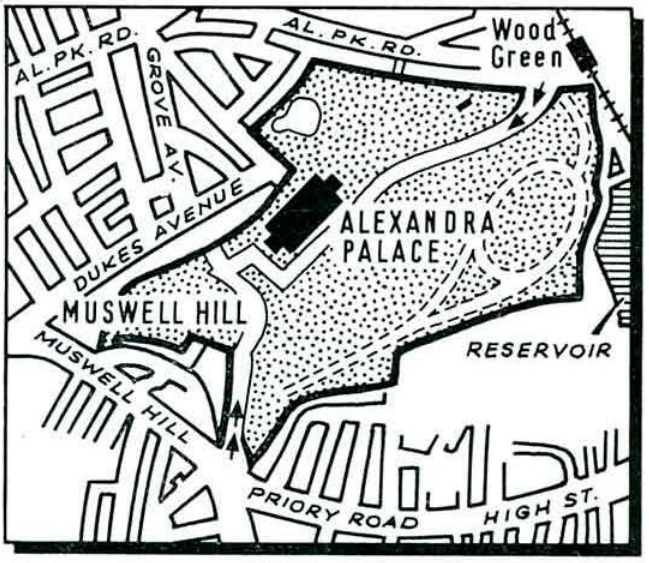
April 1977

radio communication

journal of the Radio Society of Great Britain

RSGB INTERNATIONAL RADIO COMMUNICATION EXHIBITION AND CONVENTION 6-8 MAY 1977

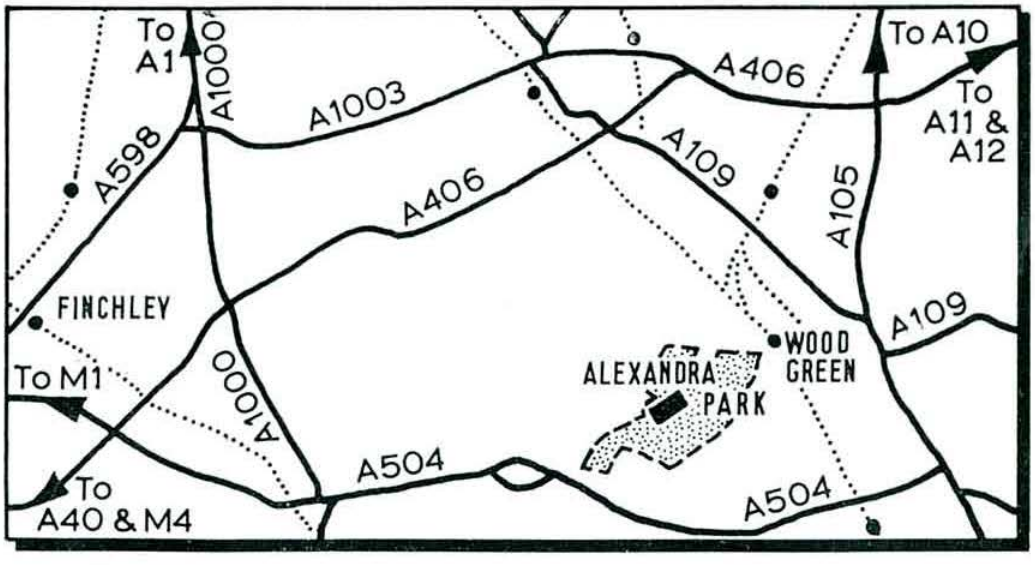


Routes to Alexandra Palace

Talk-in

GB2VHF
145·00MHz fm
145·55MHz fm
144·27MHz ssb

GB3RS
3,720kHz
ssb



See the centre pages of this issue for full details of **The Amateur Radio Event of Silver Jubilee Year.**

RSGB NEWS BULLETIN SERVICE

The RSGB news bulletin, callsign GB2RS, is broadcast every Sunday morning on hf and vhf, giving almost complete coverage of the British Isles. Its main purpose is to provide an outlet for amateur radio news items and announcements which, by virtue of their topicality or urgency, cannot wait for the next issue of *Radio Communication*.

The bulletin is prepared early on Thursday morning, and news items, marked "GB2RS news" should reach RSGB HQ by first post that day (telephoned items can also be accepted until 10am). No guarantee can be given of inclusion in part or whole of any item submitted and, once broadcast, items are not usually repeated.

SCHEDULE

Time	MHz	Location and coverage (hf) or beam heading (vhf) of station
0930	3·65	G2MI, Bromley, Kent (SE England)
1000	3·65	G8ML, Cheltenham (SW England)
	144·50	GM3UAG, Ellon, Aberdeenshire (NNW)
	144·50	G8GGK, Croydon, Surrey (NE)
1015	3·65	GI3GAL, Belfast (N Ireland)
	144·50	GI3TLT, Bangor, Co Down (N)
1030	3·65	G2CVV, Derby (N Midlands)
	144·50	G4DCH, Burnham-on-Sea (NW)
	144·50	GM3UAG, Ellon, Aberdeenshire (SW)
	144·50	G3PWJ, Brierley Hill (NW)
1045	144·50	G8CDP, Middlesbrough (NW)
	144·50	G8GGK, Croydon, Surrey (SW)
	144·50	G8BHQ, Stockport (NNW)
1100	3·65	G5VO, Bridlington (NE England)
1115	3·65	G3LEQ, Knutsford (NW England)
1130	3·65	GM3TCW, Wishaw, Lanarkshire (S Scotland)
1145	3·65	GM3HGA, Aberdeen (NE Scotland)

An rtty news bulletin, callsign GB2ATG, is also transmitted every Sunday at 1200 on 3·590MHz and at 1230 and 1245 on 144·6MHz. This bulletin carries items of interest to rtty enthusiasts.

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CONTENTS

Radio Communication **is published by The Radio Society of Great Britain as its official journal on the first Thursday of each month and is sent free and post paid to all members of the Society**

ABC
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

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Contributions and all correspondence concerning the **content** of *Radio Communication* should be addressed to: The Editor, *Radio Communication*, 35 Doughty Street, London WC1N 2AE. Tel 01-837 8688. **(Circulation** queries should be addressed to: The Subscriptions Department, RSGB).

Closing date for contributions unless otherwise notified: 4th of month preceding month of publication.

Advertising, other than Members' Ads, should be sent to the above address marked for the attention of Mr C. C. Lindsay. Tel 01-686 5839 (ADVERTISING ONLY).

South Midlands

TOTTON (H.Q.), LEEDS, CHESTERFIELD, LINCS,

FTV250
FTV650B

DIGITAL II
+ Scanner

MMT 144/28
MMT 432/28
MMT 432/144

PA 160/10/BL

KP202
KCP 2

Whether you are a listener, a newly-licensed G8, an old hand at the HF bands, or Mr. V.H.F., the array of equipment currently available for VHF is most bewildering. On these pages we make a few suggestions from our large stocks that may help guide you through the maze.

If you already have a HF transceiver, or feel one day you may wish to use the DX bands, then, you can do far worse than use a transverter. Perhaps the Yaesu FTV250 for two, and the FTV650B, suitably modified by us, for four metres. Both offer complete flexibility of station design and requires no plugging or unplugging of any leads, whatsoever, when changing from VHF to HF. As an alternative we offer the range from Microwave Modules. Their 70cm unit is exceedingly popular, coming in three forms with a 144MHz, 28MHz or 50MHz IF. For this latter item we offer the FT620B 6m transverter, which by virtue of its high output frequency can substantially improve image problems (even permitting single conversion to 23cm). The MMT432/144, when used in conjunction with the Yaesu Musen FT221R, from us, will allow full repeater working on 70cm with the in-built 1·6MHz shift and full 4MHz coverage.

Should your interest be purely in listening, and you have a communications receiver, we offer a range of external converters and amplifiers from 4m through to 23cm, or you may prefer a self contained unit such as the FR101D. This covers all UK amateur bands, from 1·8 through to 144MHz with detectors and filters for AM, FM, SSB, CW, etc.

For mobile use, the range is very wide and the choice difficult. For 70cm, rapidly growing in popularity, a Multi U11 for FM, or for SSB a Liner 430, which with its Oscar VII capability offers interesting possibilities of mobile satellites QSOs. In this vein satellite translation from 2 to 10, or the enjoyable full duplex 70-2 crossband should not be neglected. Crystal controlled FM transceivers, such as the FT223, are very popular. We would recommend that you seek one with at least, a 20-channel capability, even if you may not intend to use them all at first. The more advanced synthesised equipments, whether this employs digital or crystal mixed techniques, are surprisingly good value when looked at in the long term, with no crystals to buy for band plan changes or to update with activity. We could suggest either a Yaesu Sigmasiser 80R which covers all of 2m in 25kHz steps and has repeater up and down shifts in the necessary parts of the band, or, perhaps, the Kyokuto Digital 11. This is a digitally synthesised transceiver, covering in 5kHz steps the entire band (and a receive facility to 149). Repeater up and down shifts of 600kHz are fitted (but we can modify the transceiver to provide a 1·6MHz transmitter shift). An automatic crystal controlled tone burst is available, as is a scanner. This unique device allows you trouble-free searching of the band in a hitherto unavailable form. All important normal functions of the transceiver are maintained, but in addition, when scanner is switched on the unit tunes automatically from 145 to 145·87MHz in 25kHz steps. As soon as the squelch opens, scanning stops and for seven seconds you hear what is on the channel. If you flick the small toggle switch on the microphone over, the equipment will lock on the frequency. Conversely, should you not wish to use that channel (say lock out the local repeater input or output frequency) you can momentarily squeeze the push to talk and next time round, the scanner will skip this frequency. Any or all of the frequency scanned may be locked out in this manner, if so desired.

As the next step to your mobile installation we would suggest a linear amplifier for 2, the KLM 160W output device is strongly recommended. Other units are available providing 80W out on 2 or 45 or 80W on 70cm.

If you seek hand held equipment (or an all-purpose transceiver with your main interest being elsewhere), the KP202 has a fine reputation. It is a two watt true walkie-talkie that works well into its own or an outside antenna, produces at least 2W output and has an exceedingly sensitive receiver.

For home station use, any of the mobile equipments with suitable power supply are quite satisfactory, but special mention should be made of the multimode equipments, such as the FT221R. This operates on: selectable SSB (remember LSB for Oscar 7), FM (with full repeater facilities including inverse and 70cm shift), CW (with sidetone and semi-break-in) and on AM. Powered from mains or from 12V its sophisticated circuitry is equally at home working SSB DX or local rag chewing on FM.

IF ANY ITEM HERE OR PREVIOUSLY ADVERTISED HAS WHETTED YOUR APPETITE, PLEASE DO NOT HESITATE TO CONTACT US AT TOTTON, LEEDS, CHESTERFIELD, LINCS OR BIRMINGHAM.

FT101E 160-10m (all 2MHz)
100W P.E.P. with low pwr output socket

FR101D 160-10m, 2 and 4m,
BC bands, FM, SSB, AM, CW

SIG80R 2m FM 12V 10W
80 × 25kHz channels, 600kHz shift

FT620B 50-52 or 50-54
SSB, AM, CW. Ideal transverter source

FT221R 144/8MHz, -6 + 1·6MHz shift
10W (plus) SSB, CW, FM, AM, 230/12V

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SOUTH MIDLANDS COMMUNICATIONS LTD.

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YAESU

ANTENNAS MAKE THE STATION. THERE CAN BE LITTLE DOUBT THAT THE EFFICENCY OF YOUR STATION IS GOVERNED AS MUCH BY WHAT IS OUTSIDE THE SHACK AS BY ITS CONTENTS

MOBILE

FIXED

Consider the improvement a few dB's can bring to your 2m station. If your 99% time distance is 100 miles (for given signal strength) then an extra *9dB* can push this up by 150 miles giving you *7-fold increase* in workable area. If your antenna is at 20ft, 3dB comes from a mere 10ft increase, 6dB if raised to 60ft (60 miles range). For DX (400 miles) 3dB comes from a 30 to 60ft change (more where the take off is obstructed).

Remember that feeder loss must be added to your receiver noise figure. Pre-amps (and attendant cross-mod) by all means, but remember a change of coax (or baying or stacking antennas) yields a greater receiver improvement and, of course, gives you a higher ERP.

You effectively double your receiver sensitivity and transmit power when using a 5/8 whip (over ½ wave) and an even greater improvement is effected with change from a halo to a clover leaf.

To keep your antenna aloft, mounting can be made to the house (eaves or chimney stack) but for larger arrays, resort must be made to a mast or tower, guyed, wall mounted, or free standing as partially detailed below.

TELOMAST
TELESCOPIC GALVANISED
10' sections without or c/w rigging.
Carriage £2.75, ex-stock VAT 8%
30' **£22.85** or **£41.75** c/w rigging
40' **£29.75** or **£53.75** c/w rigging
50' **£69.95** or **£69.95** c/w rigging

HAMTOWER
SELF SUPPORTING
Galvanised lattice 10' sections. Free-standing with climbing steps.
Carriage £3.50 ex-stock 8% VAT.
30' c/w base grillage .. —
40' c/w base grillage .. P.O.A.

TELETOWER
TELESCOPIC GALVANISED
Carriage and rigging (RX) extra.

42' mast	**£121.00** (RK **£28**)
57' mast	**£174.00** (RK **£28**)
79' mast	**£224.50** (RK **£49**)
101' mast.. ..	**£303.50** (RK **£76**)

VERSATOWER
TILTING TELESCOPIC
Galvanised lattice, 20' sections
Post, wall, plate, socket mounts

P25	**£156.50**	W40	**£157.50**
P40	**£207.00**	BP60	**£272.00**
P60	**£249.00**	P80	**£377.50**

JAYBEAM 70 (4m), 144 (2m), 432 (70) (Car. about £1) VAT 12½%

For general work, with the emphasis on distant mobiles, Oscar etc, crossed yagis are increasingly popular. However, for maximum gain needed to push your signal over the horizon we would suggest long yagis, on 2, such as the 14Y/2M (offered exclusively by SMC) or the MBM88 for 70.

D5/2m 5 over 5 slot feed ..	**£11.00**	PBM10/2m 10 ele Para ..	**£20.50**
D8/2m over 8 slot feed ..	**£14.75**	PBM14/2m 14 ele Para ..	**£25.20**
5XY/2m 5 element crossed	**£12.90**	D8/70 8 over 8 slot feed ..	**£12.57**
5XY/2m 8 element crossed	**£16.10**	PBM18/70 18 ele Para ..	**£15.00**
10XY/2m 10 element crossed	**£21.30**	MBM48/70 46 ele Multi ..	**£17.50**
5Y/2m 5 element yagi ..	**£6.20**	MBM88/70 88 ele Multi ..	**£23.40**
8Y/2m 8 element yagi ..	**£8.10**	12XY/70 12 ele crossed ..	**£24.00**
10Y/2m 10 ele long yagi ..	**£17.20**	4Y/4m element yagi ..	**£10.20**
14Y/2m 14 ele long yagi ..	**£22.00**	PMH2/70 2 way harness ..	**£4.75**
Q4/2m 4 element yagi ..	**£13.20**	PMH2/C Circ. phasing ..	**£4.10**
Q6/2m 6 element quad ..	**£17.60**	PMH2/2m 2 way harness ..	**£5.50**

CUSHCRAFT VHF OMNI (Carr. 90p) VAT 12½%

Top the tower or mount on your chimney stack a 2m gain vertical. The Ringo Ranger (ARX2) offers over the conventional ground plane elimination of unsightly radials and 6dB gain from only 9' 6" (weighs less than 1½lb!!)

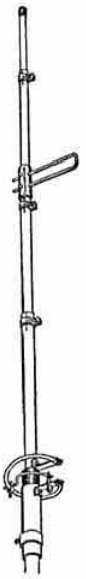
If you prefer horizontal omnis are available for net control, RAEN, SSB mobile etc, etc.

ARX2 Ringo Ranger 145MHz	**£21.50**	ARX450 Ringo Ranger 432MHz	**£21.50**
AR2 3dB Ringo Vert ..	**£12.75**	ABW144 2m Big Wheel	**£14.50**
AR2S QRO AR2	**£15.00**	ABW12S ABW harness ..	**£7.30**
CX1000 29MHz Ringo ..	**£25.75**	ASQ1 2m Squalo	**£11.75**

BANTEX VHF WHIPS (Carriage 90p) VAT 12½%

The mobile season is with us again. For 2m. ssb a Cushcraft, for FM a ¼ or 5/8 Bantex roof mounted (on the standard or magnetic base). If the mounting is to be lower down use a longer 3dB antenna only.

B5 ¼ 145MHz	**£6.35**	70 ¼ 70MHz	**£4.00**
BGA f.g. ½ 2m fibreglass ..	**£8.75**	Trunk Lip Mount ..	**£5.25**
BGA s.s. ½ 2m stainless steel	**£8.50**	Magnetic Base Mount ..	**£8.50**
B5U ¼ 432MHz	**£5.00**	Standard base unwanted deduct	**£0.50**



COAX PLUGS (p & p extra) VAT 8%

Whilst it is undoubtedly true that the UHF, PL259 range leave much to be desired over 200MHz, their mechanical performance is excellent. We offer plugs in standard or P.T.F.E. insulation for ¼" (with reducers for) smaller cables, adaptors and converters. For the discerning BNC, N and C types are stocked. For accessory connections we hold from stock phonoplugs, plastic or metal barrelled, jack plugs. ¼" stereo or mono, mic. plugs, power plugs, (for the Yaesu range), and a wide collection of similar ancillaries.

PL259 Standard UHF plug	**£0.48**	258 Back to back (female)	**£0.80**
UHF fixed reducer ..	**£0.56**	"T" adaptor (2F + 1M)	**£1.20**
"Solderless" UHF RG8U	**£0.51**	Right angle (1M + 1F)	**£0.90**
"Solderless" UHF UR43	**£0.51**	Phono/car to SO239 ..	**£0.55**
UG** Reducers state UR43 or 70		SO239 2-hole socket	**£0.37**

LIGHTNING ARRESTORS (p & p 30p) VAT 8%

By bleeding static lightning arrestors reduce the chance of a strike. They may be of either the simple adjustable spark gap or of the precision gas discharge type, constructed for straight in line or bulkhead mountings.

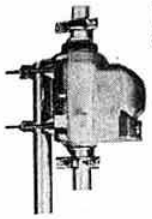
SM566 Spark PL/50 ..	**£2.25**	NSK Gas 50/50	**£7.50**
LA2 Spark PL/50 ..	T.O.S.	LA1 Gas 50/50	**£17.50**

CABLES RF FEEDERS (Carriage extra) VAT 8%

Feeders are the point where amateurs often falsely economise. For mobile use, a cable with a stranded centre (UR76) etc.), for fixed a long unsupported run without a cattenary, or allowing the cable to slap against the mast are taboo, breakages of the centre conductor will arise with disastrous results.

If you are using a 3/16 cable changing to ¼ can be the most cost effective improvement.

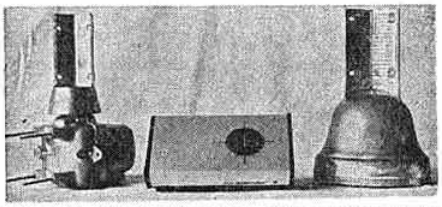
UR67 50ohm Heavy	33p yd	UR39 75 ohm Medium ..	24p yd
UR57 75 ohm Heavy ..	36p yd	T3278 75 ohm Distribution	20p yd
75 ohm Flat Twin	10p yd	UR43 50 ohm Solid Cent. ..	15p yd
300 ohm ribbon	12p yd	UR76 50 ohm Strand Cent.	33p yd



ROTATORS

Ex-Stock in Totton for fast delivery.
VAT: Rotators 12½%. Cable and deliv. 8%.
Carriage (BRS or post) FREE. Securicor delivery **£1** extra (mainland).

AR30 (illus. right near and centre)	**£39.50**
AR40 (illus. right centre and far)	**£46.00**
AR33 (de-luxe control AR40)	**£57.50**
Big Torque sim CD44 Head	**£79.50**
CD44 (C.B. illus. left) med. duty	**£95.00**
Ham II (C.B. illus. left) heavy duty	**£129.00**
2010/220 Stolle though Rotator type	**£41.25**
2030/220 De-luxe Stolle	**£45.50**
AK121 Versatower Mounting Kit	**£3.60**
5 core—AR30/40/332030 .. .. .. per yd	20p
8 core—CD44, Ham II .. .. .. per yd	32p



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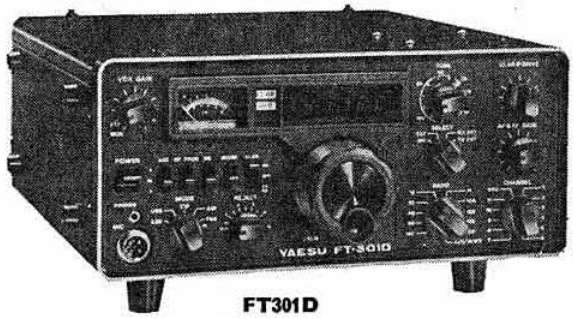
EVENINGS — AGENTS — ALL QTHR			
G3ZUL	Stourbridge (03843) 2517		Brian Kennedy Peter Avill
GM8DOX	B. of Allan (078683) 3223		Ian McKechnie
GW3TMP	Pontybodkin (035287) 846		Howarth Jones
GI3WWY	Tandragee (0763) 840656		Mervyn Anderson

Access

YAESU MUSEN

FT301 SOLID STATE GOLD LINE



FT301D

YAESU'S fully solid state transceiver line features the latest in technology:- Bandpass filters with wideband PA eliminates PA tuning for band changes, RF speech processor, IF tunable rejection control, full no compromise top band to ten (2MHz) coverage

PROFESSIONALLY ENGINEERED TRANSCEIVERS FOR THE UNCOMPROMISING AMATEUR

FT301S 10W analogue	FT301SD 10W Digital
FT301 100W analogue	FT301D 100W Digital

FT301D FEATURES (WITH OPTIONS INSTALLED)

160-10 metre inclusive coverage
Multi mode USB-LSB-CW-AM-FSK
12VDC (234V with FP301 & FP301D)
11½" (14") × 5" × 11½", 22 lb weight
Silky smooth precision VFO drive
Readout to 100Hz (digital version)
11 fix channels per band Segment
Semi break in with sidetone
4 models—10/100 Dig/analogue
RX on M.S.F. (5MHz) and CB
Front panel microphone gain
R.F. derived feedback circuit
Rejection tuning (I.F. passband)
RF speech processor (in I.F.)
Adjustable carrier level
Fully switchable 3 position A.G.C.
Clarifier (IRT with RT and TT)
600Hz, 2·4kHz, 6kHz bandwidths
Triple PA protection circuit
100kHz crystal calibrator + MSF
Switchable fixed noise blanker

FT301 SPECIFICATIONS

Frequency range
160-10 metres transceive
M.S.F. and CB receive
Modes
USB, LSB, CW, AM, FSK
Frequency stability
>100Hz/½H (A.W.U.)
<100Hz for 10% line change
Backlash
50Hz or better
Antenna impedance
50 ohms, nominal
Power requirements
234V AC with FP301
13·5V DC 1·1A RX 21A TX

Sensitivity
¼μV for 10dB N + S/N @ 14MHz
Selectivity
SSB 2·4kHz at 6dB (1·67:1SF)
AM* 6kHz at 6dB (2:1SF)
CW* 600Hz at 6dB (2:1SF)
FSK as SSB
Spurious responses
Image > −50dB
Internal spurious <1μV
Audio output
3W (int. and ext. speaker)
Audio distortion
<10% at 3W output

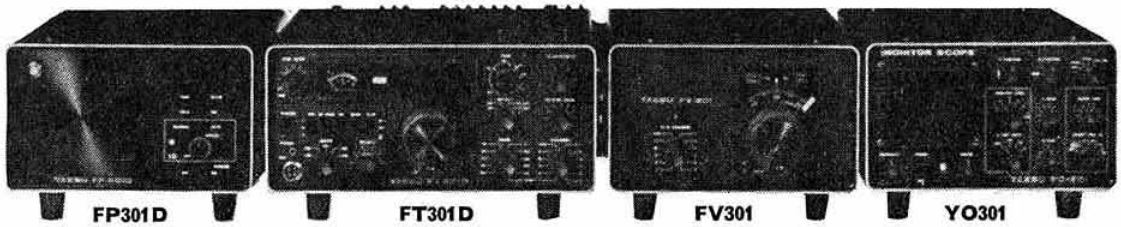
Input power
>200W PIP A3j
>200W DC A1 (50% duty)
>50W A3 and F1
Audio response
0·3-2·7kHz ±3dB
Carrier suppression
> −40dB
Sideband suppression
> −50dB
Spurious radiation
> −40dB
Dimensions
11½" (14") × 5" × 11½", 22lb

★ THE FT301D AND ACCESSORIES ALL YOU NEED FOR A COMPLETE HOME STATION ★

The FP301D AC PSU with built in speaker, 12/14 digital clock and optional automatic CW identifier.

The FV301 external V.F.O. for split frequency working with a 11 crystal channels (per band segment).

The YO301:- Monitor; TX (1.8-50MHz @10-500W) RX IF (9-10.7MHz). Scope 4MHz BW. 2 Tone Osc., etc.


FP301D FT301D FV301 YO301

OUR AGENTS

Amateur Electronics,
508-514 Alum Rock Road,
Alum Rock, Birmingham B8 3HX

South Midlands Communications Ltd,
S. M. House, Osborne Road, Totton,
Southampton, Hampshire SO4 4DN

Western Electronics (UK) Ltd,
Fairfield Estate,
Louth, Lincolnshire LN11 0JH

THE COMPLETE RANGE

Keep it to yourself, won't you, but did YOU know that we have the widest range of VHF and UHF equipment available to meet the most stringent requirements of the discerning amateur radio enthusiast, who is continuously endeavouring to keep his shack up to date without upsetting his bank manager.

It's no secret, though, that we have recently expanded our entire production capacity, enabling us not to just manufacture our standard range of first classVHF/UHF converters and varactor triplers, which have gained world wide acclaim over several years, but to arouse new interest by launching on to the market certain new products such as our 50MHz and 500MHz frequency counters, ÷10 500MHz prescaler and our latest range of all-mode linear transverters for 144MHz and 432MHz.
This month we are briefly reviewing this wide range, but please do not hesitate to contact us either by post or telephone for any technical details, or to request detailed data sheets for any of the products mentioned below.

144MHz.

