 103 countries in one year, there should be plenty of scope!

Please start sending in claims for the new Five-Band Table right away—countries worked on 3.5 to 28 mc.

Top Band

This is the time of year when Top Band really begins to hum in the DX context. G3IGW (Halifax) fixed himself up some tests with VK6NK and SWL's Allen and Drew, all of Perth, Western Australia, to run through the last three weeks of December. Conditions seem to have been extraordinarily good, and Mike rang the bell well and truly on December 13, with his signals peaking 589 to SWL Allen and a good solid contact with VK6NK into the bargain. On the 15th, G3IGW was heard 1400 miles further east by VK5KO, for four minutes. As if this were not enough, the tests continued, with DL9KRA, G3RPB, EI9J, GI3OQR and G4QD known to have been heard in VK6-land. Then again on December 23, G3IGW made a second two-way of it. He was heard in VK no less than eight times during the periods of the tests, and has the QSL and the tape of the

QSO from SWL George Allen to remind him of the feat. G3IGW found the 160m. band generally in better shape than it has been for some time, and made a first-ever QSO with 9X5SP at 2115z. Other signals hooked in the late evening period before midnight included VE3EK at 2230, VP9GJ at 2247 and KV4FZ at 2234z, as well as K2GNC at 2115z. Thus, Mike's score for countries on Top Band shoots up from 42 to 46, which must make him the pacemaker for the U.K. Congratulations to all concerned!

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

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

would be a fine achievement.

It is well said that work is the curse of the drinking classes; and for GI3WSS (Co. Down) work has most definitely put a damper on his activity. However, Cyril did manage to connect with GD3SVK, raised a card from OE7ZUJ/P for a new country confirmed, and got a certificate from *CQ Magazine* as Top GI in the 1969 *CQ WW 160 Contest*. Congratulations.

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

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

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

G3XTJ (Palmer's Green) seems to have been doing nicely, having booked in HB9T, OE3KIW, OE5XXL, ZB2BO, in the way of EU/DX, plus GW3JNA, GW3AKB, GM3EZQ and GC2CNC (Jersey) who is hampered by a very poor aerial for Top Band, but will continue to be on while he can raise the stuff.

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

That light-house site of GW3UUZ's is near ideal for Top Band, and the

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

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

Nice to hear again from GM3IAA (Inverness) after a very long silence. Jim has been having a dabble in the TransAtlantics, and comments on the effect of the time-difference between him and the folk down in South England. For instance, on January 11, at 0803z, W1BB sent "band dropping out fast, now QRZ" to which GM3IAA replied, for a last desperate try. Back came W1BB at 0810z reporting the GM3IAA signal peaking to 559, at a time when the south of England stations were lost to W1BB, and all but gone with GM3IAA himself. The uninitiated may well enquire "So what?"—but it proves once again the old Top Band adage that the path from A to B is open during darkness but *peaks* around the dawn period at one end or the other of the path, very markedly. And it also points up the advantages or otherwise of having a site that sits on the right sort of ground. GM3IAA has an aerial which is probably better than average—he knowing about aerials—but signals to W peak at about 3-4 S-points lower than they do to the general run of stations down South, purely as a function of the local rock structure.

G3VPS (Wartling) will be with

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

Eighty and Forty

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

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

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

At G3VMK (Abbots Langley) the emphasis has been on 3.5 mc CW, in the morning period. In terms of results, we see all W call areas, including five W6's and a couple of Sevens, assorted ZL's, 9Y4 for a new one, KH6GLU who escaped the net, and VK's. The evening gave ZL, UL7GW and a few UA9's, all around 1630z, JA1MCU missed at 1830z, and CT3AS worked at 2200z. The main gripe—a G5/2 using 3508 kc on AM at 0830z on Saturday mornings! This particular character wiped up a three-way contact between ZM3GQ, WB6HGU and G3VMK. Turning to Forty, not so much activity was registered, but a careful listen around at lunchtime on December 27 showed JA's and VS6DO there at potentially workable strength.

G8HX (Mansfield) has deserted Top Band in favour of the HF's, the reason being the arrival in the shack

of a DX-100U which Frank reckons to be an FB CW transmitter—it certainly is. All the bands have been tried, but Eighty is being given fuller treatment, with most W call areas raised before going to work. An “oddie” was SM2AX, working other stations over a period of a couple of hours and giving his location as “Oslo.”

An unfamiliar callsign on the LF bands enters the lists at this point, namely G3NOF (Yeovil) who has put up an E-W wire, 274 feet long and fed through an L-match, at 30 feet. This has been used in the evenings and early morning periods with some effect. Around 2300, conditions have been pretty fair to VE1 and VO1, while mornings have shown up VE3, W and South America. Three gotaways were KV4FZ, HK3WO, TA3MQ. But OJØMR, PY7ASQ, TF5TP, VE1AAW, VE1ALJ, VE1IE, VE1UA, VE3ACD, VE3DLC, VE3WQ, VO1CM, VP9GJ, VS6DO, YV4UA, W2HCW, WA1A1M/VO2 and XE1KS all fell neatly into the bag.

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

At G3VLX (Sidcup) the threat to desert Top Band has become real—not a mention this time, although the 200-foot end-fed has not been idle. CW on 3·5 mc gave 3Z9PT, OH3MM, HB9QA, DM4ZXH, UY5MV, UC2LB, HA8KCK, while SSB produced LA, DK, OY1R, YU, OK, I1, GM, ON, EI, PA, OZ, to start off the score in countries.

Eighty SSB gave G3XAP a first-ever in CN8MN—but the main interest was down at the CW end of Forty. Phil lost a QSO with a W7; he disappeared under a G2 who came up on channel, worked a well-known G3/3, and then complained bitterly that G3XAP was QRM'ing him! The lost QSO was in fact Phil's first W7, on any band, which was bad enough—but to add insult to injury the offender was overdriving his KW-2000 and producing clicks over a wide area, so had not read the instructions about driving his transmitter! One can sympathise to some extent with both sides in such a situation—G3XAP robbed of his prey, and the G2 probably wondering

whatever had hit him and almost surely not knowing a W7 was anywhere around, let alone right underneath him. But the situation need never have arisen if the tacit agreement to use the LF 10 kc for inter-continental working were rigidly observed by all concerned.

G3XTJ has a semi-vertical dipole, as he describes it, with which he has been giving 7 mc CW a pretty fair roughing-up, more being heard than actually worked as yet, while he finds his feet on 40 metres. Worked were VP2MU, OJØMR, UO5, EA, most W call areas and VE. “Heard” included W6, PY, PJ2HT, HK2RAC, XE2WS, XE1OE, YV1PW, VK2AVA, VK3MR and C31AP.

CW was also the mode favoured by G2DC (Ringwood). Though Jack only operates using the key, he is not averse to listening round the Phone areas in the search for information which could lead to an improvement in his scores. Jack, “acting on information received” in this way, found a new one in the shape of OJØMR, as well as raising VP9GJ, XE1RV, most W call areas, and VE1-3. Jack thoroughly approved of the way the

OJØMR, Market Reef, exercise was carried out by the OH chaps, and their slick operating. Apparently, the Reef well justifies the granting of independent country status, as it boasts a lighthouse as well as the statutory horde of crabs! Seriously, whatever may be thought of the *criteria* currently being used to define a “country” one cannot but admire the way this particular show was organised and carried out. As for Forty, the grapevine worked again when Jack got the buzz that EA9EJ used CW in the small hours. Consideration suggested between 0100 and 0200 should do it, so Jack turned out at 0115z, heard him, hooked him first call, and was back in bed by 0145! Market Reef was also raised, at 0630z, to make it two new ones for the band and the run-of-the-mill stuff added all W call areas, as well as VE1-4.

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

SIX-BAND DX TABLE

(All-Time Post War)

Station	Countries	28 mc	21 mc	14 mc	7 mc	3.5 mc	1.8 mc
G2DC	338	172	309	329	167	116	20
G3DO	337	202	242	330	90	83	9
G3NOF	318	187	220	302	35	49	2
G3LZQ	259	140	156	208	72	38	8
G3KMA	249	191	178	187	123	54	11
G3IGW	207	127	156	168	125	101	46
G3RJB	168	75	54	153	60	37	8
G3XBY	164	108	115	102	70	56	6
9H1BL	163	95	95	123	56	48	—
G3PQF	161	105	47	98	84	56	13
G3VPS	135	46	42	115	58	38	14
G3WPO	103	35	24	66	49	30	21
G3XAP	95	44	46	43	42	29	13

Note: Placings this month are based on the “Countries” Column. Claims must be made at least every three months to retain a place.

power out from the shack if real success is to be achieved.

The HF Bands

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

Contests

Several to mention this time: We have already talked about WAB

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

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

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

Advance warning now of the *CQ WW WPX SSB* affair, which plays off over the weekend April 11-12. Rules are as in previous years, with the exception that this year as an

experiment *double* points accrue from QSO's made on 160, 80, and 40 metres. Don't forget that in this one it is prefixes, *not* countries, that count for multipliers, and that only thirty of the 48 hours may be used, rest periods being 18 hours in up to five periods.

Results, now, also from *CQ*. Last year's *CQ WW WPX* battle showed KV4FZ as winner in the multi-band single-operator category, just to prove he is no one-band merchant. But, sadly, only a couple of U.K. stations anywhere in the lists, these two being G3NLY with the best single-band entry on *Forty*, and GM3VTB who came sixth on *Eighty*. Claimed scores—not results—for the *CQ WW DX Phone* and *CW Contests* for 1969 are also to hand, but the only G call noted anywhere, CW or Phone, is that of G2BW, sixth in line in the 28 mc single-band CW list. It baffles us why there are not more U.K. entrants for these Contests—as we know, large numbers take part!

Awards

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

This and That

A very hot-under-the-collar letter comes from G3YJD (Watford) who complains that DX stations *encourage* bad manners on the bands, in that operators who call in before the end of a QSO are given priority by the DX station, while those who wait in the queue get left in the cold. Fair comment, as far as it goes, but distinctly unfair to the DX chaps. Clearly, when a "DX station" is by modern definition not so much a long way off but rather a *new country* to the 'chaser concerned, what is DX to G3KFE may be of no interest what-

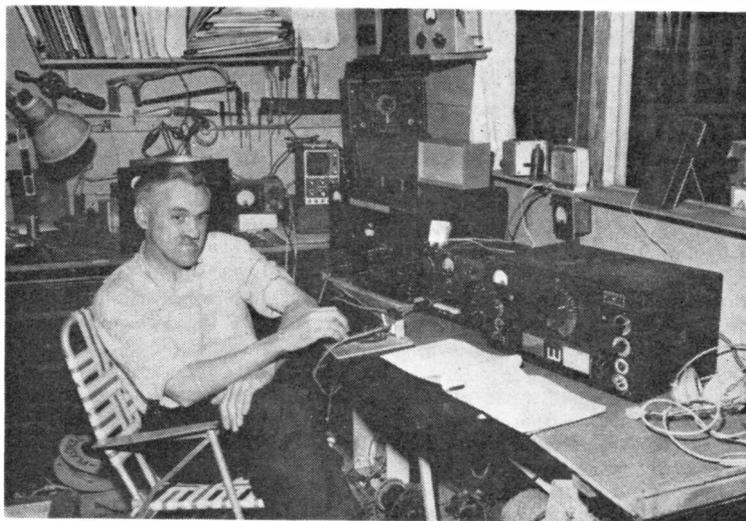
TOP BAND COUNTRIES LADDER

Station	Confirmed	Worked
<i>Phone and CW</i>		
G2NJ	98	98
G3HDO	98	98
G2HKU	96	96
G3WPO	95	94
G13WSS	90	92
G3VLX	81	97
G8HX	76	83
G3XTJ	63	88
G3XTL	62	78
G3KFE	50	66
G3LXD	37	65
<i>Phone only</i>		
G2NJ	98	98
G3TSL	94	97
G3WPO	91	90
G3VGB	84	95
G3PQF	81	92
G3XDY	39	67
G13WSS	44	59
G3NPB	17	62

(Failure to report for three months entails removal from the Table. Claims may be made at any time. Six months of "Nil" reports will also result in deletion.)

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

Changing tack a little, a welcome note from W6AM (Long Beach, Cal.) encloses some historical information on Don's set-up over the years. His first Phone station was an *arc* job, about 1912, using the call 6OC with an aerial that ran over three sets of 2200-volt power lines! 1919 saw him signing 6DR and working spark with Art Collins of Cedar Rapids (now of Collins Radio) over 200-300 miles. The Phone rig of the same period had one 7½-watt bottle, with a rheostat for the filament voltage, which was critical if good oscillation and modulation were to be obtained. On this 6DR worked the G.E. Co. in Schenectady—remember KDKA?—and was then licensed for a series of tests to determine what wavelength should be used by the BC stations of the time: 200, 400, 800, 1200 or 2500



Frank Stork, G3TEE, has his radio amateur being in a shack at the bottom of his garden at 75 Waterloo Lane, Bramley, Leeds, 13, where most of the gear is home-built, though he has a CR-100 and an HRO as receivers.

metres. FCC decided on 400 metres, and gave amateurs 375-metre licences, so they could call the BC stations and give reports direct! Sadly the pictures are not reproducible, but that of the 1919 rig depicts clearly the spark-coil and the tackle of the period. The other picture, taken at IRE Wescon recently, shows W6AM and W6EA, who worked regularly in 1912, alongside a display of the gear of those times. Nearly sixty years a radio amateur—some record! And still near the top of the DXCC ratings, at that.

Some recent prefix announcements may be of interest: A few have already been heard, but others are still dormant. A2 for Botswana, C2 for Nauru, C3 for Andorra, 3BA Mauritius, 3CA Equatorial Guinea.

Ten Metres

After the diversion, back to the matter in hand. G3NOF found a few ZS's around 0900, followed by VK about 1100, with N. America in the afternoons until the closure near 1700; this was followed by the odd re-opening at 1800z. SSB QSO's were registered with AX3VK, FL8MB, XW8BP, YS1XEE, all U.S. call areas other than W7, ZS, and 9J2ED.

Trials at G3VLX of the new rig with a W3DZZ-type trap dipole

resulted in SSB contacts with W, UB5, VU2, 9J2, 5N2, and G(!) to start the score rolling.

G2DC looked, as always, mainly at the CW end, where the band was opening to the East around 1000 and to VK most days at 1100. AX2BPN, VK2FZ, MP4BBA, VK8HA, VK9GN, PY1HO, UF6FE, ZE1DC, ZS1EJ, all W call areas and VE1-4. Jack was a little startled at the collection of odd prefixes that came his way as, for example, AX(VK) Cook Bicentenary; CV, which is CX in a new shirt; and 4M5 for YV.

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

Keep a look out on 28·028 CW for the QRPP signals from G3XBY (Wombourne) who has a couple of BC-109's in the PA to take 500 milliwatts. With this he has raised UA1DV at 449, and G3TCK at 549. However, being crystal-controlled is a bit of a snag, and Dale would appreciate reports. With the big rig, Sideband yielded JW1CI, VP2AC,

XW8BP, ZC4AK, ZE, ZS, 5Z4LS, 6W8AL and 7Q7JG.

QSL Matters

A few points of interest crop up in the "DX-pedition of the Month" *Bulletin*, to hand from W2GHK. First, the question of care in getting *time* right on the QSL card—a surprising number of people get snarled up by keeping the shack clock on local time. Stay with GMT—and licence conditions! In the case of contest QSO's, the band and serial number of the QSO are a help. W2GHK points out the need for an s.a.e. for each and every card for which *direct* return is desired, for the simple reason that DOTM cards are handled by several volunteers from various locations, which confuses the issue no end if you want to get several cards into one envelope. Another good reason is that if one of the cards you want in that envelope is for a station who has been a bit tardy in sending in logs, then the whole batch are hung-up waiting the late arrival. However, DOTM have no objections to Bureau cards, and deal with all cards from the Bureaux, sending return cards the same way, as also they do for direct cards without s.a.e. or IRC. Incidentally, a 4 × 9½-inch envelope, stamped and self-addressed, will result in a copy of the next *DOTM Bulletin* if you want it. Address is: P.O. Box 7388, Newark, New Jersey, 07107, U.S.A.

Some other addresses: G3XTJ quotes VP2MU as being *via* VE2YU, and OJØMR *via* OH2NB. From G3NOF we have TF5TP *via* DL7FT; PJ7JC through VE3EUV; CN8DW to W6GZI; all VP2V's *via* VE3ACD; HL9UZ to WA2FRW; HL9VL to WA7KSD; XW8BP to DL7FT; CT2AK to VE7BWG; VP9BK to VE2DCY.

Fifteen Metres

Of course, for this band it is usual to think of GM3JDR (Golspie) who has been exclusively on 21 mc for a long time now. Activity has been down somewhat in that Don has been packing up for a move up over to Auckengill, Wick, Caithness—if he gets much further North, he will fall off the end! However, the new place is country so no TVI troubles should arise, and there is lots of room to lay out an aerial farm. This should, in due course, result in

operation on all bands from Ten to Top Band. Only one DX SSB contact was registered during the month, with ZS5IQ, but CW came up with IRØXPS, YT2OR, KZ5KBN, KP4DXW, 9H1AY, VK5DS, PY1DB, 9H1AZ, ZB2BO, TJ1QQ, SU1IM, 4Z4GG, PY7VMT, UA9BZ, VK6SA, UH8KAA, all W call areas except 6 and 7, and the same areas for Novice calls. (Incidentally, if you are on CW, don't forget to look for the U.S. Novices.)

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

However, G2DC reckons 21 mc to be the best of the boiling for good all-round DX with tolerable QRM levels. Jack finds it often pays to hang on when the band appears to be dying out to the U.S., as often

some good QSO's may then be racked up with South Americans. G2DC worked CW with OJØMR, OA, CX, LU, PY, VK's assorted, TJ1QQ and XW8AX.

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

Twenty

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

G2DC describes 20 metres as "boisterous" during daylight hours, with all-round DX to be found. For him, OJØMR was a new one on this band, and ZM1AAT/K on the Kermadecs, who said he would be there for a while and gave the best times for U.K. contacts as 0730-0800z *via* long path, his favoured frequencies being 14030 and 14195 kc



These three old timers—left to right: G5VQ, ZE3JO/G2SO and G6CT—total between them more than 100 years of Amateur Radio.

for CW and SSB respectively.

Aerials of all shapes and sizes pop up at GW3UUZ, and Andy used a 270-foot end-fed at 90 feet to raise VU2OLK for a new country.

G3NOF found the mornings pretty unproductive, the openings to VK/ZL being poor and of short duration, but W6 and W7 have been pretty strong around 1700z, with evening openings to Central and South America. CE0AE, DU1FH, FG7TH, FP8CS and HL9VL all escaped, but Don did manage to bring in HL9UZ, JA's, OJ0MR, TA2SC, TU2CS, VE4ZX, VE6AO, VE7AAD, VE7BD, VK's, VP2VI, VP8KD, VP8KO, W6's, W7AAD, W7BBH, W7BTH, W7CHZ, W7LFA, ZL and 9Y4AA.

G3XBY rang up his first 100 countries on Twenty by raising GM3JUD on CW, a method which also turned up PJ2VD. Sideband gave VP2VI.