MMT144/28 : 144MHz linear all-mode transverter.
Features: 10 watts RMS output power.
30dB receive gain.
2·5dB noise figure.
Aerial changeover achieved by a pin diode switch.
I.F. : 28–30MHz.
Price : **£88.88 inc. VAT**

MMC144/28 : Single conversion 144MHz receive converter with protected dual gate MOSFETs.
Typical gain: 30dB. Noise figure: 2·5dB.
I.F.'s : 12–14, 14–16, 18–20, 24–26, 28–30MHz.
Price : **£20.25 inc. VAT**

MMC144/28LO: As above unit but has an extra buffer amplifier at 116MHz for use in transverters.
Provides 5mW at 116MHz.
Price : **£22.50 inc. VAT**

MMC144/2 : Double conversion 144MHz receive converter which achieves good image rejection at low intermediate frequencies.
I.F.'s : 2–4, 4–6MHz.
Price : **£20.25 inc. VAT**

MMA144 : Low noise preamplifier with two independent outputs.
Typical gain: 18dB. Noise figure: 2·5dB.
ALSO AVAILABLE FOR 70 and 136MHz.
Price : **£14.63 inc. VAT**

1,296MHz.

MMC1296/28 : 1,296MHz receive converter utilising a hybrid ring mixer, with a matched pair of schottky diodes driving a MOSFET I.F. amplifier
Typical gain: 25dB.
I.F.'s : 28–30, 144–146MHz.
Price : **£28.13 inc. VAT**

MMV1296 : 1,296MHz varactor tripler.
Will accept up to 30 watts of 432MHz drive and achieves 60% efficiency.
Price : **£33.75 inc. VAT**

432MHz.

MMT432/28 : 432MHz all-mode linear transverter.
Features: 10 watts RMS output power.
30dB receive gain.
3·0dB noise figure.
Aerial changeover achieved by a pin diode switch.
I.F. : 28–30MHz.
Price : **£109.13 inc. VAT**

MMT432/144 : 432MHz DOUBLE CONVERSION all-mode linear transverter.
Features: 10 watts RMS output power for 10 watts 144MHz input.
10dB receive gain.
3·0dB noise figure.
Aerial changeover achieved by a pin diode switch.
I.F. : 144–146MHz.
Price : **£149.63 inc. VAT**

MMC432/28 : 432MHz receive converter featuring 2 RF amplifiers and a MOSFET mixer.
Typical gain: 30dB. Noise figure: 3·8dB.
I.F.'s : 14–16, 18–20, 28–30, 144–146MHz.
Price : **£24.75 inc. VAT**

DIGITAL PRODUCTS.

MMD050 : Six digit 50MHz frequency counter.
Frequency range: 0·45–50MHz.
Input sensitivity: Better than 50mV RMS.
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MMD050/500 : Six digit 500MHz frequency counter.
Two ranges: 0·45–50MHz.
: 50–500MHz.
Combined version of MMD050 and MMD500P.
Price : **£85.32 inc. VAT**

MMD500P : Divide by 10 prescaler to give 500MHz capability when used with MMD050.
Fully TTL compatible.
Output level is 2·5 volts p.p.
Input sensitivity: Better than 200mV.
Frequency range: 50–500MHz.
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70MHz.

MMC70/28 : Receive converter for 70MHz.
Similar to MMC144/28.
I.F.'s : 4–4·7, 14–14·7, 18–18·7, 28–28·7MHz.
Price : **£20.25 inc. VAT**

MMC70/28LO : Similar to MMC144/28LO.
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Incidentally, ALL of our products are FULLY GUARANTEED FOR 12 MONTHS.

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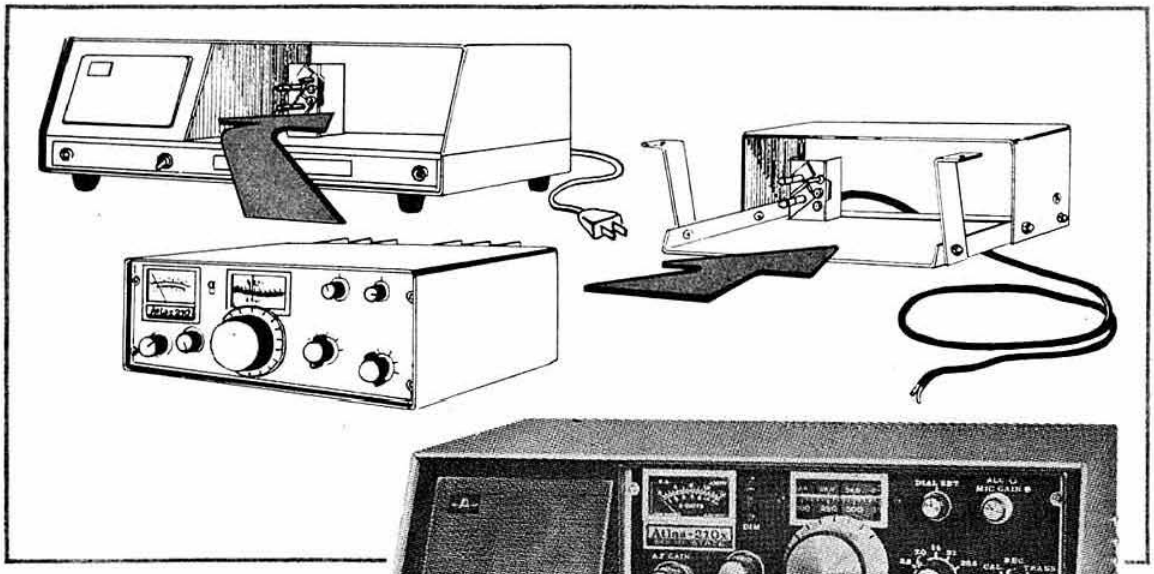
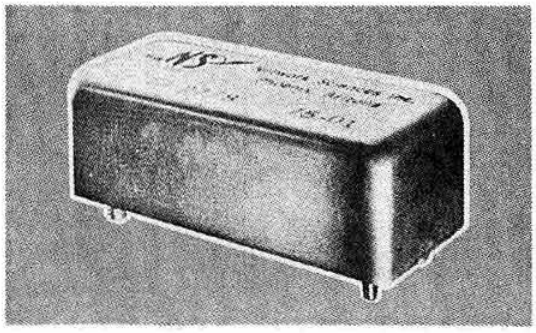


GO FIXED OR MOBILE WITH THE Sensational ATLAS-210/215X



SUPER SELECTIVITY: The Atlas transceivers feature an 8-pole crystal ladder filter designed especially for Atlas by Network Sciences of Phoenix, Arizona. This filter represents a major breakthrough in filter design with unprecedented skirt selectivity and ultimate rejection. Its superior selectivity has been tailored to take full advantage of the extremely wide range of signal levels that the Atlas front end is capable of handling.

NOT JUST AN IDEAL MOBILE RIG —BUT A SUPERB BASE STATION BY ANY STANDARDS

The Plug-in Mobile Mount has specially designed rear connectors for DC power input, antenna jack, and mic. jack, that match the same connectors on the Atlas transceiver. Thus all necessary connections for mobile operation are made in seconds by merely sliding the unit into the mobile mount.

Fixed station operation is achieved in the same easy manner, since the Atlas Model 220-CS Console Supply has the same rear connector system as the mobile mount. The internal speaker is automatically disconnected, and the front facing speaker in the console is turned on. Also, the mic. jack is brought out to the front, as well as a headphone jack. The Model 220-CS operates on either 110 or 220 volts, selectable, 50-60 cycles.

AMATEUR ELECTRONICS UK

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THE FT-221R AND FRG-7 PICTURED HERE ARE ONLY TWO ITEMS IN THE LARGE YAESU RANGE WE CARRY. PLEASE NOTE OM's—WE NEVER ADVERTISE ITEMS WE DO NOT NORMALLY STOCK.

KEN PERFECT G3FIK

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TRIO TS-700G

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Specification

FREQUENCY RANGE 144–146MHz
MODES—USB, LSB, FM, CW, AM
RF OUTPUT—More than 15w FM
30w ssb input power
ANTENNA IMPEDANCE—50Ω co-axial
CARRIER SUPPRESSION—Better than 40dB
SIDEBAND SUPPRESSION—Better than 40dB
MAXIMUM DEVIATION— ± 5kHz
REPEATER SHIFT— ± 600kHz
TONE BURST—Automatic 1750Hz
MICROPHONE—Dynamic 500Ω
AF RESPONSE—Speech optimised 400–2600Hz

RECEIVER—Ssb, CW, AM, Single conversion
FM, double conversion
INTERMEDIATE FREQUENCIES—10·7MHz, 455kHz
SENSITIVITY—SSB/CW, better than 10dB S/N at 0·25 microvolts
FM, better than 20dB as at 0·4 microvolts
IF SHAPE FACTOR—Better than 2:1 all modes
AUDIO OUTPUT—More than 2w in 8Ω
STABILITY—Within 150Hz in any 30 minutes after warm up
POWER SUPPLY—120–240 Vac or 12Vdc. All supplies built in
DIMENSIONS—278 × 124 × 320mm
WEIGHT—11Kg

BONUS DEAL

TS-700G PRICE NOW INCLUDES **FREE** MATCHING VOX-3 WITH EVERY RIG

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INC. VAT @ 12½%

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Matlock Derbyshire
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ELECTRICKERY

If you are considering the purchase of a multi mode VHF rig, consider the facts that the TS700G is so outstanding in all respects that it is being used as the centre building block for extended station facilities by many radio amateurs and designers. Typical Magic Boxes for doing just this are shown below.

Magic box No. 1 is the Microwave Modules MMT 432/144 linear transverter. By using this in conjunction with your TS700 or 700G, you have all their excellence and facilities duplicated on 70cm transmit and receive. 10 Watts output and a high performance receiver in the MMT 432/144 give you top two band performance at modest cost. The transverter is available direct from us and is normally in stock at all times.

Magic box No. 2 is the Datong Electronics UC/1 up-converter. This amazing black (actually grey) box turns your TS700 or 700G into a fully synthesised HF receiver having continuous coverage from 90kHz to 30MHz in thirty 1MHz bands. All the receive facilities of the TS700G are available—AM for the broadcast stations and aircraft, shipping, etc., LSB and USB for the SSB activity on all the amateur bands from 160 to 10 metres, or RTTY in conjunction with Magic box No. 3.

Pin point tuning accuracy is guaranteed by the TS700G 1kHz readout and easy to read dial. Truly an excellent station addition for the VHF amateur. The UC/1 is available only from Datong Electronics.

Magic box No. 3 is the TD224/DM170 RTTY combination. This all seeing eye used inconjunction with the TS700G and the UC/1 turns those jingle bells into a TV display and adds a further interest to your amateur radio activity. There is a surprising amount of RTTY activity on the amateur bands but the average amateur (and his wife) have been put off the mode by the need to use a clanking noisy teleprinter as the readout device. The TD224 ends all that by converting the RTTY signal into an easily read display on a TV screen. (Any UHF TV set can be used). Full details of the system are available from us, as are the units themselves. Better still, why not visit us and see the whole system in operation; it really seems like Ye Olde Magicke at work. If you promise not to tell anyone, you can see tomorrow's news as well. . . .

TR-2200GX

FOR 2 METRES

Basic Specification

Frequency range 144–146MHz.
Power output Over 2W.
RX sensitivity 0·4μV for 20dB QS.
Number of channels Up to 12.
Tone generator 1750Hz tuning fork.
IF shape factor 2:1
Size 5½" × 2½" × 7½".
Weight 3·5lb inc. batteries.

AT THE PEAK OF PORTABLE PERFORMANCE

TR-3200

FOR 70cm

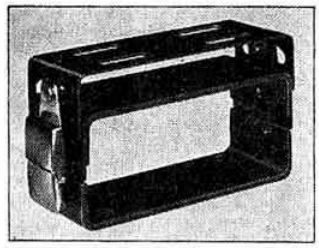
Basic Specification

Frequency range 433–436MHz.
Power output Over 2W.
RX sensitivity 0·4μV for 20dB QS.
Number of channels Up to 12.
Tone generator 1750Hz tuning fork.
IF shape factor 2:1.
Size 5½" × 2½" × 7½".
Weight 3·5lb inc. batteries.

The TR2200GX represents the very best of TRIO design. It is the latest in the line of continuous progress from the first TR2200 and maintains the TRIO tradition of top quality at a reasonable price. The TR2200GX has all the features that you could want—high power output; sensitive receiver; flexible use from internal batteries or external power using the lead supplied; built in removable telescopic antenna with flexible whip available; built in metering of signal strength, transmit output and battery condition; fitted with twelve channels at low, low prices, in short, all that you could want.

All operator controls are placed for maximum convenience on the top face of the rig and a protective carrying case is included in the price.

The matching accessories include a 10W amplifier for mobile use, which incorporates SWR protection and a regulated supply for the TR2200GX; a quick release mobile mount and a low cost rechargeable battery pack.



MB1A mobile mount for TR2200 series and TR3200. £9.45 incl. VAT.

The TR3200 from TRIO. Not content with having the lead in 2 metre handy portables, TRIO have gone a step forward and produced the best 70 cm postable to match.

The TR3200 is a really terrific rig; over 2 W out, with switched reduction to 400 mW for local contacts; tailored speech response with a new limiting amplifier and new microphone, give the crisp speech quality you like.

Excellent receiver performance with double IF filtering at 10·7 MHz and 455 KHz with no less than five limiters to guarantee noise free performance on even the weakest signals.

12 channel capability with three channels fitted. (SU8, 18, 20.) Supplied complete with all the usual accessories as the TR2200GX and including the new 5/8 wave high gain removable antenna.

The VB2200GX is the matching 10 Watt mobile amplifier for the TR2200GX. It will also match any of the previous TR2200 series equipment. Small size and low weight for easy fitting in any vehicle make the VB2200GX a must for the operator who wants the very best of all worlds, portable and mobile.

The VB2200GX is self contained and puts out in excess of 10 Watts for 2 Watts drive power. It also contains a fully regulated supply for the TR2200GX driver, and has positive SWR protection for the PA transistor. The amplifier may be switched out of circuit if required, but still provides the regulated supply for the TR2200GX.

The VB2200GX is supplied complete with all connecting leads and is ready to go. Price? only £45 including VAT (12½%). Compare that with any others.

PRICES Inc. 12½% VAT

TR2200GX	£130.50 (fitted 3 channels)
	£160.00 (fitted 12 channels)
VB2200GX	£45.00
TR3200	£171.00 (fitted 3 channels)
MB1A	£9.45
NiCad pack	£9.72

Don't forget, the following accessories are provided with the TR2200GX and TR3200

Removable antenna	free
Carrying case	free
Shoulder strap	free
Battery charger	free
External power lead	free

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TRIO

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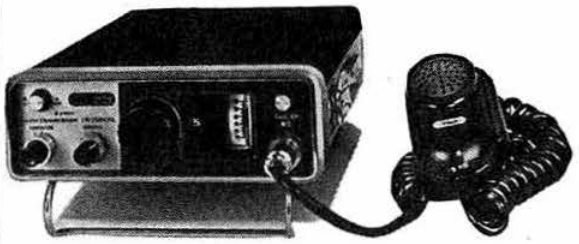
TR7200G £175 inc. VAT. FITTED 10 CHANNELS



STRAIGHT TALK— or 'Wilson's wittering again'.

In my opinion, the TR7200G is still the best two metre FM rig on the market. I agree that there are some quite flashy newcomers with all sorts of gimmicky goodies but none of them offer the basic ingredient which TRIO put into all their equipment. "Oh aye," they all said, "wots that?" QUALITY, that's wot, 'e snappily replied.

It cannot be mere coincidence that many repeater groups, who are usually short of the ready (get your wallets out), are lashing out good money to buy the TR7200G receiver section for use as the repeater receiver; 'cos it's the best, you see. One group—I don't think I should tell you which—but NAway I digress; have both 7200G receiver *and* transmitter working as the repeater.

The fact is, the quality which TRIO build into all their products make those products capable of taking commercial punishment without flinching (like the lady giving French lessons two flights up) and those of you who are smart enough to own the TR7200G will agree that it has the same indefinable touch of class which you get with a Rolls-Royce, or a Savile Row suit, not that I should know with me clapped out Mini and Bill's cut down trousers to wear.

As far as electrical performance is concerned, the TR7200G is simply superb. The transmitter output is typically 15 Watts, the receiver sensitivity on current shipments is 20dB quieting for 0·3μV input—and I can prove it, but more of that anon. The audio quality; well, let's face it TRIO make magnificent Hi-Fi equipment and the expertise is carried over into their communications transceivers so it's very, very good.

The special touches though, are details like the 22 channel dial being engraved with all R and S channel numbers so that when you are using the rig, the dial says R6 when you are on R6 and not some meaningless number. It also has channels specially designated for your local natter nets or Raynet.

Details like the LED under the channel number being RF powered and only lighting on those channels fitted with receive crystals. The "on-air" lamp is also RF powered from the transmit crystals so you know precisely what crystals you have in the rig. How about the best engineered mobile mount on the market giving instant slide in/slide out installation with no nasty little screws to fiddle with. You can even padlock the mount so that the guy who steals your rig also has to steal the car (I'm not sure that this is an advantage in some of the larger cities...).

Details like the fully variable PA protection which gradually reduces power input to the PA when SWR increases. This allows you to continue operating when your mobile antenna gets wet (and rain really does change the SWR on most antennas). You may be surprised to find that this protection is not fitted on some rigs. Just an example of corner cutting that TRIO will not entertain.

Even the outer case of the TR7200G is dust and splash proof and reflects the TRIO concern with quality. The tone generator for repeater access is the TRIO exclusive tuning fork controlled oscillator which guarantees stability even when the interior of the rig is being cooked due to sitting in a hot car on a summer day —or frozen in winter. TRIO detail quality again.

There is no doubt that the TR7200G is the best mobile FM transceiver available at any price. Those of you who have seen and handled the TR7200G will, I'm sure, soon become happy owners. Those who are not quite so discriminating may choose to buy something else, possibly on the grounds of price.

So, how about a price of £175 including VAT at 12½% and fitted 10 channels? This will cover most UK activity and should you require other channels for local net activity these can always be fitted at will. Remember, should you require a channel which does not coincide with a 25kHz spot frequency, you can fit a crystal; the fellow with his 25kHz spaced synthesiser cannot.

TR7200G. For all reasons — IT'S THE BEST, FORGET THE REST

I noticed in a recent ad for the F**7 receiver (*S.W. Mag* March) that "The output is expurged—". I thought that this was something that you only did to constipated cats, but if you own an F**7 which needs expurging, contact your local vet immediately before there is a nasty explosion.

Thought I'd forgotten didn't you? How can I prove the TR7200G performance? Well, I've just spent 2¾ thousand smackers on a new all-singing all-dancing signal generator—and this is where a synthesiser really comes into its own—in a signal generator. The dear old Marconi TF995/A5s (two of them) have now been put out to grass, even though they are considerably better than the gear I've seen in most workshops. I have always insisted that my workshop facilities had to be better than those of any other dealer in the country, since this means that you, the customer, can be assured that your equipment is correctly maintained. Poor Bill, I even pensioned off the TF791 deviation meters and replaced them by the latest Racal automatic search and lock meter. I thought his face would never smile again. All part of the service back-up which you will receive *only* at Lowe Electronics.

NEW DEVELOPMENTS

Following the recent successful use of the "leaky feeder" technique for providing radio communication in mine shafts and tunnels, we have been carrying out trials aimed at adapting this system for amateur use.

The idea of underground aerials is not new, having been described by Curzon in the "Submarine Communication Journal" as long ago as 1963, but has not been brought to the attention of the radio amateur fraternity.

The basic requirement is a length of heavy duty coaxial feeder having specially woven loose outer copper braid. This is buried in the ground at a depth of 18" and as far as possible in a straight line. The length of the cable should be a multiple of a half wave on the lowest frequency band to be used, i.e. 132' for all band coverage from 80 to 10 metres. Account must be taken of the velocity factor of the cable in use, normally 0·66 for solid dielectric cable. This would reduce the length of the proposed 80 metre aerial to only 87' thus making it rather easier to install. The remote end of the cable should be left open circuit electrically but physically well waterproofed before burying.

A good quality SWR bridge should be used between the transmitter and the buried feeder, in order to monitor system operation although the actual value of SWR does not matter too much owing to the unique method by which the signal is radiated.

As you know, standing waves on a coaxial feeder can cause radiation from it—this is the heart of the system. Any power fed into the leaky feeder will be completely radiated into the earth and, as we use the earth as one half of the antenna in vertical radiators such as the ground plane, the buried feeder system is simply the reverse of this.

Excellent signal reports have been received using the experimental systems at Matlock and Southampton and we were most pleased to be involved in the trials at the request of the originator Mr Curzon. The only note of caution in respect of this sytem is that use of high power may cause some dielectric heating of the ground and damage to grass roots so one must not bury the antenna across lawns or other grassed areas. Any small domestic animals are also in danger of being expurged!

Further details on the buried antenna and supplies of the special poor quality loose braid cable can be obtained from Mr Curzon at Sub-Marine Communications Ltd in Southampton.

A happy April to all my readers.

LOWE ELECTRONICS

HEAD OFFICE — **119 Cavendish Road, Matlock, Derbyshire. Tel. 0629, 2817 or 2430 9 a.m. to 9 p.m.**

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Power Capability 100W.
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Complete with mounting brackets for masts up to 1¼" O.D.
Available now.
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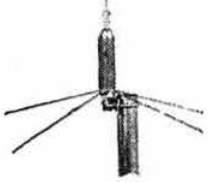

ASP658UK
425–440MHz 5dB Gain Base Station Colinear
Power capability 100W
Termination Female 'N' Type connector.
Complete with mounting brackets for masts up to 1¼" O.D.
Available now, **£15.49** plus 75p carr.

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Trio TR3200	£3.35
Icom IC-215	£3.85

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ASPA680UK ▶
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Power capability 350W,
Length: approx. 12'
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Rated wind velocity: 118 mph.
Termination: Male 'N' Type Connector.
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ASPN701UK ▶
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Termination Male 'N' Type Connector.
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Gutter mount suitable for use with ASP629, ASP393 complete with 10' RG-58U cable and PL-259 connector **£8.09** plus 50p post and packing.

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No hole boot mount. suitable for ⅝" hole snap in mount, easily adaptable for other mounts.
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Gutter mount suitable for use with ASP677, ASPE667, easily adaptable for use with other antennas. Complete with 10' RG-58U cable and PL-259 connector.
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New Magnetic Mount ▶
Shown with ASP629, but also fits ASP393, ASP677 and ASPE667. Complete with 10' RG-58U cable.
£9.19 plus 50p post and packing.

VAT of 12½% to be added to above prices.

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Model	Price	VAT	Total	Model	Price	VAT	Total
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FP75B }	£269.00	£33.62	**£302.62**	FP2AC/B	£65.00	£8.12	**£73.12**
DC75B }				FTV250	£139.00	£17.37	**£156.37**
FR101 S.Dig	£359.00	£44.87	**£403.87**	FT301D	£580.00	£72.50	**£652.50**
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Other models in the "301" range also in stock—ask for prices. All models carry the WESTERN guarantee and delivery is FREE.

ORDER now to avoid disappointment—CHEQUE, CASH, H.P., ACCESS, BARCLAYCARD accepted—maybe even coffee before long!

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Heavy Duty is up to 100% stronger than Standard

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PM2000 SSB/PEP Wattmeter (3·5–30MHz), none other like it, **£48.60**
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Two excellent rigs have been added to the popular ICOM range: The 215, a 3W hand portable, and the 240, a 10W synthesised programmable mobile transceiver.

ICOM IC-240 £198

The IC-240 is the start of a revolution in 2 metre transceivers. It has all the advantages of the highly popular IC-22A, with its easily selected 22 Channel capability, but does it all with a phase locked synthesised system. Hence you can program it for all 22 channels *WITHOUT HAVING TO BUY ANY CRYSTALS.* Channels are hard wired using diodes according to clearly described instructions. We supply the UK version with 15 channels already wired in, these being 10 simplex and 5 repeater. Thus there are 7 more frequencies for you to program at your own whim—ideal for RAYNET and local net use. You can program for any of the 80 channels at 25kHz spacing between 144 and 146MHz.

As an optional extra, a scanning system will be available shortly which will scan all 22 channels.

The IC-240 has the same excellent FM performance as the well known and highly popular IC-22A.

Duplex (for repeater use) operates by shifting the RECEIVE frequency. This means that by switching to SIMPLEX when using a repeater channel you will automatically be listening on the INPUT channel of the repeater without having to wire in special "Reverse Repeater" channels. A 1750Hz tone burst is, of course, built in.

The channels already prpgrammed are:

SIMPLEX S0, S16, S17, S18, S19, S20, S21, S22, S23, S24.

REPEATER R3, R4, R5, R6, R7.

NOTE: PRICES MAY VARY ACCORDING TO THE STATE OF THE POUND AND VAT

ICOM IC-215 £162 (with 12 channels fitted)

ICOM are pleased to introduce their first FM portable and a careful look at the features will soon show how popular it's going to be. You can use it *ANYWHERE.* Change vehicles, use it in the shack or take it for a walk to the local high spot and you have the high quality FM communication, for which ICOM are so famous, available all the time. The batteries are larger than those of its competitors, thus giving considerably longer life. The 3 watt output and high sensitivity receiver makes it a useful main station set, where it can be operated from an external power supply and a good antenna system. Thus the IC-215 can be a good starting point for the man who has just obtained his licence and wants to get on the air without having to spend too much money.

The unit incorporates 15 channels to select from: 12 by the main channel selector and a further 3 by the function switch. All crystals are plug-in type HC-25/U and are the same as the crystals used in the popular IC-22A. Being fundamental crystals, they are tunable over a reasonably wide range and a separate trimmer is supplied for each crystal making accurate frequency adjustment possible. This is very important for optimum results with minimum interference.

The output power can be switched to 3W on HT for long distance work or 0·5W on LOW for short distance contacts or working a nearby repeater. Battery consumption is minimised in the LOW power mode.

Sockets for external power and antenna are provided on the rear. The antenna socket takes a standard PL259 plug and, a fully collapsible antenna is built into the top of the rig. This can be unscrewed and removed to provide a screw socket for a flexible helical antenna. We have had an Antenna Specialist flexible antenna specially made and tuned to suit the IC-215.

Why not see and buy the excellent ICOM range at your nearest Thanet agent—phone for an evening or weekend demonstration.

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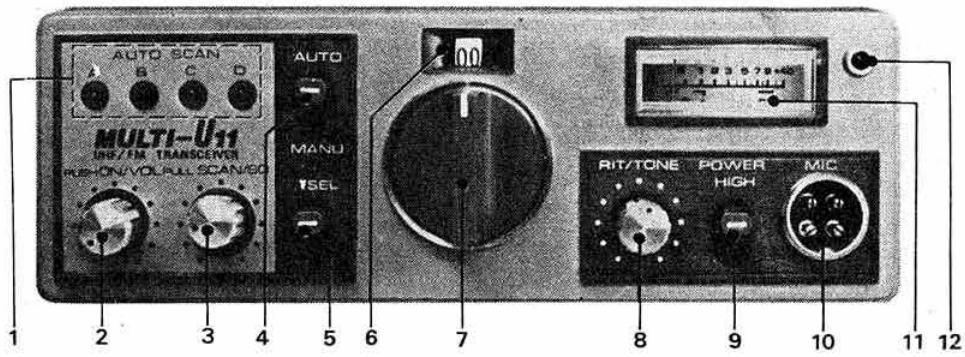
FDK 70CMS *MULTI–U11*

HEAD & SHOULDERS ABOVE ALL OTHERS



LATEST VERSION FOR UK MARKET NOW WITH 1750HZ T/B—ENGLISH HANDBOOK—9 CHANNELS FITTED— £249 Inc. VAT.

KEY TO CONTROLS: 1. *Auto-scan channel indicator.* **2.** *On-off/Volume control.* **3.** *Scan-squelch switch.* **4.** *Auto/Manual switch.* **5.** *Manual scan switch.* **6.** *Fixed channel indicator.* **7.** *Manual channel selector.* **8.** *Receiver incremental tuning control.* **9.** *High/low power switch.* **10.** *Microphone socket.* **11.** *S-meter, centre zero, rf indicator.* **12.** *Transmit indicator*

The FDK-U11 is a born leader. 70cms is a demanding band, requiring the highest standard of engineering and electronic design. The FDK-U11 is designed to meet this high specification. It is the only 70cms transceiver to have stood the test of an independent RSGB review in *Radio Communication* (December 1976) and is now the most widely used 70cms transceiver in use today. A look at its basic specification and design will confirm its supreme leadership in 70cms FM.

The receiver employs a triple conversion superhet with a first IF of 45MHz to ensure high image rejection. (Other rigs employing a first IF of 10·7MHz at 70cms really do have image problems!) Triple conversion also facilitates the use of much lower frequency conversion crystals resulting in superior frequency stability. The signal from antenna passes through a 2 stage RF amplifier and mixer housed in a completely screened box. This is one of the hottest front ends we have come across and confirmed by the RSGB review ·4 uv gives better than 20dB quieting. The signal then passes through a 2 stage 10·7MHz crystal filter (a nice design point this!) and on to the main 455kHz IF chain embodying 6 stages and switchable wide and narrow filters. This ensures really hard limiting and superb adjacent channel selectivity not realised in other models. The receive channel crystals operate a back lighted dial so that only channels loaded with crystals are illuminated. And of course the now famous priority channel scan ensures continued monitoring of the main simplex channels. (Beware of rigs boasting channel scan adaptors—they simply lock onto the local repeater and stay there!) But perhaps one of its most essential features not included in any other rig is the receiver incremental tuning. On 70cms this really is essential.

The transmitter section employs a highly stable oscillator chain and is phase modulated by a well tailored audio section for that distinctive, fully deviated signal now so familiar from the many U-11's operating through the U.K. and continental repeaters. The driver and PA stages are completely enclosed in a metal box together with a very sophisticated filter section producing a signal so free of spurious output that it meets commercial specifications! The PA is fully protected and normally gives 12-13 watts output.

FREE CREDIT

For a limited period you may purchase an FDK transceiver and spread your payments over 6 months without paying a penny extra. This offer applies only to UK licensed amateurs. **Example:** Multi-11, deposit **£49.68** and 6 payments. Multi-U11, deposit **£62.50** and 6 payments. Phone or write for full details and beat inflation.
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EL-40X Deluxe balun-fed "Mini-Dipole". Approx length 75ft. Supplied complete with special balun for perfect matching and tvi reduction. A complete set of hardware is supplied including an inverted "V" kit. The high "Q" traps are completely weatherproof yet light in weight and a unique clear vinyl covered copper element is employed to ensure that the antenna lasts for years. 1kW rating.
COMPLETE SYSTEM £27.00

FDK

for 2 metres Multi-II

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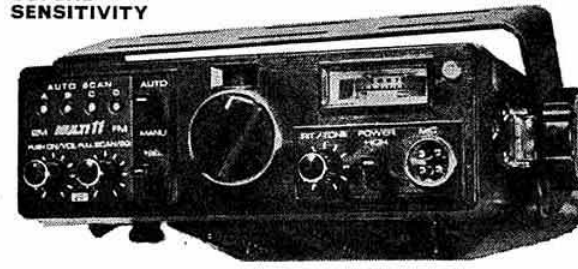

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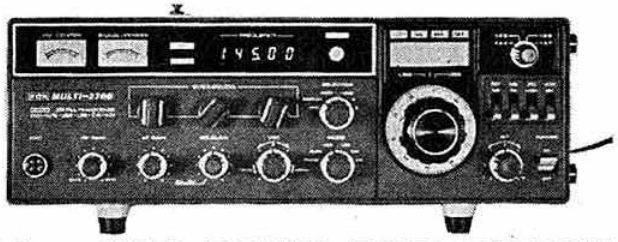

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DIGITAL OR ANALOGUE PLL FOR STABILITY

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MMC 70MHz conv. 28-30	£22.50	(36p)
MMMC 70MHz conv. 28-30 + local osc.	£22.50	(36p)
MMC 2m. conv. 28-30 + local osc.	£22.50	(36p)
MMC 70cm. conv. 28-30 or 144-146	£22.50	(36p)
MMC 1296/144 or 28-30	£28.12	(36p)
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70cm. converter IF 144-146	£18.00	(n.c.)
2m. boxed pre-amp	£8.72	(n.c.)
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WATERS

Stable tone-burst modules 1750Hz	£3.93	(25p)

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PBM10/2M 10 ele. parabeam	£23.00	(£1.50)
PBM14/2M 14 ele. parabeam	£28.35	(£1.75)
5XY/2M 5 ele. crossed yagi	£14.50	(£1.25)
8XY/2M 8 ele. crossed yagi	£18.10	(£1.50)
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PMH2/2M 2 way phasing harness for 2 of 2 metre antennas	£6.15	(75p)
PMH4/2M 4 way phasing harness	£14.85	(£1.00)
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UHF ANTENNAS BY JAYBEAM

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12XY/70cm. 12 ele. crossed yagi	£27.00	(£1.50)
PMH2/70cm. 2 way phasing harness	£5.30	(75p)
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Q-Trap compact 80/40 dipole kit 79ft.	£14.62	(£1.00)
Q-Trap coils only	£7.98	(50p)

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C4 10-20m. compact 1·2kW vertical	£38.25	(£1.50)

ROTATORS

AR30 antenna rotator	£44.40	(£1.50)
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CD44 antenna rotator	£106.85	(£1.75)
Ham II antenna rotator	£145.00	(£2.00)
CD bearing	£4.21	(50p)
Stolle 2010 antenna rotator	£46.50	(£1.50)
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12AVQ 10-20m. vertical 2kW.	£37.60	(£1.50)
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TH3 Mk3 10-20m. yagi 2kW	£154.12	(£2.50)
BN86 balun 2kW.	£13.50	(50p)

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MFJ audio filter boards 80/110/180 Hz	£14.62	(50p)
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SWR dual meter	£12.65	(50p)
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Drake low pass filter	£18.00	(75p)
Ferrite rings 1⅛" for a.f.i.	30p	(8p)
HP3A high pass tv filters	£2.53	(15p)
Set of 10 HP7 ni-cads	£9.72	(75p)
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Our Transverter is fully YAESU compatible and may be operated with most other HF transceivers. Drive required at 28MHz up to 500mW. Power input up to 200 watts (50% efficient). Each Transverter is aligned using our SPECTRUM ANALYSER to obtain an extremely clean output spectrum. Microwave Modules receive converters are fitted to all our Transverters.

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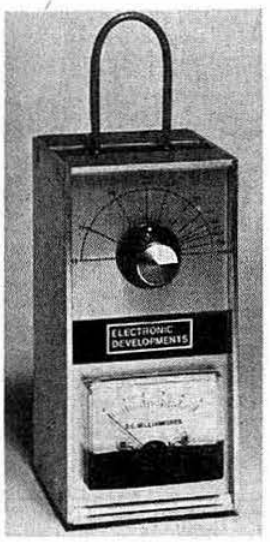

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70cm LINEAR EDL 432P

Following the success of our 432MHz Linear Amplifier assembly EDL 432 and due to the increasing enquiries for a self contained unit, ELECTRONIC DEVELOPMENTS are pleased to announce the unveiling of a new linear filling these needs, the EDL 432P.
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SPECIFICATIONS:
Typical efficiency 50% at 50 watts.
Input drive 5-10 watts
Output power 50 watts RMS
Input connector: BNC, 50 ohm. Output connector: "N" Type, 50 ohm.
Size: 10¾ × 6¼ × 10¾in (26 × 16 × 27¼cm). Weight: 22lb (9.9kg)

EDL432 £56.25 inc VAT (see previous adverts for further details or write for data sheet).

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Telephone 01-837 8688

Founded 1913
Incorporated 1926

Member society, International Amateur Radio Union

PATRON: HRH The Prince Philip, Duke of Edinburgh, KG

The national society representing all UK radio amateurs

Membership is open to all those with an active interest in radio experimentation and communication as a hobby. Applications for membership should be made to the general manager, from whom full details of Society services may also be obtained.

GENERAL MANAGER AND SECRETARY
G. R. Jessop, CEng, MIERE, G6JP

EDITOR
A. W. Hutchinson

ANNUAL SUBSCRIPTION RATES

UK corporate: £8, including VAT. **Overseas:** £8.

Associates under 18: £3. **Students aged 18 to 21:** £4.50.

OAPs with 15 years' membership: £4.50. **Affiliated societies:** £6.50 (including *Radio Communication*); £3.25 (excluding *Radio Communication*).

CURRENT COMMENT

The 1977 President's Committee

At recent Council meetings it was decided to set up a Presidential Working Party consisting of the President, the immediate past-president and the executive vice-president to look into the organization of the whole Society in depth, with a particular relation to the Society's headquarters, the organization of Council and its committees, and the interaction between headquarters, Council and committees.

This note is an invitation to any individual or group, whether directly associated with the Society or not, to contribute constructive views that they have on this topic. Detailed contributions are not essential at this stage: a summary of the main points, which later could be amplified, is all that is necessary. For obvious reasons it may not be possible to reply to all letters. Any contributions marked as confidential will be strictly treated as such.

Contributions may be passed on via any of the Society's regional representatives, or sent directly to the executive vice-president, Dain Evans, 4 Upper Sales, Chaulden, Hemel Hempstead HP1 2AJ.

Lord Wallace of Coslany, BRS3003634

HM The Queen's Silver Jubilee Celebration

The Home Office advises us that holders of the Amateur Licence A or Amateur Licence B may, if they wish, substitute for the prefix of their assigned callsign the letters GE when operating between

0001 Saturday 4 June and 2359 Sunday 12 June 1977

in celebration of HM The Queen's Silver Jubilee.

(In addition to those who have received their new licences since 1 January 1977, this does of course include those who hold the Amateur (Sound) Licence A or B which will be replaced by the new A or B later in the year.)

This means that for all prefixes shown in clause 9(1) of the licences (G, GM, GW, GI, etc), GE may be substituted, eg GE3AAA.

The facility is subject to two provisos:

(a) in no circumstances can the callsign be abbreviated such that the prefix is separated from the body of the callsign;

(b) use of the temporary prefix **must** be limited to the period stated above.

The Home Office stresses that this is a one-off concession to mark a significant national occasion, and is in no way a precedent for similar requests in the future.

QTC
amateur radio news

Honour for the President
The President, Lord Wallace of Coslany, has been appointed a Lord-in-Waiting to HM The Queen. The Society congratulates Lord Wallace on this honour, which has special significance in Silver Jubilee Year.

Regional Representative, Region 6
Due to change of employment area, Mr D. C. Andrews, G4CWB, will resign from the office of regional representative for Region 6 with effect from July 1977, and nominations are therefore invited to fill the vacancy.

Not later than 30 April 1977 any five corporate members resident within Region 6 (Berkshire, Buckinghamshire, Oxfordshire), may nominate any other qualified corporate member resident in the region for the office of regional representative by delivering their nomination in writing, together with the written consent of such person to accept office if elected, to the general manager at RSGB headquarters. Each such nominator shall be debarred from nominating any other person for this election.

In the event of no nomination being received from the corporate members in Region 6 by 30 April 1977, the Council reserves the right to make an appointment.

In the event of more than one person being nominated, a ballot will be conducted, details of which will be published in the June 1977 issue of *Radio Communication*.

Regional Representative, Region 13
Only one nomination for the position of regional representative for Region 13 was received by the closing date, 28 February 1977. This was for Mr A. B. Givens, GM3YOR, and subject to approval by Council he has been appointed to that office.

Make use of the scheme of representation
For everything other than editorial and membership and subscription queries, members are urged to use the established and well-tried chain of communication. Please contact your area representative who, via the appropriate regional representative, will consult his zonal member of Council. This will not only help to lessen the load at headquarters; it will also mean that regional representatives and zonal members of Council will be better informed and kept up to date.

HQ closed, 6 May
RSGB headquarters will be closed on Friday 6 May because of the attendance of staff at the RSGB International Radio Communication Exhibition and Convention.

Callsigns
In accordance with the Radio Regulations the ITU has allocated provisionally the callsign series S9A-S9Z to the Democratic Republic of Sao Tomé and Principe.

GB2RS news bulletins
Comments have been received at RSGB HQ concerning the new 3,650kHz frequency. The change was made only after much discussion and monitoring, but if after a trial period has elapsed a further change, or reversion to 3,600kHz, seems desirable, then this will be done.

Criticism of the news bulletin content is made by some members. In this connection HQ has no magic crystal ball which enables the bulletin compiler to have instant access to sources of information throughout the UK. The bulletin is only as good as the information which is fed to it. Newspapers have extensive and expensive news gathering networks. The RSGB network is its members. If you have news of national interest, Ray Eckersley at RSGB HQ will be glad to hear from you by letter or telephone.

RAE, forthcoming changes
From 1979 the Radio Amateur's Examination will be in the form of objective tests containing multiple-choice questions, and anyone preparing for his amateur licence on his own and living in the London area, may be able to assist the City & Guilds of London Institute.

In preparation for this change the institute is to pretest objective questions, trying them out on candidates who have reached examination standard. Pretests are intended to test the performance of individual questions and syllabus coverage. Information is obtained which assists the institute's reviewing panels in judging whether each individual question should be included in the question bank for use in future examinations.

In order to obtain reliable information, pretests must be administered to a sample of students which is as representative as possible of those who will take the examination. Many would-be licensed amateurs prepare for examinations without following a college course, and the institute invites such candidates who live in the London area to assist in these pretests. As well as helping the City & Guilds, the tests may help would-be examinees to revise their work and gain some examination experience.

The pretests are to be held at City & Guilds of London Institute, 76 Portland Place, W1, on Tuesday 3 May 1977 from 10.15am. Anyone willing to assist please contact Miss Jackie Clifford, (01-278 2468 Ext 491). Invitations will be issued to eligible candidates.

Broadcasting satellite conference
This conference in Geneva ended on 13 February with the signing of the final acts established by the 660 delegates from 111 countries. The work of the conference did not affect the frequency allocations of the amateur service but representatives of the IARU were present at Geneva in order to maintain contact with the many delegates who will also be present at WARC 1979.

An important decision of the conference not directly connected with its main purpose was to instruct the ITU to publish the text concerning the rearrangement of the Radio Regulations. This text will serve as a basis for telecommunications administrations to present proposals to the 1979 WARC. The draft edition of this document weighs more than 1·5kg and is the size of one of the volumes of the London telephone directory. Familiarization with the rearranged regulations will be a task for all those working towards the WARC.

Satellite information

A 230-page supplement to the February edition of the *Telecommunications Journal*, the monthly magazine of the ITU, contains details of all the satellites launched between 1957 and 1976. Single copies of this journal are available from the ITU at a cost of 7.50 Swiss francs.

"Ham Radio Magazine"

Subscribers to *HRM* are asked to remit promptly on receipt of a renewal notice. A delayed renewal may result in an issue being despatched by sea mail instead of the air mail bulk delivery. This generally results in a delay of at least six weeks. It will be realised that the double processing and transmission to the USA requires time additional to that required for a domestic magazine.

Please ensure that subscriptions to *Ham Radio Magazine* are sent to the address given on the publications page of *Radio Communication* and **not** to RSGB headquarters.

Facts and figures

The Home Office advises that the following numbers of amateur licences were in force at 28 February 1977:

Class A 15,977 Class B 6,305

The callsign record received from the Home Office dated 18 February 1977 gives the latest callsigns issued in the G4 and G8 series as G4FVF and G8NCK respectively.

BARTG Convention 21 May 1977

The annual convention of the British Amateur Radio Teleprinter Group will be held on Saturday 21 May 1977 at the Village Hall, Meopham, Kent. The features include lectures, trade stands, bring-and-buy stall and a tape factory, all of interest to the rtty enthusiast.

Doors open at 11am. Trains to Meopham station will be met until 1.15pm.

Lectures on rtty

The British Amateur Radio Teleprinter Group invites any club which would like a lecture on amateur rtty, given by one of the group's team of lecturers, to write to the secretary, GW3IGG, 40 Lower Quay Road, Hook, Haverfordwest, Dyfed SA62 4LR.

Radio Amateur Old Timers' Association Reunion

Lord Wallace of Coslany, RSGB President, will be guest of honour at the 19th Reunion of RAOTA at the Horseshoe Hotel, Tottenham Court Road, London W1, on Friday 22 April. Full details of membership can be obtained from Miss May Gadsden, 79 New River Crescent, London N13 5RQ.

Calling all Scout amateurs

Scout headquarters wishes to compile a list of all radio amateurs connected with the Scout movement and invites them to write to G2CKB/G3BHK, c/o The Activities Secretary, The Scout Association, Gilwell Park, Chingford, London E4 7QW, detailing the following information: (a) name, address and callsign; (b) their connection with the Scout movement (past or present); (c) any special fields of radio interest; (d) if the organizer of a Scout radio club—the name of the club, callsign and brief details of their activities.

Following the compilation of this list it is hoped to co-ordinate various county radio activities and to circulate information of interest to the amateurs concerned.

Northern Radio Societies Association Annual Convention & Exhibition

Belle Vue, Manchester

Sunday, 24 April 1977

Doors open at 11am

Trade stands	Club display stands
Inter-club quiz	Grand raffle
Construction contest	Club stand trophy
RSGB bookstall	RTTY and repeater exhibits

FM talk-in for mobiles on 144MHz S22 and R6 (GB3MP), 432MHz RB4 (GB3MR) and 433·2MHz.

Exhibition hall entrance is at rear of Belle Vue opposite main car park (off Hyde Road—A57).

Doram club discount scheme

Doram Electronics Ltd wish to expand their highly successful offer of special terms to amateur radio clubs and other groups of constructors. Under these terms amateurs can buy through their clubs or groups and can obtain up to 20 per cent off list prices, subject to the conditions outlined in the agreement.

This scheme is at present operating throughout the world on a trial basis but Doram would welcome as many clubs as wish to participate. No limit to numbers is foreseen and there is no restriction on the number of orders placed in one year, even though the scheme will obviously be of more interest to the most active building groups.

For further details contact Mr J. Dixon, Doram Electronics Ltd, PO Box TR8, Wellington Road Industrial Estate, Wellington Bridge, Leeds LS12 2UF. Tel 34222.

New clubs

The Kidderminster & D ARC has recently been formed and meets every Friday at 7.30pm at the Youth Centre, Bromsgrove Street, Kidderminster. Further information can be obtained from the secretary, Geoffrey C. Weale, G4ACS, 23 Willowfield Drive, Marlpoll Gardens, Kidderminster DY11 5DN.

A new club has been formed in Haverhill, Suffolk. Meetings are held on alternate Fridays at the Haverhill Sports Centre. Details are obtainable from G8BXB, QTHR.

Somerset Repeater Group

This group is being formed by D. R. L. Hawkins, G8KNF, who hopes to secure a site for the proposed Phase 3 repeater. Interested persons should contact him QTHR.

ARC of Nottingham on Radio Trent

The ARC of Nottingham are taking part in a show called "Talkback" on Radio Trent, which discusses topics of local and national interest, and on which listeners are invited to phone in their comments and questions. A panel of ARCoN members will have 90 minutes to explain the workings of amateur radio and demonstrate typical QSOs on various bands. The programme will be broadcast live on Wednesday 20 April from 1830-2000bst, 301m or 998kHz (250W) and 96·2MHz vhf (300W) slant polarization. Further information is obtainable from G4DLR, QTHR.

(Continued on p276)

The G3PLX Mk2 rtty video display unit

by J. P. MARTINEZ, G3PLX*

AMATEUR radioteleprinter activity has until now relied on the use of second-hand teleprinters for transmission and reception, but recent advances in mos ic technology have made a solid-state rtty terminal not only a possibility but an attractive proposition for amateur rtty. This article, describing the logic design of such a unit, should be of interest both to amateurs already familiar with teleprinter operation, and to those who have hitherto been dissuaded from trying rtty because of the noisy, mechanical nature of the equipment used. In describing this video display unit, the author assumes that the reader has some basic knowledge of rtty and logic circuits. However, all the background information on rtty is given in the *Radio Communication Handbook*, and the series of articles "Learning about logic" by G3FRB, in *Radio Communication* from June 1976 onwards, contains all the background information about logic circuits. The Mk1 vdu, on which this unit was based, was demonstrated at the British Amateur Radio Teleprinter Group convention in May 1976. The Mk2, developed later, was designed for simplicity and low cost. The ICs used in this design cost about £50 in December 1976.

Fig 1 shows the block diagram of a typical amateur station using a vdu system for rtty. The audio output of the receiver is demodulated by the frequency-shift converter to give a logic-level output which is taken to the vdu logic unit. The output of the logic is a video signal and synchronization signals, which can be combined and modulated on to a carrier in the uhf tv band and fed to the antenna socket of a domestic 625-line tv receiver. Alternatively the video and sync signals can be fed direct to purpose-built timebase and crt drive circuitry, perhaps using parts from an old tv set. Although this second approach gives a better quality display and can result in a complete self-contained unit, it requires some knowledge of tv circuitry, which is beyond the scope of this article. The latter scheme was the one used by the author, who used parts from a 12in portable tv receiver, thus overcoming the problems associated with the live-chassis construction of larger receivers.

Transmission of rtty signals is also carried out by the vdu, the input being from a 31-switch keyboard which can be either a commercially available unit or a home-made device. The rtty output from the unit is at logic levels and can be used to key the transmitter, and, of course, be fed back to the vdu input to monitor the outgoing message.

The capabilities of the vdu

The vdu can receive theoretically about 4,000 characters per second, the speed being determined by a simple RC time-constant network. The display takes the form of 24 lines of 40 characters. This is a shorter line than the standard teleprinter, which has about 70 characters on a line. A vdu with a 70-character line would need a display with rather better definition than the average domestic tv set, and with the video at the 625-line standard it would need fast memories which at the present time are not cheaply available. So 40 characters per line is a compromise, although it is becoming a standard for this sort of display. The BBC and IBA teletext systems use 24 lines of 40 characters, and indeed it would not be difficult to add circuitry to this vdu to enable it to copy teletext.

In addition to responding to received carriage return and line feed codes by starting on a new line, if the received line is longer than 40 characters the vdu continues writing on the next line with no letters missing. When all 24 lines are full, writing starts on the top line again, replacing old copy with new copy. The screen can be cleared manually at any time, and there is also manual control of carriage return, line feed, "letters" and "figures" functions. A "page return" button is also fitted to reset the vdu to the top left corner of the screen before receiving a message. The "bell" and "who are you?" characters are decoded in the vdu as they are received and operate logic outputs that are available for uses external to the vdu.

Although the logic circuitry could all be built on PCBs, the author preferred to use commercially available dual-in-line layout cards with a standard printed track pattern, wiring the interconnections between devices with self-fluxing polyurethane-insulated wire. This method makes modifications and improvements to the unit very easy at a later date. The circuitry divides into three main areas—the input unit, the memory and display and the timing circuits—and these can be built on three standard boards plugged into 43-way edge connectors. The power supply requirements are 5V at 0·9A, −12V at 30mA, and +12V at a few milliamps for the uhf modulator if this is used.

VDU circuit description

The block diagram of the vdu is shown in Fig 2, the heart of which is the memory block. This can be thought of as 24 rows of 40 locations, each capable of storing a character code. Incoming rtty is converted from series to parallel form by the universal asynchronous receiver/transmitter (uart) and stored in successive locations in the memory as it is received. The whole content of the memory is read out, character by character and row by row in sync with the tv line and frame scan, and each character code selects the shape of the corresponding letter from the 64 possible shapes stored in the character generator memory. This is a read-only memory (rom) which stores the letter-shapes as an array of black or white points in the form of a rectangle five units wide by seven units high. The video output waveform of the vdu is assembled from this information by a shift register driven by timing signals synchronous with the stream of character codes from the memory. The character generator devices available, being primarily intended for computer applications, require inputs in ASCII code, and so the Murray-coded rtty input must be converted to this form. This is done between the uart and the memory by a programmable read-only memory (prom), which is also programmed to decode the control characters in the incoming rtty.

Since it is not possible to write into one location at the same time as reading from another, the two operations are separated. The read/display operation takes place during the

*11 Marchwood Court, Broadsands Drive, Gosport, Hants.

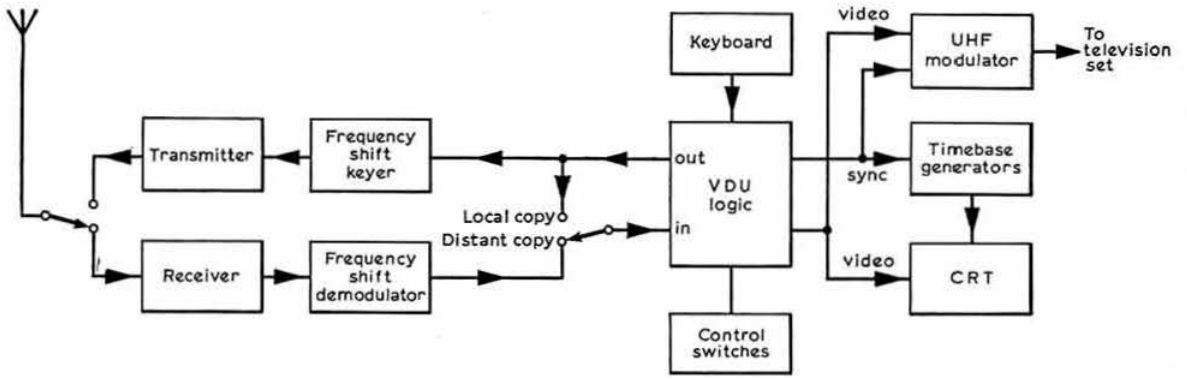


Fig 1. Block diagram of typical amateur rtty station using a vdu, showing the use of either a uhf modulator with a domestic tv or a purpose-built crt display

visible tv linescan, and any rtty character received during this time is held in the uart until the line flyback period, when control of the memory is handed over to the input unit, and the waiting character is then written into its correct location.