Forward Planning

February 8 is the start timing for TI9CI to be in business for about five days; there is a rumour that the lads plan to go on to Roncador Cay and operate from there as W9FIU/KS4B. W4AMG/Spratly will probably be all over by the time this is in readers' hands, Jens being accompanied by operators of the calibre of HS3DR, VS6AA, VS6BF and



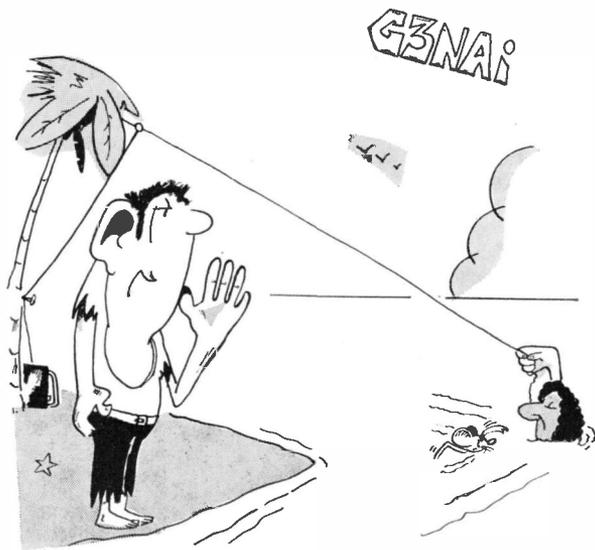
The GB3IEF group, of the Lothians Radio Society, on the occasion of the Edinburgh International Festival. Left to right, standing: GM3SBS and GM8BPL, with GM8BJF and GM3OWU, seated right. They worked over all bands, and also ran RTTY and CG/TV.

VS6DR. From there Jens has ideas about activating several rare spots with the help of his yacht *Exodus*. Cards, and donations *after* the trip to help finance the next one, to P.O. Box 16321, Hong Kong accompanied, in the case of cards, by an s.a.e. and five IRC's. This is only one of the boats which, if plans for 1970 all mature, will be out. Another, *Mia Mia*, is already fitted up with Yaesu (Sommerkamp) transceiver and linear.

Keep tabs on TJ1QQ, as it is believed Herman will shortly be on from Fernando Poo, with the new prefix, 3C1QQ—cards to W4DQS for this one. Qatar is coming up soon—latest information suggests February 21-27, with OD5BZ and various other operators. Cards should be sent to MP4BHH, with s.a.e. and IRC.

Sign-Off

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



"... out a bit further, Martha—can't get resonance on Top Band ..."

VHF BANDS

A. H. DORMER, G3DAH

THE comment about conditions last month might well be repeated. With the exception of a couple of very minor lifts, which brought propagation up to the height of terrible, the bands have been very unstable. Pressures from Christmas up to the first week of January showed *maxima* and *minima* of 1022 to 1000 mb, but the bad weather from January 8 until January 14 coincided with a drop to just over 990 mb, and activity and DX went with it. At least the *Quadrantic* meteors in early January did some good for M/S operators. It was instructive to note that under these poor tropo. conditions, it was the well-modulated signal which was getting the contacts. The S6 carrier and 50% mod. chap was calling CQ fruitlessly.

QSL Points

Month after month your scribe records QSL return rates as supplied by winners of the various VHFCC Awards, and month after month the same order of figure crops up—something around the 50% mark, and this seems to be true irrespective of the band in use. The reason for quoting these figures is that the frequency with which they were included in the data on the station, as supplied by the claimant, seemed to indicate the widespread interest in this particular aspect of Amateur

Radio, and so it was decided to try and find out a little more about the causes of the general dissatisfaction with the prevailing state of affairs as regards QSL'ing.

The first step was to eliminate any suggestion that the various QSL bureaux were at fault. These are run by a hard-working set of chaps who get very little thanks for it, but who run the service very well, as is testified by the generally favourable reply received to the question "How do you find the QSL Bureau?"

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

Then there is the QSL direct. It appears that many operators wanting a particular card have assumed that because they have sent a card direct, they will automatically get one back the same way. Consider the case of the DX-pedition where a hundred and more contacts are made from some rare spot. Most of the stations contacted will want a QSL card, and the cost of sending these out by post, to say nothing of the cost of the cards themselves, may be more than Club or private funds should be asked to bear. So, if a card is wanted urgently, send one direct by all means, but do not fail to put an s.a.e. in with it—making the envelope large enough to take the average-sized card.

There is also the question of the value to the recipient of the information contained on the card. The fact that the old-timer's 100-watt signal was received RS59 at a range of 50 miles is hardly likely to engender

such a burning enthusiasm in his hoary breast that it would require a posse of police to restrain him from rushing down to the Post Office to send a return QSL by special delivery! But even a short-range report *can* be useful if it includes other than straightforward reception information, and is more likely to get a response. It is to be deplored that so many QSL cards these days seem to contain so much pictorial and other irrelevant matter and so little space for useful comment.

Admittedly, this enquiry was not particularly widespread—some twenty amateurs in various brackets were contacted—but it highlights the points made by the majority, and may help to bring up the general return-rate.

* * *

With effect from December 15, a new QSL Bureau has been in operation for Eire. The address is: EI-QSL Bureau, PO Box 73, Athlone, Eire.

It has been reported by the French authorities, and it must be true for other European agencies also, that a large number of QSL cards are routed to their QSL bureau addressed to foreign stations which have been operating in that country while on holiday (with an FØ callsign, for example) and with no indication on the card to show the callsign or address of the operator in his *own* country. Obviously, this makes the task of forwarding such a card a tedious business. It is suggested that when making out cards for such stations, and this could also apply to G5/3 calls, the visitor's home call should also be included. Similarly, stations with special calls should lodge particulars of their home call and address with the relevant QSL bureaux.

There seems to have been a spot of bother with Belgian amateurs and their QSL bureau, as a result of which the incorrect address has been inserted in certain publications. The correct QTH is now: UBA QSL Bureau, PO Box 634, Brussels 1.

Beaconry

The VHF beacon at SM4UKV has been withdrawn from service and will not be reinstated. The Swedish authorities are considering the installation of two new beacon stations,

SK1VHF on the island of Gothland, and SK2VHF in the neighbourhood of Umea in Northern Sweden. Further information as it becomes available. The Max Planck Institute beacon, SM4MPI, continues to be heard in this country and is a very good indicator of propagation towards Scandinavia. Frequency is 145.96 mc with a power of 150 watts, and although the antenna is headed 330° it seems to have a good side-lobe into the U.K.

The Radio Society of Rhodesia has been advised by the Ministry of Posts that the 50-54 mc band is withdrawn from amateur use as it is required for TV. There has been no activity on 50 mc since December 1969, and hence no ZE1AZC beacon, although the 70 mc installation is still operative.

The ZB2 beacons are to be moved to *Iceland* following the withdrawal of permission for operation on the Rock. Frequencies will be 145.129 mc and 70.275 mc and operation will be continuous. To those who raise an eyebrow at the frequencies, which do not accord with the new Region 1 Plan for beacon operation, the answer is that they are to be Government sponsored and are not, therefore, required to conform. The third beacon will be on 50.009 mc and operation will be restricted to outside the limited number of TV hours in Iceland.

The Sutton Coldfield 70 cm beacon should shortly be showing on 433.5 mc with the callsign GB3SC.

GB3SX is on 70.699 mc during tests and will ultimately be set up at Crowborough, Sussex. Permission is being sought for two beacons in the 23 cm band, one probably in Bucks. and the other on the South Coast.

Australis "Oscar 5"

The date for the launch of this satellite goes back and back. The latest forecast is now January 19, so by the time these notes appear it may well be up there. Just to recall the salient features: This is *not* a transponder, but carries a beacon operating continuously on 144.050 mc with a power of 50 milliwatts. It will have a retrograde orbit with a period of about 115 minutes and an inclination of 101.6°. Reception of the signal should be possible using standard amateur equipment, although the interpretation of the telemetry will

FINAL ANNUAL THREE BAND TABLE

January to December, 1969

Station	FOUR METRES		TWO METRES		70 CENTIMETRES		TOTAL pts.
	Counties	Countries	Counties	Countries	Counties	Countries	
G3DAH	25	3	70	16	19	6	139
G3COJ	15	2	60	3	28	7	125
G8BMD	—	—	58	9	37	8	112
G2JF	—	—	60	14	29	7	110
EI6AS	29	7	55	12	—	—	103
G3LAS	26	2	49	11	13	2	103
G8AUE	—	—	44	5	40	9	98
G8ATS	—	—	43	7	39	8	97
G3EHM	—	—	56	11	23	4	94
G2AXI	28	3	41	8	10	1	91
G3EKP	34	6	24	6	11	3	84
G8APZ	—	—	47	8	20	5	80
GD2HDZ	—	—	50	7	17	4	78
GI5ALP	14	6	45	10	—	—	75
G8AYN	—	—	33	6	23	7	69
G8BYV	—	—	28	9	22	8	67
G8BWW	—	—	54	10	—	—	64
G8ADP/A	—	—	36	6	19	3	64
G3OHH	51	6	—	—	—	—	57
G8AUN	—	—	43	11	—	—	54
G8CEZ	—	—	45	8	—	—	53
G3TDH	46	6	—	—	—	—	52
G8ABA	—	—	41	7	—	—	48
G8BJK	—	—	39	6	—	—	45
GW5NF	—	—	37	8	—	—	45
G8APJ	—	—	26	6	8	2	42
G8ASR/A	—	—	35	6	—	—	41
G8BJC	—	—	34	6	—	—	40
GC8AAZ/P	—	—	35	5	—	—	40
G3AHB	—	—	24	4	8	1	37
G8BKR	—	—	21	3	10	2	36
G8BDJ	—	—	23	6	4	2	35
G3KMI	12	1	14	3	—	—	30
GW8CGN	—	—	26	4	—	—	30
G8ARM	—	—	—	—	23	5	28
G8CZD	—	—	17	3	—	—	20

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

FINAL 23 CM ANNUAL TABLE

January to December, 1969

STATION	COUNTIES	COUNTRIES	TOTAL
G8AUE	14	2	16 (Also 1 + 1 on 13 cm)
G8ARM	7	1	8
G8ADP/A	5	2	7
G8BAV	3	1	4
G8AYN	1	1	2

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

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

VHF Annual Tables

Overall winner this year turns out to be your scribe with a lead of 14 over the runner-up, G3COJ of High Wycombe, Bucks., who will receive a year's free subscription to SHORT WAVE MAGAZINE. Congratulations, Brian.

It is pleasing to record that a total of 36 callsigns appeared in the overall Table this year, compared with 24 in 1968, and that six operators achieved the century compared with only three last year. Propagation conditions in 1969 were not all that better, so it may be assumed that activity was higher. Undoubtedly, the G8/3 activity accounts for much of this. A highly satisfactory state of affairs.

The Four-Metre section was headed, once again, by the indefatigable Roger Hargreaves, G3OHH, operating from Mow Cop, who pushed up his total from 55 to 57 to give him a lead of 5 over the runner-up, G3TDH of Luton, Beds.

Kent was well represented in the two-metre section by G3DAH and G2JF who occupied first and second places, with G3COJ close behind. There were 33 entrants this year

against the 23 of 1968.

G8AUE got home in the 70 cm section, and also led in the 23 cm Table by a substantial margin.

Thanks go to all readers who have supported this feature during the year. The new Tables start from January 1st, 1970, so please send in your claims regularly. It would be of interest to see more entries for 23 cm.

The New Band Plan

Although it is perhaps early days yet to comment in detail on the impact of the new VHF Band Plan, there are a couple of points which are worth making. The first is that one *still* hears phone in the CW segment of 144.0 to 144.15 mc. This has not been noted on Four or 70 cm. How much is ignorance and how much deliberate one cannot know. However, for those who have not yet re-crystallised, but who would like to, the facility of a crystal exchange through this Column is still open.

The adoption of a Modulation Index of 1 for NBFM operation has caused some criticism since, as pointed out in this Column in October last, this index is not a constant. The *IARU Region 1 Bulletin* for December 1969 throws further light on the subject by suggesting that the Deviation Ratio should have been specified rather than the Modulation Index. The intention of the Brussels Conference in May 1969 was that a standard should be specified such that NBFM really was narrow-band (NB). This the use of the Modulation Index did not do. A specified Deviation Ratio of 1 (unity) does, however, produce the required

answer, since the definition of this constant is that it is equal to the maximum deviation under full modulation divided by the maximum audio frequency permitted—so, with a maximum audio frequency of 3 kc and a deviation ratio of 1, the peak deviation will be 3 kc, the standard required. Since the average male voice does not carry significant amounts of the higher audio frequencies, the difference in bandwidth radiated by an NBFM system with a deviation ratio of 1 and an audio of 3 kc, and the equivalent AM transmission, is barely detectable. So, *Deviation Ratio* of 1 it should be.

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

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

VHFCC Awards

Awards this month go to Mike Gibbings, G3FDW, a very well-known operator on four metres; to G8CAI, Richard Flowerday; and to Robert Hooper, G3WEV, the two latter for their work on two metres. Congratulations to them all.

G3FDW operates from Retford in Notts. and has a QSL return rate better than any reported so far. Out of the 69 English counties worked, he has QSL's from 68 of them, which is pretty good going. All contacts were made with SSB, CW or NBFM, as Mike does not usually work AM. Details of his station appeared last month.

From Harlesden in North London, G8CAI gains the two-metre Award with a QSL return rate of about 75%. The QTH is 100ft. a.s.l. with an excellent take-off in all directions except around North, where he gets screening from the house, but this is shortly to be remedied by raising the 8-element Yagi from 27ft. to 38ft., with the eight-over-eight slot for 70 cm at 42ft. Most contacts have been made with a QQV06-40A PA running at 50 watts input, and modulated by a pair of 5B/254M's in Class-AB1, although a 15 watt rig having a QQV03-10 as the output stage was also used for part of the time. The receiver is a home-built transistor double conversion superhet with a tunable IF of 16-18 mc, the first stage being a 2N3819, but again, for part of the time, an R.1155 was used with an FET converter. It looks as if Richard has found plenty of time for construction as well as for operating. The latest project is a two-metre Tx with a BLY33 in the PA.

Bristol is the QTH from which G3WEV gains his Award. A black spot for VHF, he says, although one must remark that this is not so for everyone—look at the way G6GN gets out! The gear used was a TW2 transmitter to a six-element beam at 25ft., the receiver being a JKK converter to a Heathkit RA1. The

QSL return rate was initially 55%, all contacts being QSL'd direct, and a further reminder card raised this to 75%. Bob does not say if he sent an s.a.e. with all the cards, but if he did, someone is being a bit mean.

DX - o t i c a

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

Readers of this Column in the December 1969 issue will have seen the reference to the outstanding achievement of G3LTF (Chelmsford, Essex) in working no less than five OH stations during the opening to Scandinavia during October last. Further details of this success are now to hand. The stations worked were: OH0AA, OH3TE, OH2GY, OH2NX and OH3RG, all between 2000 and 2130z on the night of October 19. Signal strengths varied between RST 539 and RST 579 for all contacts. At 2130, OH2AA had climbed to RST 599! To put this into quantitative terms, the signals were about + 10 dB over noise in 500 c.p.s. Peter followed these QSO's with contacts with SM3, 4, 5 and 0, and from an examination of the QRA Locators given, it looks as if the ten contacts gave an average range of some 1,100 miles. His best-ever DX contact on extended tropo. propagation on two metres remains that with UA1DX in Leningrad.

MAJOR METEOR SHOWERS—1970

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

* * *

On November 16, G3LTF had a M/S QSO with OY2BS *via* the *Leonids*. It took about 1½ hours to complete, and peak signals were up to 30 dB over noise in 100 c.p.s. He has recently been hearing W1FZJ /KP4 on two-metre E-M-E, having rigged up a couple of crossed 10-ele Yagis for the purpose, since nearly all his E-M-E work these days takes place on 70 cm, with a dish antenna. Just before Christmas he was copying the KP4 at 8-10 dB over noise in 100 c.p.s. bandwidth. The signals were also readable in 500 c.p.s. The receiver for Two is the usual TIS34 cascade job, with a noise figure of about 1.5 dB. The line loss is only 0.7 dB! G3LQR also heard W1FZJ on December 24. The American station has now had QSO's with SM7BAE, who uses 16 10-element Yagis; with K2CBA; and with W1MX, who has 16 × 3 Quads. Incidentally, SM7BAE has had his 7th E-M-E QSO with ZL1AZR; the latter copied SSB during the last exchange.

[over

THE VHF/UHF BAND PLAN

Abridged Version

Four Metres

70-025 to 70-1 mc	CW only.
70-1 to 70-7 mc	All modes.
70-675 to 70-7 mc	Beacons.
70-26 mc	Mobile calling frequency.
	RTTY.

* * *

Two Metres

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

145-0 mc

145-3	Mobile calling channel.
	RTTY North and International.
144-6 mc	RTTY South.
145-41	SSB calling channel.

* * *

70 Centimetres

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

432-9 to 433-1 mc	Zone 6.
433-1 to 433-3 mc	Zone 7.
433-3 to 433-45 mc	Zone 8.
433-45 to 433-5 mc	Beacons.
433-3 mc	RTTY International and UK North.
	RTTY UK South.

432-6 mc	
432-15 mc	

	SSB calling channel.
--	----------------------

* * *

23 Centimetres

1296 to 1296-15 mc	CW only.
1296-15 to 1297-95 mc	All modes.
1297-95 to 1298 mc	Beacons.

SWL James Clay, of Margate, Kent, has just received confirmation of his reception of a couple of choice ones back in August 1969. These are YU2OB and HG5AIR, both on two

metres. James has a 4-ele beam at 23ft. from a QTH 100ft. a.s.l. The receiver is a 6CW4 converter into a CR-100.

General News

The wall version of the QRA Locator Map is available from SHORT WAVE MAGAZINE, 55 Victoria Street, London S.W.1, price 9s.

The South Bucks. VHF Club have arranged a talk on amateur television for their next meeting at Bassetbury Manor, High Wycombe, on Tuesday, February 3. Time is 8 p.m.

G8AYN (New Addington, Surrey) is temporarily off the air on 23 cm. while rebuilding the tripler stage of the transmitter.

G8BCN (Clacton-on-Sea, Essex) seems to have completed a long building session. On 70 cm. he now has 24 watts into a QQV03-20A and a home-built, 24-element, long Yagi, with which he has worked seven countries, the best DX being two OZ's. On two metres a QQV03-10 with 12 watts DC input feeds a 10-ele home-built Yagi, and he is now equipped for 23 cm. transmission using a 2C39A tripler running at 20 watts. The antenna is a 4½ft. parabolic dish at 25ft. A converter for 23 cm. is under construction, and should be ready shortly. Meanwhile, contacts are being made with one borrowed from G8ATL. RTTY equipment is also installed, complete with reperforator and tape distributor, the TU being a DL6EQ type.

G3JHM (Worthing, Sussex) and G3JVL (Hayling Island, Hants.) are two of those operators who have taken up the challenge of spanning the Atlantic by 50/70 mc skeds with VE3AIO in Ontario. It appears that there is a rare form of "forward Aurora" which should make such contacts possible between TF3 and VE and, if the Curtain moves far enough to the South, between G and VE. Arrangements are being made for the TF3 beacon aerial pattern to have a lobe in the general direction of W/VE, and the integrated logic keying unit constructed by G3JVL will shortly be shipped to Iceland. Incidentally, for those who are going to have a shot at this DX, please keep the keying speeds down to 10-15 w.p.m., as VE2AIO uses a phase lock receiver and integrating detector. His Tx power is 1 kW to multiple stacked Yagis. (P.634, December, refers.)