The timing chain starts with a 7,000kHz crystal oscillator using two gates IC30c and IC30d. The 7MHz square-wave is divided by seven in IC31, a divide-by-16 counter with feedback via gates IC37a and IC35d to shorten the count cycle. The resulting 1MHz pulse train is divided by 64 in IC32 and IC33. The six intermediate outputs of these counters are taken to the memory column address lines, so that during the first 40μs of this count sequence the memory will output one complete row of 40 character codes. Gate IC39b goes low between 48 and 52μs and this is used to synchronize the line flyback at the end of a row. Flip-flop IC34a is set at 40μs, and reset at 64μs; this output is used to transfer control of the memory to the input board during the line flyback interval. The line sync pulse from IC39b is further divided by 10 in IC36 and the outputs are gated by IC38b, c and d, so that the modified outputs count in the binary sequence 1 2 3 4 5 6 7 0 0 0. These outputs go to the row-select pins of the character generator device IC17. When this row-select counter is at count 1, the five outputs of the character generator will be at high or low logic levels corresponding to the five black or white points on the top row of the five by seven rectangle. As the memory outputs change at 1μs intervals, so too will the character generator outputs. These five signals are loaded in parallel into five of the stages of an eight-bit shift register IC16 and shifted out of the register in sequence by the 7MHz clock. The output of IC16 is the video output of the vdu, and so far has traced out the tops of a row of characters. On the next tv line the row-select will be at count 2, and the character generator outputs are programmed to give the second row of five points. After seven tv lines the video output will have

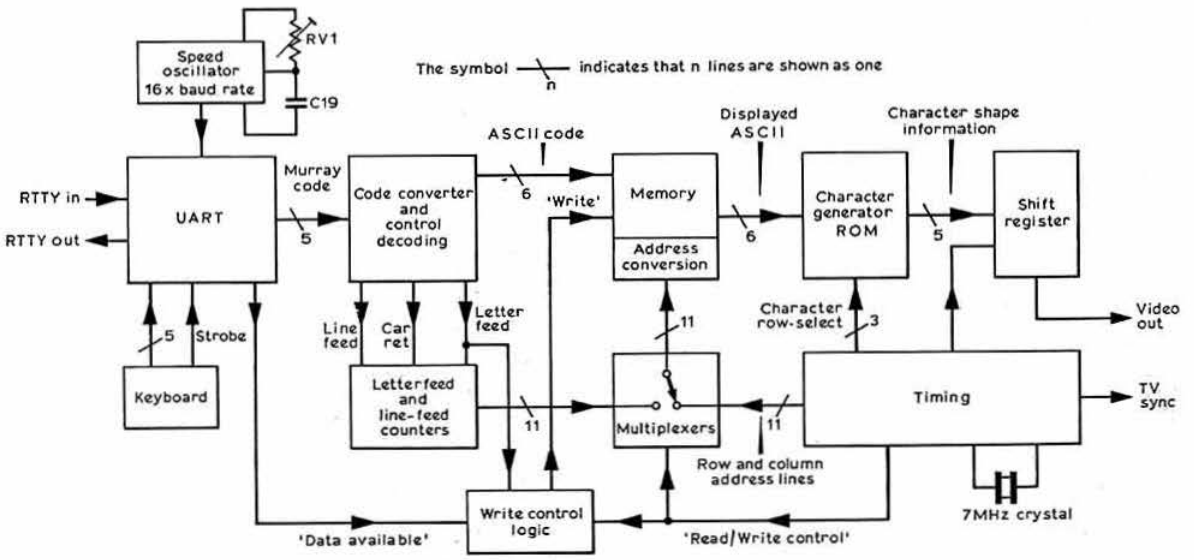


Fig 2. Block diagram of vdu logic

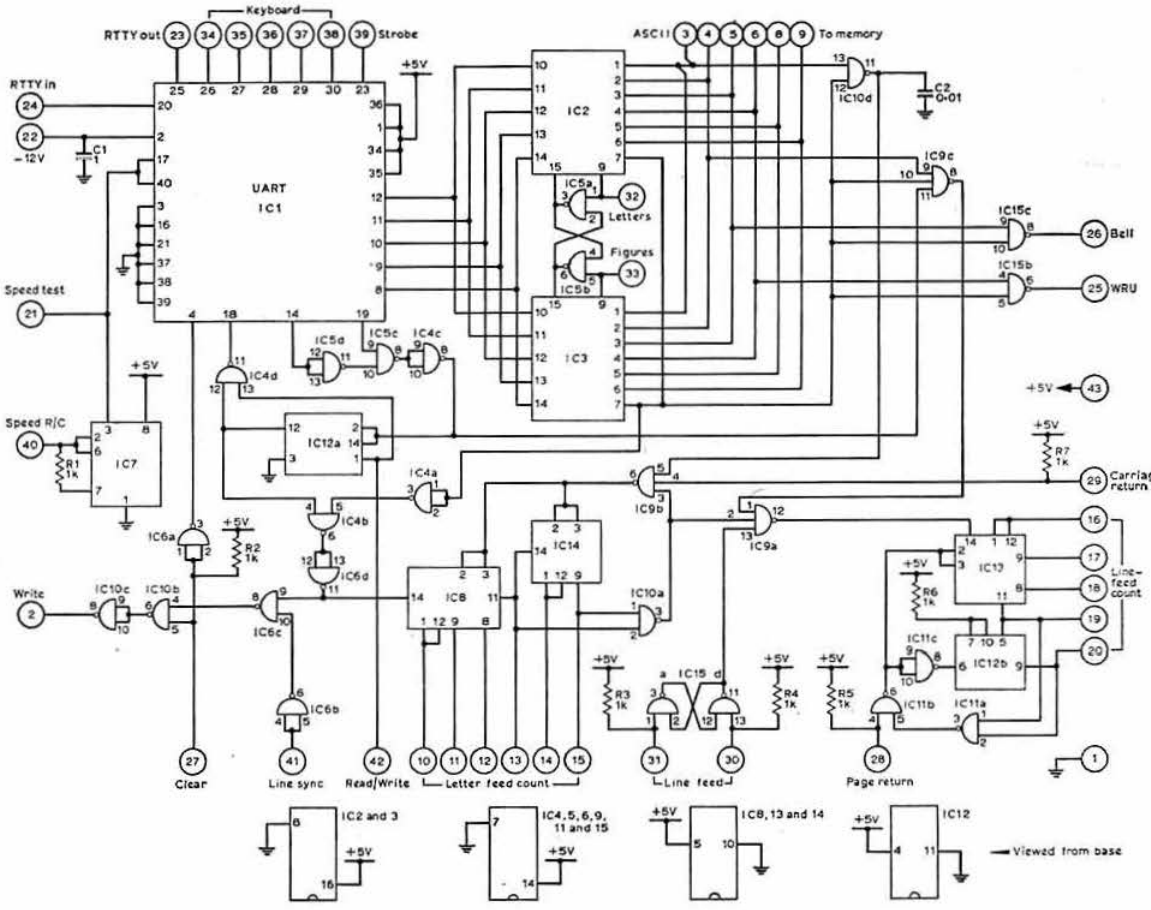


Fig 3. Input board. Figures in circles are edge connector pin numbers. C3, 4, 5 and 6 across +5V supply not shown

traced out the shapes of the characters in one row of the memory. The character generator is programmed so that row-select count 0 gives no output, and so the following three tv lines will display blank, giving a margin separating the row of characters from the row below.

At the end of this sequence of 10 lines, pin 11 of IC36 goes low to start another cycle, and this is taken to counters IC34b and IC45. The five stages of these counters are the row address lines for the memory. Every 10 lines the row address count is incremented, selecting the next row of 40 characters in the memory, which will be displayed as before below the previous row, and so on down the screen.

The tv frame timing is done by counters ICs 40–42, which form a divide-by-1,024 counter, with feedback to shorten the count to 625. The input to this counter is from pin 8 of IC33, which is at twice line frequency (31·25kHz), so that the 625 counter cycles at 50Hz. A flip-flop formed from IC44a and b is set when the 625 counter is reset (count 0) and reset at count 5 by IC43d. This flip-flop output is the tv frame sync pulse. Another flip-flop, IC43b and c, is set by gate IC37b at count 80, when the tv scan is at the top of the screen, and reset by gate IC37c at count 560 at the bottom of the screen. The output of this flip-flop is used to remove the reset on the row address counter and the character row-select counter, thus starting off the display sequence already described. When the reset is reapplied at count 560 the row address counter has just counted to 24, and one display cycle has therefore been completed. The whole display cycle repeats at 50Hz to give a stationary flicker-free display of the contents of the memory.

At the other end of the vdu, the incoming rtty is received by the uart IC1, triggered by the high-to-low transition at the start of the character. The timing of the code elements is done by the oscillator IC7, which free runs at 16 times the baud rate (727Hz for 45 bauds). The five-bit Murray code appears on pins 8-12 and goes to the code converter, which consists of two PROMs, IC2 and IC3, which have eight outputs, each of which can be individually programmed high or low for each of the 32 Murray code characters formed on the five input lines. For each of the non-control characters, outputs 1-6 are programmed to the corresponding six-bit ASCII code, and output 7 is programmed low. For the remaining control characters output 7 is high, and the others are arranged to decode the individual control functions. For example when the input is 01000, the carriage return character, outputs 1-7 are programmed to 1000001,

so that a two-input gate IC10d with its inputs on 1 and 7 will only go low on this character. Study of the complete prom programme in Table 1 will show how the line-feed, bell, and wru (who are you?) characters are decoded in the same way. One prom contains all the "letters" characters and the other contains the "figures", and the changeover from one to the other is done by flip-flop IC5a and b, which controls the "enable" pins of the PROMS. If the "letters" prom is enabled, the "figures" prom is disabled, and so the common output lines carry ASCII codes corresponding to Murray code "letters" characters. Output 9 of the "letters" prom is programmed high for all characters except the "figures" character, and will go low when a "figures" character is received, and this will trip the flip-flop so that control is transferred to the "figures" prom. Output 9 of the "figures" prom is high on all characters except the "letters" character, and so if "letters" is received, control is transferred back to the "letters" prom.

The WRITE sequence is started off when the uart has completed the serial-to-parallel conversion of an rtty character. It signals this when, halfway through the stop element, pin 19 goes high, indicating that data is available on pins 5-9. If the stop element itself was not correct (high), then the frame error circuit in the uart takes pin 14 high, inhibiting the operation that follows. The "data available" signal takes IC4c high, and the circuit now waits until the end of the current linescan. This is signalled by the read/write control line from the timing board going low, clocking flip-flop IC12a and setting its output high. If the prom output 7 is low, indicating that the character is not a control character, then IC4b goes low. This is gated with the line sync pulse to give a low pulse at IC10c. This is the memory WRITE line, and signals the memory to store the ASCII code presented to it by the prom. If prom output 7 is high, no WRITE pulse is generated, and so the prom output, which is not an ASCII character but a control decode instruction, is not stored.

The location in the memory that the ASCII code is written into, is determined by the states of two counters; the letter-feed counter IC8, IC14, and the line-feed counter IC13,

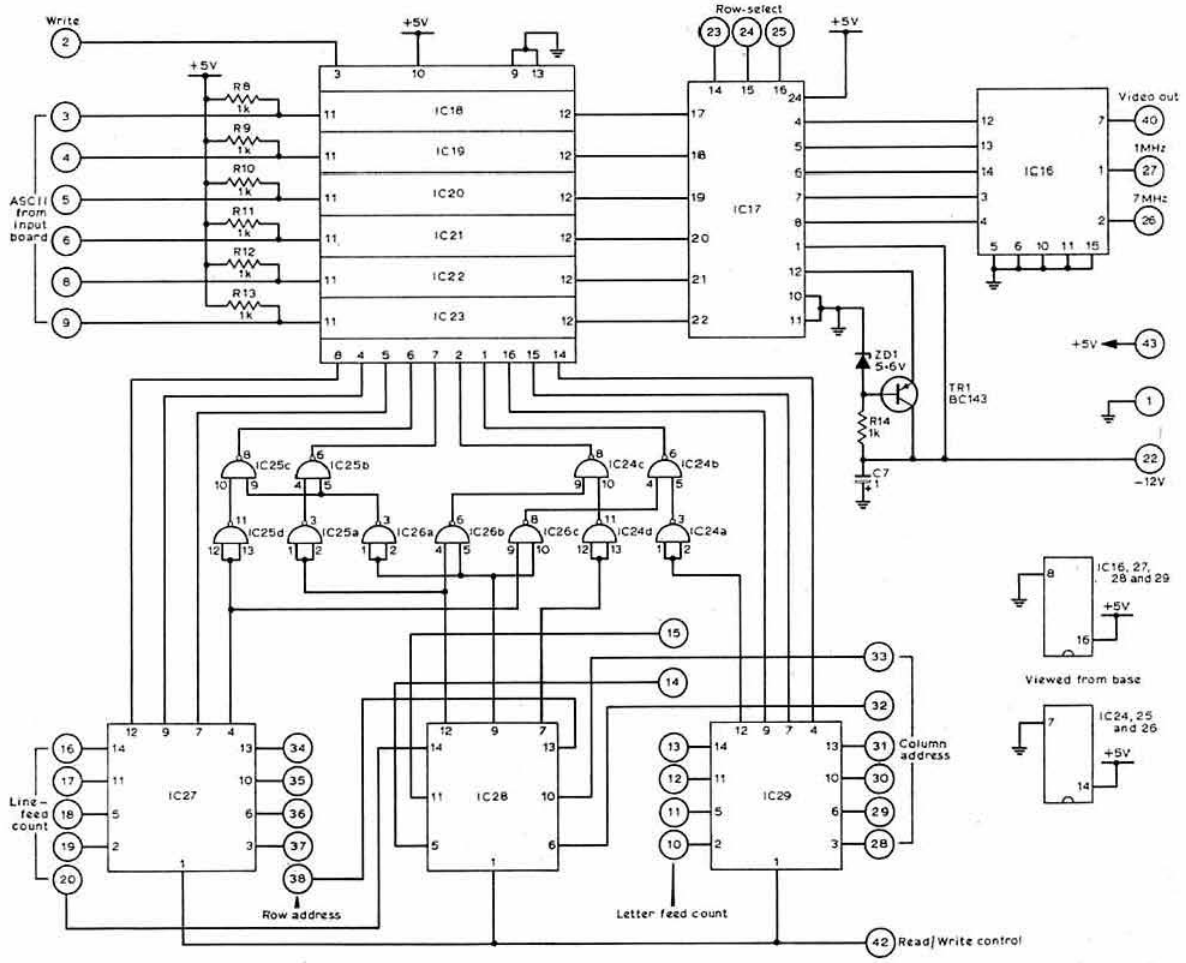


Fig 4. Memory and display board. Figures in circles are edge connector pin numbers. C8, 9, 10 and 11 across +5V supply are not shown. ICs 18-23 are connected in parallel on all pins except 11 and 12

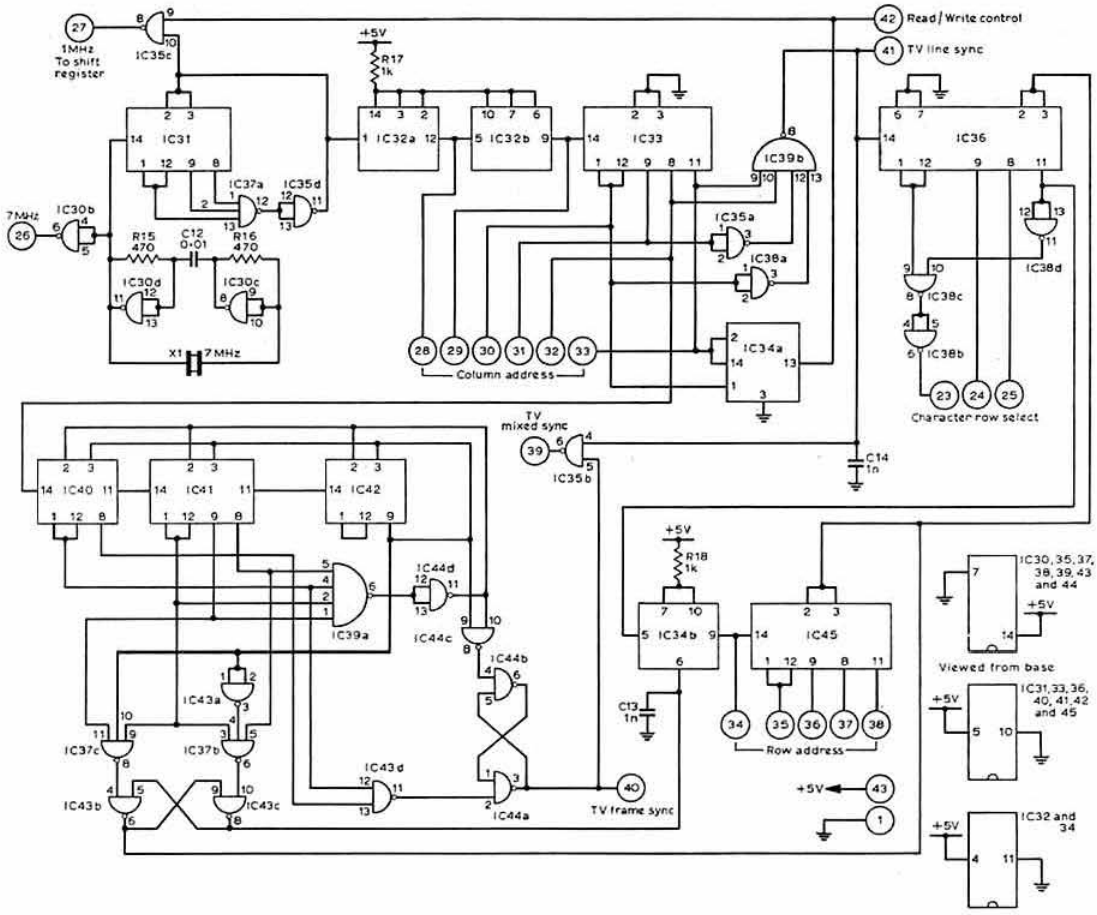


Fig 5. Timing board. Numbers in circles are edge connector pin numbers. C15, 16, 17 and 18 across +5V supply are not shown

IC12b, the outputs of which denote the column and row in which the character is to be stored in the memory. The letter-feed counter is incremented each time a non-control character is received, and is reset to zero either when a carriage return character is detected by IC10d, or if the manual carriage return button is pressed, or if the end of a row is reached, in which case the line-feed counter is also incremented via IC10a and IC9a. The line-feed counter is also incremented either when a line-feed character is detected by IC9c, or if the manual line-feed button is pressed. IC15a and b prevent contact bounce of this button from feeding more than one line at a time. The line-feed counter is reset either if the page reset button is pressed or if the counter tries to count past 23.

When the read/write control line goes low at the end of a displayed linescan it also switches over the memory address lines, from the row and column address lines on the timing board to the line-feed and letter-feed counter outputs just described. This is done by 11 two-input multiplexers (two-way switches) controlled by the read/write control line like an 11-pole relay. In this way the incoming character is written into its correct location. Gate IC35c inhibits the display during this time, so that this character is not displayed down the sides of the screen. When the read/write control line goes high again at the end of the flyback interval, IC4d goes low, taking uart pin 18 low. This internally clears pin 19 to the low state, clearing flip-flop IC12a, and the circuit is then idle until the next rtty character has arrived in the uart.

To clear the screen the rde (receive data enable) pin on the uart, pin 4, is taken high from the clear button via IC6a, disabling the uart outputs which then float high to the "letters" character. Although this is a control character and is not normally written into the memory, the prom is programmed to give the ASCII code for a blank space (000001). The clear button also holds the WRITE line low continuously, via IC10b, and this has the effect of writing blank spaces into all memory locations during the next display scan.

So far the memory has been described as a block of six-bit memory locations arranged in 24 rows of 40. The memory in fact consists of six devices, ICs18-23, each capable of storing one bit in each location. The address lines and the WRITE line are common to all six devices so that they all operate together, with six inputs and outputs. The memory devices

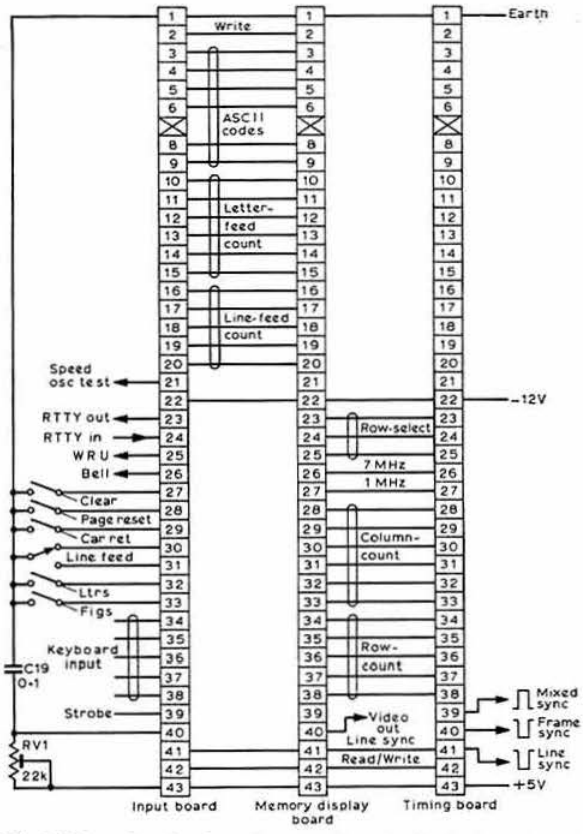


Fig 6. Internal and external connections to the logic, viewed from the back of the edge-connectors

are in fact arranged in 32 rows of 32, not 24 rows of 40, but the conversion is done quite simply by gates ICs 24-26, which in effect store characters for display in columns 32 to 40, in memory rows 24 to 32.

Keyboard

The keyboard circuit shown in Fig 7 uses diodes to generate the required code patterns corresponding to each of the 31 keys. When a key is pressed the required code is set up on the five output lines. Where there is a diode from a key-line to an output-line that output is pulled low, and if there is no diode that output line remains high—held by a "pull-up" resistor inside the uart to which the keyboard output lines are connected. A sixth line is always taken low when a key is pressed, and this turns off TR2, allowing C20 to charge. If the key bounces, TR2 discharges C20, but about 10ms after the last bounce the voltage of C20 will have risen to trigger the monostable IC46, causing it to deliver, on pin 1, a short pulse low. This goes to the STROBE input on the uart and starts it transmitting the rtty character; a start bit, followed by the five code bits in sequence. The uart has an input buffer, so if a second key is pressed while the first character is still being transmitted it will be stored in the buffer, and will be transmitted after the first with a two-bit gap between the two characters.

An alternative to this home-built keyboard is a commercially available item. The author used a Clare-Pendar KB5 keyboard which, at the time of writing, is available on the second-hand market. The connections to the circuit are the same as the keyboard described here, but the KB5 has a "two-key rollover" system which makes typing at speed easier.

UHF modulator

Fig 8 shows the circuit of a simple uhf modulator for use with the vdu. A crystal oscillator feeds a harmonic generator to deliver about 2mV at a frequency within the tv band. This is fed to an rf stage of the type designed for agc control. With both logic inputs from the vdu high, RV1 is used to set the collector current of this stage to the maximum gain condition. The logic input to RV2 is low between the sync pulses, and this raises the collector current to lower the rf

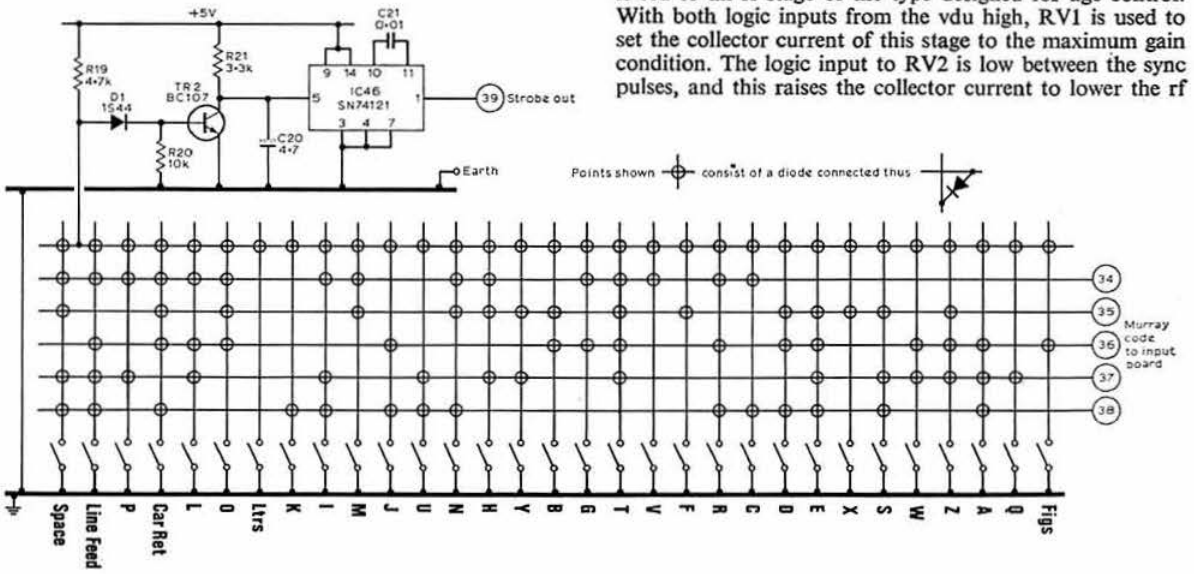


Fig 7. Keyboard circuit. The points in circles connect to the uart on the input board shown in Fig 3

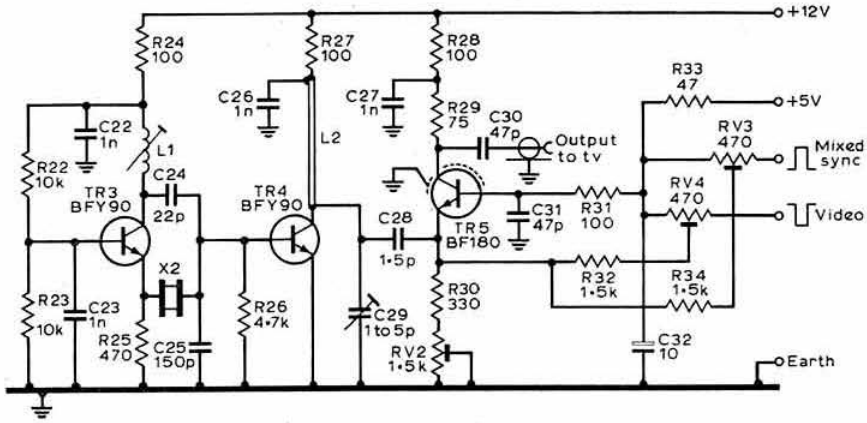


Fig 8. UHF modulator suitable for feeding domestic tv receiver

output. Thus RV2 is adjusted to set the black-level of the modulated output. The logic to RV3 is the display video, and when this goes low the collector current is increased still further, decreasing the rf output to the white level.

The author used a 67MHz fifth overtone crystal from the junk box, with C29 tuned to peak up the eighth harmonic at 536MHz. The choice of crystal frequency and harmonic number will depend on available crystals and the frequencies of the local tv broadcast signals. The author built the unit in a tobacco tin, soldering earthed components directly to the box. A screen should be installed between the input and output circuits of TR5. With RV2 and RV3 turned to the +5V line, tune the tv to a suitable harmonic and peak C29 and RV1 for minimum background noise on the screen, attenuating the signal to the tv if no noise is visible. Turn RV2 up until the tv locks to the vdu sync, and then turn RV3 up until video is visible. These two presets can be adjusted more precisely by comparing the black and white levels of the display with those of a broadcast test-card.

Programming code converter memories

The programmable read-only memories IC2 and IC3 in their natural state have all outputs low at all locations. The procedure for programming them is as follows:

(1) Apply +5V to pin 16, set pin 15 to logic high, and set up the address code of the location to be programmed.
(2) To programme an output high, connect that output to −0·7V and
(3) Raise pin 16 supply voltage to 10V and, within 10ms,

Table 1. Code conversion prom programming chart

Murray code input pins 14 13 12 11 10	Letters prom: Output pins 123 456 79	Letters prom: Character displayed	Figures prom: Output pins 123 456 79	Figures prom: Character displayed
0 0 0 0 0	000 000 11	(blank)	000 000 11	(blank)
0 0 0 0 1	101 000 01	E	110 011 01	3
0 0 0 1 0	010 000 11	(line feed)	010 000 11	(line feed)
0 0 0 1 1	100 000 01	A	101 101 01	- hyphen
0 0 1 0 0	000 001 01	space	000 001 01	space
0 0 1 0 1	110 010 01	S	111 001 01	' apostrophe
0 0 1 1 0	100 100 01	I	000 111 01	8
0 0 1 1 1	101 010 01	U	111 011 01	7
0 1 0 0 0	100 000 11	(car ret)	100 000 11	(car ret)
0 1 0 0 1	001 000 01	D	000 100 11	(who are you ?)
0 1 0 1 0	010 010 01	R	001 011 01	4
0 1 0 1 1	010 100 01	J	001 000 11	(bell)
0 1 1 0 0	011 100 01	N	001 101 01	, comma
0 1 1 0 1	011 000 01	F	101 001 01	%
0 1 1 1 0	110 000 01	C	010 111 01	: colon
0 1 1 1 1	110 100 01	K	000 101 01	(
1 0 0 0 0	001 010 01	T	101 011 01	5
1 0 0 0 1	010 110 01	Z	110 101 01	+
1 0 0 1 0	001 100 01	L	100 101 01	)
1 0 0 1 1	111 010 01	W	010 011 01	2
1 0 1 0 0	000 100 01	H	110 001 01	#
1 0 1 0 1	100 110 01	Y	011 011 01	6
1 0 1 1 0	000 010 01	P	000 011 01	0 zero
1 0 1 1 1	100 010 01	Q	100 011 01	1
1 1 0 0 0	111 100 01	O	100 111 01	9
1 1 0 0 1	010 000 01	B	111 111 01	?
1 1 0 1 0	111 000 01	G	000 000 01	@
1 1 0 1 1	000 000 10	(figs)	000 000 11	(figs)
1 1 1 0 0	101 100 01	M	011 101 01	. full stop
1 1 1 0 1	000 110 01	X	111 101 01	/ stroke
1 1 1 1 0	011 010 01	V	101 111 01	=
1 1 1 1 1	000 001 11	(ltrs and clear)	000 000 10	(ltrs)

Note: the symbol # is programmed in "figs H" as there is no ASCII code for "£".

Components list

R1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 36	1kΩ
R15, 16, 25, 35	470Ω
R19, 26	4·7kΩ
R20, 22, 23	10kΩ
R21	3·3kΩ
R24, 27, 28, 31	100Ω
R29	75Ω
R30	330Ω
R32, 34	1·5kΩ
R33	47Ω
R37	390Ω
RV1	22kΩ
RV2	1·5kΩ
RV3, 4	470Ω
D1, 2, 3, 4	IS44
ZD1, 2	5·6V 1W
ZD3	4·7V 0·5W
XI	7MHz
X2	3rd or 5th overtone
L1 (to suit frequency)	10t 20swg 5mm diameter for 70MHz
L2 35mm straight 20swg wire 3mm above ground plane	
TR1	BC143
TR2	BC107
TR3, 4	BFY90
TR5	BF180
TR6	BFY50

C1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 15, 16, 17, 18	1μF
C2, 12, 19, 21	0·01μF
C13, 14, 22, 23, 26, 27	1nF
C19	0·1μF
C20	4·7μF
C24	22pF
C25	150pF
C28	1·5pF
C29	1-5pF trimmer
C30, 31	47pF
C32	10μF
IC1 (General Inst)	AY5-1013
IC2,3 (Texas Inst)	SN74188AN
IC4, 5, 6, 10, 11, 15, 24, 25, 26, 30, 35, 38, 43, 44	SN7400
IC7	NE555
IC8, 13, 14, 31, 33, 40, 41, 42, 45	SN7493
IC12, 32, 34	SN7473
IC16	SN74165
IC17 (Signetics)	2513/CM2140
IC18, 19, 20, 21, 22, 23 (Signetics)	2102-1B
IC27, 28, 29	SN74157
IC36	SN7490
IC9, 37	SN7410
IC39	SN7420
IC46	SN74121

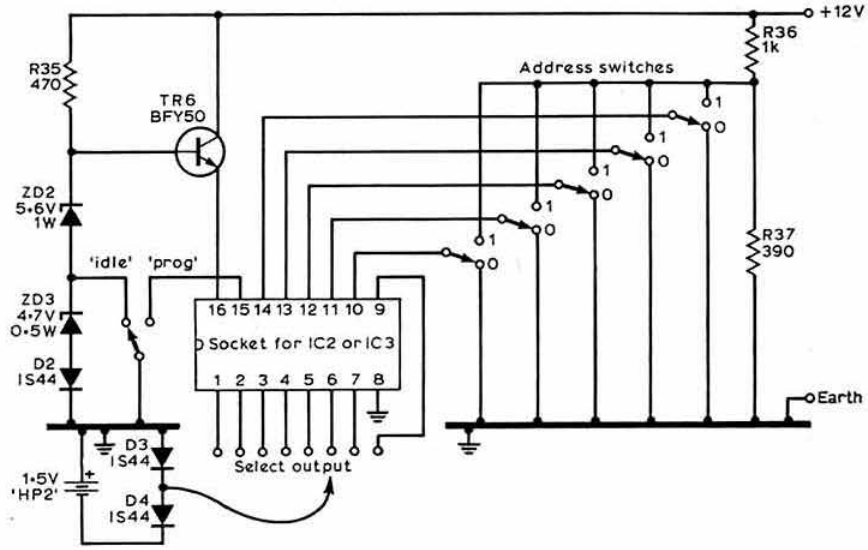


Fig 9. Circuit for programming the PROMs. The supply should be capable of delivering 100mA

take pin 15 low for about 1s, then take it high and, within 10ms, lower the supply back to 5V.

(4) Repeat 2 and 3 for each output to be programmed high at this location, and repeat 1, 2 and 3 for each location requiring programming.

Note that outputs not programmed high will remain low and could, if required, be later programmed high, but once programmed high there is no way of bringing them down again, as programming these devices involves "blowing up" internal links. Fig 9 shows the circuit of a jig for this purpose. Even if it is only to be used once it is worthwhile building the jig on to a panel, with proper switches for the address lines, sockets for the outputs and a wander plug for the −0·7V supply. The programme button should be one with a snap action so that the change-over is fast. A neat and logical panel layout reduces the chance of an error in programming.

To check that an output has been successfully programmed, disconnect the −0·7V supply and, with the supply pin at 5V, take the enable pin low. A voltmeter connected between the output pin and the +5V line will read zero if that output has been "blown", and +5V if not. If the procedure described appears too risky in view of the irreversible

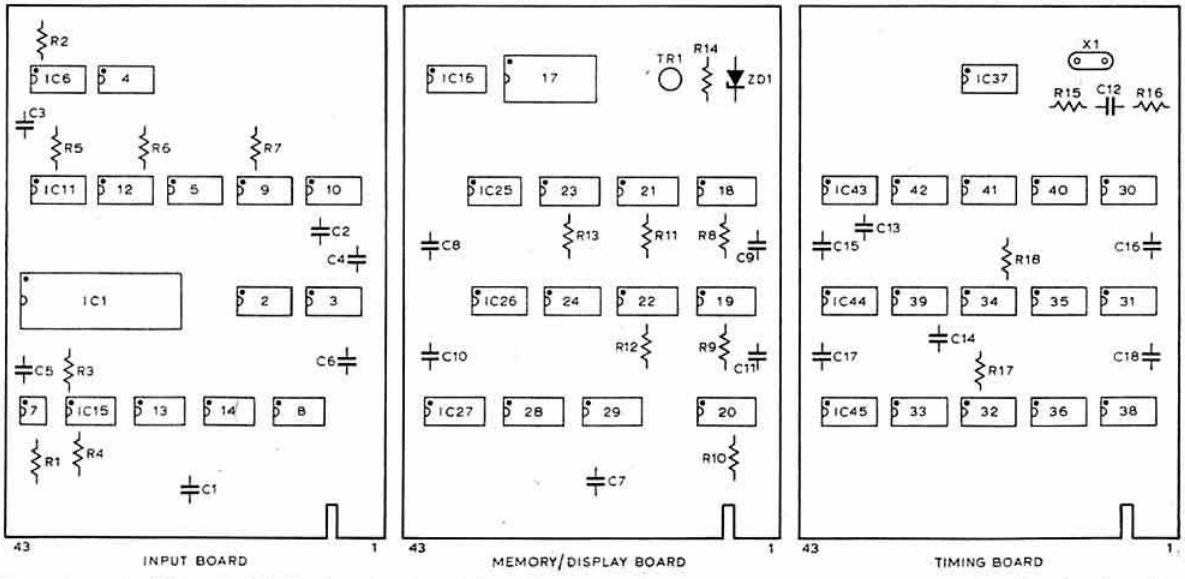


Fig 10. Layout of Vero dual-in-line boards, viewed from the copper side, ie the components are on the opposite side from that shown

nature of programming errors, many suppliers of the PROMS have facilities available for carrying out programming to order.

Construction hints

The author recommends the use of dual-in-line layout boards, available from Vero Electronics or RS Components, for the three logic units. Fig 10 shows the layout of these three boards using this system, viewed from the copper side. Self-fluxing polyurethane-insulated wire is used for wiring between pads on the copper side of the board. This wire is available from Vero, but the writer used 32swg wire from a scrap transformer winding. This wire is similar to "enamelled" wire, but is a much lighter colour and the insulation melts with a soldering iron.

Wire up all the supply and earth connections to each device first and check thoroughly for errors before proceeding. Errors involving the supplies usually result in destruction of an ic, but errors on input or output pins do not and, if not spotted before wiring is complete, can be found when the board is electrically tested. Build the timing board first and check, if a 'scope is available, that the line sync pulse is 4μs wide with a 64μs period, and that the frame sync pulse is 160μs wide with a period of 20ms. Feed the combined sync to the display and check for correct synchronization. The video feed to the display can now be used as a fault-finding aid for the rest of the circuitry, displaying the logic signals present at any point in the circuit. For example, the column address lines will appear as vertical bars of different widths, and the row address lines as horizontal bars. If the uhf modulator is used for this, RV2 must be turned up and RV3 down to prevent the signal being displayed from interfering with the synchronization of the tv.

Build the memory/display board next and, with that connected to the timing board and the WRITE line held high, the display on switching on should appear as random characters, changing to a screenful of question marks if the WRITE line is taken low. Again the display can be used to inspect any of the waveforms on this board. Finally the input board can be built and tested by linking the rtty input to the rtty output and typing in from the keyboard. On this board most of the signals change infrequently and, in the absence of a 'scope, are best checked with a testmeter or, in the case of the very short pulses in the write-control area, by listening for clicks in a pair of headphones connected to the circuit with a series capacitor.

Operation on the air is quite straightforward, if a little different from a conventional teleprinter. On switching on, press CLEAR, PAGE RESET and CAR RET so that copy starts at the top left hand corner of a clear screen. If the copy turns to figures as a result of an error in the incoming signal, quickly press "Letters" to prevent further erroneous display. When the screen is full, press CLEAR, so that when copy starts at the top again it does so on to a clear screen. If this is not done, however, no copy will be lost, but the resulting display can be rather confusing. On transmission from the keyboard with local copy on the vdu, remember that the distant receiving station is most likely to be using a conventional teleprinter with a 70-character line. To save wasting his paper it is possible to omit the carriage return and line feed at the end of the 40-character vdu line, provided that these are sent before the next line on the vdu is three-quarters full. Rtty operation with a vdu is far less tiring than with a printer and, of course, is much quieter and does not use up any paper. At G3PLX the vdu is often left on, copying other station's contacts while the operator is busy with other things, even while in contact on another band on phone!

It is hoped that this article has shown that a home-built rtty display specifically for amateur purposes, although clearly a large project, is no longer outside the capabilities of the keen constructor. Apart from the unit's uses for rtty, there is the new field of data transmission, recently announced by the Home Office, and the basic display design is compatible with existing data transmission systems such as Oracle, Ceefax and Viewdata.

Acknowledgement

This article would not have been possible without the contribution of Hans Voltz, G8HVO, who helped to prove the design by building the first working unit. The author is most grateful to him. □

QTC

(Continued from p267)

500 editions of World Radio Club

To mark its 500th edition, World Radio Club invited an audience of shortwave enthusiasts to participate in the programme broadcast round the world by the BBC World Service on 16 and 18 February. Among those present was the President of RSGB, Lord Wallace of Coslany, who was interviewed by the programme's presenter Frank Hennig. Questions from the audience were answered by a panel of experts: Bill Wood, head of the BBC's Engineering Information Department; Desmond Colling of the International Short Wave League, and Henry Hatch, G2CBB, the programme's resident engineering personality.

Over 32,000 members have joined World Radio Club since it began in July 1967. Designed especially for shortwave enthusiasts and those who are fascinated by the technical aspects of radio communication, it also caters for the

Henry Hatch demonstrates a crystal receiver he designed for listeners using such everyday household oddments as a cotton reel. (*BBC photograph*)

listener whose only aim perhaps is to achieve better reception of all World Service programmes. It also covers technical achievements in the field of communications, especially British developments and contributions.

As the World Service broadcasts to people for whom English is not necessarily their first language, World Radio Club makes a special point of using straightforward and uncomplicated English, whether describing simple aerials or space communication technology. By simplifying technicalities, many young people are attracted to the programme which, for this reason, is never afraid of being basic and explaining the first principles of radio.

One of the great advantages of World Radio Club is that it can call on all the resources of the BBC and it is able, regularly every week, to supply newsworthy dx, reports of new stations and new frequencies. Every member receives frequency charts and is eligible to enter monthly competitions.

Stolen equipment

One Yaesu FRG7 receiver and one Trio Kenwood QR666 receiver were stolen from the premises of Derwent Radio, Scarborough, on 19 February. Information should go to the police.

East London RSGB Group competition

A competition is being held by the East London RSGB Group to promote interest in construction of radio, hi-fi and electronic equipment. It is open to every RSGB member. The idea is to make a piece of equipment, totally enclosed by a 2oz tobacco tin with lid. The power source need not be included in the tin. The judges will take into account such factors as tidyness, layout, originality and design. Circuits and/or plans should be available and magazine articles will be accepted as constructional plans. Entry forms with rules can be obtained by sending an sae to G4CJQ, QTHR. Cash prizes will be awarded to the winner and first two runners-up, and extra prizes will be given if the entry exceeds 30.

"Inter-hospital" radio society

Four amateurs who are students at St Mary's Hospital Medical School, London, are trying to form an "inter-hospital" radio society, either in London or at a national level. Possible activities would include maintaining contact with students spending elective periods abroad, and the formation of contest groups. Interested persons (not just medical students) should contact M. J. Hurst, G4ASZ, St Mary's Hospital Medical School, Norfolk Place, Paddington, London W2. □

Simple alignment for Drake 4C receiver

by J. BAZLEY, G3HCT*

FOR those amateurs who prefer to align their own receivers, the specification for the Drake "C" line at first sight places it beyond most of them by stating that a frequency counter with an accuracy better than 25Hz at 50kHz and 50Hz at 5·6MHz is essential. No doubt this is ideal, but acceptable accuracy can be obtained by using the 100kHz crystal calibrator within the receiver provided that care is taken to calibrate it accurately against MSF or a similar frequency standard at 5·0MHz. This latter point cannot be over-emphasized.

Before commencing alignment it is advisable to have had the receiver and crystal calibrator switched on for 30min, as the author has noticed that some calibrators drift a few cycles from switch on. It is easier to adjust the 100kHz oscillator trimmer without the noise blanker installed. Do not forget the manufacturer's instructions *switch off* before removing the noise blanker and insert the "jumper plug" temporarily in the noise blanker socket.

If you do not have an accessory crystal to cover 5MHz, MSF at the frequency can be received as follows:
(1) Bandswitch to 3·5MHz;
(2) Passband control to exact centre of range (12 o'clock position);
(3) Receiver dial to 3,632·5kHz;
(4) Mode switch to ssb;
(5) Preselector tuning to approximately 6.

Carefully tune MSF to zero beat. Now switch on the crystal calibrator and carefully adjust the capacitor (C174) on the crystal calibrator board to zero beat.

Refer to the manual for "50kHz bfo and i.f. alignment". Apply a signal from the crystal calibrator to V4 on the pin specified by means of a disc 0·005μF capacitor to the ANT phono socket on the rear apron of the set. Adjust T11 for zero beat (the 100kHz calibrator is beating against the first harmonic of the 50kHz oscillator). Follow the remainder of the alignment instructions in this section of the manual.

To set the 5645 oscillator proceed as follows:
(1) Bandswitch to 28kHz;
(2) Passband tuning control to exact centre of range (12 o'clock position);
(3) Crystal accessory switch to cover range 28–28·5MHz;
(4) Crystal calibrator on;
(5) Mode switch to ssb;
(6) Receiver dial to exactly zero beat at 28·225kHz;
(7) Switch off the crystal calibrator and the fifth harmonic of the carrier oscillator should be heard. Carefully adjust C59 (the top trimmer on the second mixer oscillator board on top of the chassis) to zero beat.

To set the 5595 oscillator proceed as follows:
(1, 2, 3, 4) As above;
(5) Mode switch to a.m.;
(6) Receiver dial to 27,975kHz;
(7) Adjust C60 (bottom trimmer on the second mixer oscillator board on top of the chassis) to zero beat.

The S-meter adjustment paragraph refers to adjusting R55 to set the bias level. In answer to a request to the manufacturers for a reference voltage and test point they stated: "Connect a vtvm to the black/white wire at the avc switch and adjust R55 for −1·35V (avc in 'M') position." The remainder of the alignment is straightforward. □

*Brooklands, Ullenhall, Solihull, Warwicks.

C

Amateur television

by J. L. WOOD, G3YQC*

MANY amateurs have at some time expressed an interest in fast scan television but are usually fearful of the cost and apparent complexity of this branch of the hobby. This article attempts to give practical guidance on starting a tv transmitting station and, it is hoped, to dispel certain misconceptions concerning the average amateur's ability to cope with the technical problems involved.

Television is an exciting field where one can indulge the so-called true amateur pursuit of designing and constructing one's own equipment and one where there is still an enormous amount of original experimental and development work to be done.

Amateur tv (atv) work is usually carried out on the 432MHz band, although more and more stations are starting to use 1·3GHz where there is more space; a 625-line tv channel occupies a bandwidth of about 6MHz. Any future atv repeaters will probably be on the 1·3GHz band. For the purposes of this article 432MHz equipment will be described but most of the techniques apply equally well to 1·3GHz.

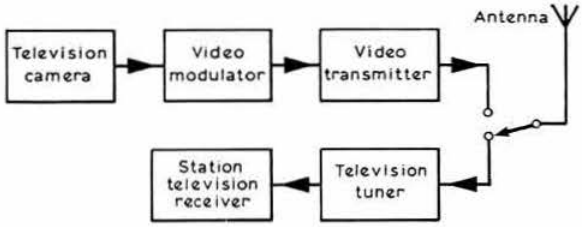


Fig 1. Block diagram of basic television station

Fig 1 shows the block diagram of a typical atv station. This is how one usually starts, and indeed many tv amateurs of long standing do not feel the need for anything more sophisticated.

Antenna systems

Since a video signal needs to be fairly strong to produce reasonable pictures at the receiver, an efficient antenna system is essential. An 18-element Parabeam is chosen by many and gives good performance at reasonable cost. The Multibeam antenna does not appear to give a good account of itself in tv use. The eight-over-eight slot-fed Yagi is a good choice; the author uses a 64-element array consisting of four eight-over-eights stacked and phased in a square configuration.

* 54 Elkington Road, Yelvertoft, Northampton NN6 7LU.

Off-air photograph of identification caption transmitted using similar equipment to that described in the article. G6AHT/T was the author's tv callsign up to the abolition of this category at the end of 1976

The bandwidth of the antenna system must be wide enough to include the tv section of the band (ie up to 440MHz). The antenna should of course be mounted as high and as clear as possible.

Do not attempt to use cheap coaxial cable at tv frequencies; the extra cost will be amply justified in the end. The cable should be of 50Ω impedance and if it is much less than 0·5in thick it should be viewed with suspicion! It is wise to standardize from the start the type of coaxial connectors used throughout the station. For rf cables some types are just not good enough, and BNC connectors are good but will not accept the large diameter cable. "N" type connectors are probably best; they are readily available and perform very well at 440MHz. Do not mix 50Ω and 75Ω plugs and sockets otherwise mechanical damage may result (to say nothing of the mismatch).

Receivers

The tuner most commonly used today is the Mullard ELC1043 varicap (varactor tuned) tuner. These units require no modifications to tune the 432MHz band. Fig 2 shows how to connect the tuner for atv reception. The 1kΩ pot at pin 3 is the main tuning control and is brought out to the front

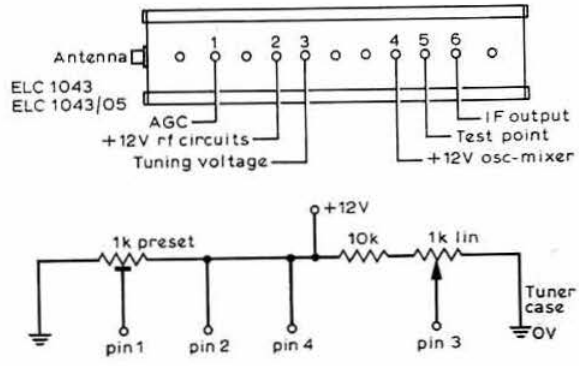


Fig 2. Tuner layout and connections

panel; it is desirable to use a reduction drive otherwise the tuning may be somewhat critical.

The tuner is set up as follows. Set the 1kΩ preset control for +3V at pin 1 and set the 1kΩ tuning control for +0·6V at pin 3. Connect a 432MHz antenna to the input terminal and a short length of 75Ω coaxial cable from the i.f. output (pin 6) to the vhf input of a tv receiver, and switch the receiver to Channel 1; there should then be an increase in white noise (snow) on the screen. Tune in a local 432MHz signal and adjust the 1kΩ agc preset for maximum signal strength. Remove the tuner top cover and adjust the i.f. output coil for maximum. Extra i.f. output gain may be achieved by removing three turns from the tuner i.f. coil and re-peaking for maximum.

The ELC1043/05-type tuners are similar to the one described, the main difference being that it is a lower noise version. However, it will not usually tune directly to 432MHz and therefore small capacitors should be soldered across the leadless capacitors in the oscillator and mixer compartments as shown in Fig 3. To make the capacitors, take two pieces of thin covered wire 1·5in long and solder one to each side of the oscillator capacitor as shown; repeat for the mixer capacitor. Set the tuning voltage at pin 3 to around +0·5V and twist the wires together a little at a time until a local test signal is tuned in; this will give a tuning range which overlaps the phone end of the 432MHz band. Use as little extra

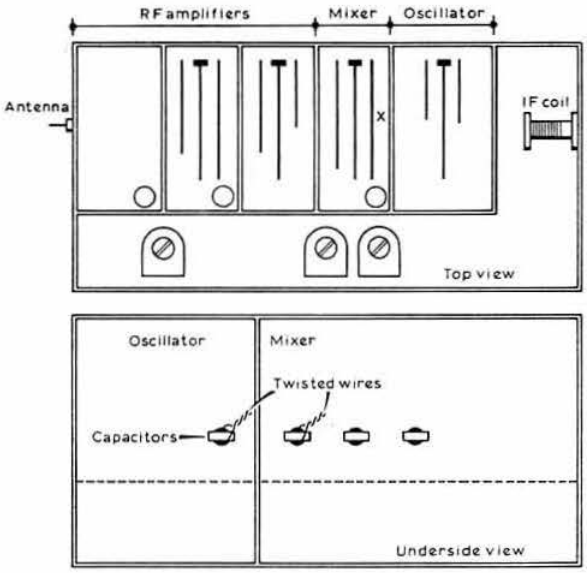


Fig 3. Modifications to ELC1043/05 tuner

capacitance as possible, otherwise the oscillator may stop. Lay the twisted pairs against the pcb and replace the bottom cover.

Finally, while listening to the test signal, adjust the right-hand link in the mixer compartment (marked X in Fig 3) for maximum output. This changes the oscillator injection to the mixer and should be carried out using a plastic trimming tool. Next, adjust the coupling lines of the two rf tuned circuits and the input coupling to the mixer for best signal.

For those with a noise generator the tuner should be aligned for best s:n ratio. These tuners may of course feed a uhf tv i.f. directly, in which case the tuner i.f. coil should not be modified. A regulated power supply is essential since any voltage fluctuations will alter the tuning frequency.

The tv receiver is usually a black and white set which has been "retired" in favour of a new colour set. Ideally it should be a dual-standard type. These sets usually contain two main component boards, one for the sound and vision i.f. amplifiers and demodulators and the other for the sync and scanning circuits. There will usually be some kind of mechanical switching arrangement coupling these two boards together; this is the vhf/uhf switch. If the coupling is broken it will be possible to switch in the vhf tuner with one half while switching the timebases between the 405- and 625-line standards with the other.