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

G3JHM is planning a DX-pedition this summer and would like to hear from interested parties which countries are most in demand on four metres.

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

G15ALP in Londonderry is looking for Sunday morning skeds on two metres. He continues to get good results over the 285-mile path to G3CCH in Scunthorpe, mostly on SSB, but CW is used when conditions are poor, and he would welcome other long-distance contacts on a regular basis. He now has his collinear array back up, with added directors to give it a gain of some 15 dB over a dipole. Jack is also interested in M/S contacts. Oversea journals please copy!

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

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

THREE BAND ANNUAL VHF TABLES

January to December — 1969

Final Placings by Bands

FOUR METRES

Position	Station	Counties	Countries	Total
1	G3OHH	51	6	57
2	G3TDH	46	6	52
3	G3EKP	34	6	40
4	E16AS	29	7	36
5	G2AXI	28	3	31
6	G3LAS	26	2	28
7	G3DAH	25	3	28
8	G15ALP	14	6	20
9	G3COJ	15	2	17
10	G3KMI	12	1	13

TWO METRES

Position	Station	Counties	Countries	Total
1	G3DAH	70	16	86
2	G2JF	60	14	74
3	G3COJ	60	13	73
4	E16AS	55	12	67
5	G3EHM	56	11	67
6	G8BMD	58	9	67
7	G8BWW	54	10	64
8	G3LAS	49	11	60
9	GD2HDZ	50	7	57
10	G8APZ	47	8	55
11	G15ALP	45	10	55
12	G8AUN	43	11	54
13	G8CEZ	45	8	53
14	G8ATS	43	7	50
15	G8AUE	44	5	49
16	G2AXI	41	8	49
17	G8ABA	41	7	48
18	G8BJK	39	6	45
19	GW5NF	37	8	45
20	G8ADP/A	36	6	42
21	G8ASR/A	35	6	41
22	G8BJC	34	6	40
23	GC8AAZ/P	35	5	40
24	G8AYN	33	6	39
25	G8BYV	28	9	37
26	G8APJ	26	6	32
27	G3EKP	24	6	30
28	GW8CGN	26	4	30
29	G8BDJ	23	6	29
30	G3AHB	24	4	28
31	G8BKR	21	3	24
32	G8CZD	17	3	20
33	G3KMI	14	3	17

SEVENTY CENTIMETRES

Position	Station	Counties	Countries	Total
1	G8AUE	40	9	49
2	G8ATS	39	8	47
3	G8BMD	37	8	45
4	G2JF	29	7	36
5	G3COJ	28	7	35
6	G8BYV	22	8	30
7	G8AYN	23	7	30
8	G8ARM	23	5	28
9	G3EHM	23	4	27
10	G8APZ	20	5	25
11	G3DAH	19	6	25
12	G8ADP/A	19	3	22
13	GD2HDZ	17	4	21
14	G3LAS	11	2	15
15	G3EKP	11	3	14
16	G8BKR	10	2	12
17	G2AXI	10	1	11
18	G8APJ	8	2	10
19	G3AHB	8	1	9
20	G8BDJ	4	2	6

AR88 in the car outside. Sale completed and both parties satisfied.

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

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

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

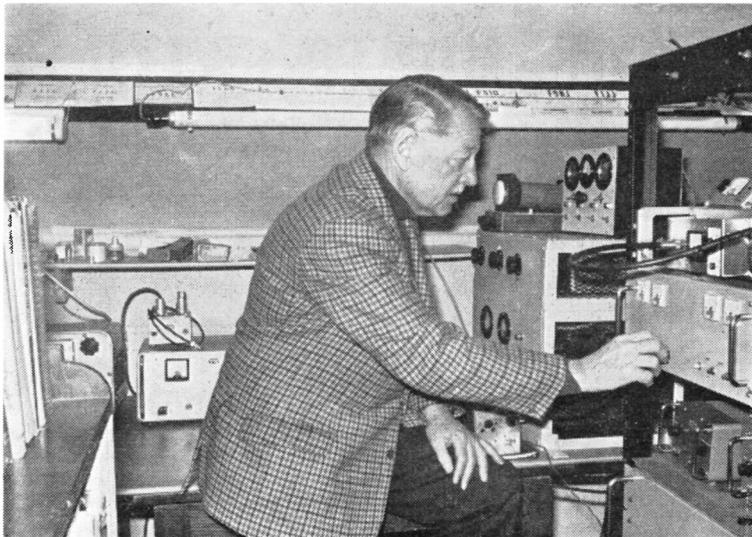
It appears that there may be another G3BA trip to Eire at the end of May. Recalling previous successful forays, this will be one to underline in the diary.

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

The absence of G8AUE from the bands recently is explained by his QSY to Farm Close, Pentrich, Derbyshire. The take-off is good all round from the 500ft. a.s.l. site about 1½ miles north of Ripley, so his signals on VHF and UHF should be just as good as they always were from Shottle.

Contests

Propagation during the two-metre SSB contest on January 12 was very poor. Not only was there little DX over 150 miles, but what there was, was degraded by heavy QSB. G3GZJ (Redruth, Cornwall), to whom congratulations on winning the previous event, was heard working into the Midlands with considerable difficulty, and G13GXP and EI6AS were both on, but barely readable, even by G3BA! Under these conditions it is difficult to make an assessment of the activity level, but from the scores being passed



Mike Dormer, G3DAH, Summerleigh, Beltinge Road, Herne Bay, Kent, is active on three VHF bands (as well as being /M on Two) and has the gear in a shack specially laid out for the purpose. We gather that recently he has been having a bit of trouble, attributable to the Law of Murphy, with some of it.

towards the end of the contest, an inspired guesstimate might be that it was down compared with previous events.

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

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

Deadline

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

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

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

MEMBERSHIP OF THE I.T.U.

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

THE MONTH WITH THE CLUBS

By "*Club Secretary*"

(Deadline for March issue: February 6)

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

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

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

Scotland and the North

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

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

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

Derby have quite a good month, even for them. Above all there is the annual dinner and dance at the Derbyshire Yeoman, Kingsway, Derby, which is booked for February 14—tickets from G2CVV, if any are left.

February 11 is down for Mr. R. E. F. Street to talk about Printed Circuits for the Home Constructor, while on the 18th there is an Open Evening for the SWL's. To round things off, comes a talk on the techniques of Passing the R.A.E., dated for the 25th. All of these, unless otherwise stated are at Room 4, 119 Green Lane, Derby.

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

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

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

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

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

The West and Wales

This is an ever-growing clip of late. We start off by calling at **Barnstaple** and District, who have the 11 and 25 February for their dates at G4CG's place at Crinnis, High Wall, Sticklepath, Barnstaple, Devon. This is a new club in a fairly remote area, and the first couple of meetings have been very successful.

Still in Devon, with **Saltash**, we find they are at Burraton Toc H on February 6, for a Radio Darts Quiz (which sounds rather intriguing!) and on the 20th they will be treated to a practical demonstration of the relative merits of Top Band and Two.

Over the border we have **Cornish**, who serve a mighty big county. Their main meeting is on the first Thursday in each month, at the SWEB Clubroom, Pool, Camborne, when there will be a talk, by G3OCB, in which he will be discussing "How to use IC's" and a short one discussing a home-brewed digital clock cooked up by G3VGO. In addition to this there are quite a few other activities by way of sub-sections, details of which could be obtained from the hon. sec.

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

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

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

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

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

The Special-Interest Group

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

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

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



Recent presentation at the Silvertown Radio Club, when SWL Phillip Jones (left) received the G3NJJ trophy for the most meritorious piece of home-constructed equipment, a radio-controlled boat.

Picture courtesy "Waltham Forest Guardian & Gazette"

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

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

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

A National Society in its own right is the **Radio Society of East Africa**, which caters for all the amateurs in the area. The current issue of *QTC* carries an extremely interesting retrospect article by Bob Tanner, 5Z4AA, covering the radio aspects of his 27 years in East Africa.

British Railways mention in their Newsletter a series of changes of net frequencies, both in the inter-G context and internationally—this group is affiliated to an international tie-up of railway radio amateurs.

The Midlands

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

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

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

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

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

Turning northwards, **Wirral DX Association** are next in the pile. This crowd get together in members' homes, and so it is essential to make contact with the hon. sec. before attending a meeting—see Panel. It is understood that the February gathering will be treated to a talk and demonstration by G3VUY of his transistorised transceiver, which covers 1.8 and 14 mc.

Surprisingly enough, the **Wolverhampton Newsletter** shows only one meeting in February—a Film Show at Hq.—when the usual form seems to indicate rather more. Perhaps it would be a good idea to get in touch with G3UBX to see if there is anything else doing during the month at Neachells Cottage, Stockwell Road, Tettenhall.

Civil Defence Hq. in Gaol Street, Hereford, is also the home for the **Hereford** chaps, but, sadly, no indication is available as to the dates or the doings, the latest detail to hand being out of date by the time this reaches print. For details, therefore, contact the hon. secretary.

South Birmingham have done the job properly—moved into a new Hq. and elected a new hon. sec. Hamstead House, Fairfax Road, West Heath, is the spot, and is the home of the local Community Association, with a room provided for the shack, and an adequacy of tall poplar trees to hold up the aerials. Plans are in stew for a revised “plan of campaign” to take advantage during

the next few months of the additional facilities. Lucky chaps!

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

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

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

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

Coventry are so well entrenched that they forget to tell us where they meet. However, the programme is as follows: February 6 and 20 are Nights-on-the-Air, when the Club transceiver will be in action, and as a sideline an R.A.E. lecture and Morse practice respectively. February 13 is the big one as Texas Instruments are coming along to give their talk on Transistor Transmitters. That leaves the 27th, for which they have a Quiz fixed up.

Mansfield have a date at the New Inn, Westgate, on the first Friday in each month; of late the discussions have turned around summer activities, such as balloon-borne aerials for Top Band, using model-control wire propped up by four or five party balloons full of hydrogen—the idea has been tested and proved workable; so doubtless we shall hear the Mansfield chaps from some rare counties as soon as the weather picks up.

Just one day after taking office, the new hon. sec. of **Leicester** had to write in to catch the deadline; so we could hardly blame him for saying the programme is not yet finalised! However, action is already in hand, and meanwhile we can say that the clubroom in Groby Road is open on Sunday mornings and Monday evenings, with a welcome to all visitors or prospective members.

The London Area

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

The first and third Friday of every month is booked by **Purley**, the former in the small, the latter in the large, room of the Railwaymen's Hall, 58 Whytecliffe Road. Naturally, the February 6 date, therefore, is an informal

Natter Night, with the lecture on Colour TV, by G3DPW, on February 20. Odd, but the use of a smaller room seems to emphasise an "informal" meeting.

By coincidence Greenford, who are next on the list, use the same dates, 6th and 20th, albeit they assemble at the Community Centre, Oldfield Lane, Greenford, Middlesex. Details are not given, although it is understood that something will be arranged in time.

Crystal Palace have an annual general meeting arranged for February 21, although it is not known where the meeting is to be held. For this, and any other details, contact G3FZL at the address below.

For the dope on Surrey, we have also to refer you to the hon. sec., although here we can give you the Hq. address. It is at the "Swan and Sugarloaf" in South Croydon, where in December the lads had a very useful session on "measurement and calibration," with precision test equipment organised by various folk to enable any doubts as to the accuracy of the standards in

members' shacks to be easily resolved. A Good Idea, this.

Echelford dates for February are not available at the time of writing; but we can pass on to any proposed visitors to this group a word of warning about car-parking. The lads have the use of St. Martins Court, Kingston Crescent, Ashford, Middlesex, for their sessions; but the road to the estate on the right of the Hall as you face it is used by ambulances and must be kept clear at all costs. The authorities took a very poor view of an ambulance on an urgent call being held up for several minutes while the person concerned was extracted from the meeting and made to move his car! What is important to remember is that there are possibilities that a repetition of this sort of incident will cause the hall to be lost for meetings.

Probably the most consistent reporter to this piece since your conductor has been involved with it is the hon. secretary of Acton, Brentford and Chiswick who reminds

Names and Addresses of Club Secretaries reporting in this issue :

ACTON, BRENTFORD & CHISWICK: W. G. Dyer, G3GEH, 188 Gunnersbury Avenue, Acton, London, W.3.
 A.R.M.S.: N. A. S. Fitch, G3FPK, 40 Eskdale Gardens, Purley, Surrey, CR2-1EZ.
 BARNSTAPLE: H. G. Hughes, G4CG, Crinnis, High Wall, Sticklepath, Barnstaple, Devon.
 BISHOPS STORTFORD: A. Stanley, G3WUR, 43 Havers Lane, Bishops Stortford (57251), Herts.
 BRADFORD: R. J. Cockerham, G3WTF, 7 Beechwood Grove, Moorehead Lane, Saltaire, Shipley, Yorks.
 BRIGHTON (Technical College): R. A. Bravery, G3SKI, 7 Copse Hill, Brighton (506418), BN1-5GA.
 B.A.T.C.: I. Lever, 1 Abbots Close, Swanley, Kent, BR8-8BX.
 BRITISH RAILWAYS: H. A. J. Gray, Eleven, Swanton Drive, East Dereham, Norfolk.
 CHIPPENHAM: P. Strand, G3UTO, Whiteoaks, 8 Brookwell Close, Chippenham (3723), Wilts.
 CIVIL SERVICE: C. Luxton, 8 Twyford Crescent, West Acton, London, W.3.
 COLCHESTER: R. C. Greenleaf, G3VAG, 27 Ernest Road, Wivenhoe, Essex.
 CORNISH: J. Farrar, G3UCQ, Elm Cottage, Ventonleague, Hayle, Cornwall.
 COVENTRY: C. Jaynes, 20 Belgrave Road, Wyken, Coventry, CV2-5AY.
 CRAY VALLEY: D. Buckley, G3VLX, 234 Halfway Street, Sidcup, Kent (01-850 6945).
 CRYSTAL PALACE: G. M. C. Stone, G3FZL, 11 Liphook Crescent, London, S.E.23 (01-699 6940).
 DERBY: F. C. Ward, G2CVV, 5 Uplands Avenue, Littleover, Derby (21931), DE3-7GE.
 DERBY (Nunsfield House): N. J. Gregory, G3LCV, 21 Back Lane, Chellaston (3516), Derby.
 DORKING: R. Greenwood, G3LBA, 8 Deacon Close, Downside, Cobham, Surrey.
 EAST WORCS.: R. J. Mutton, G3EVT, Summerhayes, Mill Lane, Alcester (2041).
 ECHELDFORD: M. Clift, G3UNV, 45 Fordbridge Road, Ashford (59628), Middlesex.
 FLINT: J. Howarth Jones, GW3TMP, 3 Bryn Clyd, Lees Wood, Mold, Flint.
 GREENFORD: F. C. Reid, G3VMD, 34 Carlton Avenue, Greenford, Middlesex.
 GUILDFORD: A. G. Coker, G3WHM, 48 Charlock Way, Burpham, Guildford, Surrey.
 HEREFORD: S. Jesson, 181 Kings Acre Road, Hereford (3237).
 LEICESTER: F. D. Rawcliffe, G3UGM, 215 Glenfield Road, Leicester, LE3-6DL.
 LINCOLN: G. O'Connor, 61 Steep Hill, Lincoln (24113).
 LOTHIANS: W. Marshall, GM8BPL, 15 Craigeith Hill, Edinburgh, EH4-2EF.
 MAIDENHEAD: E. C. Palmer, G3FVC, 37 Headington Road, Maidenhead (20107), Berks.
 MANSFIELD: F. N. F. Bewley, G8HX, 116 Westfield Lane, Mansfield (25208), Notts.
 MIDLAND: H. L. Bate, G8AMD, 88 Darnick Road, Sutton Coldfield, Warks.
 MID-WARWICKSHIRE: J. F. Coggins, G3TFC, Market Corner, Coventry Road, Baginton, Warks. (Toll Bar 3688).

NORTHERN HEIGHTS: A. Robinson, G3MDW, Candy Cabin, Ogden, Halifax (44329).
 NORTH KENT: A. Watt, G3WZJ, 67 Glenhurst Avenue, Bexley, Kent.
 NORTH LEEDS: G. Brown, 2 Fearnville Close, Dib Lane, Leeds, 8.
 NOTTINGHAM: J. Smith, 21 Duke Street, Arnold, Nottingham (265921), NG5-6GP.
 PENTLANDS: G. Burt, GM3OXX, 1/5 Essendon Terrace, Clermiston, Edinburgh.
 PETERBOROUGH: D. Byrne, G3KPO, Jersey House, Eye (351), Peterborough.
 PLYMOUTH: J. Peters, G3YDU, Treetops, 43 Holtwood Road, Plymouth (77878), Devon.
 PURLEY: A. Frost, G3FTQ, 62 Gonville Road, Thornton Heath, Surrey.
 R.A.I.B.C.: Mrs. F. Woolley, G3LWY, 331 Wigan Lane, Wigan, Lancs.
 RADIO SOCIETY OF EAST AFRICA: The Hon. Sec., P.O. Box 5681, Nairobi, Kenya.
 ROYAL NAVY: RS. A. Walker, H.M.S. Mercury, Leydene, Petersfield, Hants.
 SALTASH: J. Ennis, G3XWA, 19 Coombe Road, Saltash, Cornwall, PL12-4ER.
 SCUNTHORPE: H. Holmes, G3MSB, 69 Crosby Avenue, Scunthorpe, Lincs.
 SHEFFORD: C. W. Stedman, G3XWS, 10 Wychwood Avenue, Luton, Beds.
 SOLIHULL: H. D. L. Clark, G3YOY, 222 Kinton Green Road, Olton, Solihull, Warks. (021-706 0485).
 SOUTHAMPTON: A. Partner, G3HKT, Tekhi, Hound Road, Netley, Southampton.
 SOUTH BIRMINGHAM: E. A. Burke, 236 Beaumont Road, Bournville, Birmingham, 30.
 SOUTHDOWN: L. E. Tagliarfero, 9 Tugwell Road, Hampden Park, Eastbourne (54244), Sussex.
 SPEN VALLEY: N. Pride, G8BSC, 100 Raikes Lane, Birstall, Nr. Leeds (Batley 3925).
 SURREY: R. Morrison, G3KGA, 33 Sefton Road, Croydon, Surrey, CRO-7HS (01-654 5982).
 TAUNTON: P. Jones, G3WPJ, 20 Chilton Street, Bridgwater, Somerset.
 UNIVERSITY COLLEGE OF WALES: R. Wilcox, GW3TSH, 520 Neuadd Lewis Jones, University College, Singleton Park, Swansea, SA2-8PS.
 VERULAM: W. C. Dennis, G3NCK, 129 Colney Heath Lane, St. Albans, Herts.
 WAKEFIELD: M. E. Garner, G3XVU, 13 Kingsdale Avenue, Drighlington, Bradford.
 WEST KENT: R. Trevitt, G3SSE, 28 Delves Avenue, Tunbridge Wells, Kent.
 WIRRAL (DX Association): J. A. Share, G3OKA, 21 Curlender Close, Bidston, Birkenhead, L41-7BN.
 WOLVERHAMPTON: J. P. H. Barden, G3UBX, 28 Coalway Road, Wolverhampton, WV3-7LX.
 WORCESTER: R. L. Avery, G3TQD, 24 Alexander Avenue, Droitwich (3943), Worcs.
 WORTHING: P. J. Robinson, G6KFH/T, 46 Hillview Road, Worthing, Sussex.

us that on February 17 there is a Film Show at Chiswick Trades and Social Club, 66 High Road, Chiswick, London, W.4. Visitors, as always, very welcome.