It is an advantage to be able to receive either positive- or negative-going video signals. To do this it is usually only necessary to reverse the video detector diode; in some cases it may also be necessary to slightly alter the biasing of the following video amplifier. It is advisable to do the switching with a small relay so that lead lengths can be kept as short as possible.

Transmitters

There are two types of video transmitters in common use. The first is a conventional oscillator-multiplier-pa chain, the pa receiving the modulation. The second uses a more modern approach and generates a video-modulated i.f. at the CCIR recommended frequency of 38·9MHz and then heterodynes it up to 432MHz in a way similar to ssb techniques (Fig 4).

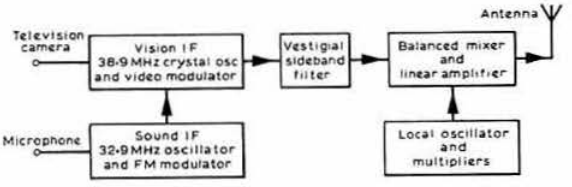


Fig 4. Vision transmitter with i.f. injection

A practical transmitter of this type is described in [1] and a suitable vestigial-sideband filter is described in [2]. The vestigial sideband filter restricts the total bandwidth of the tv channel by attenuating most of one sideband. However, this does not mean that a special receiver is required since the carrier is still transmitted at full power (Fig 11).

Many amateurs already have a 432MHz transmitter incorporating a pa similar to that described in [3] which can be modified to tv use. Since the pa is to be video modulated the following changes must be made:

(*a*) The amplifier must be fairly linear, ie Class AB or B. Therefore the control grid must be provided with a stabilized negative bias supply variable up to around 100V.
(*b*) The screen grid derives its supply from the modulator.
(*c*) Anode and grid supplies must be bypassed at video frequencies as well as rf.

The modified pa circuit is shown in Fig 5. The grid inductance lines L2 are secured to the grid pins by removing

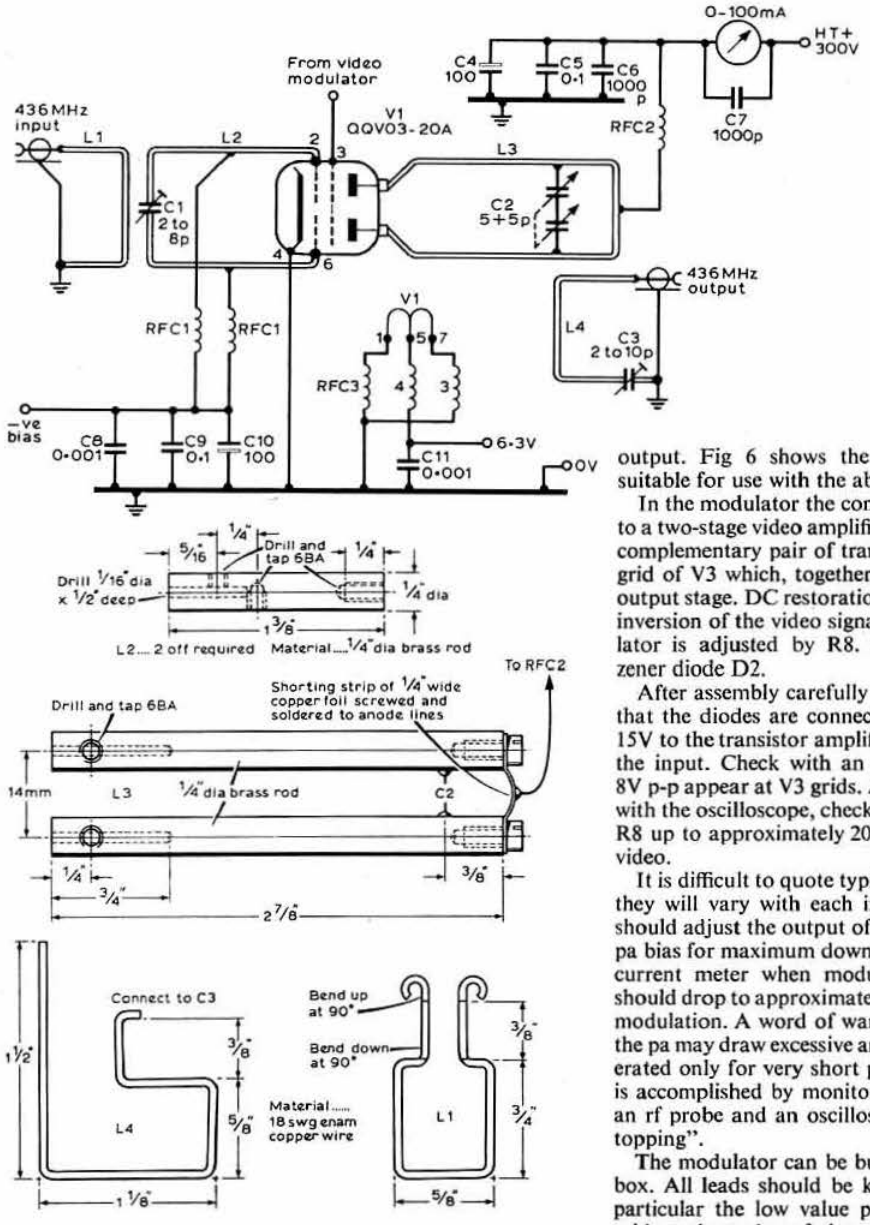


Fig 5. 436MHz linear amplifier for television service

pins 2 and 6 from the valve holder, drilling out the holes to 0·25in and pushing the ends of the lines directly on to the valve pins, securing with the grub screws.

Amateurs generally try to follow the broadcast signal standards as far as possible, and therefore the 625-line negative modulated standard is usually transmitted. Negative modulation means that peak-white results in the smallest output signal while peak-sync drives the transmitter to full output. Fig 6 shows the circuit of a vision modulator suitable for use with the above-mentioned pa.

In the modulator the composite video signal is ac coupled to a two-stage video amplifier which has fixed gain and uses a complementary pair of transistors. The output is fed to the grid of V3 which, together with V2, forms a "totem pole" output stage. DC restoration is effected in this stage as is the inversion of the video signal. The output level of the modulator is adjusted by R8. V3 cathode is held at 10V by zener diode D2.

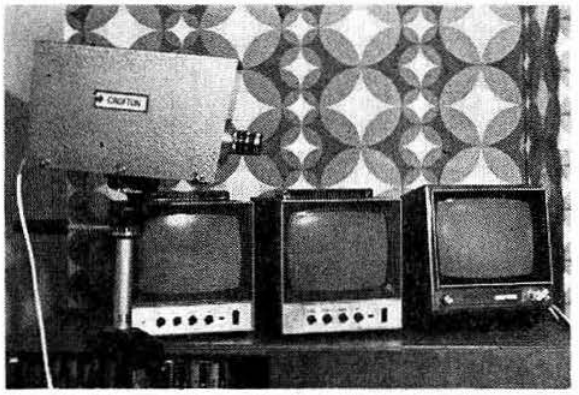
After assembly carefully check the wiring and make sure that the diodes are connected the right way round! Apply 15V to the transistor amplifier and connect a video source to the input. Check with an oscilloscope that approximately 8V p-p appear at V3 grids. Apply ht to the output stage and, with the oscilloscope, check that the output can be varied by R8 up to approximately 200V p-p composite negative-going video.

It is difficult to quote typical levels for setting up the pa as they will vary with each individual design. As a rule one should adjust the output of the modulator together with the pa bias for maximum downward indication of the pa anode current meter when modulation is applied. The current should drop to approximately half the current drawn without modulation. A word of warning—if modulation is removed the pa may draw excessive anode current which should be tolerated only for very short periods. Final adjustment of R8 is accomplished by monitoring the transmitter output with an rf probe and an oscilloscope and adjusting for no "flat topping".

The modulator can be built on a 4½ by 3½ by 2in diecast box. All leads should be kept as short as possible and in particular the low value parasitic stopper resistors at the grids and anodes of the valves should be wired right up against the valve base pins. A *very short* lead (which may be coaxial) is used to couple the modulator output to the pa screen grids.

A.M. sound can be added by applying a 1V p-p audio signal from a small amplifier and switching out the 82Ω terminating resistor to provide a high impedance load. However, when switching from video to sound it is essential to adjust the pa bias to keep the anode current at a safe level, since current maximum will occur with no modulation.

During transmission it is desirable to monitor the transmitter output signal so that any distortion can be seen



Two 9in video monitors and a dual standard receiver used as the station receiver. The camera is built from a Crofton Electronics kit

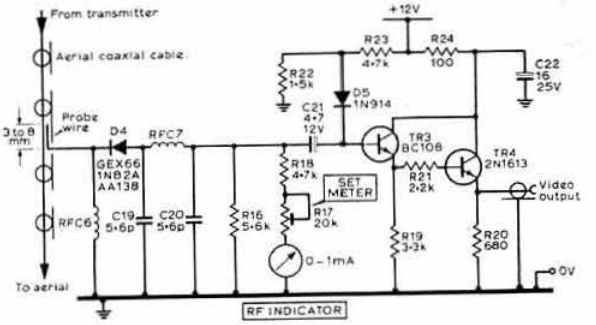


Fig 7. Video rf probe and power indicator

immediately. It is possible to monitor the transmission using the station receiver but this is not usually satisfactory due to receiver swamping. The best way is to build a small probe unit which "sniffs" a very small amount of rf from the antenna coaxial cable, demodulates it and produces a standard 1V video signal across a 75Ω load and which is suitable for feeding into the video monitor. The circuit of an rf probe unit is shown in Fig 7. The probe itself should be a very short length of insulated wire pushed under the braiding of the coaxial cable, as shown in the circuit diagram, the length being adjusted to give a video output of about 1-2V p-p. A maximum of about 6V p-p can be obtained from this unit if desired.

Demodulation takes place in D4 and video passed through a pi-network filter to a two-stage emitter-follower amplifier. The clamp circuit at the base of TR3 is to ensure that the video is added to the dc voltage from the potential divider formed by R22 and R23.

The black level may be adjusted by altering the value of R23. The 100Ω resistor in the collector circuit is to protect the transistors from accidental short-circuit of the output. The output impedance is 75Ω and should be terminated at the monitor. The 1mA meter gives an indication of the amount of power being transmitted along the coaxial cable and is very useful as a tune-up aid. The calibration is set so that around three-quarters of full-scale deflection occurs when the transmitter is running at full power.

TV cameras

TV cameras are not difficult to obtain, nor need they be as expensive as one may assume. They are often advertised in the British Amateur Television Club's journal *CQ-TV*. The cameras generally available are ex-industrial units such as those used in security systems. They are periodically released on to the amateur market and a unit in working order may be purchased for upwards of around £20. The lens is usually "C" mount and is sometimes supplied with the camera.

The type of camera to look for should be solid state, use a vidicon tube and produce a standard 1V p-p composite video output (video plus syncs) across an output impedance of 75Ω. If the camera has an rf output the picture may be monitored directly on a domestic tv set, usually tuned to Band I Channel 1 or 2.

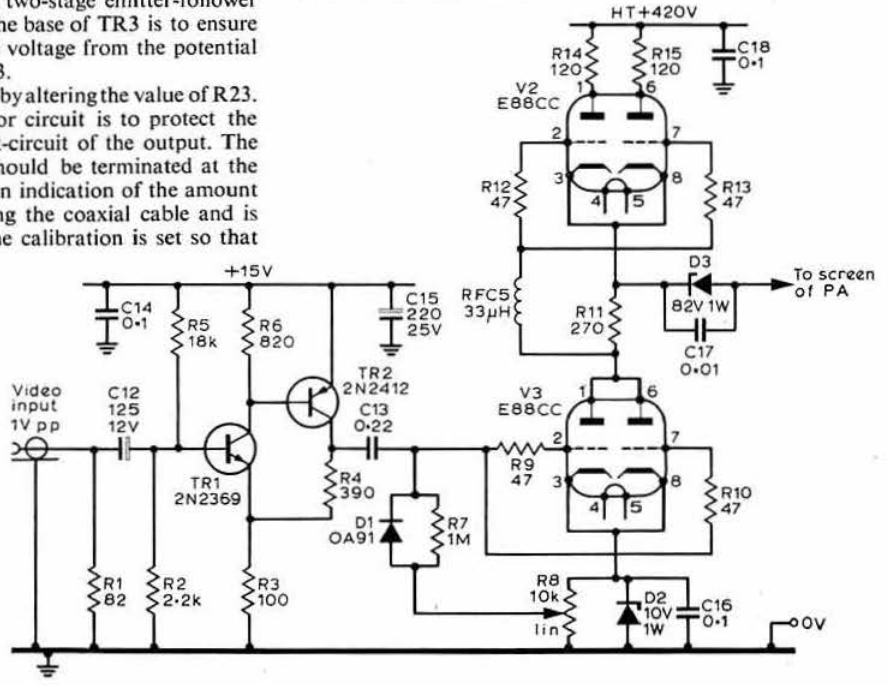


Fig 6. Circuit of video modulator for negative modulation

Components list

R1, 32	82Ω	**C1**	2–8pF Philips "beehive" trimmer
R2, 21, 30, 37	2·2kΩ		
R3, 24	100Ω	**C2**	5 + 5pF split stator ceramic tuning
R4	390Ω		
R5	18kΩ	**C3**	2–10pF ceramic trimmer
R6	820Ω		
R7	1MΩ	**C4**	100μF 450V electrolytic
R8	10kΩ linear pot		
R9, 10, 12, 13	47Ω	**C5**	0·1μF 450V
R11	270Ω	**C6, 7**	1,000pF 450V ceramic
R14, 15	120Ω	**C8**	1,000pF 200V ceramic
R16	5·6kΩ	**C9**	0·1μF 200V
R17	20kΩ preset	**C10**	100μF 200V electrolytic
R18, 23, 25	4·7kΩ		
R19	3·3kΩ	**C11, 23, 26, 29**	1,000pF 30V disc ceramic
R20, 36	680Ω		
R22, 35	1·5kΩ	**C12**	125μF 12V electrolytic
R26	470Ω		
R27	20kΩ linear pot	**C13**	0·22μF polyester
R28	75Ω	**C14**	0·01μF disc ceramic
R29	22kΩ	**C15**	220μF 25V electrolytic
R31	1kΩ		
R33	4·7kΩ linear pot	**C16**	0·1μF polyester
R34	68kΩ	**C17**	0·01μF polyester
R38	10kΩ	**C18**	0·1μF 700V
All resistors ¼W 5%		**C19, 20**	5·6pF silver mica
		C21, 32	4·7μF 12V electrolytic
V1	QQV03–20A		
V2, 3	E88CC	**C22**	16μF 25V electrolytic
		C24	3–30pF ceramic trimmer
D1, 7	OA91		
D2	10V 1W zener	**C25**	2·2pF disc ceramic
D3	82V 1W zener	**C27**	220pF disc ceramic
D4	GEX66, 1N82A, AA138	**C28**	64μF 15V electrolytic
		C30	47pF disc ceramic
D5	1N914	**C31**	2–6pF ceramic trimmer
D6	OA90		
		C33	½–5pF tubular ceramic trimmer
		C34	6·8pF ceramic
TR1	2N2369	**C35**	Formed by twisting together two pieces of thin insulated wire 16mm long
TR2	2N2412		
TR3	BC108		
TR4	2N1613		
TR5	OC171		
TR6	OC170, BCY70	**C36**	0·047μF ceramic
TR7	AF186, 2N3321, GMO378	**C37**	10μF 15V electrolytic
		C38	1,000pF feedthrough

L1, 2, 3, 4	See Fig 5
L5	9t 28swg close-wound on 5mm former
L6	3t 28swg close-wound on same former as L5 windings spaced 6mm apart
L7	5cm 14swg silvered copper wire
L8	2cm 16swg silvered copper wire spaced 4mm from L7
RFC1	13t 24swg 3mm dia 25mm long
RFC2	9t 22swg 5mm dia 25mm long
RFC3	9·5t 22swg 5mm dia 19mm long
RFC4	9t 20swg 5mm dia 16mm long
RFC5	33μH
RFC6, 7	15cm 26swg 3mm inner dia, coil length 10mm self-supporting
RFC8, 9	18cm 26swg on 10mm former, close-wound, self-supporting
RFC10	4t 36swg wound on 6mm former (dope with epoxy)

Picture monitors

A video monitor (ie tv set without rf circuits) is very useful but not absolutely essential for the beginner. Monitors can be purchased from similar sources as the camera. However, it is possible to use the station tv receiver as a monitor in two ways:

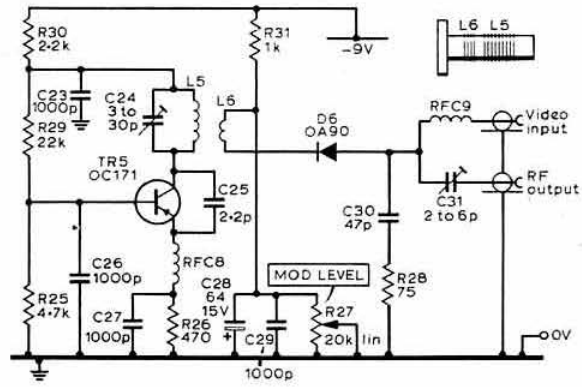


Fig 8. RF modulator for Band 1 (C27 is 220pF, not 1,000pF as shown)

(*a*) By feeding the video signal via a suitable isolating circuit directly to the video and sync separator circuits in the receiver. However, unless the user is familiar with tv receivers this method is not to be recommended, since the tv chassis is usually live and can be dangerous.

(*b*) The safest way is to build a small rf modulator which accepts the camera output and modulates an oscillator to produce a signal suitable for connection to the antenna socket of a domestic tv set. Fig 8 gives the circuit of such a modulator which is suitable for use on 405-line sets.

The oscillator may be set to any desired channel in Band 1. The frequency is adjusted by capacitor C24; C31 sets the output level which should not be too high or distortion may occur.

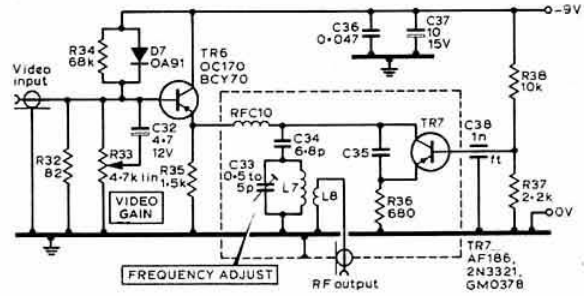


Fig 9. Circuit of uhf modulator

Fig 9 shows the circuit of a uhf modulator which was designed by G6ACH/T and first appeared in *CQ–TV* No 78. The modulator may be set to any channel around the centre of the uhf tv band (say Channel 40) that is not being used for local broadcast reception. The components enclosed within the dotted line should be fitted into a screened compartment; a suggested layout for this section is also shown in Fig 10. All components with the exception of the oscillator section may be assembled on a pcb or Veroboard. The video gain should be kept as low as possible to ensure best undistorted output. The modulator may conveniently be built in a small metal box which may also house the battery.

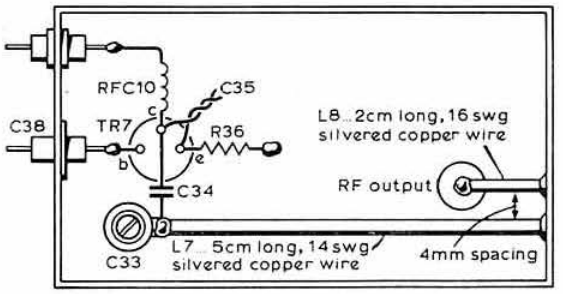


Fig 10. Layout of oscillator section

The signal

Fig 11 shows the frequency spectrum of the CCIR-recommended vestigial sideband rf signal as transmitted in the UK. The separation between the sound and vision carriers is 6MHz; the vestigial sideband extends for 1·25MHz (−3dB); the video bandwidth is 5·5MHz, and the sound carrier is frequency modulated. Using this diagram the correct vision carrier frequency may be calculated to ensure that the signal remains within the amateur band used.

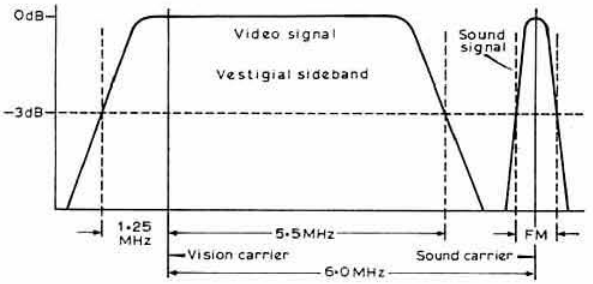


Fig 11. Bandwidth of a system "I" 625-line tv transmission showing 1·25MHz vestigial sideband and inter-carrier sound

The waveform of one line of video is shown in Fig 12 and includes the various pulse timings. The colour burst is shown on the back porch but is obviously omitted on monochrome signals. Black level is set at 30 per cent and peak-white corresponds to 100 per cent of the total amplitude.

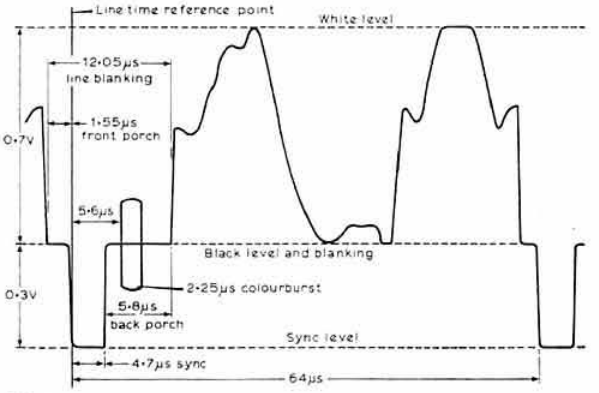


Fig 12. Typical line waveform showing sync information and signal amplitude levels

BATC

Anyone interested in amateur television would be well advised to join the British Amateur Television Club [4]. The club issues a quarterly magazine, *CQ-TV*, which is virtually the only source of practical information on tv equipment and techniques regularly available to amateurs in the UK. The club has its own library and sales department and can often supply hard-to-get items at reasonable cost; it also publishes books on fast and slow scan television.

There are two 144MHz calling channels, 144·23MHz (ssb) and 144·75MHz (any mode) where tv amateurs can often be found. The 144MHz band is regularly used for sound talkback to 432MHz and 1·3GHz atv transmissions.

References

[1] *VHF Communications* Vol 5, No 1.
[2] *VHF Communications* Vol 8, No 1.
[3] *VHF-UHF Manual*, p6.57, 1972 edition.
[4] BATC membership secretary: Brian Summers, 13 Church Street, Gainsborough, Lincolnshire. □

NEW PRODUCT

Clipper for the FT200

Following the G3LLL rf clipper designed for the FT101, Holdings of Blackburn announce a new unit intended for use with the FT200, also known as the Tempo One and the FT250 (in Europe). The clipper is operative in both transmit and receive modes giving additional receive gain which is apparently required in this Yaesu model. Slight internal modifications are required to the FT200 but no additional holes need be drilled.

The clipper mounted on top of an FT200

The price of the unit is £49 including VAT and postage or alternatively air mail postage overseas and documentation. Further information can be obtained from Holdings, Mincing Lane, Darwen St, Blackburn. Tel 59595. □

The "disappearing inductance"—a new trick and some better beams (Part 1)

by L. A. MOXON, BSc., CEng, MIEE, G6XN*

TO claim anything as new these days is a risky business. What is known as "information retrieval" has become a major problem for the experts, since most subjects are covered by a large number of publications and new ideas often emerge in journals which have little circulation outside their country of origin. The author recently made the mistake of claiming as "new" [1] the type of resonator (Fig 1) consisting of a capacitor bridged across part of an antenna or other straight conductor which serves as the tuning inductance—an arrangement used many years ago by DL1FK [2,3] although he appears to have restricted its use to the parasitic elements of minibeams.

Publication in *Technical Topics* has brought to light no other evidence of prior use, yet the idea is of basic importance since it allows the rf characteristics of any metal structure to be modified without necessitating mechanical tampering. It allows, for example, the tuning of typical "monoband plumbers delight" beams to other frequencies, de-tuning of guys or metal rigging without the need to cut into them and insert insulators, the prevention of interaction between a vertical antenna and a metal mast supporting it, and the construction of low-cost "weightless" traps with no weatherproofing problems. In the DL1FK application it is used as a loading inductance to increase the electrical length of an element at 14MHz, while acting as a series capacitance to reduce the effective length at 21MHz. It appears to the author that it may also have potential as a loading device for monoband applications; extra losses due to circulating currents being offset by the extremely high intrinsic Q.

In this article the linear resonator—to give it a descriptive title—is not used as a loading device but to improve the performance of full-sized multiband beams by "getting rid of traps" thereby allowing the full aperture to be used at the higher frequencies, and to equip conventional monoband beams with a similar multiband capability without affecting their normal operation. It is also applied to the design of traps, allowing them to be used in circumstances for which conventional traps would be unsuitable. These applications depend, to a greater or lesser extent, on the "disappearing inductance", a unique feature of this type of resonator whereby the inductance is in effect conjured into existence by the presence of the capacitor. The effective value of capacitance, being governed largely by the approach to resonance with the inductance of its own long leads, decreases rapidly with frequency so that the inductance reverts to its normal role of being merely "the middle bit of the antenna". In other words, at the lower frequency the inductance, which plays such an important role at the higher frequencies, is no longer there as such. Both the "disappearing act" and use as a loading device relate to the lowest frequency of operation, so that, being mutually exclusive, they provide the basis for a clear distinction between the DL1FK application and those forming the subject of this article.

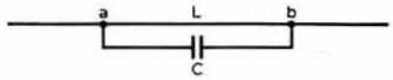


Fig 1. Linear resonator. An electrical conductor, ab, having an inductance L, is bridged by a second conductor which includes a capacitance C

The problem of multibanding

Multiband operation of antennas requires them to be tuned and matched at each frequency. In the case of rotary beams this is usually achieved by the wasteful process of cutting them down to size, either by means of traps or by the use of separate "nested" elements for each band—as in the case of the so-called multiband quad which is really three separate beams mounted concentrically. In each case gain is sacrificed at the higher frequencies by failing to use the whole of the available aperture, and at all frequencies there are additional losses due to presence of the traps or, in the case of loops, probable though unpredictable losses resulting from interaction between loop elements [4]. A number of designs [4, 5] and the design by VK2AOU/DJ2UT of a three-band beam have been evolved to overcome these problems, but for one reason or another they have failed to achieve as much popularity as trapped or nested beams.

Development of full-gain beam using linear resonators

The story begins with the construction of a triband beam using resonant stubs in the centre of 14MHz elements to act as "insulators" which convert them into colinear pairs on 28MHz, thus making full use of the available aperture. Operation on 21MHz was obtained using relays to switch in additional capacitance, and the usual triband matching problem was solved by the simple process of tapping a feedline (which could be of any impedance) across a suitable portion of the tuning inductance (Fig 2 (a)). Trials using a phased pair of driven elements proved highly successful; with minor variations, this method of matching has been used throughout subsequent developments.

Construction of a second and hopefully more durable version was held up by delays in the delivery of centre insulators, until in desperation the author decided to try a linear resonator (Fig 2 (b)). Though previously considered and mechanically desirable, the idea had been set aside because of difficulty in getting to grips with the theory, but rough tests with a wire dipole proved encouraging and the new beam was constructed as a 2-el "plumbers delight" Yagi. After successful tests at ground level this was raised to 40ft and during initial tests on 14MHz the 21MHz relays were inadvertently operated but failed to produce any noticeable effect. This was disconcerting, since on previous

* 1 Stoner Hill House, Froxfield, Petersfield, Hants.

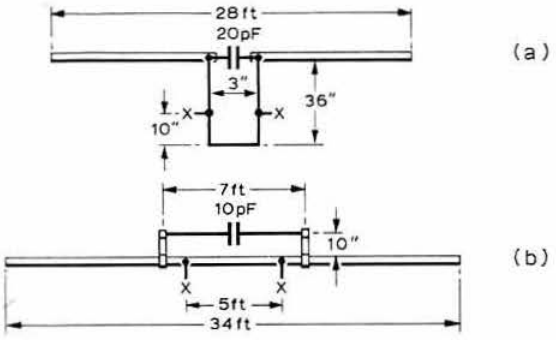


Fig 2. Comparable two-band beam elements using (a) conventional and (b) linear resonators. Feedpoints denoted by XX were obtained experimentally with 50Ω feeder using 1:1 balun in case (a) and 4:1 balun in case (b). The overall length is reduced in case (a) to compensate for the inductance of the stub. Frequencies are 14 and 28MHz. Capacitance is roughly double for 21MHz and in case (a) though not in case (b) the additional capacitance must be switched out for operation on 14MHz

form the swr should have gone "sky high" and there should have been no front-to-back discrimination! Concern quickly changed to bewilderment on finding that the beam was nevertheless working perfectly on 21MHz. It took some time to unravel the mystery, although the solution proved delightfully simple, and to the reader, who has already been let into the secret, it may seem obvious.

Yet another lucky break occurred during tests of a 3-el version. The original beam was broadband at the higher frequencies but in this respect the first "plumbers delight" version was very poor. With faulty logic, since the radiation pattern was satisfactory over the whole band despite high swr at the band edges, this was attributed to the use of wire instead of tubing for the capacitor leads. This was corrected in a third version but, despite some improvement, the fault persisted and a new one appeared, the beam now being somewhat skewed and the front-to-side ratio poor. The new fault was found to be due to the use of gamma match which, though apparently satisfactory with two elements was unbalanced to the extent of allowing currents to flow in the boom, now of course twice as long, and this was distorting the radiation pattern. Change to a T-match with a 4:1 balun cured this trouble and, unexpectedly, also disposed of the bandwidth problem. The same treatment was then successfully applied to the 2-el version, but it was difficult to understand the apparent connection between balance and bandwidth, and the improvement is now thought more likely to be due to the incidental use of the 4:1 balun, whereby the transition from low to high impedance is effected in two stages.

This story carries an important moral which, at the risk of digression, seems worth stressing. Bandwidth (ie the impedance or swr bandwidth) is a property of an antenna plus its feeder system—not, as frequently assumed, of the antenna alone.

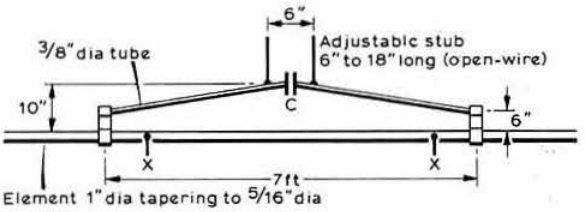
Practical designs

Two-band linear-resonator beams or, if relays are used to switch the capacitors, triband beams, can be designed on the basis of data for 14MHz monoband beams which can be found in any handbook. Alternatively, an existing beam may be suitable.

A rigidly-constructed centre section such as the one illustrated in Fig 3 is required for each element, and it is recommended that in the first instance small variable capacitors should be used and the beam tuned up on each band using normal procedures, but choosing dry weather and taking careful note of the paragraphs below dealing with spurious resonances. This adjustment may be found rather critical but, once completed, it is a fairly simple matter to replace the capacitors one at a time by fixed capacitors plus one of several alternative forms of trimmer, making sure with each substitution that the performance is unaffected.

The need for this two-stage procedure is temporary, arising from the fact that this type of antenna is still in the development stage and the author has not been able to make accurate measurements of small capacitances. In any case, since there is considerable latitude in the basic design, experimenters will probably want to make use of materials and components which they happen to have available, so that a fairly wide range of trimming adjustment may be needed in the first instance. When the substitutions have taken place it will be found that if, for example, a short open stub of variable length is used as a trimmer, the adjustment will actually be *less* critical than the more familiar process of adjusting element lengths. This is because of the relatively large values of radiation resistance arising from use of the whole of each element at each frequency.

Two methods of trimming can be recommended, on the grounds that they are easy to use and require no special provision for weather protection. One is the use of open stubs as mentioned above, and the other consists of moving the mounting bracket for the capacitor along the boom, thereby exerting a bellows action on the "trombone" section. In the case of a triband beam this method is applicable to one of the higher-frequency bands only; although both bands are affected by the movement there is no problem if adjustments are carried out in the right order and a sufficient length of adjustable stub is provided for the remaining band.



Element	Overall length	Capacitance (pF)	
		21MHz	28MHz
Driven	33ft – 10ins	20·5	10·0
Reflector	35ft – 0ins	18·5	7·5
Director	32ft – 4ins	16·5	7·0

Fig 3. Suggested dimensions for "trombone" based on experimental triband beam. Inset shows actual element lengths, and approximate capacitance as measured but with 2pF deducted for the stub. The dimensions are not critical but a larger range of capacitance adjustment may be needed initially—see text. If relays are used for band-switching, allowance must be made for contact capacitance where applicable (see Fig 4). Matching circuit for driven element is connected to XX—see Fig 5

For 28MHz, tuning can be carried out by varying the length of the trombone, but this tends to be less convenient; though possibly of some use at 28MHz this method is not applicable at 21MHz since one is then in effect varying two inductances (of about the same value) in opposite directions. In some cases the whole of the required capacitance can be obtained by running open-wire stubs back along the boom, a method which has been used at 21MHz for the parasitic elements of one 3-el design, and is expected to be satisfactory at 28MHz for both elements of a 2-el design. As a corollary to the above, it should be noted that tuning is critically dependent on the shape of the trombone, but this should cause no difficulty if well-supported tubing is used. The first version used thin wires with flimsy brackets at one end and terminals mounted on a plastic food box at the other. Despite this, it survived for several months, but after a series of gales the back-to-front ratio at the higher frequencies dropped to a low value.

Two points must be stressed. Components must be of the highest quality, and careful attention to symmetry is important not only in regard to the feeder system but also the layout of the components. The reader should not be too frightened by this since the original 2-el "plumbers delight" gave a good account of itself, though in breach of most of the rules. With three elements however, symmetry is essential because the boom is nearly resonant at the higher frequencies and its ends are not tied down to earth by being connected to the centre of $\lambda/2$ elements, as they are in more conventional designs. Lack of balance results in a current in the boom, and the radiation from this fills in the end nulls and causes skewing of the main beam as described earlier.

An interesting postscript to this event was provided when the trouble with the end nulls reappeared, although there was no skewing. This was due to the antenna support being not quite vertical, so that, due to the low height, one end of the elements was closer to the ground in the end-on position, thus upsetting the balance and causing boom current to reappear. This fault should not occur at normal heights unless, as might happen in some cases, one end of an element comes close to an obstruction on certain bearings. In such cases it might be advisable to insulate the elements from the boom.

Capacitors similar to those used in traps may be used in series/parallel combinations to make up the required values; some have been left exposed to the weather for long periods without ill-effect, though a protective coating of Araldite would be advisable. Capacitors made up from lengths of cable, though usually regarded as suitable for a Clemens or gamma match, are not adequate. Relays for band-switching must be capable of standing high rf voltages and currents—though an ability to switch them is not necessary provided the obvious precautions are taken—and they must have low rf losses. Surplus open-type relays with heavy-duty ceramic-insulated contacts are available and have been found satisfactory, but need weather protection. Sealed relays are preferable and BR type MO5 seems likely to be suitable, a view endorsed by the makers, but it has not been tried and carries a high price-tag in small quantities.

Many different arrangements of capacitors and relay contacts are feasible and the required component ratings depend on the method chosen. Fig 4(a) yields the lowest open-circuit rf voltage and losses, which could be important at 28MHz, but the contacts may have to carry up to 4-5A

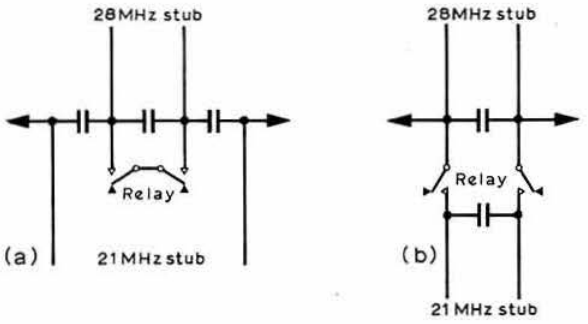


Fig 4. Alternative switching circuits for capacitors, with trimming stubs; (a) ensures lower component voltages, (b) results in lower currents. In case (a) the 28MHz capacitance includes both stubs, in case (b) it is the 21MHz capacitance which includes both stubs and the required trimming order is therefore reversed

peak current at 21MHz. In contrast, Fig 4(b) halves the current at 21MHz but doubles the voltage at 28MHz. In case (a), adjustment of the 28MHz stub has little or no effect at 21MHz; in case (b) the reverse applies, and in both cases one of the stubs may be replaced by recourse to the "bellows" action described earlier. Relay windings should be bypassed and the leads filtered for rf.

Adjustments should be carried out for each band as described in *Radio Communication Handbook* [6] except that at the higher frequencies maximum gain is arguably a better criterion than the nominal front-to-back ratio, which, from the point of view of minimizing the *average* level of interference, can be somewhat misleading [7]. Tuning for maximum gain unfortunately reduces the bandwidth but this may still be adequate at 21 and 28MHz due to the large increase in radiation resistance resulting from use of the full length of each element, the relatively wide spacing and the tendency for dx signals to be confined to rather less than the full extent of the 28MHz band. Fig 5 illustrates a suitable matching circuit, and Fig 6 shows the actual swr values obtained for one particular 3-el beam design. In view of the large number of variables these results are unlikely to be repeated exactly, and some experiment with the capacitor values may be desirable.

It is appreciated that the relays have the disadvantage of being another potential failure source and this may engender some prejudice. Compared to a beam rotator the

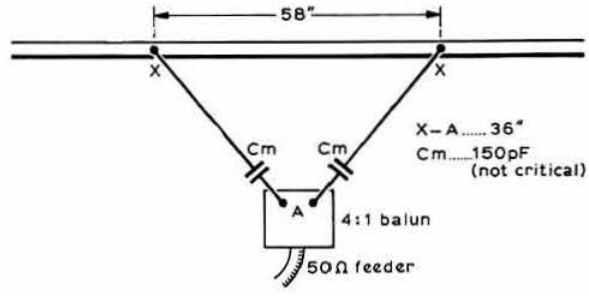


Fig 5. Typical balanced feed system for a G6XN driven element

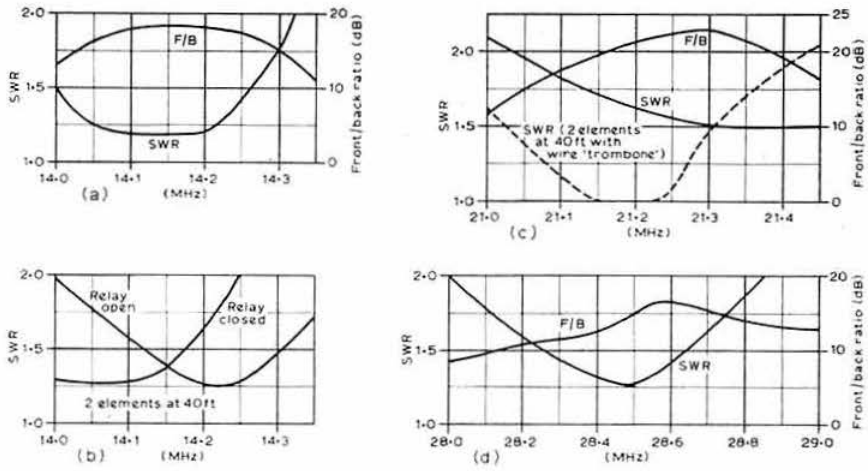


Fig 6. Typical values of swr and front: back ratio obtained with the 3-el beam (Fig 3) at a height of 7ft, except for (b) which shows the effect of the relays on tuning at 14MHz for the 2-el beam (final version), and the dotted curve in (c). These curves are pessimistic as tuning was mainly for maximum gain. Note that the 3-el beam in (c) was tuned near the hf edge but remained operational down to 21·0MHz

relays are in the same category as the proverbial gnat, but if repairs would be difficult and the design of relays inadequate for the job, the point has some validity. The alternative is to use passive switching, which is feasible but requires a more complicated "trombone". Fig 7 shows one method, the additional linear resonator L_sC_s being a direct replacement for the relay; tuned to 28MHz, it acts as a trap to prevent current flowing through the additional capacitance. This was tried in lumped-circuit form during tests of the early split-element beam but there was a just-measurable loss at 21MHz, and the idea was shelved for the time being. It is unlikely that the extra loss would be experienced with the linear resonator, and it is regretted that an opportunity to try this was missed owing to doubts engendered by the inherent complexity of a four-wire "trombone". Some interdependence of 21 and 28MHz adjustments is inevitable with an arrangement of this kind, but further complications can be avoided if L_s and C_s are disposed in a plane at right angles to that of L and C, so that at 28MHz the equal but opposite currents in L_s C_s produce zero field at L and C.

This problem has now been successfully tackled from a new angle, based on series connection of linear resonators for 21 and 28MHz (Fig 8). One useful feature has been lost, however, since 14MHz tuning is considerably affected by the 21MHz resonators. Fig 8(a) bears some resemblance to one of the arrangements proposed by DL1FK, but it has been found essential to include 28MHz traps, which also exploit the "disappearing inductance" principle. These are needed to prevent 28MHz currents from taking the wrong path, but as the 21MHz resonator is connected to points of fairly low impedance at 28MHz they have only a modest task to perform. They are easily constructed and adjustment is not critical.

A somewhat modified system (Fig 8(b)) is used for the driven element, since the method of matching requires the central portion of the element to provide a common path

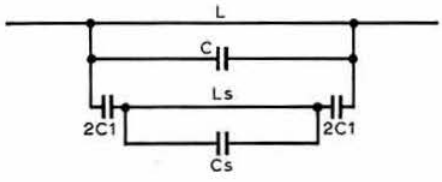
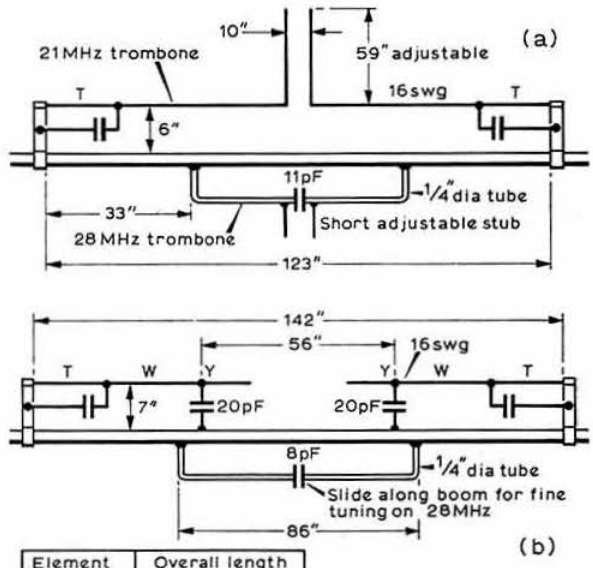


Fig 7. Passive switching. A second linear resonator Ls Cs tuned to 28MHz removes from circuit the additional capacitance (C21) required for 21MHz



Element	Overall length
Director	30ft - 7ins
Driven	32ft - 6ins
Reflector	32ft - 7ins

Fig 8. Double trombones for triband operation without relays: (a) parasitic elements, see text for alternative options; (b) driven elements, points XX provide delta match for open-wire line. Extensions Y, Y (18in on experimental model) provide fine tuning on 21MHz. Traps T,T are linear resonators 17in long with 40pF capacitors and are tuned for zero current at W, W, on 28MHz by adjustment of spacing, 1·25in approximately. All dimensions in inches except overall lengths (inset). (Points XX (not shown) are at the lower terminals of the 20pF capacitors)

for all three frequencies. Matching is more difficult with this arrangement, but with some further elaboration along the lines of a T-version of the well-known multiband gamma match, better than 2:1 swr was obtained in a 50Ω feeder. However, very little effort was put into this, the antenna being required as part of a permanent system of antennas which uses 600Ω line to reduce cost and minimize losses. With the connections indicated the swr in 600Ω line rose to a maximum of four at 21MHz. This was acceptable, but with the help of a Smith chart it was found possible to achieve an swr of less than two on all bands merely by using a short length of 300Ω line in the exact position required for bypassing the beam rotator. Unfortunately there is no guarantee that this result would be repeated in another installation, and the mechanical design, using ultra-light-weight elements braced with polythene cord, has not been put to the test.

There are a number of inter-related mechanical and electrical problems which have been bypassed rather than resolved, and this design is definitely not for the novice. Nevertheless, it probably signposts the most interesting course for further development, and may appeal to readers with special skills who wish to break new ground. The author considers that in its present form it constitutes an adequate monument to his chief mentor, Heath Robinson, and that for him it would be sacrilege to pursue the matter further!

The earlier version can be recommended to experimenters with more confidence. Its main appeal probably lies in the ease with which an extra band can be added to existing monoband designs and in the improvement of performance at the higher frequency compared with multiband antennas operating on the principle of aperture restriction. Addition of the third band, though basically simple, may need improvisation or further experiment as discussed in the context of Fig 7.

The linear resonator

So far the why and the how have been considered but any reader attempting to construct one of these beams is likely to encounter a number of puzzling features and may be led down some false trails. For all its apparent simplicity the linear resonator is a complex device. Its main features, and probably all that the experimenter needs to know, are summarized in Fig 9, which shows the equivalent "lumped circuit", and Fig 10, which illustrates the frequency response of typical resonators assuming conductors of equal diameter and varying degrees of coupling between them. To assist interpretation Fig 11 gives a rough idea of the way the coupling factor varies with spacing of the conductors. For the more advanced amateur who may wish to develop his own designs a number of basic formulas have been included in the caption to Fig 9.

In Fig 10 it will be seen that one effect of coupling is to bring the series and parallel resonances closer together, so that if, for example, this type of resonator is used to generate the series capacitance needed for bringing a 14MHz dipole to resonance on 21MHz, the effect at lower frequencies is reduced. There are several ways of using such a device to achieve multiband resonances, and perhaps the most obvious would be to use the series resonance for "shorting out" about one third of a 14MHz dipole and thus bring it to resonance on 21MHz. However, this tends to create difficulties at 14MHz since the parallel resonance in the absence

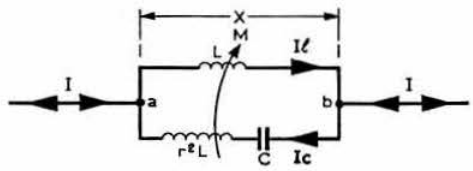


Fig 9. Lumped circuit equivalent of linear resonator. Putting r = "turns ratio", k = coupling factor, $y = \omega^2 LC$ (where $\omega = 2\pi \times$ frequency) we obtain

$$X = \omega L \left[\frac{yr^2(1-k^2)-1}{yr(r-2k)+y-1} \right]$$

Parallel resonance (X = ∞) is given by $y_p = \frac{1}{2r^2(1-k)}$

series resonance (X = 0) by $y_s = \frac{1}{r^2(1-k^2)}$

and the frequency at which Il = 0 by $y_0 = \frac{1}{r^2 - kr}$

For linear resonators with equal diameter conductors (r = 1) the frequency ratios are given by fo/fp = $\sqrt{2}$ **(ie half an octave),** $fs/fp = \sqrt{\frac{2}{1+k}}$ **and** $fs/fo = \sqrt{\frac{1}{1+k}}$

Current ratios are given by I = Il + Ic and $\frac{Il}{Ic} = \frac{y(r^2 - kr) - 1}{y(1 - kr)}$

which reduces to — kr at series resonance. Practical values for linear resonators are k = 0·2 — 0·5, r = 1·0 — 1·3

of coupling is exactly half an octave below the series resonance, so that the short-circuit at 21MHz would be expected to result in an open circuit at the lower frequency. By invoking the coupling factor to bring the resonances closer together the idea becomes less absurd, and has been tried with some success—although interaction between the tuning of the series circuit on 21MHz and the length of element required for 14MHz was sufficient to make the adjustment extremely difficult.

Unfortunately Fig 10 does not tell the whole story, and it could be argued that bringing the resonances together does not get rid of the problem but merely brushes it under the carpet. This is because series resonance might be defined in two ways—the frequency at which the reactance between terminals is zero, and the frequency at which the series circuit can be regarded as an effective short-circuit so that no current flows through the inductive path. Normally with lumped circuits these frequencies would be identical, but this does not apply when mutual coupling is present. In this case the parallel resonance and the short-circuit frequency retain their half-octave separation, whereas at the zero-reactance frequency there is no short-circuit and there could well be a large and undesirable circulating current, causing appreciable losses and perhaps a reduction in bandwidth at 21MHz.

No real difficulty has been experienced on this score but it does impose some constraints, and it is useful to be aware of what happens as the length of the trombone is varied. At 28MHz this is acting as an insulator, and the voltage across it tends to stay constant so that both rf current and losses are inversely proportional to length. The current is about four times the loop current of the dipole, so that for comparison with the radiation resistance any losses must be multiplied by 16. For a 5ft trombone a typical calculated value of loss resistance is 0·15Ω, which translates into a negligible power loss of only 1·6 per cent. At 21MHz the situation is more complicated, but with the recommended dimensions the current I_c through the capacitor divides into

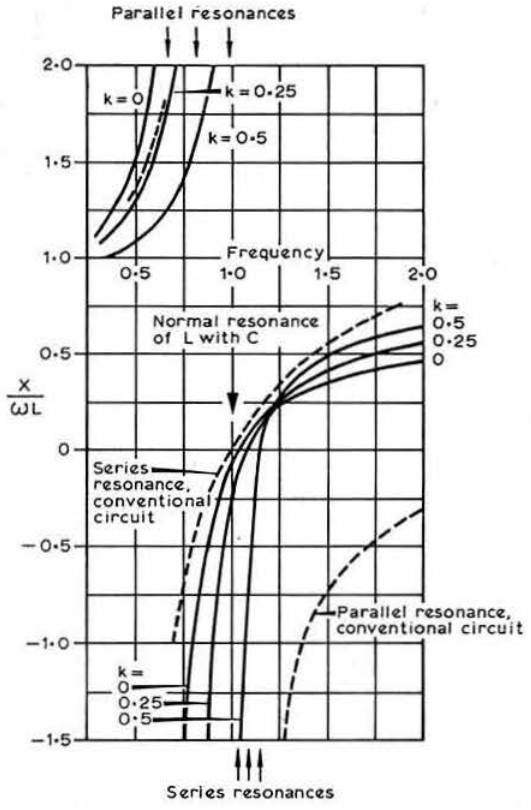


Fig 10. Reactance curves for linear resonators showing effect of mutual coupling. Frequency scale is relative. $\frac{X}{\omega L}$ is the ratio of reactance between the terminals of the resonator to the natural reactance of the conductor. Mutual coupling shifts the curves to the right and brings the series and parallel resonances closer together. Dotted curves show for comparison the characteristics of conventional resonators

roughly equal proportions between L and the inductance L_a of the outer portions of the dipole, each of these being somewhat less than the current I_R associated with the radiation resistance.

As a rough guide, I_c should be roughly equal to $2I_R$, and anything more than $3I_R$ is definitely excessive. The ratio increases rapidly as the length is decreased, but as the length is increased it gradually falls to unity so that all the current is flowing in the capacitor and none through L, which can no longer be used as a matching device. This of course is the "short-circuit" series resonance and is somewhat lower than the true series resonance as defined by "zero reactance". The gradual transition means that the usual distinction between series and parallel resonance has become somewhat blurred.

Despite the matching complications there is still the basis for a workable system; the 21MHz radiation resistance being so large the capacitive arm of the trombone can be routed directly via the balun terminals and the element becomes series-fed. However, the low frequency resonance has now been moved considerably lower, due partly to the larger trombone and partly to the "capacitive end-loading" effect produced at 14MHz by moving the ends of the trombone outwards. This was found to reduce the required element length by about 14 per cent. The arrangements shown in Fig 8 are a compromise, involving objections on mechanical grounds to the use of too long a trombone, and involve a reduction in overall length of about seven per cent.

Referring to Fig 4, any increase of C beyond the value required for 21MHz will have an appreciable and eventually catastrophic effect at 14MHz, though under proper control it can be used to convert a director into a reflector. On a reflector it has the opposite effect, turning it into a director. This may be surprising but the explanation will be obvious from careful inspection of Fig 10.

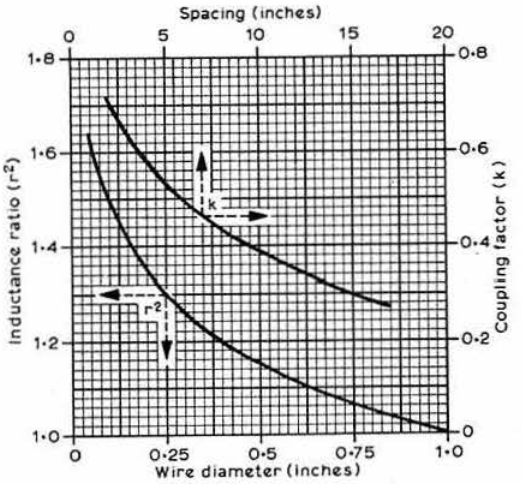


Fig 11. Variation of coupling factor with spacing, and inductance ratio with diameter of smaller conductor. Figures based on length of 7ft and large conductor diameter of 1in but these are not critical. Values for k assume 1in diameter for both conductors but decrease by only 11 per cent if one conductor is reduced to 0·1in. Use scales indicated by arrows. These curves are for use with design formulas attached to Fig 9

It should be noted that the above method of loss calculation can readily be applied to any part of any of the elements described here—so that, if necessary, they can be absolved from suspicion. This has in fact been done in respect of the beams illustrated in Figs 3 and 8.