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

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

The South

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

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

A home-built, home-designed, all-transistorised amateur band receiver of his will be demonstrated and explained by G3VCT to the chaps at **Maidenhead** on February 2, the informal following on the 17th. All are welcome at both these events, at Victory Hall, Cox Green, Maidenhead.

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

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

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

Every Tuesday at the Rose Wilmot Youth Centre, Littlehampton Road, is the **Worthing** form. One notes a

Constructional Contest on February 10, a Ragchew on the 17th, and G3JKY expounding the principles of Simple D/F gear on the 24th. Lastly, there is the most important social event of the year, namely the annual dinner on the 28th, tickets for which can be obtained from G6KFB/T.

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

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

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

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

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

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

Conclusion—and Deadline

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

Next few deadline dates are: **February 6** (March issue); **March 6** (for April); and **April 3** (May issue). Please note these and action accordingly! The address is simply: "Club Secretary," SHORT WAVE MAGAZINE, BUCKINGHAM. 73 and BCNU.

THE R.A.E. — QUESTIONS AND ANSWERS

GUIDANCE FOR THE BEGINNER

As in previous years, the treatment here is of the City & Guilds examination for radio amateurs, to be held in May this year, the paper below being that set for the May, 1969, R.A.E. Note that both questions in Part I are always obligatory—and can be answered easily if the Licence Regulations have been carefully studied. Though for the Exam. itself there is a choice of six out of the eight questions set, here all have been

answered to illustrate how they can be tackled. From the point of view of the average candidate, these answers have been expanded rather more than might be advisable within the time allowed—normally, a candidate could allot himself only about 20 minutes per question. Long and detailed explanatory answers are not usually required. Some of the answers given here also illustrate the approach to current practical problems. The R.A.E. is Subject No. 55 in the City & Guilds of London Examinations Syllabus and its pass-certificate is the basic qualification for an AT-station licence in the U.K.—Editor.

RADIO AMATEURS' EXAMINATION—May, 1969

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

Part I

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

(15 marks)

Answer (1)

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

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

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

(15 marks)

Answer (2)

Over-modulation is a condition in which an AM transmitter is fed with an excess of modulation signal. Consider Fig. 1: At the points (a) can be seen the carrier, with no modulation; at (b) the carrier is modulated by a sine-wave AF signal to less than 100% modulation;

the same waveform is seen at (c) with 100% modulation of the carrier, the AF waveform still being undistorted. A further increase in the modulating signal, as at (d), results in over-modulation. Note the distortion of the AF envelope, and the fact that the carrier is at zero for an appreciable period of time. See also that the rise from and fall to zero is extremely steep. The result is the radiation of a wide band of signals which were not part of the original RF and AF signals, with a consequent loss of intelligibility, "splatter" across adjacent channels (which may result in world-wide interference) plus, often, considerable increase in interference to television reception.

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

Part II

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

(10 marks)

Answer (3)

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

Consider Fig. 2. The triode section operates as a simple oscillator with inductive feedback through the secondary of L2, tuned by VC2. The oscillations are coupled via C2 to the cathode of the pentode. The

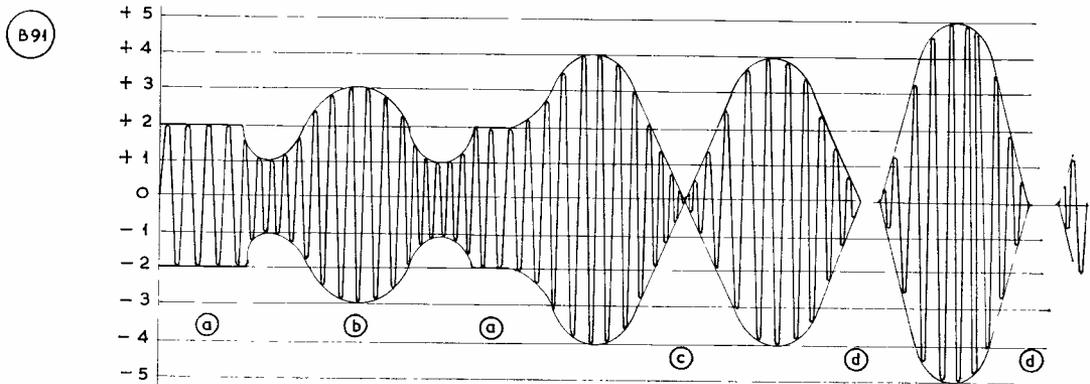


Fig. 1 Question 2

Fig. 1. Modulation waveforms. At (A), a pure unmodulated CW signal, A0; at (B), less than 100% modulation, and at (C) 100% exactly. The effect of over-modulation is shown at (D)—note the severe distortion of the modulating waveform, and periods of zero output. (To answer Q.2.)

incoming signals are impressed in some way across L1—the exact manner is irrelevant—which in its turn is tuned by VC1. Due to the slight non-linearity of the valve, not only will the signal and oscillator frequencies appear at the anode, but also sum and difference frequencies of the two we started off with; T1 is tuned both on its primary and secondary side, so that it will respond strongly to one of the signals and reject all others down the decoupling element C5. In normal practice VC1 and VC2 are “ganged” so they operate together, the oscillator then being made to tune higher in frequency than the signal by an amount equal to the IF at all positions of the ganged control, thus producing a frequency-changer stage having “one-knob” tuning. As to values, these are shown in Fig. 2, apart from

VC1, VC2, L1, and L2. These latter, of course, will be set up for whatever signal frequencies—and hence oscillator frequencies—it is desired to receive.

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

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

Answer (4)

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

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

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

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

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

Whence $Z = 31.6 \text{ ohms}$ (1)

Now, the RMS current is given by $I = E/Z$,

i.e., $I = 200/31.6 \text{ amps RMS}$

that is, 6.3 amps RMS

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

i.e. $1.414 \times 6.3 \text{ amps, or } 8.9 \text{ amps peak.}$

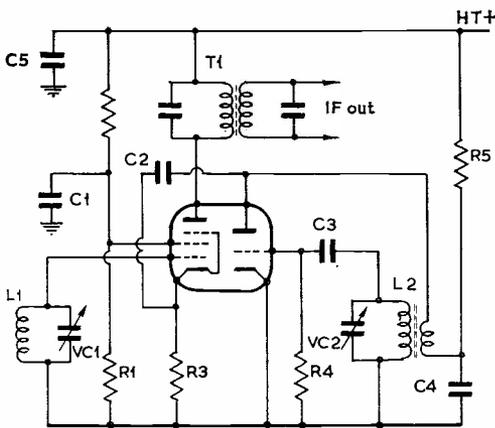


Fig. 2 Question 3

B 92

Fig. 2. A triode-pentode mixer—see text for description. Values can be as follows: C1, C4, C5, .01 μ F; C2, C3, 100 μ F; VC1, VC2, see text; R1, 150K; R2, 100K; R3, 1.2K; R4, R5, 47K; T1, IF transformer; L1, L2, see text. (To answer Q.3.)

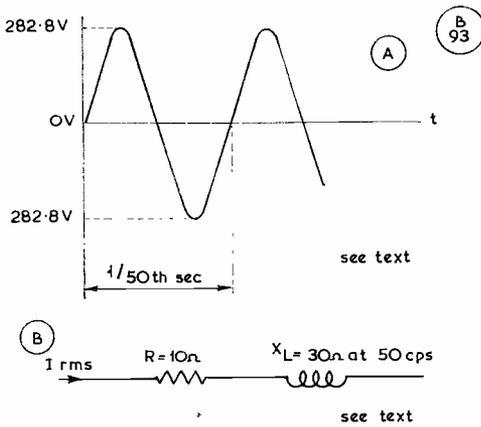


Fig.3 Question 4

Fig. 3. To answer Q.4.—See p.769.

Q (5). Describe a simple experiment to show the existence of a magnetic field around a wire carrying an electric current. What is the effect on the magnetic field if the wire is wound into a coil on a soft-iron core?

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

Answer (5)

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

Winding the wire in a coil on a soft-iron core is shown at Fig. 4B, where the direction of current and of the winding is clearly shown. This disposition results in the lines of force taking up the pattern indicated, and

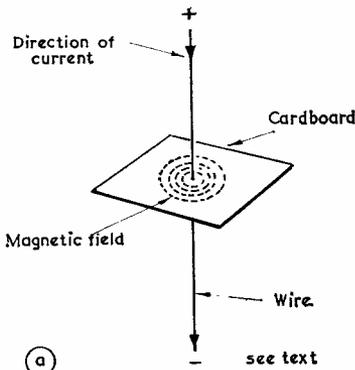


Fig. 4 Question 5

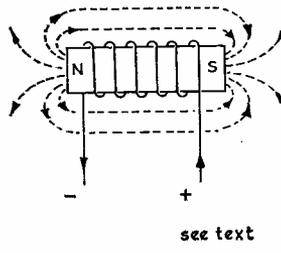


Fig. 4. To answer Q.5.



see text

the direction; the North and South poles are also indicated. The effect of coiling is to intensify the magnetic effect, and considerable further strengthening of the field results from slipping the coil over the slug of soft iron. To determine which end of the magnet is South, consider Fig. 4C: Looking at the end of the solenoid, the direction of conventional current flow being as shown by the arrow-heads on the letter "S" will result in the end nearest the observer being a South pole.

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

Answer (6)

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

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

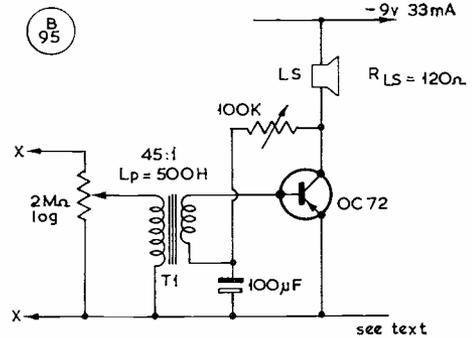


Fig.5 Question 6

Fig. 5. To answer Q.6.

B 94

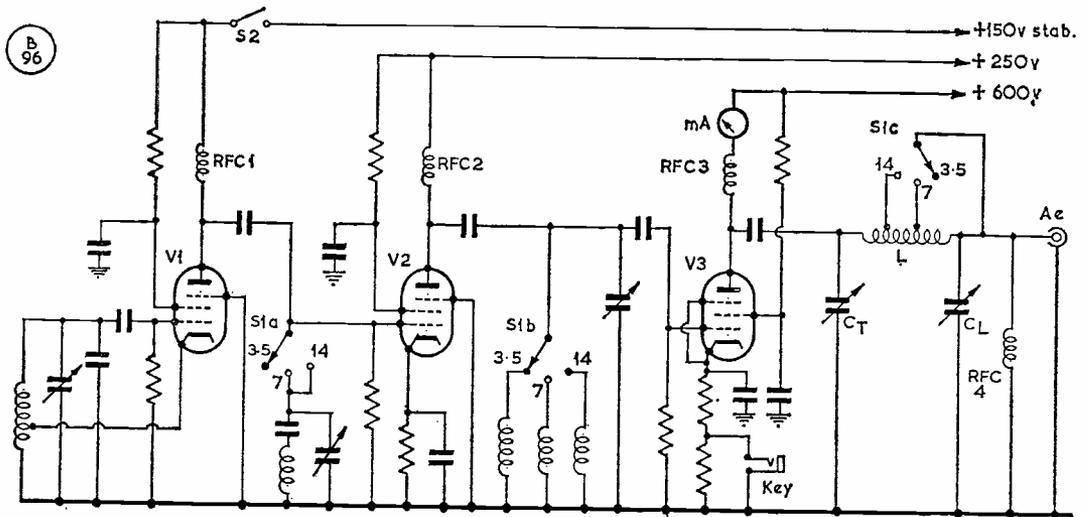


Fig. 6 Question 7

Fig. 6. CW transmitter circuit for the 20-40-80m. bands. To answer Q.7, in this context no full list of values is required.

base of the OC72 transistor, which is biased by setting the 100K resistor so that it draws 33 mA from the nine-volt supply, 4.5 volts of which appears across the 120-ohm speaker. Provided the speaker has a strong magnetic field some 60 mW of AF will come out of the speaker for a drive of 3v. at 1.2 cm/sec from the pick-up.

Q (7). Draw the circuit diagram of a CW transmitter, consisting of oscillator, buffer/frequency multiplier, and power amplifier stages with pi-network output and capable of operating in the 3.5, 7.0, and 14.0 mc bands.

Explain how the pi-network is adjusted to obtain maximum RF output for a given DC power input to the power amplifier stage.

(10 marks)

Answer (7)

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

The pi-network adjustment falls naturally into two phases. First, calculating the values—which is made much easier if a suitable set of *Abacs* is to hand—for C_T , C_L , and L_x . Voltage rating of the two capacitors will also be decided at this stage. When this is done, and the transmitter ready for testing, full drive on the

desired band should be applied to the PA grid, with a 75-ohm load on the output—assuming this is the feeder impedance into which the transmitter is intended to work. Set C_L to maximum, and rotate C_T till a drop in PA current occurs. Note the current off-resonance and at the bottom of the dip. If the latter is not what was desired in the way of anode current, alter the setting of C_L a little and re-dip the PA. By repeating this procedure several times an adjustment will be found where the current at the bottom of the dip is as required, C_T and C_L are at the correct values or very near to them, and maximum RF voltage appears across the load resistor, as shown by a valve-voltmeter. It may be found that at the desired anode current, little or no dip is perceptible, and RF output has fallen from its maximum value. If this is the case, *over-coupling* is to be suspected, and the design should be checked out, with particular attention to the HT volts on load, and to the values predicted for C_T and C_L , as well as L_x . If maximum RF output occurs other than at the bottom of the dip, the need for neutralisation should be considered.

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

Q (8). Describe how two radio stations can communicate with each other by long-distance ionospheric propagation.

Why is it usually necessary to change frequency according to the time of day? (10 marks)

Answer (8)

Around the earth there are several bands or "layers" of ionised air, at various heights above ground. These

layers are ionised by the sun, to an extent which is related to time of day, time of month, and the number of sunspots—the latter changing in accordance with an eleven-year cycle. The daily change is one of a tendency for layers to de-ionise during the hours of darkness.

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

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

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

Answer (9)

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

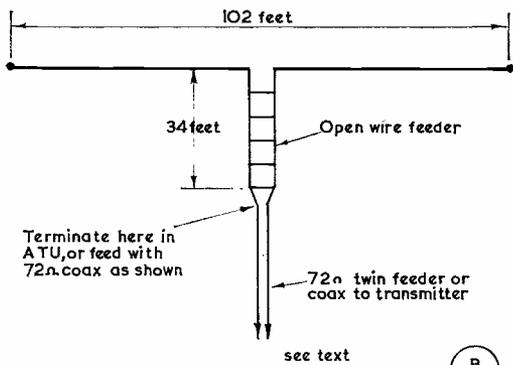


Fig. 7 Question 9

Fig. 7. Centre-fed multi-band aerial system, "G5RV type," as discussed in text. (To answer Q.9.)

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

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

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

Answer (10)

See Fig. 8A: Here is shown a moving-coil meter movement connected as the load in a full-wave bridge rectifier circuit. If such a meter is used in conjunction with the usual meter multipliers it will, with some slight rescaling at the low-voltage end of the ranges, be usable

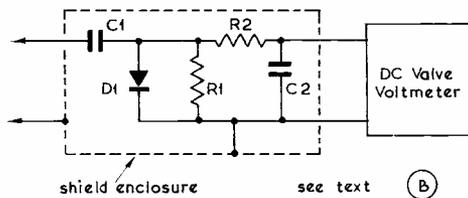
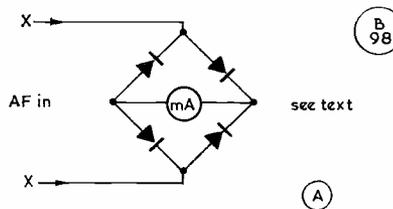


Fig. 8 Question 10

Fig. 8. To answer Q.10.

for measuring AF voltages of substantially sine waveform. In order to "look" directly at AC current, it would be necessary to use "current transformers" at the ranges other than basic, and the design of these is rather outside the scope of R.A.E. However, the instrument can be used indirectly by measuring the voltage across a known resistor. At RF, one can use a thermocouple arrangement at the expense of some considerable cramping of the lower end of the scale, but it is easier once again to measure RF voltage by way of a diode probe as diagrammed in Fig. 8B. Here, output is fed to a DC valve-voltmeter. D1 should have a high reverse resistance, C1, about 100 μF , must be rated for the highest DC voltage likely to be met by the probe. The output of the diode is developed across R1, 68K; R2 and C2 play no real part in the operation, being inserted to prevent stray RF from the probe getting into the DC valve voltmeter. Such a device can be used to measure the RF voltage across a known value of resistor, and hence, indirectly, to measure current.

FOR GOING METRIC

A leaflet is now available giving illustrated examples of how to read a micrometer in steps of 0.01 mm. and, where a vernier scale is fitted, to 0.001 mm.—together with a comparison inch-scale from 0.5in. to 0.001in. Copies are obtainable free of charge from: Information Office, Dept. 3, The Metrication Board, 28 Kingsway, London, W.C.2.

RADIO AMATEURS' EXAMINATION—MAY 1970

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

DEPOSIT CREDIT ACCOUNT SCHEME

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

Note: Copies of the R.A.E. Question Papers for the years 1967-'68-'69 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, and suitable for R.A.E. study or reading: *Amateur Radio* (Rayer, 26s. 6d.); *Guide to Amateur Radio* (6s. 6d.); *Radio Amateur Examination Manual* (5s. 9d.) and—for a standard text—the *Radio Communication Handbook* (69s.). Prices quoted are post free, from stock for immediate delivery (normally by return), and orders with remittance should be sent to: Publications Dept., Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

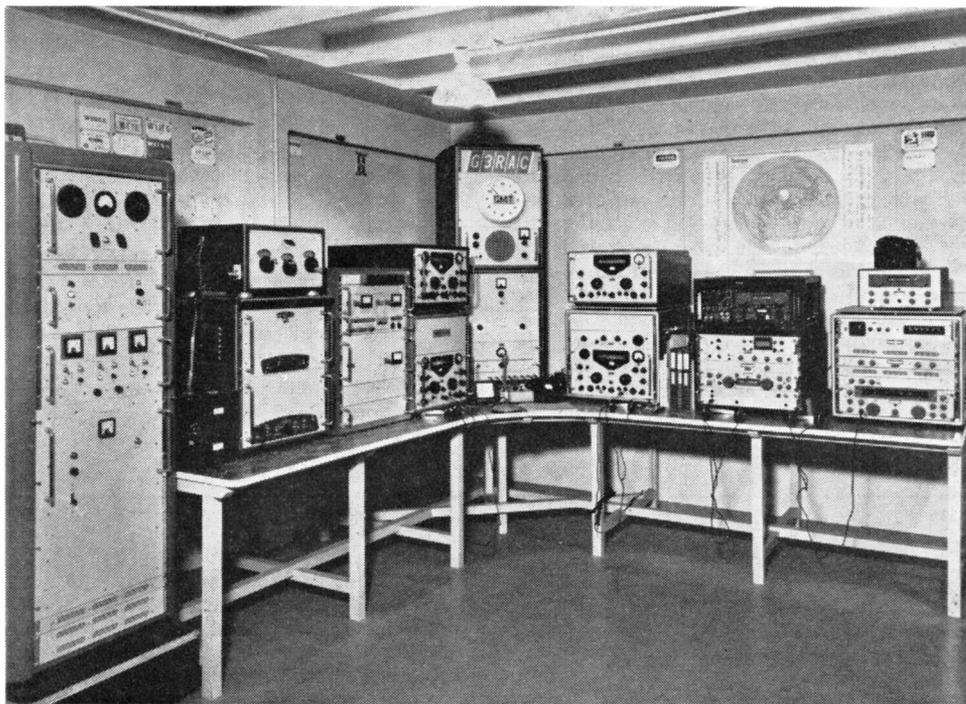
credit actually used.

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

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



"... yes, it is a bit rough, but it does work ..."



THE OTHER MAN'S STATION

G3RAC

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

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

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

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

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

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

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

NEW QTH's

This space is available for the publication of the addresses of all holders of new U.K. call signs, 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.

G2AQJ, R. Collins, 20 High Street, Upavon, Pewsey, Wilts. (*re-issue*).

G3XUT, R. L. Edmead, c/o H. C. Warner, Basseterre, St. Kitts, West Indies.

GC3YIZ, J. E. Martin, Bonne Chance, Marais Lane, Vale, Guernsey.

G3YMR, G. W. Rodgers, 51 Piper Hill, Colburn, Catterick Camp, Richmond, Yorkshire.

GM3YOK, P. C. Brown, 6 Caiystane Road West, Edinburgh, EH10 6RS.

G3YRT, A. Simister, 28 Linley Drive, Oldham, Lancs.

G3YVZ, T. Gardner, 222 Grace Street, Byker, Newcastle, NE6 2RR.

G3YWB, K. A. Wickham, 25 Westwood Road, Brunton Park, Newcastle-upon-Tyne, NE3 5NN.

G3YWO, J. M. Tripp, 11 Green Close, Wythall, Birmingham. (*Tel. Wythall 3072.*)

G3YXA, D. Hill, 2 Council Houses, Brighthurst, Market Harborough, Leics.

G3YXU, G. A. O. Ross, 42 Beattyville Gardens, Barkingside, Ilford, Essex. (*Tel. 01-550 0698.*)

G3YXZ, P. J. Marcham, 14 Lyncroft Avenue, Pinner, Middlesex, HA5 1JX. (*Tel. 01-866 2803.*)

G3YYF, R. L. G. Kemp, 7 Forewood Rise, Crowhurst, Battle, Sussex.

G3YYI, P. Dockerty, 7 The Avenue, Felling, Gateshead 10, Co. Durham.

G3YYJ, A. D. Monk, 2 Phoenix Green, Norfolk Park, Edgbaston, Birmingham 15. (*Tel. 021-454 6809.*)

G3YYO, I. D. Clemow, 42 Coombe Lane West, Kingston, Surrey. (*Tel. 01-942 6164.*)

G3YYU, M. O. Binns, 10 Northdene, Birtley, Co. Durham. (*Tel. Birtley 2674.*)

G3YZB, S. H. Bassford, The Lodge, Molesey Park Road, East Molesey, Surrey. (*Tel. Molesey 3333.*)

G3YZF, W. A. Harrison, 25 Wilmount Street, Woolwich, London, S.E.18. (*Tel. 01-855 4437.*)

G3YZI, J. E. Cummings, 77 Windermere Avenue, Scartho, Grimsby, Lincs.

G3YZL, L. B. Hooper, 8 Pitchcombe Gardens, Coombe Dingle, Bristol, BS9 2RH.

G3YZM, J. J. Lappin, B.Sc., 21-A Riversleigh Avenue, Lytham St. Annes, Lancs.

G3YZS, R. T. Jackson (*ex-G8CRF*), 29 Olivia Drive, Leigh-on-Sea, Essex, SS9 3EF.

G3YZX, H. Brindle, 4 Bowje Terrace, Newlyn, Penzance, Cornwall.

G3YZY, H. D. Brindle, 4 Bowje Terrace, Newlyn, Penzance, Cornwall.

G8CSJ, J. W. Askew, 16 Pepper Street, Platts Common, Barnsley, Yorkshire.

G8DAS, J. S. Reed, 57 Richmond Hill, Luton, Beds.

G8DAW, P. Knight, 75 Ashcroft Road, Luton, Beds.

G8DCC, D. N. Wills, 271 Kempshott Lane, Basingstoke, Hants.

G8DCE, R. H. Hodds, Holme Garth, East Gate South, Driffield, Yorkshire, E.R.

G8DDW, S. C. Fletcher, 95 Vanbrugh Hill, East Greenwich, London, S.E.10.

G8DDY, P. C. Thompson, 10 Faulkner Place, Bagshot, Surrey.

G8DFH, M. J. Matthews, 54 Kennedy House, Ramsgate, Kent.

GM8DFS, S. Rutherford, 7 Johnshill, Lochwinnoch, Renfrewshire.

G8DFX, J. Lincoln, St. Paul's House, Middle Green, Langley, Bucks.

G8DGA, C. J. Bourne, 111 Woodhouse Lane, Bishop Auckland, Co. Durham.

G8DGJ, D. A. Catterall, 626 Chorley Old Road, Bolton, Lancs., BL1 6BH. (*Tel. Bolton 44797.*)

G8DGX, J. Rolland, 4 Buxton Road, North Walsham, Norfolk.

CHANGE OF ADDRESS

G2FMO, A. L. Milnthorpe, 31 Park Crescent, Glen Gorse, Oadby, Leics., LE2 5YJ.

G3FN, A. H. B. Cross, 48 Summerfield Road, Dronfield, Sheffield, S18 6GZ.

G3HVA, D. G. Pinnock, 14 Mornington Close, Baughurst, Basingstoke, Hants.

G3KCR, D. W. Payne, 107 Vale Road, St. Leonards-on-Sea, Sussex.

G3L GK, B. M. Sandall, 38 Moorland View Road, Walton, Chesterfield, Derbyshire.

GW3MPP, G. C. Price, 1 Dorchester Court, Brandreth Road, Cyncoed, Cardiff, Glam., CF2 5LU. (*Tel. Cardiff 37280.*)

G3NAE, C. K. Richardson, Weavers Cottage, North Gorley, Fordingbridge, Hants.

G3OHC, G. C. Badger, 50 Essex Road, Four Oaks, Sutton Coldfield, Warks. (*Tel. 021-308 2512.*)

G3PHO, P. E. H. Day, 39 St. Albans Road, Sheffield, S10 4DN.

G3POG, D. V. Mawdsley, 24 Hilltop Road, Childwall, Liverpool, L16 7QP.

G3RDC, A. F. H. Wood, 43 Douro Road, Canterbury, Kent.

G3RFQ, A. J. Nadauld, 25 Blenheim Drive, Highfield, Bicester, Oxon., OX6 8NE.

G3SBO, R. V. Court, 9 Bannard Road, Maidenhead, Berks.

G3SPX, K. G. Baker, 3 Cliffe Drive, Blacker Lane, Crigglestone, Wakefield, Yorkshire.

G3USP, J. R. Middleton, 75 Greenesome Lane, Doxey, Stafford.

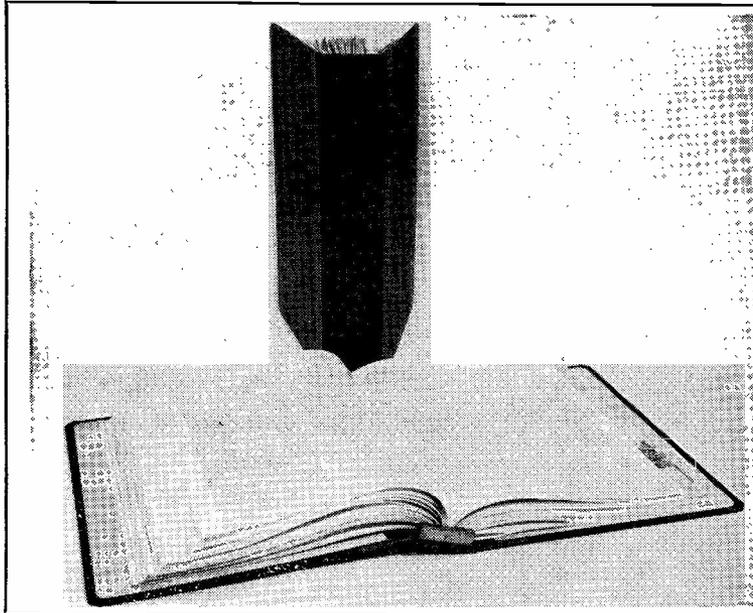
G3XNN, R. E. Jephcott, 7 Ailsworth Road, Limbury, Luton, Beds.

G8APJ, K. R. Punshon, Rustlings, Sandhill Lane, Crawley Down, Sussex.

G18AWF, J. F. MacMahon, 18 Drumclay Road, Enniskillen, Co. Fermanagh.

G8BXV, G. Rackham, 49 St. Luke's Road, Southend-on-Sea, Essex.

G8CVI, D. Elwell, Apollo, Plot 7, Perry Road, Tiptree, Colchester, Essex.



CREATE YOUR OWN REFERENCE LIBRARY

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

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

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

Price 14s. 6d. post free.

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

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

Amateur Electronics G3FIK

AN APOLOGY

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

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

**518-520 Alum Rock Road, Alum Rock,
Birmingham 8.**

Telephone : 021-327 1497

Peter Seymour Ltd.

Communications Equipment Specialists

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

L.W., M.W., Marine bands, 1.5 to 3.5 Mc/s., plus the 80 to 10 metre amateur bands, and separate S.W. broadcast bands, 15 in all, tuned on a coil turret. Also V.H.F., F.M. Variable selectivity, product detector, B.F.O., 2-speed A.G.C., treble and bass filters, built-in A.C. supply and battery compartment, twin speakers, telescopic antenna, ultra fine tuning for S.S.B., mesa transistors in front end, etc., etc. Size 12 $\frac{1}{4}$ " wide, 10" deep, 4 $\frac{1}{2}$ " high. Dual conversion on all bands above 3.5 Mc/s. IFs 2 Mc/s. and 460 Kc/s.

**ASK FOR THE
GLOBETRAVELLER AMATEUR**

£83, carriage paid

410 Beverley Road, Hull, Yorkshire
Telephone : Hull 41938

TELECOMMS G3SED

AMATEUR — MARINE — MOBILE
COMMUNICATIONS

COMPONENTS SALES AND SERVICE

RECEIVERS. Marconi CR100. 60 Khz to 420 Khz, 500 Khz to 30 Mhz in six bands. Switched selectivity down to 100 Khz. Operation from 240 AC mains. £18 10s., carriage 30s.

TRANSCEIVERS. 62 Set. 1.6 to 4 Mhz, 4 to 10 Mhz, in two ranges. Xtal or V.F.O. controlled TX, complete with modulator for RT. Provision for remote control. 12-volt operation, but easily modified for AC mains operation. £11, carriage paid.

CRYSTALS. 500 Khz, 12/6, post paid. 2182 Khz, 2871 Khz, 2262 Khz, 2381 Khz, 2534 Khz, 2097 Khz, all 27/6, post paid.

COAXIAL CABLE. Low loss 70 ohm (150 watts), 1/7 yard. Standard 70 ohm 11d. yard.

METERS. 0-30 mA. 0-50 mA. 0-100 Ma. 0-500 Ma. 0-5 amp., 0-10 amp., all approximately 2½in. round at 14s., post paid.

VALVES. 807's 3 for £1, post paid. 5U4's 3 for £1, post paid 805's 15s. each, post paid.

DRAYTON MOTORS, geared. 230V 50 c/s single phase, 37. r.p.m. Fantastic torque rate. Reversible, and as new, 42s., post paid.

Carriage charges are for England and Wales only

Terms : Cash with order Telephone Portsmouth 60036

73 From 73 TWYFORD AVENUE,
STAMSHAW, PORTSMOUTH, HANTS.

ISLE OF WIGHT
TRAP DIPOLES and TOROID BALUNS
DETAILS FROM
WEMSCOL, 60 High St., Cowes, I.o.W.

SURPLUS RADIO EQUIPMENT HANDBOOK

Over 120 pages of data including circuits/operating for 40+ types; many useful mods. and valve transistor equivalents list. A must for all using ex-Government sets. Only 30/- including p. and p. (Mail order only).

From : **SYMBOL BOOKS (Dept. 4)**

210 EASTERLY ROAD, LEEDS LS8 3ER

THE AMATEUR RADIO SHOP

G 4 M H

NEW. Full range of Trio, TS510, JR310, JR500, GR59DE, P.S.U.'s Phones, L/speakers.

SECOND-HAND. FL200B £100, Drake 2C £85, HW32A plus P.S.U. £45, AR88LF £35, Vespa 1 £85, 680X £60, 888A £65, R107 £8, Olympic Tx 80-10 £35, LG300 RF £20, also 2 metre Tx's and Converters. PYE Equipment.

OPEN ALL WEEK, EXCEPT TUESDAY

13 Chapel Hill, Huddersfield. Tel. 20774

Have you fully developed an equipment suitable for production at KW?

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

The Managing Director

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

Telephone : Dartford 25574

ONLY THE BEST WIN WORLD RECORDS!

JOYSTICK

VFA REGD.

World record winning all band antenna — available from :
Partridge Electronics Ltd., Broadstairs, Kent.

BURNS ELECTRONICS

CRYSTAL CALIBRATOR CC-10 £22 19s 0d.

ABSORPTION WAVEMETER TC-101 800 KHz to 470 MHz, 6 ranges, sensitive meter indication, easy tuning, insulated probe, matching case to CC-10 above £16 9s. 0d.

FREQUENCY STANDARD SD-11 Phase locked to Droitwich 200 KHz, all solid state, provides 1 MHz and 10 MHz outputs. Battery operated with integral aerial £59 9s. 0d.

F.E.T. CONVERTERS FC2/FC4 low noise performance any I.F., external 9v. supply £16 4s. 0d. each

LOW PASS FILTERS for 2m/4m, 50/75 ohm, handle 50 watts carrier, 50 dB stop band atten. £6 4s. 0d. each

Orders or S.A.E. enquiry to:

The Cottage, 35 Beulah Hill, London, S.E.19.

YOU NEED SOMETHING AS GOOD AS ANOTHER

JOYSTICK

VFA REGD.

TO SHATTER THE WORLD RECORD WON WITH A
JOYSTICK VFA — available from :
Partridge Electronics Ltd., Broadstairs, Kent.

PYE RANGER 15 2202 68 174 mc. AM 12 volt, boot mounting, 15 watts output, QQV03-20A PA, PP 6V6 mod. Less vibrator and accessories. Carr. 30/- **£12**

COSSOR 103BE FM MOBILES, TX/RX, 12 volt P.S.U. boot mounting. TX valves: 6BH6, 6BH6, 6AM5, 6AM5, 6AM5, QQV02-6, QQV03-20A, with control unit, mic., cables, speaker. Carr. 30/- **£12**

COSSOR 103B, similar, dash mounting. Carr. 30/- **£15**

COSSOR 102 FM WALKIE-TALKIE, will mod. for 2m. Carr. 10/- **£10**

COLLINS ART13 TX, 2-18.5 mc. 813 PA PP811 modulator, clipper, vfo or xtal, manual or auto. tuning. Size: 24 x 10 x 12. Carr. £2 **£15**

COLLINS ARR15 RX. 1.5-18.5 mc. COLLINS PTO local oscillator and BFO, 500 kc IF. Size: 11 x 8 x 20. Carr. £1 **£25**

Both COLLINS require P.S.U. for mains use, 24 volt dynamotors at carr. cost if required.

MR820 2 metre mobile TX/RX, QQV03-10 driver and PA, 12 volt transistor P.S.U. Size: 5 x 8 x 14, supplied less xtals and mic. Carr. 10/- **£20**

CR 100 Marconi RX. Carr. 30/- **£18**

FOR YOUR BOAT OR AIRCRAFT :

Bendix :

- MN26** D.F. System, 12 or 24 volt.
- MN26** A.D.F. System, 12 or 24 volt.
- SCR269G** A.D.F. System, 24 volt.
- R5/ARN7** A.D.F. System, 24 volt.
- NA1 (MN62)** A.D.F. System, 24 volt.
- RTAICB** H.F. TX/RX 10 or 30 ch., 24 volt.
- NA3 (MN85)** V.O.R. System, 24 volt.
- MN53** Market receiver 75 mHz, 24 volt.
- M132A** Intercomm amplifier, 24 volt.
- M136** P.A. Amplifier, 115 or 24 volt.
- TA20B** VHF TX 360 ch. 50 kHz, 24 volt.
- 120-** Flux Gate Compass System.
- 36105** Radio Magnetic Indicator.

Marconi :

- AD7092** A.D.F. System, 24 volt.
- 1616** H.F. Receiver, 30 ch., 24 volt.

Other equipment by AeroCom, Collins, Flitronics, Gables, Murphy, Standard Telephones, SunAir. Crystals for Collins **18S4**, **618S**, Bendix **RTAICB**, Standard Telephones **STR9** and **TR1936** series, in stock. Technical information service for aircraft radio.

S.A.E. enquiries. Mail order.

Shop open Saturdays

State call sign when ordering or TX's will be disabled.

BAGINTON ELECTRONICS

G3TFC (SALES) Ex **ZC4JC**

Market Corner, Baginton, Warks., **CV8-3AP**

24 hour Robophone service. TOLL BAR 3688.

SMALL ADVERTISEMENTS

("SITUATIONS" AND "TRADE")

9d. per word, minimum charge 12/-. No series discount. All charges payable with order. Insertions of radio interest only accepted. Add 25% for Bold Face (Heavy Type). No responsibility accepted for errors. Replies to Box Numbers should be addressed to The Short Wave Magazine, 55 Victoria Street, London, S.W.1

TRADE

WANTED: Early wireless equipments from years 1900-1920. Marconi magnetic detector, multiple tuner, coherer 106, CA, 294. Marconi, De Forest, Fleming valves. Marconiphone V2 receiver, 1922. Crystal, amateur and ship receivers. Give descriptions and prices asked.—**T. Christen, 12 Princes Terrace, Brighton 7, Sussex, BN2-5JS.**

QSL Cards and Log Books, GPO approved, cheapest and best. Prompt delivery.—Samples from **Atkinson Bros., Printers, Looe, Cornwall.**

SWOP your camera or hi-fi equipment for **Trio 9R-59DE**, h.p. or cash.—**Holdings Photo-Audio Centre, 39/41 Mincing Lane, Blackburn (59595/6), BB2-2AF, Lancs.**

QSL Samples, excellent range at the right price. Also Log Books at 7s.—**Bailey & Co., Greenfield Place, Weston-super-Mare, Somerset.**

QSL Cards: Two-colour, attractive design, variable features, from £3 3s. per 1,000 (inclusive). Send foolscap s.a.e. for samples.—**ARA Press, 46 Moat Avenue, Green Lane, Coventry.**

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

QSL Cards for Tx and SWL. Send s.a.e. for samples, stating which type required.—**Beaumont, G5YV, 8 Ashfield Avenue, Morley, Leeds, LS27-0QD.**

PLESSEY Electrolytic Capacitors, 2000 mF, 50v., 3 x 1 1/2 in., 7s. 6d.; 100+200 mF, 275v., 4 1/2 x 1 1/2 in., 7s. 6d. **T.C.C.** Electroflash Capacitors, 250 mF, 500v., 3 x 1 1/2 in., 15s. Standard screened jack plugs, 3s.—**Xeroza Radio, Dept. ZE.99B, 1 East Street, Bishops Tawton, Devon.**

LIQUIDATION STOCK: Offers invited for complete stock of Swanco Products, Ltd.—Write for inventory to: **C. L. Barnes, F.C.A., Liquidator, 22 Queens Road, Coventry, CV1-3EG.**

QSL Cards: To your own design, if required.—**Casling, G3MWZ, 31 Fiskerton Road, Cherry Willingham, Lincoln.**

READERS ADVERTISEMENTS

3d. per word, minimum charge 5/-, payable with order. Add 25% for Bold Face (Heavy Type). Please write clearly, using full punctuation and recognised abbreviations. No responsibility accepted for transcription errors. Box Numbers 1/6 Extra. Replies to Box Numbers should be addressed to The Short Wave Magazine, 55 Victoria Street, London, S.W.1.

A VAILABLE at Godshill, Isle of Wight, bed and breakfast accommodation with evening meal; h. and c. in all rooms, comfortable TV lounge, and baby-sitting facilities. Also a 4-berth caravan with all amenities.—**Barden, G3RND, Bridgecourt Farmhouse, Godshill (606), Ventnor, Isle of Wight.**

F OR SALE: Meters, flush, 2-in. square 200 mA, 10s.; dual range 40/120 mA, 12s. 6d.; flush 4in. dia., 50 microamps, 25s. Paper smoothing condensers, Micamold 8 mF 1000v., 7s. 6d.; Aerovox 2 mF 1000v., 5s. **WANTED: Woden UM1 or UM2 mod. xformer.—Ingram, 5 Springhill Cottages, Snowhill, Broadway, Worcs.**

TOP quality polypropylene non-rot rope. Diameters, 1/2 in., 1300 lbs. breaking strain; 5/16 in. + 1890 lbs. B/S; and 3/8 in. dia., 3100 lbs. B/S. Send s.a.e. for sample.—Powell, GW3HUM, 21 Tanybryn Estate, Valley, Anglesey

SELLING: Complete station, comprising National NCX-5 Mk. II transceiver, with mains PSU/speaker, K.W. Z-match, SWR Bridge, dummy load 80-10m., Hy-Gain 14-AVQ antenna with 100ft. coax, all in excellent condition. Price £195 all-in, or would consider selling separately—offers? Free delivery to 100 miles.—Ring Taylor, G3RDT, Bognor Regis 4438.

EXCHANGE or **SELL:** R.C.A. AR88D in good condition, with S-meter, matching speaker and manual, £42 10s. **REQUIRED:** Late model general coverage receiver.—Bailey, 16 Bispham Road, Carleton, Poulton-le-Fylde (4454), Lancs.

WANTED: Good Avo Valve Tester. **BARGAIN:** AR88D for sale, with S-meter and manual, also an SX-36A, coverage 27 to 142 mc, AM/FM, etc., price £60. Zenith-3000 receiver, nine-band all transistor, AM/FM/VHF, etc., £70 or near offer.—Carey, 89 Pevensey Road, Bognor Regis, Sussex.

FOR SALE: Complete station, Top Band to Ten, AM/CW, 50w. Tx, Geloso VFO into 807 PA, in Imhof cabinet, with ATU, GDO and SWR meter; also CR-100 Rx with S-meter and Eddystone speaker. The lot for £30. Would deliver up to 30 miles.—Turk, G3PQC, 102 Manor Road, Farnborough, Hants.

WANTED: Urgently, 19 Set Mk. III, PSU and microphone; both Tx/Rx in good working condition. (London).—Box No. 4864, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SALE: Creed 7B Teleprinter, with H/B power unit, also AP.66862 T.U., all in excellent condition, £20, buyer collects. Also KW-160 Tx, as new, £16.—Wyse, G3IWE, QTHR, or ring Warrington 64178.

WANTED: Pye power unit AC-10PU, also Pye FM Bantam, or similar. **FOR SALE:** Pye six-channel transistor Ranger, complete and unmodified. Trio TS-500 and PS-500, new and guaranteed, £165. G.E.C. BRT-156 FM radiotelephone, low band, as new, £25.—Austen, 28A Valebridge Road, Burgess Hill (3409), Sussex.

SELLING: Heathkit SB-301E amateur band receiver, used 26 hours only, £130. K.W. Viceroy Mk. II, little used since new, £80. Heathkit 10w. amplifier MA-12 and control unit UMC-1, £16. All this equipment in immaculate condition.—Totten, G3HJT, 29 Unwin Avenue, Bedfont, Middlesex. (Tel. 01-890 6487.)

G3NPK Emigrating! Selling Johnson Viking "Adventurer" 50w. AM/CW transmitter, plus mint Heathkit VFO. Price £20 or near offer.—Ring Knight, G3NPK, Ringwood (Hants.) 2758, after 7.0 p.m.

WANTED: Urgently, Collins 75-S receiver, to match 32S-3; good price for Rx in perfect condition.—Morrisey, EI7AB, 2 Fitzgerald Place, Rosbrien, Limerick, Eire. (Delivery U.K. or EI.)

WANTED: Joystick de luxe antenna and Type 4RF ATU; must be in good condition and reasonably priced.—Thompson, 103 Somerset Road, Failsworth, Manchester, M35-0NT. (Tel. 061-681 5696.)

FOR SALE: R.C.A. AR88LF in excellent condition, would grace any shack; price £40, no offers, buyer to collect.—Smith, G3XXJ, 29 Coldstream Road, Walmley, Sutton Coldfield, Warks. (Tel. 021-351 2370.)

SELL: QP.166, or Exchange for GC.166, or offers for whole receiver using QP.166, with Eddystone 898 dial, incorporating product detector.—Haddock, 26 Featherbed Lane, Exmouth, Devon.

SELLING: Drake R-4A receiver, in excellent condition, £120. Two low-pass filters, new, what offers? Also on offer: ATU and Joystick with ATU; Trio TS-510 transceiver, with separate VFO, brand new—offers?—Goodbody, 114 Lodge Lane, North Romford, Essex. (Tel. 01-592 7800.)

JUST AUDIO TRONICS 70 PUBLISHED

The 1970 edition of Lasky's famous Audio-Tronics catalogue is now available—FREE on request. The 28 tabloid pages—many in full colour are packed with 1000's of items from the largest stocks in Great Britain of everything for the Radio and Hi-Fi enthusiast, Electronics Hobbyist, Servicemen and Communications Ham. Over half the pages are devoted exclusively to every aspect of Hi-Fi (including Lasky's budget Stereo Systems and Package deals), tape recording and audio accessories PLUS Lasky's amazing money saving vouchers worth over £25. All goods are available by Mail Order—bringing the benefits of shopping at Lasky's to you in the comfort of your home.

Send: Your name, address and 2/- for the post only and inclusion of your name on our regular mailing list.

To: Lasky's Radio Limited, 3-15 Cavell Street, Tower Hamlets, London, E.1.



GEORGE FRANCIS

G 3 T W V

FULL SERVICE FACILITIES ON KW, EDDYSTONE, SWAN, TRIO. The same excellent service as given by us for last 11 years.

	£	s.	d.		£	s.	d.
KW2000B ...	240	0	0	Trio 9R-59DE ...	42	10	0
KW Vespa Mk. 2	135	0	0	Trio JR-500SE ...	69	10	0
KW201 ...	110	0	0	Speaker ...	4	7	6
KW Atlanta ...	250	0	0	Joystick Std. ...	5	2	6
Eddystone EB35 ...	66	13	4	De Luxe ...	6	5	0
EC10 Mk. 2 ...	69	10	0	3A Tuner ...	3	19	6
EA12 ...	195	0	0	4 Tuner ...	5	5	0

52 ohm ord. coax yd.	1	10	Shure 201 ...	5	0	0
52 ohm low loss yd.	2	6	Shure 444 ...	10	15	0
75 ohm ord. yd.	8		Mic 40 ...	1	0	0
75 ohm low loss yd.	1	6	Mic 45 ...	1	2	6
75 ohm twin bal. yd.	6		Mic 60 ...	19	6	
300 ohm twin bal. yd.	6		Mic 39 ...	1	9	11

		Solon	Soldering
Aircraft Band VHF Converter, Model 10502 ...	4	4	0
Solder Gun ...	2	7	6
		Irons ...	625
			1 11 0

MORSE OSCILLATORS	SECOND-HAND
British made. Transistorised, only requires morse key. £2 9 11	Lafayette HA 350, immaculate £60 0 0
with pitch control and ear-phone socket £2 19 11	D.C. p.s.u. for KW200A £15 0 0

No order too small. Goods dispatched by return. Postage extra.

93 Balderton Gate, Newark, Notts. Tel. Newark 4733. After 6 p.m. Newark 2578 STD 0636.

If you really cannot afford a luxury antenna like the

JOYSTICK VFA

then we have the best in long wires!

16 SWG enamelled aluminium at only 100 feet for 10/-, post free — cut as required.

Partridge Electronics Ltd., Broadstairs, Kent

G3XKF MINITENNA G3XKF COMMUNICATIONS EQUIPMENT

We prefer you to inspect our equipment and collect

K.W.2000 with K.W. power supply/speaker	£127	10	0
GELOSO 209 RX.	£30	0	0
HAMMARLUND H.X.50. T.X. Bargain at	£97	10	0
TRIO 9R59. DE. as new in carton.	£35	0	0
PYE BASE STATION on 4 metres.	£18	0	0
HALLICRAFTERS H.T. 40. 60.W. AM/CW.	£18	0	0
GONSET G.77. MOBILE. 60.W 80-10 metres.	£25	0	0

Special Offer for Musical Amateurs.

Livinston Chorale electronic Organ. 2 x 61 note manuals, Pedal Board, etc. with matching stool. Cost £425, accept £200.

J. SHARRATT.

EDLESBOROUGH, DUNSTABLE, BEDS.

Tel. Eaton Bray, 297

Glasgow Electronic Services

21 OLD DUMBARTON ROAD,
GLASGOW, C3.

For all Radio
and Electronic Components,
Trio Receivers and Transceivers,
etc., etc.

Part Exchanges — H.P. — Phone: 041-339 2642

2 METRE CONVERTERS AF239. RF stage, TIS88 F.E.T. mixer xtal controlled multiplier chain. Size: 4" x 3" x 1½". IF's 4-6, 24-26 or 28-30 mc/s. £10 each. Post free.

GORDON R. GRIGG G3PRX
72 ELMSTONE ROAD, RAINHAM, KENT

★ THIS MONTH'S SELECTION ★

Bargain Bags: (Untested but at least 60% good devices)
Germanium PNP transistors; bag of 12 2/-
Germanium point-contact diodes; bag of 40 (approx) 1/6

BNC Coax Fittings:
Free plugs 3/-; Panel sockets 3/-
Bulkhead sockets 3/-; Elbow (90°) plugs 5/-

Also the well known S-DEC and T-DEC breadboarding kits; a real time saver for experimental and prototype projects.

Our Price S-DEC 29/6 T-DEC 50/-

Many other components Large SAE brings FREE LIST

NB: Local Club Secs - may we visit you at one of your Club Meetings?

IAN S. PARTRIDGE G3PRR
122a Eskdale Avenue, Chesham, Buckinghamshire

SALE: Surplus to requirements, 70 cm. J-Beams, 8+8 slot fed, 50s., and 14-element Yagi, 55s. Carriage paid, or W-H-Y?—Jones, G5ZT, 3 Bircham View, Egguckland, Plymouth, Devon.

FOR SALE: Army No. 12 Sender, coverage 1-2 to 18 mc, runs 50 watts, few mods., offers? Also No. 31 transceiver, as new, with handset and cables, £4. **WANTED:** Two-metre transceiver, cheap.—Moore, G18DGB, 8 Ava Street, Ormeau Road, Belfast, BT7-3BS, Northern Ireland.

SELLING: BC-342 Rx, in very good condition and appearance, complete with all accessories and spare valves, at £15.—Pitt, 13 Crombie Close, Lovedean, Portsmouth, PO8-8LG, Hants.

FOR SALE: Lafayette KT-320, with speaker and home-built 1 mc xtal calibrator, together with two-month-old standard Joystick and Type 3A Tuner; price £30 or nearest offer.—Thompson, 42 Birch Road, Runcorn (5418), Cheshire.

SALE: Commercial television studio video monitors, cost about £385 new, bargain at £10 and £5 depending on condition, but all working.—Jones, G6ABC/T, 3 Bircham View, Austin Crescent, Egguckland, Plymouth. (Tel. 76552.)

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

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

SALE: R.C.A. AR88D, in very good condition, £35. B.40, with crystal, air-tested, £15.

WANTED: Information Wavemeter W.1631, and 70 cm. Converter. Rawlinson, G8BJR, QTHR.

FOR SALE: Heathkit RG-1 receiver, as new condition, price £25. (London).—Box No. 4865, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SALE: R.C.A. AR88LF receiver, very good, complete with headphones and manual, price £25, buyer to collect.—Jones, 218 Oakleigh Road, Whetstone, London, N.20.

SELLING: Type RX-80 short-wave receiver, with headphones, also Morse records, The Lot for £25, or near offer.—McNally, 3 Toller Place, Barton Seagrave, Kettering, Northants.

OFFERING: Complete station in mint condition: Heathkit SB-101 with 2.1 kc and 400-cycle filters; HP-23 PSU; SB-600 speaker unit; Collins SM-1 dynamic microphone; HM-15 SWR bridge; price all-in £195 cash. Test sked on 80 metres?—French, G3LGL, 7 Bridgnorth Road, Stourton, Nr. Stourbridge, Worcs.

FOR SALE: Five B.44's, Tx coils removed but otherwise in very good condition, 60s. each, carriage 10s. Also two only Class-D Wavemeters, with phones, very good condition, 70s. each plus 10s. carriage.—French, Post Office, Groomsport, Co. Down, Northern Ireland.

DISPOSING: Last few copies 1969 Edn. "World Radio & TV Handbook" price only 27s. 6d.—still the world's guide to all BC listening, from LW to VHF, with detailed information about broadcast stations in every country, and much incidental data of the greatest value and interest to all SWL's tuning for the world's BC stations.—Publications Dept., Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

FOR SALE: Brand-new Katsumi CW monitor, built-in relays, batteries, etc., £7. Brand new Lustraphone microphone, £4. Shure Type 201 microphone. 60s. Spare valves for KW-2000 (most of them) plus new 6146. 70s. Four-metre Tx and modulator, 5 watts input, size about 7 x 5 x 5 in., 60s. Japanese bug key, 40s. Three volumes "Electrical Engineering," by Kemp, 60s. Low-impedance chamois-padded phones, 15s. FL-8 audio filter, 10s. All items "or near offer."—Jones, GW3TMP, QTHR.

WANTED: Heavy Post Office type straight key, the brass multi-contact model; must be in good condition. FOR SALE: Copies "Short Wave Magazine," 150 assorted 1948-'67; complete for years 1952-'53-'54-'55-'56; also 40 assorted RSGB "Bulletins," 1950-'55, complete 1951-'52. All at 6d. each. Assorted copies "Practical Wireless," 18 for 1968-'69, 1s. 6d. Postage extra on all copies magazines.—Warner, 44 Roddens Road, Larne, Co. Antrim, Northern Ireland.

SALE: Valves, well-known makes, all brand new and boxed: 6K7G, 6B8G, 1s. 6d.; 5678, M8080, QS150/15, 5B/258M, 5s.; 1AD4, EL33, 7s.; 75C1, M8212, 4s.; VP23, 3s.; NT2, 2s.; 5672, 3s. 6d.; 8091, 5763, 6s.; 1A3, 2s. 6d.; CV-2209, 10s.; 829B, 25s. All each, and 6d. postage/packing on each valve; 12 or more in one batch, carriage paid.—French, Post Office, Groomsport, Co. Down, Northern Ireland.

SELLING: Lafayette HE-30 receiver, very good, £20. Heathkit RA-1 Rx, brand new, £30. Joystick with Type 3A ATU, 90s.—Cameron, Coombe Cottage, Pitchcombe, Stroud, Glos.

SALE: Table-top 75w. AM/CW Tx, coverage 10 to 80m., with TT21 PA, BK keying and electronic switching. Price £15 only (gone transceiver). Delivery 50 miles, Somerset.—Box No. 4866, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SELLING: Oscilloscope, Cossor Mk. III, in good condition, £30. Two new Hallicrafters CB-11A Tx/Rx, £35, including one crystal pair. LOOKING FOR Rx tuning 300 to 600 mc, or 600 to 1000 mc, FM, sensitivity 30 microvolts; please state details and price required.—Baer, 94 Avondale Road, South Croydon, Surrey.

WANTED: Well-built and fully completed "Cornishman," with PSU; state price asked.—Jenner, 8 Trap Hill, Formby, Nr. Liverpool, Lancs.

DISPOSAL: Equipment of the late G3TER, including little-used FL-200B Tx, £90; FR-100B Rx, £85; Heathkit DX-40U with VF1-U VFO, fair condition, £22; Heathkit RA-1 Rx, requires attention, £20; Vibroplex key, £6; Avometer Model 7, £10; Medco LFF, 60s. Delivery carriage free; prefer inspection.—Groves, G3UYM, 3 Halsey Drive, Hitchin, Herts.

EXCHANGE: Pye Reporter, modified for two metres, Rx and Tx, in mint condition FOR rough AR77, HRO or W-H-Y?—Ring Kinver 3170 (Staffs).

SALE: G-Line KW-2000, in perfect condition, with AC/PSU and Shure 201 mike. Price £120.—Crisp, G3ELJ, QTHR.

HW-32A, covers all of 20m. in two bands, complete with high-quality mains transformer to build PSU; price £50 or near offer.—Brown, G3NTM, 18 Georgian Close, Leacroft, Staines (56567), Middlesex.

WANTED: Mixer crystals for "G2DAF" Mk. I SSB Tx. Filter Type MF 455, prefer with USB crystal.—Baldock, G3UID, 19 Theydon Avenue, Woburn Sands, Bletchley, Bucks.

EXCHANGE or SELL: Eddystone 770R Mk. II VHF receiver, covering 19 mc to 165 mc, in very good condition, price £120 or near offer, or would EXCHANGE, with cash adjustment either way, for other radio equipment.—Jesson, 181 Kings Acre Road, Hereford. (Tel. 0432 3237, evenings.)

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

RTTY: Selling Terminal Unit ATM FSY-1-1 (10P/16142—AP.100386), complete with relay, £6 10s., carriage extra.—Michaelson, G3RDG, QTHR, or ring 01-455 8831.

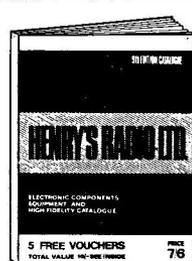
SALE: Eddystone 888A receiver, in immaculate condition, complete with S-meter and mounting blocks, £65 or near offer.—Heap, G3NCZ, The Gables, East Park Road, Blackburn (56532), Lancs.

WANTED: K.W. CW Valiant Tx and Power Supply, also receivers R.1132 and R.1084. (Berkshire).—Box No. 4869, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

HENRY'S RADIO LTD.

COMPREHENSIVE CLEAR
CONCISE CATALOGUE

★
ALL TYPES OF
ELECTRONIC
COMPONENTS, TEST-
EQUIPMENT, KITS and
BUILT UNITS.



Over 300 pages fully detailed and illustrated with more than 6,000 stock items. Everything for amateur and professional use. Complete with 5 vouchers. 10/- value, for use with purchases.

ORDER AS CATALOGUE A. PRICE 7/6. p.p.2/-.



HENRY'S RADIO LTD.

Mail Order Dept., Components,
Organ Dept.,
303 EDGWARE ROAD, LONDON W.2.
Telephone: 01-723 1008-9.

High Fidelity and Equipment Centre
309 EDGWARE ROAD,
LONDON W.2.
Telephone: 01-723 6963

OPEN MON-SAT 9am-6pm. THURS 9am-1pm.

Listen to the world with Eddystone



When you own an Eddystone communications receiver, you have the broadcasting world at your finger tips — wherever you happen to be — on land or at sea. The reputation these sets have attained is proof of their excellence and reliability and at Imhofs, there is a special Eddystone department, where you can see, hear and compare all models listed here. Same day despatch to any part of the world; free delivery in the U.K.; plus after sales service for which Imhofs and Eddystone are world famous.

EDDYSTONE EB35 Mark II broadcast receiver AM/FM transistorised. A high performance all-band receiver, can also be used as a 'Hi-Fi' tuner. Powered by 6 SP2 torch cells, or, with Type 924 power supply unit, from AC mains. £82.4.9d.

EDDYSTONE 940 (13 valve) communications receiver. A connoisseur's instrument combining 'Professional' appearance with performance; has a world-wide reputation, two RF stages ensure high-sensitivity. £158.0.0d.

EDDYSTONE EC10 transistorised communications receiver. An enthusiast's receiver at a modest price. Embodies features usually only found in much more expensive designs. Powered by 6 SP2 torch cells or Type 924 power unit (AC). £59.10.0d.

EDDYSTONE EC10 Mark II transistorised communications receiver. A de-luxe version of this famous design now incorporating 'S' meter and limited fine tuner. £69.10.0d.

EDDYSTONE EA12 'Ham Band' receiver. Built to professional standards but specifically for the amateur enthusiast. High sensitivity for all reception modes CW, MCW, AM and SSB. FSK adaptor available as ancillary £195.0.0d.

There is an Eddystone Communications receiver for any frequency between 10k Hz and 870 MHz; full details from Imhofs or your local Eddystone agent.

IMHOF'S

MAIN EDDYSTONE
DISTRIBUTORS



Dept: 11/2
112-116 New Oxford Street, London, WC1 Tel: 01-636 7878

S.S.B. PRODUCTS

XTALS! XTALS! XTALS! State frequency and alternatives you require. All 10/- each. 1,000 kc. xtals, 15/- each. 1,000/100 kc. dual xtals, 30/- each. S.A.E. please.

NEW EDDYSTONE AND TRIO. EC10, £59. EB35 Mk. 2, £80. 940, £153. TS150/PS510, £200. 9RS9DE, £39. JR500SE, £65. Latest JR310, £74. These are all new, boxed. 10% allowed off for clubs, etc. Good part exchange allowance.

RECONDITIONED GEAR FOR SALE. EC10, £35. Labgear LC50 80-10m. Tx. Hallicrafters SX101A, first class Rx., £98. Redifon R50M, 95 kc/s. to 32 mc/s. Eagle F.M. tuner was £29 15s. As new £18. Linear 2 x 813 in Imhof table top cabinet. Power unit. VFO. Eddystone large dial. Complete except exciter, £25 + 30/- carriage.

6HF5's 2gns. plus 10/7 P.T. each (2/6 P. & P.). No extra for matching pairs or fours. Bases 5/- each.

MATCHED 6HF5's. SPECIAL OFFER 4-6HF5's, 4-Bases plus Handbook and Circuit of simple to make 800w. Linear. Price £10 (saving 35/-). Postage 4/6 extra (includes P.T.).

6146's. £2 each. Matched pairs in stock (4/6 P. & P.). Gives extended life and better linearity.

BIRKETT'S BETTER BEAMS. 2 metre W.S. Yagi 5 element (10 dBs. gain) with masthead bracket. Only 49/6 plus 10/- carr.

SCARAB ½ lattice quality xtal filters, inc. carrier xtal, Tx circuit and layout. All parts to make it inc. 3 newly made xtals, £7/10 plus 2/6 P. & P. Special offers to all who use our filter.

ATTRACTIVE ROUNDED CORNER CABINETS AND PNLS. Louvred. Lift up lid. 15" x 10" x 6" approx. Removable base, etc. Only £4 plus 10/- carriage. Well enamelled.

NEW ROTARY RELAYS. R.C.A. 12v. 3-sets c/o + 1-M/B. Beautifully made. F.B. for 160-2m., 11/6 each plus 2/6 P. & P. Cct. for one button controller included free.

7 LITTLE CASTLE STREET, TRURO

G. W. M. RADIO LTD.

VALVE VOLTMETERS No. 2. 150v. A.C./300v. D.C., £3/10/-. Cathode Follower Valve Voltmeters A/S 576. 1mv to 100v. in 6 ranges, £4. Both are for 200/250v. A.C. and carriage paid.

KLYSTRON power supply units. Modern, slight external damage, £4/10/-. carriage paid. Superior Headsets with boom microphone, Airline type 62, 600 ohms, 32/6, post paid.

METERS. 2 1/2" round 500 ma. 3/4" square 5 ma calibrated 0-400 amps. 3/4" square Moving Iron 100 volts, 15/- each, post paid. Oblong 6" x 4 1/2" 250-0-250 Microamps calibrated 2.5 volts, 750 mV, 50 mV, 4 1/2" x 4 1/2" 204 microamps, calibrated 3v., 10v., 100 ohms, 35/- each, post paid.

ONE ONLY. C.T. 478 Precision Signal Generator 1.3 to 4.2 k.Mc/s., calibrated attenuator, etc. for 200/250 A.C., £27/10/-. carriage paid. Excellent condition.

RECEIVERS. RI475. 2-20 Mc/s. Large slow motion dial, etc., with original power unit for 12 volts D.C. or 230 volts A.C. Less connecting cables, all connections marked, £11, carriage £1.

RECEIVERS. B40. 640 kc/s. to 30 Mc/s. Speaker A.C. power unit built-in. Bandwidth switched 1, 3 and 8 kc/s. Crystal calibrator, circuit diagram, £22/10/-. carriage 30/-.

SINGLE GANG 500 pf VARIABLES. 6/-, post paid. AVO 7, fully reconditioned with test leads and leather case, £13, registered post paid.

WEATHER FORECASTING EQUIPMENT. Rainfall gauges, consisting of copper funnel, collecting bottle and measure with chart for year, 30/-.

Wet and Dry bulb Hygrometers with relative humidity charts, Centigrade, 24/-.

8-day Thermographs readily available charts £7/10/-. All post paid.

WAVEMETER Class D as new with accessories, 6v. D.C., £7, carriage paid.

AERIAL VARIOMETER TUNERS for 19 set, 16/6, post paid.

HEADSETS for 19 set with microphones, used, 10/-, post paid.

RACAL RA17. Aerial trimmer capacitors 220pf, 5/-, post paid.

CENTRE ZERO AMMETERS. 30 amp. for cars, 7 amp. for motor cycles, 8/6 either, post 1/6.

CRYSTAL CALIBRATORS No. 10. Excellent condition, £3/10/-. post paid.

WALTON pocket watches, unused, £3/10/0/-, registered post paid.

VALVES, new 807 and 5U4, 6/- each, post paid, or 6 for 23/-, post paid.

RELAYS PO 3000 type, new, 1000 ohms, 2 make 2 break 5 amp contacts, 7/6, post paid.

FOR CALLERS ONLY

AR88 RECEIVERS, from £35, **7B TELEPRINTERS,** £10.

All Receivers and Test Equipment are in working order at time of despatch. Carriage charges quoted are for England and Wales only.

Telephone 34897

Terms: Cash with order.

Early closing Wednesday.

40-42 PORTLAND ROAD, WORTHING, SUSSEX

SELLING: Eddystone EC-10 Mk. II receiver, brand new, complete with unregistered guarantee, manual and batteries, price £55.—Bradley, 6 Linden Grove, Folkestone Street, Hull, HU5-1BP, East Yorkshire.

FOR SALE: Heathkit DX-40U transmitter, £15. Codar CR-70A receiver, £12. Codar T.28 receiver, £10. Discatron portable record player, £15. (Home Counties).—Box No. 4867, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

FOR SALE: Home-built 10-80m. transmitter, rack mounted, will run 300w. AM/CW, with PSU and high-level modulator (pair 811) complete and tested, except PA requires assembly; ideal for the constructor, £14 or near offer.—Abel, G8CVE, 9 Grove Terrace, Maltby, Rotherham, Yorkshire.

WANTED: Quality short-wave receiver in EXCHANGE for my mint Akai 1710 stereo tape recorder (cost £108) and/or 500mm. F5-6 Tele-Xenar lens for S.L.R. (cost over £100). (Scotland).—Box No. 4868, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SALE: Home-built Rx of hybrid design. Transistorised from AF to IF stage, which is 3/EF183 at 5-2 mc. Full crystal filter accurately etched with carrier crystals in product detector. Was designed for SSB. Built into professional cabinet 12 x 11 x 7 inches, with Eddystone 898 dial and modern fittings. Front-end and AGC to be completed. Reason for selling: No time to complete and must go commercial. Full details, or offers.—Catchesides, Barnwell Hall, Patchway, Bristol, BS12-5DF.

FOR SALE: Heathkit SB-300 Rx, in excellent condition, price £95. Also Heathkit OS-1 'scope, mint, £14.—Ring Warren, Waterloo (Hants.) 3177.

WANTED: Heathkit Sideband Adaptor SB-10U. Highest price paid for as-new specimen. (Eire).—Box No. 4870, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SALE: Creed Auto-Tx Type 6S/4. Also '7B and '8B teleprinters, incomplete. Offers?—Kanaar, 14 Queens Road, Belmont, Sutton, Surrey (or ring 01-642 6415, 6.0 to 8.0 p.m.).

OFFERS invited for Racal RA-17 receiver, in perfect condition. Continuous coverage 1.0 to 30 mc, crystal synthesizer, 23 valves, 7 crystals, film scale tuning, etc., with handbook. (London).—Box No. 4871, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SELLING at half-list prices: Racal digital frequency meter Type SA520 (list £140); Advance AC valve millivolt meter (£40); Levell transistor tester (£25); Muirhead attenuator, 75-ohm (£16). All items in mint condition. (London).—Box No. 4872, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

FOR SALE: Galvanised lattice steel mast, similar B.X.I. triangular, telescopes from 42ft. to 25ft., two winches, takes Ham-M rotator, ball races, etc., perfect condition, £45. Jackson Vee-Vee Beam for 15-20m., on 2 1/2-in. aluminium boom, consistent S9+VK/ZL, price £15. Either available May/June. Any demonstration, photographs.—Lee, G5FH, QTHR.

WANTED: J.K.X. 4-metre Converter, 4 mc IF preferred, but others considered. Also Electroniques coils BP28, XO33, XO34, XO35, XO36.—Loveland, 1 The Ridings, Hare Hill, Adlestone, Surrey.

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

FOR SALE: Small and compact AC mains receiver. LW/MW/SW, £5. Transistorised UHF/VHF converter, 10s.. American VHF Rx, tunable 80 to 150 mc, with PSU/speaker, £15. Carriage extra; s.a.e. with enquiries.—Hayward, Sunnyfields, Lighthouse Road, St. Margaret's Bay, Nr. Dover, Kent.

OFFERING: DC power supplies, 12-volt, for SSB transceivers—transformers, components and complete modules up to 450w. p.e.p., send s.a.e. for details. Also an Eddystone 880 professional Rx, in excellent order, at £185. Precision one-megacycle oscillators with temperature controlled ovens, modern 7-transistor design, as new and tested, £5 each. Many assorted components, s.a.e. for list.—Sandall, G3LGG, 38 Moorland View Road, Walton, Chesterfield, Derbyshire.

SALE: R.C.A. AR88D Rx, perfect, £42. Car radio, SW/MW/LW coverage, £8. Also components, PSU's, preselectors, magazines, etc., etc.—Thompson, Thurstley Cottage, 1 Church Road, East Molesey, Surrey. (Tel. 01-979 4503.)

WANTED: In perfect order and appearance, Collins S-Line transmitter (any model) with Collins 516F-2 AC/PSU or K.W. Viceroy Mk. IV with extra lattice filter; also Shure 444 microphone.—Brindle, G3YZX, 4 Bowjey Terrace, Newlyn, Penzance, Cornwall.

FOR SALE: Sommerkamp FR-500 Rx, coverage 10 to 160m., and FL-500 Tx, 10 to 80m., both as new, £110 each, or £210 the pair, no offers.—Ratcliffe, G3KZW, 63 Leyland Green Road, Ashton-in-Makerfield, Wigan, Lancs.

WANTED: QQV03-20A valves, must be as new. Offering QQV06-40A's or 6146's (new and boxed) in exchange. (Scotland).—Box No. 4873, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

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

WANTED: Brand new and unused valves: Four 811A's; Two matched 6146A's; 4X150A (7034). Also Johnson Matchbox Model 250-30-3, in mint condition; Collins 4.0 kc bandpass filter F455FA-40, also 6.0 kc bandpass filter F455FA-60; Collins 312B-5, 75A-4, and 51S-1; must be in as-new and mint condition.—Box No. 4875, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

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

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

OFFERING: Heathkit DX-100U, in very good condition; best offer over £20, plus carriage, secures.—Kemsley, G3FUN, 1 St. Mary's Road, Faversham (2608), Kent.

SALE: Heathkit SB-401 Tx, professionally wired and as new, £120. R.C.A. AR88D, with manual and spare valves, in mint condition, £60 or near offer. Hy-Gain tower Type HT-18, in good condition, £50. G. & D. Linear, 500-watt, new valve, £30. Two 813's, unused, 40s. each. Professional Vortexian Recorder, WV5/5, as new, £75 or offer.—Menzies, GM3GNE, 60 Beech Avenue, Newton Mearns, Renfrewshire, Scotland. (Tel. NEW 2392.)

SELLING: R.C.A. AR88D receiver, in good condition, price £35. Mosley TA-33 3-element beam, near-new condition, £15.—Smith, 21 Manor Road, Eastwood, Nottingham.

SALE: Ideal for young SWL, H.A.C. two-valve three-coil (9 to 170m.) Rx, 60s. Johnsons 2-4m. two transistor VHF Rx, 40s., built up and with full instructions.—Whitworth, 94 Pine Hill, Epsom (26016), Surrey.

WANTED: HA-350 or similar receiver. **FOR SALE:** Lafayette KT-340 with handbook, £18. Tuning Unit Type TU-5B, mint, 40s. Avo resistance/capacity bridge, £7. K.W. Geloso converter, 10 to 80m., £10. Toyoto 12 x 50 binoculars, with case, £10. Type 234 PSU, 40s. R.C.A. AR88LF receiver, £29. Buyers collect.—Earnshaw, 12 Clarke Brow, Middleton, Manchester.

Echelford Communications

32 FELTHAM HILL RD., ASHFORD, MIDDX.

Ashford (MX) 55265 any time up to 9.30 p.m

SECOND-HAND ITEMS

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

	P/P
Lafayette "Precon" type HE73 an HF converter with output between 3.5 and 5.5 MHz.	
Mains powered	£15 0 7/6
Lafayette SW receiver type KT320, general coverage SW receiver. Mains powered ...	£22 10 10/-
Veritone SW receiver type CR150, a simple general coverage receiver, ideal for beginners.	
Mains powered	£17 0 10/-
BC-348L receiver, with separate mains PSU. A good general coverage receiver, few mods. ...	£16 0 15/-
B44 Mk3 4 metre transceiver with mike and cables, no mods. carried out, full details of ESGB mods. included	£8 0 15/-
Home-brew NBFM/CW transmitter. Covers 7, 14, 21, 28MHz 30W O/P mains powered, well built. Well worth more than Minimeter HF band transmitter, complete with PSU, not working and weighs a ton	£9 0 40/-
EIL Laboratory valve voltmeter Model 26, mains powered	£20 0 20/-
Avo R/C bridge, mains powered, useful bit of gear	£1 10 7/6
BC221-M frequency meter. Less PSU	£15 0 15/-
CRT unit, these contain a 5" double-beam CRT, mains transformer many HS resistors, etc. Standard rack width, good for break-up ...	£3 0 25/-
Codar PR30X mains powered pre-selector	£7 0 4/6

Hours of business:

Monday, Tuesday, Thursday, Friday 9.00 a.m.—6.00 p.m.
(Closed for Lunch 1-2 p.m.) Saturday 9.00 a.m.—5.30 p.m.

CLOSED ALL DAY WEDNESDAY

A. G. WHEELER, ECHELFORD COMMUNICATIONS

TAURUS ELECTRICAL SERVICES

Prop. G3TED

LOOK

CSE 2AR all Silicon Solid State Top Band Receiver.

LIST PRICE £44.00

OUR PRICE £29.10.0 Air Tested

- 600M Amplifiers. 19" rack mounted. Mains supply, £3.
- Lightweight headsets. 600Ω imp., 9/6, post paid.
- Transistors, A.F. and R.F. 3/9 dozen, post paid.
- Transistorized Morse Oscillator Modules. Will drive speaker or phones, 18/9, post paid.
- New Unijunctions P-N-Planar UT46 with full information, 8/6, post paid.
- New and Boxed Mains Relay, 2 pole 2-way octal base, 17/6, post paid.
- New Jack Plugs 2/6; Jack Sockets, 2/9 or 5/- pair, post paid.
- Tank Aerials. Three 4" sections making 12', 8/6. P. & P. 5/- any number Bases, 4/6. P. & P. 2/-.
- Brusts Sets. Safe for Mobile Operation, 10/-, post paid.
- Xtal insets to fit above Brusts Sets, 7/6. P. & P. 9d.
- Head Sets. 19 set type or type DLR, 11/-, post paid.
- Dry Battery Packs. 72 and 1 1/2 and 1 1/4, 4/6 each. P. & P. any number 3/-.
- New Key Switches. Less knobs, 2/6. P. & P. any number 1/-.
- New Small Condensers. New Junk. 200 for 25/-, post paid.
- New Boxed Morse Keys, 5/- each plus 2/- post and packing.
- Xtal Lapel Mikes. Complete, 6/6.
- Miniature Indicator Lamps, L.E.S. Red, blue, yellow, white. Smart looking, 2/6 each. Less bulbs to fit 12v. or 6v., 1/- each.
- New supplies P346A, 200 meg. -5, Transistors, 9/-, post paid.
- SPECIAL OFFER OF MIKES. D x 73 Pizo Dynamic, 32/6, post paid.
- M.S.11. Dynamic with Flexible Desk Stand, £3, post paid.
- ACOS Xtal (metal), MIC45, £1 2/6, post paid.
- CM20 Xtal (plastic), 9/6, post paid.
- CM70 Xtal Stick with Accessories, £2 7/6, post paid.
- VALVE HOLDERS, B9A and B7C, 8d, each, Octal Ceramics, 1/3.
- BY100 Rectifiers, 3/9 each, SM78P Silicons 800PIV 750M/A, 3/9.
- Thyristors, 400 PIV 8 amps, 9/6 each.
- Jap Vernier Slow Motion Dials, 500 mm., 10/-; 70 mm., 12/6, post paid.
- Plugs. Octal, B9A or B7C, 2/6 each.

26/28 NOTTINGHAM ROAD, LOUGHBOROUGH, LEICS.
Telephone 5131

New Branch now open at
88 ARKWRIGHT STREET, NOTTINGHAM

R Y R Y R Y - R T T Y - R Y R Y R Y

Send/Receive RTTY with these easily-built PRINTSET Basi-kits from West Germany.

- DL6EQ TWO-TONE LIMITERLESS CONVERTER** Basi-kit with pre-tuned Bandpass Filter and Mark/Space Filters, Dual-Magic-Eye tube ... £8/0/3
- FREQ. SHIFT KEYS** Basi-kit for CO or VFO ... 13/6
- AFSK OSC.** Basi-kit for SSB or VHF Tx. ... £2/13/6
- 130 and 500 mhy SHIFT MONITOR INDUCTORS** 18/6 ea.
- 425 Hz FORKS, 13/9. 88 mhy TOROIDS** ... 12/- pair

14 page Catalogue SP5 describes these and other RTTY, VHF, SSB, El-Bug kits and units.

SPACEMARK LTD. 14 PICCADILLY, MANCHESTER 1. (Tel.: 061-237 0817)

DERWENT RADIO S.A.E. LISTS

- | | |
|---|--|
| KW Atlanta and AC p.s.u. ... £250 | Eddystone Edometer ... £27 |
| KW 2000B and AC p.s.u. ... £240 | Eddystone 940 ... £158 |
| KW Vespa II and AC p.s.u. ... £135 | Eddystone EA 12 ... £195 |
| KW 201 converter ... £111 | Eddystone EC 10 ... £59.10 |
| KW Q multiplier ... £8 10 | Eddystone EC 10 Mk. II ... £69.10 |
| KW E-Z match ... £12.10 | Eddystone mains p.s.u. ... £6 15 |
| KW P.E.P. meter ... £16 10 | Eddystone 898 dial ... £6 6 |
| KW 3 way coax AE switch £3 3 | Eddystone plinth speaker ... £4 6 |
| KW balun ... £1 15 | Diecast boxes 8/3, 11/11, 10/11 |
| KW traps and T piece ... £3 10 | Codar AT-3 transmitter ... £16.19 |
| KW low pass filter ... £4 14 | Codar T-28 receiver ... £15.17 |
| KW trap dipole ... £11.10 | Codar 250/S ... £8 10 |
| Lafayette HA500 ... £45 | Codar 12/MS ... £11.10 |
| Lafayette HA700 ... £37 | Codar 12/RC ... £2 10 |
| Trio TS 510 and AC p.s.u. ... £212 | Codar PR-30 ... £5 19 |
| Trio JR-500 receiver ... £69.10 | Codar PR-30x ... £7 19 |
| Trio 9R59DE receiver ... £42.10 | Joystick standard ... £5 10 |
| Trio SP-5D speaker ... £4 7 | Joystick de-luxe ... £6 11 |
| Trio HS-4 headphones ... £5 19 | Joystick 4RF tuner ... £7 2 |
| Eagle SWR bridge ... £9 19 | Joystick 6RF tuner ... £4 10 |
| Eagle RF 45 tuning meter ... £2 | Joystick 3A tuner ... £4 4 |
| Katsumi el bug ... £7 15 | Amphenol PL 259 ptfc ... 6/- |
| Hansen SWR bridge ... £3 10 | Amphenol SO 243 ptfc ... 7/6 |
| G Whips 160/80 ... £9 | Lafayette HA 600 ... £45 |
| G Whip tribander 14-28 ... £9 | Repanco coils and trans-formers. ... 25/- |
| G Whip multi mobile ... £15 10 | 100 kc/s. 87G xtals. ... 25/- |
| G Whip base mount ... £1 10 | Selection 50 odd xtals, our choice, rebate on unwanted xtals. box ... £2 |
| Garex 2m. converter 28-30 Mc. ... £10 7 | 6J56A valves, RCA ... 35/- |
| Garex 15w. 2m. tx ... £8 15 | 6LQ6 valves, RCA ... 46/- |
| Garex 2w. 2m. tx ... £16 10 | Halsen mobile Ae ... £6 17 |
| Garex 15w. 2m. tx kit ... £4 17 | Halsen extra coils ... £3 17 |
| Garex Standard mod kit ... £4 15 | Teisco B1002 dynamic mic ... £2 12 |
| Lafayette HA 700 ... £37 | TTC 5 band RF meter ... £3 19 |
| Garex de-luxe mod. kit ... £7 17 | Antex soldering iron 15w. ... £1 12 |
| Garex popular p.s.u. kit ... £3 15 | Antex soldering kit ... £2 15 |
| Garex heavy duty p.s.u. kit ... £4 12 | 2 way intercom ... £2 15 |
| Garex dual p.s.u. kit ... £2 18 | |
| Eddystone 830/7 ... £285 | |

WANTED : WE ARE ALWAYS PLEASED TO HEAR ABOUT YOUR TRADE-IN EQUIPMENT AND ARE LOOKING FOR GOOD CONDITION KW, EDDYSTONE, AND TW ITEMS IN PARTICULAR. WE CAN OFFER CASH, RADIO EQUIPMENT OR NEW PHOTOGRAPHIC EQUIPMENT IN PART EXCHANGE. WE ARE ALSO PREPARED TO ACCEPT CERTAIN PHOTOGRAPHIC EQUIPMENT IN EXCHANGE FOR RADIO. S.A.E. WITH REQUIREMENTS.

H.P. on any items over £35 in value. One third deposit and up to two years to pay. Payments may be by Post Office Giro. You may also place your orders by Giro. Our account number 64 041 0006.

Second-hand equipment in stock

- | | |
|-------------------------------------|----------------------------------|
| KW 2000A and AC p.s.u. ... £190 | Eddystone 940 ... £100 |
| KW Vanguard 160-10 ... £45 | Minimitter Mercury tx ... £30 |
| KW Vespa and AC p.s.u. ... £115 | Collins filter ... £25 |
| KW Valiant and DC p.s.u. ... £30 | Heath DX 100 ... £40 |
| Trio JR 500 50-10m. ... £55 | Codar AT-5 ... £13 |
| Trio 9R59DE ... £30 | Codar T-28 ... £12 |
| KW Viceroy 4 with AC p.s.u. ... £95 | Codar PR 30 ... £4 10 |
| Trio TS 500 and AC p.s.u. ... £175 | Codar PR 30X ... £5 10 |
| Halicrafters SX 43 ... £35 | Sommerkamp FR 50 DX ... £115 |
| Drake SW 4A and speaker ... £155 | Lafayette HE-80 receiver ... £30 |
| Pye base low band ... £20 | Class D w/meter ... £6 |
| Pye base hi band ... £20 | Lafayette HA 500 ... £38 |
| Star SR 550 ... £30 | Inoue IC 700R ... £75 |
| Codar CR 70A receiver ... £16 | Eddystone EA 12 ... £140 |
| KW 160 am/Cw tx ... £18 | KW E-Z match ... £8 |
| Heath Mobican ... £30 | Hansen swr bridge ... £2 |
| KW Q mult ... £5 | Heath HW 30 ... £23 |
| Pye ranger ... £5 | KW Viceroy II & psu ... £80 |
| Eddystone 840c ... £40 | Heath RA-1 ... £30 |
| Trio VFO ... £20 | Trio 9R59 ... £25 |
| Eddystone 740 ... £30 | Eddystone 640 ... £20 |

Please add extra for carriage. S.A.E. for lists

28 Hillcrest Avenue, Scarborough, Yorks.

FOR SALE: K.W. Vanguard, Mk. II, 10 to 80m., in good working order, price £30, delivery West Midlands area.—Holt, G3PTS, 39 Dovehouse Lane, Solihull, Warwickshire.

DISPOSING: SHF general coverage base Rx, tuning 500 to 3000 mc, R.A.F. type R.1294, 8 valves, meter, BFO and handbook, requires only simple PSU, price £15 (this is a rare one). Type TG-10 auto Morse paper tape keyer, U.S. Army model, 115v, mains input, 7 valves and P-E cell, variable speed tape drive, with circuit, £10. Class-D Wavemeter, unmodified, £4. FL-8 audio frequency filter, 15s. BC-453 (Q5'er), 60s. G.E.C. BW-456 miniature 100 kc xtal calibrator, internal mains PSU, smart job, £4. R.1147 receiver, coverage 180 to 220 mc, £5. Pye Reporter PTC-118, for four metres, 12v, and mains inputs, £5 10s. ARRL "Handbooks" for 1945, '46, '48, '49, '51 and '56, 7s. 6d. each. All post or carriage extra. Prefer buyers to collect R.1294 and TG-10.—Cockle, 14 Leewood Way, Effingham, Leatherhead, Surrey. (Tel. Bookham 5439.)

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

SALE: Eddystone 940, powerful communications receiver, with plinth speaker, headphones, Joystick aerial and matching unit, price £92 10s. or near offer. (London area).—Box No. 4876, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

FOR SALE: Radatec radar detector, in mint condition (this has saved me from five police radar traps), no longer required, original cost £13, my price £7. Also a B.44 transceiver, all mods. for 4 metres done, and in good working order, £7.—Watmough, G3WXB, 128A Baldwins Lane, Croxley Green, Watford (27499), Herts.

SELLING: Minimitter Mercury transmitter, covers 10 to 80m. bands, AM/CW/FM, runs 150 watts, in first-class condition, price £40. Prefer buyer examines and collects, otherwise carriage extra.—Willoughby, 50 Valebrook Close, Cheriton, Folkestone, Kent.

FOR SALE: Codar CR-70A receiver, £15, or near offer. B.44 Mk. II, working, with two crystals, £5. Mod. transformers, PL504, new, 18s. QQV03-10, 4s.; QQV06-40A, used, 8s. Send s.a.e. for lists.—Sears, G3YEG, Roselea, Wycombe Road, Stokenchurch, Bucks. (Tel. Radnage 3191.)

SELLING: Heathkit DX-100U AM/CW transmitter, covering 10 to 160m., in very good condition, with microphone and c/o relay, price £40 or near offer. Also B.40B receiver, £15 or offer. Both these with manuals. Take the pair for £50.—Clouting, G3YGS, 3 Jackson Court, Brading Crescent, Wanstead, London, E.11. (Tel. 01-989 3275.)

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

OFFERING: Collins 75A-3 receiver, in immaculate condition, with auto-xformer, spares and manual, offers? Also a 100-watt modulator for QRO two-metre Tx, 2/6GJ5's in Class-B, with UM3 mod. xformer, built-in PSU, metered, £10. JXK T1588A FET two-metre converter, IF 28-30 mc, hardly used, £12. All carriage extra.—McAlister, G3YFK, 10 Woodfield Road, Shrewsbury (55673), Salop.

FOR SALE: Trio communications receiver, Model 95-59DE, one year old and in as-new unscratched condition, price £25. Matthams, 1 Howard Court, Park Lane, Knebworth, Herts.

MORSE MADE !!!
EASY !!!

FACT NOT FICTION. If you start RIGHT you will be reading amateur and commercial Morse within a month. (Normal progress to be expected.)

Using scientifically prepared 3-speed records you automatically learn to recognise the code RHYTHM without translating. You can't help it, it's as easy as learning a tune. 18-W.P.M. in 4 weeks guaranteed.

For details and course C.O.D. ring s.t.d. 01-660 2896 or send 8d. stamp for explanatory booklet to: G3HSC/Box 14, 45 GREEN LANE, PURLEY, SURREY.

Technical Books and Manuals

AERIAL INFORMATION

ABC of Antennas	17/-
Aerial Handbook	15/9
Amateur Radio Antennas (Hooton)	O/P
Antenna Handbook, Volume 1	33/6
Antenna Round-Up, Volume 1	27/6
Antenna Round-Up, Volume 2	33/6
Antenna Handbook, 11th Edition	26/6
Beam Antenna Handbook	33/-
Ham Antenna Construction Projects	27/-
Quad Antennae	28/6
S9 Signals	9/6

BOOKS FOR THE BEGINNER

Amateur Radio (Rayer)	26/6
Basic Mathematics for Radio and Electronics	18/9
Beginners Guide to Radio	O/P
Beginners Guide to Electronics	16/-
Beginners Guide to Colour TV	15/8
Better Short Wave Reception	27/6
Course in Radio Fundamentals	11/9
Dictionary of Electronics	8/6
Foundations of Wireless	23/-
Guide to Amateur Radio	6/6
How to Become a Radio Amateur	11/-
How to Improve Short Wave Reception	20/-
Learning Morse	O/P
Morse Code for the Radio Amateur	2/-
Learning the RT Code	4/9
Novice Handbook, Tx & Rx	25/-
Radio, by D. Gibson	13/9
Radio Amateur Examination Manual	5/9
Short Wave Listening	16/-
Short Wave Listener's Guide	13/8
Short Wave Receivers for the Beginners	O/P
Understanding Amateur Radio	26/6

GENERAL

Official (I.T.U.) Chart of International Frequency Allocations	35/6
CQ Anthology 1952-59	27/6
Eliminating Engine Interference	17/-
Guide to Broadcasting Stations	6/9
How to Listen to the World	26/6
Introduction to Valves	9/4
Radio Experiments (Rayer)	17/3
RCA Silicon Power Circuits	23/-
RCA Receiving Tubes Manual	30/-
RCA Transistor Manual	23/-
RCA Transmitting Tubes	15/-
Radio Astronomy for Amateurs	O/P
Soldering Handbook	22/6

Shop & Shack Shortcuts	34/6
Television Explained	26/6
World Radio & TV Handbook 1970 Edition	43/6

HANDBOOKS AND MANUALS

Amateur Radio DX Handbook	42/-
Electronic Circuit Handbook, Vol. 1	27/6
Electronic Circuit Handbook, Vol. 2	27/6
Mobile Handbook, CQ	27/-
Mobile Manual, ARRL	27/-
New RTTY Handbook	35/-
New Sideband Handbook, CQ	28/-
Novice Handbook Tx & Rx	25/-
Radio Amateur Handbook (ARRL) 1969 Edition	Paper 50/-
Radio Communication Handbook (RSGB)	69/-
Radio Handbook, W.I. Orr	88/6
Surplus Conversion Handbook	26/6
Transistor Radio Handbook	O/P
Transistor Substitution Handbook	17/-

USEFUL REFERENCE BOOKS

Amateur Radio Techniques	14/3
Amateur Radio Construction Projects	21/-
Amateur Radio Circuit Book	11/10
Elements of Radio Engineering	16/-
Guide to Amateur Radio	6/6
Engineers' Pocket Book	15/10
Hams' Interpreter	9/6
Hints & Kinks, Vol. 6 (ARRL)	11/9
Radio Amateur Examination Manual	5/9
Operating an Amateur Radio Stat.	2/8
Radio Amateur Operator's Handbook	6/6
Radio Valve Data	11/8
Radio Data Reference Book	14/6
Radio Engineer's Pocket Book	12/6
Service Valve & Semiconductors Equivalents	5/6
(Amateur) SSB Radio Guide	31/-
Single Sideband for the Radio Amateur (ARRL)	26/6
Surplus Schematics (CQ)	23/6
Q & A on Audio	10/-
Q & A on Electronics	10/-
Q & A on Transistors	10/-

VHF PUBLICATIONS

VHF Handbook, Wm. I. Orr	30/6
VHF Manual (ARRL)	26/6
VHF for the Radio Amateur	O/P
VHF/UHF Manual (RSGB)	23/-

The above prices include postage

Available from **SHORT WAVE MAGAZINE**

Publications Dept., 55 Victoria St., London S.W.1

01-222 5341

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

(Nearest Station: St. James's Park)

(GIRO A/C. No. 547 6151)

WORLD RADIO/TV HANDBOOK 1970

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

Lists all International short-wave stations, including frequencies for each country, foreign broadcasts, long and medium wave stations (AM broadcast Band), TV stations and domestic programmes. Long recognised as the established authority by broadcasters and listeners. It is the only publication that enables you to identify BC stations quickly and easily. Enables you to fill more pages in your log book on the SW BC bands and helps you add more BC-station QSL cards to your collection.

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

PLEASE ORDER YOUR COPY EARLY!

All available from:

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

Short Wave Listening

PHILIPS PAPERBACK

SHORT WAVE LISTENING by J. Vastenhou. Size: 8½" x 5½".
107 pages. Numerous text diagrams.

Price 16s.

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

The first group includes many emigrants who in their new country are anxious not to lose touch with their homeland, and those who are intending to emigrate and will thus in future have to do much of their listening on short waves. The second group is of those enthusiasts who regard short wave radio as an indispensable medium for the exchange of information internationally in the broadest sense and employ it in order to widen their knowledge of other countries. The book, which deals with the possibilities and problems of short-wave reception on the level of popular science will enable the reader to discover a whole new world of his own.

CONTENTS

Short Waves	Do Any Regulations Exist
The Principles of Short-Wave Transmission	Governing the use of Frequencies in the Short-Wave Bands?
Practical Short Wave Transmitting	DX-ing In Practice
Short Wave Prediction	DX-ing With a Tape Recorder
Sources of Interference	DX-ing Using a Frequency Meter
The Aerial	Some Commonly Used DX Terms in Three Languages
The Correct Choice of Receiver	Transmission of Time Signals at Standard Frequencies
Communications Receivers	Some of the More Important DX Clubs

Available from stock:

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

"CALLBOOK"

WINTER EDITION

Limited Quantity Only!

Please order your copy early

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

DX Listings 45/6 **US Listings 69/6**

The two together, covering the World, **£5/10/0**
Post free

Available only from

Publications Dept.,

SHORT WAVE MAGAZINE

55 Victoria Street, London, S.W.1
01-222 5341

Peter Seymour Ltd.

Introducing the NEW
SWAN DE-LUXE CYGNET
Model 270

SPECIFICATIONS:

Power Input: 260 watts P.E.P. in SSB voice mode, and 180 watts in CW mode.

Frequency Range: 3.5-4.0 mc, 7.0-7.3 mc, 14.0-14.35 mc, 21.0-21.45 mc, 28.0-29.7 mc.

C.F. Networks: Crystal Lattice Filter. Same as used in the Swan 500C. 2.7 kc band width at 6 dB down. 4.6 kc wide at 60 dB down. Ultimate rejection exceeds 100 dB.

Grid block CW keying with off-set transmit frequency. Solid state VFO circuit temperature and voltage stabilized.

Receiver sensitivity better than ½ microvolt at 50 ohms for signal-plus-noise to noise ratio of 10 dB.

100 kc Crystal Calibrator and dial-set control.

S-meter for receiver, P.A. Cathode meter for transmitter tuning.

Improved AGC and ALC circuit. Separate R.F. and A.F. gain controls.

Sideband selector.

Voltage input: 200/240 volts 50 cycles, 12-14 volts DC.

Dimensions: 5½ in. high, 13 in. wide, 11 in. deep.

Net weight: 24 lb.

Brochures on request

410 Beverley Road, Hull, Yorkshire
Telephone: Hull 41938