As well as by use of mutual coupling, the resonant frequencies may be brought closer by increasing the inductance of the series circuit; this is not subject to the same restrictions though it is important to ensure that losses remain negligible in comparison with the radiation resistance. Some increase of inductance is possible by decreasing the conductor diameter, but it is difficult to achieve a ratio greater than about 1·5 without loading coils, and in general any diameter from about 0·1 to at least 0·5in is electrically acceptable, with mechanical and bandwidth considerations tending to favour the higher value.

(To be concluded next month)

technical topics

Pat Hawker, G3VA

IN the January *TT* I referred to the highly informative article by Ulrich L. Rohde, DJ2LR, in *Ham Radio* (October 1976), on optimum techniques for solid-state receivers. But I also took the opportunity of suggesting that an ultra-complex, professional approach to modern equipment design may not necessarily be the most suitable for the average amateur to try to attempt to emulate, and gave examples of where even professionals may sometimes court disaster by striving too hard to better the state-of-the-art.

What I did *not* intend to imply—and I am sure few readers would have read this into my remarks—was that DJ2LR was advocating circuit techniques that would lead to disaster! Indeed a recent letter from DJ2LR/W2 emphasizes that in his article he was showing the "ultimate possibilities" and not attempting to start "average" amateurs copying commercial designs, though of course that does not mean that his company (Rohde & Schwarz) will not continue to pursue the "Rolls Royce" idea and offer to the professional market "the absolute best there is".

Indeed he makes the interesting point that, as a professional engineer, he enjoys amateur radio for the opportunity it gives him to test sophisticatedly-engineered communication equipment under the almost unregulated channel selection and crosstalk and voluntary interference that is called amateur radio communication! He adds: "If a commercial receiver survives this test, then in my opinion it will always survive a commercial or military application where clear frequencies are clearly defined and very little channel splatter is noticeable."

This is in line with something I have written elsewhere: "The performance requirements of an amateur receiver are every bit as exacting (in some respects even more exacting) than those demanded for professional communications receivers." Though I did add that "the amateur usually has to achieve this within a restricted budget".

More sunspots galore!

Last year (*TT* August 1976) I referred to the hopeful and fascinating article by F. M. Smith, G8KG, (*Radio Communication* July 1976) on the prospects for solar cycle 21—though it was noted that many other published forecasts were pessimistic, even to the extent that there could be a virtual absence of sunspots for many years to come (as occurred in the "mini ice-age" between 1650 and 1715 AD). Afterwards G8KG kindly dropped me a note to say "I am not sure that I can rightly be described as an optimist—rather as 'anti-pessimistic', ie as questioning the validity of the pessimistic forecasts for the next two cycles," and adding: "It is interesting to note that the mini ice-age fell within my first period of 'hunting' and ended when synchronism was established at Sc −3 which reached its peak in 1718. Coincidence?"

Certainly already there are signs that the worst fears of the pessimists look like being unfounded: solar activity during the past few months definitely seems to be picking up at last.

Professor Martin Harrison, G3USF, has drawn my attention to a forecast which is not only anti-pessimistic but positively brimming over with optimism. This is to be found in a letter: "Sunspot cycles and solar activity forecasting" in the highly-respected scientific journal *Nature* (Vol 265, 24 February 1977, pp713-5) by G. Ramaswamy of the Indian Oil & Natural Gas Commission. He claims to have found (and checked during Sc20) a linear relation between the relative intensity of solar cycles as measured by the ratio of the maximum of two consecutive cycles and the relative skewness of the first cycle. The formula he has derived leads him to suggest that the solar cycle just starting is likely to see 1·84 times *more* activity than Sc20. If this should prove true it would result in an annual average sunspot number of 195 and would imply a cycle close to the fabulous Sc19, the most active cycle in 200 years!

Personally I am not taking bets, one way or the other, but at least it should not be long now before this latest theory can be put to the test on 28MHz and even 50MHz!

Russian direct-conversion demodulator

During the 19 years (reached this month) of *TT*, I have scanned through many copies of the Russian magazine *Radio* seeking ideas for the column. But despite seeing some intriguing-looking diagrams and antennas I have always previously been discouraged from attempting to draw on this source because of the impenetrable (to me) double-transposition code in which it is all written: a combination of the Cyrillic alphabet, strange device coding, unknown abbreviations and then the basic Russian language.

However the December 1976 issue contained an article by RA3AAE that clearly represents a basic idea for a product detector/mixer or direct-conversion receiver demodulator that I have never previously encountered, yet would appear to be of general interest to anyone interested in questions relating to the design of heterodyne and mixer stages.

If I have grasped the principle rightly it is to use the third order product ($2f_2 - f_c$ or $f_c - 2f_2$) of a diode mixer, instead of the conventional second-order product ($f_2 \pm f_c$), using back-to-back diodes. In this way RA3AAE shows that the device characteristic approaches the desirable "square-law" form of curve, rather than the less desirable cubic law of a conventional diode mixer.

If my supposition is correct, then the Russian technique

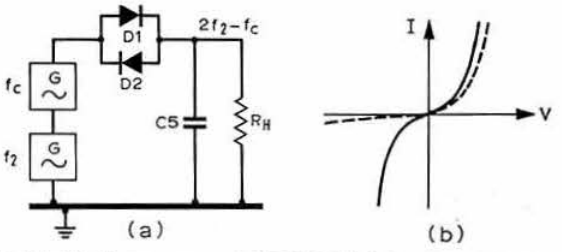


Fig 1. (a) Basic arrangement of RA3AAE's heterodyne detector showing use of back-to-back diodes. (b) The solid line represents the normal "cubic" diode characteristic while the dotted line indicates the modified "square-law" characteristic

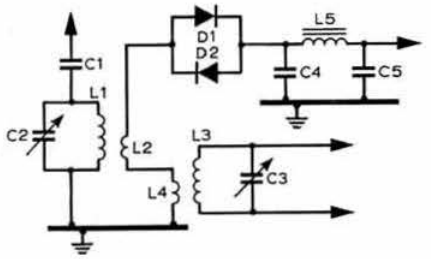


Fig 2. Unbalanced form of the RA3AAE product detector

should offer the possibility of a semiconductor mixer technique capable of handling strong as well as weak signals, yet without the high-level oscillator injection that some of the alternative techniques demand.

Figs 1-3 are reproduced from the article: Fig 1 shows the basic arrangement and the modification to device characteristics; Fig 2 an unbalanced product detector; while Fig 3 represents a semi-balanced form using four diodes. It seems a novel idea that might be worth following up. And if anyone likes to volunteer to read the original Russian text and let us all know if there are any further important points to note, I will be glad to send along a copy.

A gilded fet-Vackar vfo

There is still a lot to be said in favour of a free-running LC oscillator for many transmitter and receiver applications. For quite a few years the G3PDM version of the fet-Vackar arrangement (originally published in *TT* December 1969 but also to be found in *ART* and the latest *Radio Communication Handbook*, Vol 1) has been generally recognized as being about as good a vfo as any. One reason for this is the emphasis that G3PDM put on the mechanical as well as the electrical precautions that should be taken when building such oscillators. Another excellent oscillator is the basically similar design in the *VHF-UHF Manual* (p5.7). For most applications a well-made vfo to either of these designs should prove adequately stable, settling down to a few hertz within about a minute of switching on. But nobody would claim that even these designs are completely free of drift during the short warm-up period.

This has prompted Bob Heaton, G3JIS, to investigate further the question of whether additional stability can be achieved during this short warm-up period: "gilding the lily" of vfo stability as he puts it. He writes:

"Having recently made up the 'G3PDM' as a 4·2 to 4·4MHz vfo, I carried out some crude thermal stability checks by spraying each component in turn with a freezer aerosol. This showed that two components cause appreciable frequency shift when covered with frost: the coil (bare wire) and the fet device.

"Relatively little can be done about the coil (unless one is prepared to attempt very complex thermal compensation) except to enclose the unit in order to free this from draughts, but some action is possible with the fet. This was found to be passing 7mA which appeared rather excessive and was assumed to be the main cause of the warm-up drift.

"There are two ways of readily reducing the current:

(1) Reduce the capacitance of C5 so reducing drive (an

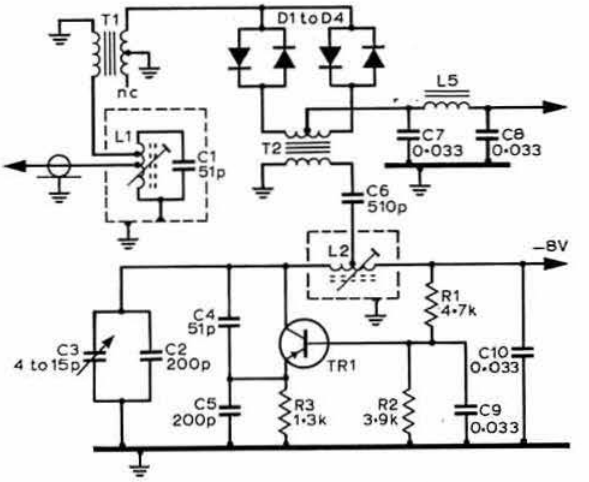


Fig 3. Semi-balanced form of the detector together with oscillator

increase of drive could cause the gate-source diode to conduct and load the tuned circuit so adversely affecting stability).

(2) Apply source bias. As the fet has an approximately square law characteristic the change of slope could be used instead of varying C5 to control oscillation and provide dc stabilization of the operating point. In practice C5 was fixed at 10pF (silver mica) instead of the original 20pF variable trimmer in the original design.

"In the first mock-up with typical 'mare's nest' construction (plenty of stray feed-back) a source resistance of 1,000Ω was found to maintain oscillation when by-passed by 1,000pF. However the final version on its printed circuit board (Fig 4) required additional shunt components of 1,500Ω and 0·05μF (mylar) to maintain oscillation. Fixed resistors of at least 0·5W rating are recommended to reduce resistor heating to a small value.

"Switch-on drift in the original G3PDM circuit had been of the order of 400 to 500Hz. The source bias reduced the current taken from 7 to 2·5mA. Stability checks were made by beating the oscillator with a crystal calibrator. After modification the drift from switch-on at zero beat to the end

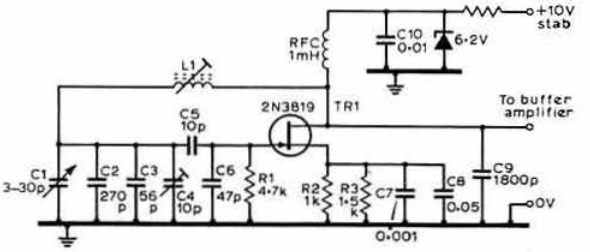


Fig 4. The 4·2-4·4MHz fet-Vackar vfo with the added source-bias components as used by G3JIS. Components: L1 17t 1in dia, length 1·6in, 20swg. C1 3-30pF. C2 270pF (sm); C3 56pF (sm); C4 6·5pF (Tetfer trimmer); C5 10pF (sm); C7 0·001pF; C8 0·05μF; C9 1,800pF (sm); C10 0·01μF. R1 4·7K 2W, hi-stab; R2 1,000Ω; R3 1,500Ω. TR1 2N3819. Note that source bias components C7 and C8 can be combined as single 0·05μF capacitor and R2 and R3 combined as single 600Ω resistor

of the first minute was approximately 30Hz, with negligible subsequent drift.

"For many applications the process of adding source bias must appear as a mere 'gilding the lily' of oscillators which are excellent in their original forms. But clearly this modification would be more important in vhf circuits where multipliers are used and which could mean that a 9kHz drift on 145MHz could be reduced to 500Hz which would maintain the signal within an ssb receiver/transmitter passband even during warm up.

"It will be appreciated that there is a neutral (zero temperature coefficient) bias point of a fet, but unfortunately this varies with parameter production spreads, so that it is necessary to determine this on individual devices. The Mullard fet book indicates this as approximately V pinch-off—0·73V, indicating that this would tend to be of the order of about 5V negative bias. The experimental Vackar oscillators would not function with such high bias voltages although they work satisfactorily at the lower bias voltages where the slope is steeper.

"This all suggests that the message to be gleaned from the foregoing is that *any* negative bias at all that will maintain oscillation is better than *none*, as some self-stabilization of the direct current operating point will be achieved and this will reduce warm-up drift."

We would emphasize that this final gilding of the Vackar lily would be wasted by failing to note the basic suggestions on achieving good vfo stability made by G3PDM and to be found in the references quoted above.

Rotor 0-v-2 receiver

A note from Richard Kay, G3OQF/HB9ANW, comments as follows on the simple valve "straight" receiver mentioned in *TT* December 1976 p915. He writes:

"Being completely fed up with all the commercial gear adverts, it was a real pleasure to see this circuit. I built it in a day, just a lash-up on the kitchen table, and it worked first time (my coil was for the 3·5MHz band): stacks of signals even without an antenna!

"After struggling with the Dutch text in the original *Electron* write-up I found that the reason for the 1MΩ resistor in the cathode of V1 was to tame the reaction a bit. Readers might also like to note that the 10kΩ resistor shown in the regeneration potential divider circuit in fact seems to have been 150 or 180kΩ, rather indistinct in the original diagram. I chose 150kΩ and it works fine." (see also p308)

Personal lightning protection

In the January *TT* attention was drawn to the advice of Dr R. H. Golde and Prof W. R. Lee on reducing the dangers from lightning for those whose outdoor pursuits in the high hills make them vulnerable. Since then Jim Clarke, the IBA's engineering safety officer, has drawn my attention to some rather more detailed advice on this subject, published in Switzerland some years ago and subsequently translated by the Electrical Research Association, as follows:

"In our view, the best position to adopt in order to protect oneself in open country is to kneel on the ground or to sit in the Japanese manner on the backs of the feet and lower part of the legs, or to squat on something which will act as an insulator, with the feet together of course. For people who are exposed to lightning hazards in the course of their work—walkers in mountains, frontier guards etc—one possibility is a protective cage in the form of a tent, weighing about 4kg, developed at Munich Technical University.

"A protective cage consisting of fine wire mesh is also conceivable which, with or without an inner layer of insulation, is placed over the cape normally worn by mountain walkers or is sewn, for example, into the outside of the cape; when lightning threatens, the individual wraps himself in the cape with its hood and kneels with his knees together on the inside of the cape. Damage to the metal mesh and the fabric must be seen as a probability in the event of a lightning stroke; it would appear however that any serious risk to a person wrapped in this way can be completely avoided.

"Another means of providing protection is to design the long alpenstock, about 1·5 to 2m in length and which often used to be carried as a lightning conductor, with an insulating sheath; the individual kneels on a metal fabric into which the conducting alpenstock is solidly thrust or screwed. The insulating sheath of polyethylene or polyester reinforced with fibre-glass can be so designed, without any appreciable increase in the weight, that it prevents current from flowing to the body in intimate contact with it. The body is connected only via the shoes with the metal fabric on the ground. Kneeling on the metal fabric means that the alpenstock projects considerably beyond the body, so that the capture discharge originates at the former and not at the body.

"Clearly the reliability of protection provided by the latter two methods needs to be demonstrated experimentally . . . and all three methods ensure protection only if the individuals are stationary; to provide protection when people are walking is a more difficult problem to solve."

The series-phase antenna

During recent months a recurring topic in *TT* has been the potential value of traditional "long-wire" antennas not only for hf but also for vhf/uhf where the space problems are far less daunting: the long-wire terminated inverted-V ("Bruce"); the Chireix-Mesny zig-zag array; possibly the Beverage which works at hf but is virtually an unknown quantity at vhf; and above all that "queen" of antennas, the ever-attractive bi-directional or the terminated uni-directional rhombic which is known to be an excellent performer well up into the uhf range.

One "long-wire" antenna that was developed in the 'thirties (or possibly the 'twenties) and enjoyed some years of popularity both as an hf and as a vhf fixed beam antenna, but has long disappeared from the textbooks, is the Marconi-Franklin series-phase array. That indefatigable antenna experimenter, Ted Cook, ZS6BT, recently brought this array to my notice and a little library research soon brought out a number of additional reasons why it might be worth joining him in looking a little more closely into this system. ZS6BT has already developed a novel form of this array for use as a 144MHz antenna for working through Oscar.

Among the pre-war references to this array is its use for an early Marconi air-navigation aid working on about 33MHz (*Wireless Direction Finding*, by R. Keen, 3rd edition) and its use for hf communications ("The series phase aerial array" by N. Wells, *Wireless World*, 15 October 1937), although I should point out that ZS6BT disputes certain features of the description by N. Wells as to the way in which the system works, and has developed a rather different *balanced* form of the array suitable for either vertical or horizontal polarization. The original antennas comprised terminated unbalanced

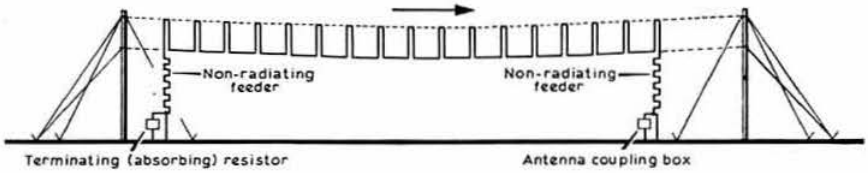


Fig 5. The original Marconi-Franklin hf series-phase "in-line" antenna of the form described in *Wireless World* 15 October 1937. This vertically-polarized antenna has 17 λ/4 "loops" spaced at λ/4 intervals. 36 λ/2 earth radials were placed below each end. Note that the line of fire is *away* from the termination

systems with vertical polarization (and which were sometimes made to reverse the direction of fire by transposing the terminating resistor and feed point): Fig 5.

While it could be argued that the gain for a given array size is unlikely to be as great as for a Yagi, there are some features of the system which would seem to make it attractive even today. Since basically it is a long-wire terminated array without parasitically excited elements it should not be difficult to achieve reasonable bandwidth; this is further underlined by the high radiation resistance which is specifically mentioned by N. Wells as one of the main attractions.

The main snag would be the large amount of ground needed for an hf array, which would limit the scope for achieving other than perhaps a moderately sharp reversible lobe, and on vhf the mechanical problems of forming each "element" of two separate wires rather than a solid element.

In the 1937 article it was shown that, by using up to four parallel "17-loop" arrays, forward gains of the order of 12-15dB (reference a vertical dipole) could be achieved in practice and that "theoretical gains are higher and, as a matter of fact, are often attained in practice". More realistically, an amateur hf array would be considerably lower in gain, but at vhf high gains are by no means out of the question. At this stage, ZS6BT is not prepared to estimate what gain he is achieving on 144MHz although he has an excellent front-to-back ratio, an apparently sharp lobe and adds: "Let's say that the array shows the sort of promise I had hoped for." But he stresses that he still has a good deal more work to do on the system. I have a few doubts as to whether his balanced form of array works in precisely the same way as the original series-phase and this may well account for the differences in the way that ZS6BT says it works and the diagrams in the 1937 *Wireless World* article. But does that really matter? Either way this could be a useful form (or two useful forms) of antenna.

In his original note, ZS6BT commented: "On first examination the phasing seems awry, but after close inspection the beauty of Franklin's design emerges. If we see five elements (ie five 'loops') then numbers 1, 3 and 5 are a half-wave part and 180° out of phase, producing the classic 'end-fire' pattern; however, assuming a travelling wave, elements 2 and 4 are 90° out of phase with 1, 3, 5 and are mutually a half-wave apart and 180° out of phase. Thus 90° after 1, 3 and 5 'fire', 2 and 4 take over."

To form the balanced array, ZS6BT simply stacks an inverted array under the first one, and the whole structure begins to look a bit like a Yagi but of course consists of long wires: ZS6BT in effect forms a wooden boom with dowel crosspieces and then tapes the wire to the structure.

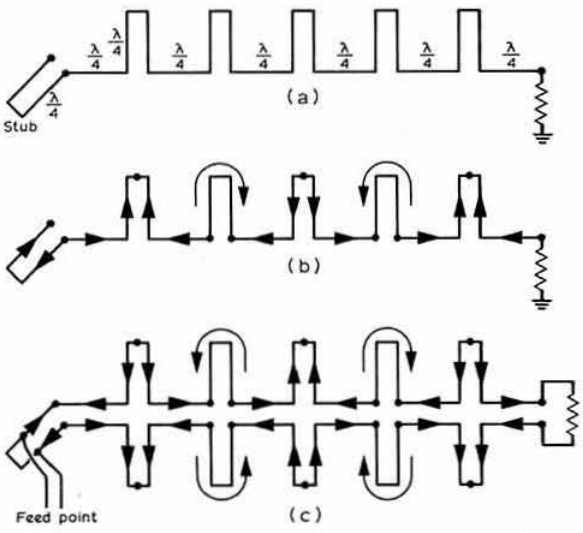


Fig 6. (a) ZS6BT's series-phase antenna showing the λ/4 loops. (b) Current distribution suggested by ZS6BT. (c) Balanced form of vhf array suitable for 144MHz with either horizontal or vertical polarization as being developed by ZS6BT

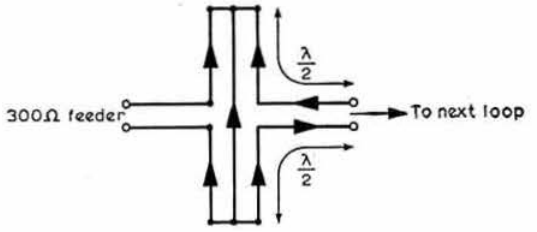


Fig 7. More recent technique used by ZS6BT for feeding his 144MHz series-phase antenna

Fig 7 shows the technique that ZS6BT uses to feed the first "loop".

Clearly the balanced vhf series-phase array is an idea for experimenters and not presented as a fully-fledged design; nevertheless it seems most interesting.

Electronic semi-automatic keyer

In these days of sophisticated electronic keyers, keyboard morse generators and the like it may seem terribly old hat to describe anything with a "manual" element about it. Be that as it may, I still believe that manual keys have some tangible advantages over fully electronic devices, though I promise to keep off that hobby-horse this month. But it brings me conveniently to a half-and-half unit—the "EDMD keyer" by G. Blake, ZL3FX (*Break-in*, December 1976). EDMD stands for "electronic dots, manual dashes": in

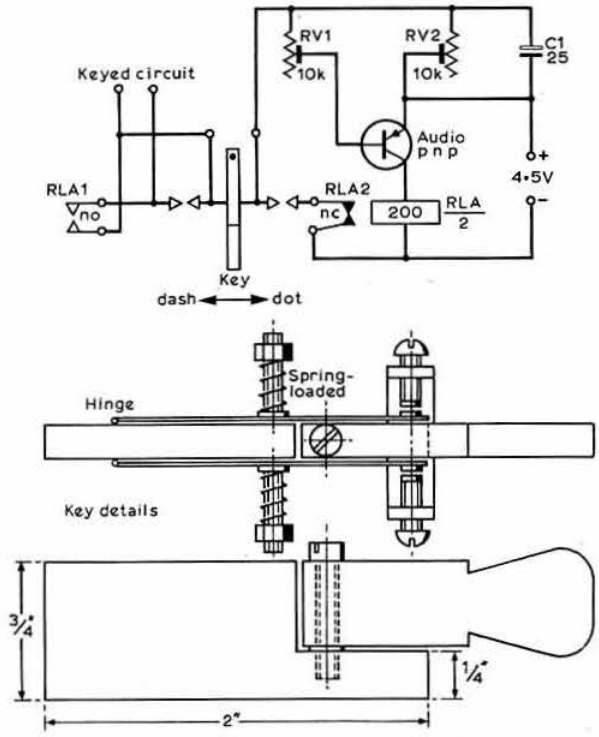


Fig 8. ZL3FX's "electronic-dot, manual-dash" semi-automatic keyer. 10kΩ carbon pots. Relay winding about 200Ω. A open contacts, B closed contacts, C keyed circuit. Almost any audio pnp transistor should prove suitable (npn devices could be used with suitable polarity changes)

other words a semi-automatic "bug" key with the dots formed electronically (so that one avoids the mechanical contact-bounce problems of some mechanical bugs) but with the dashes produced manually by just pushing over the paddle. Many years ago such an approach was described by G3OIT using a VR105 voltage regulator tube as the active device (still included in *ART*) but the ZL3FX has a single transistor oscillator, similar to those used in some of the simpler fully electronic keys but without the "dash" oscillator: Fig 8. The relay used by ZL3FX is homemade (2,000 turns of 40-gauge wire using the core of a small audio output transformer) but probably most amateurs will be able to find a usable high-speed relay with a winding of about 200Ω that will serve the purpose.

He used a piece of 0·25in perspex for the mounting and paddle of the 3½in long key. The lever expands two brass strips 1¼ by ⅜in which are spring loaded and pressure adjustable. Hinges are made by bending strip ends over a piece of brass wire which is pressed into the perspex with a soldering iron. Plenty of clearance should be allowed between the spring retaining stud and the blades, and place insulation where the spring meets the blades to avoid short-circuits. Perspex pillars carrying the contacts are attached to the body by screws and suitably spaced; the contacts were taken from a discarded switch. The potentiometer in the emitter circuit controls "speed" while that in the base circuit controls "weighting".

ZL3FX reports that "the key is a pleasure to use due to the lever action, adjustment, quietness and current drain of only 1mA".

Skin heating and hand-portable rigs

Most articles on potential hazards are written to draw attention to dangers: it is perhaps equally important that those which refute the existence of dangers should be given equal prominence. A recent paper by three Motorola engineers "Heating of biological tissue in the induction field of portable radio transmitters" reports an investigation into the question of whether there could be any danger to users of 150MHz hand-portable units with several watts output when operated in close proximity to the user. With such powers it is easy to come to the conclusion that the field in the immediate vicinity of the antenna may be above the 10mW/cm² safety limit, though it has previously been noted in *TT* that it can be misleading to calculate such fields on the simple basis of the far field and the inverse square law.

The Motorola experiments were made with a transmitter output power of 6·4W using a short helical antenna which can be expected to have near fields much stronger than $\lambda/4$ whips. Careful measurements were made of the rise of temperature on various layers of simulated skin and muscle. The important conclusion of this work is that there is very considerable attenuation of the induction field of antennas due to the complex dielectric constant of the human body at vhf. The very high static fields outside the simulated human tissue were found practically to collapse at the air-fat and fat-muscle interfaces so that the readings of commonly used radiation meters are likely to overstate considerably the real power penetrating the tissue.

The experiments thus provide useful reassurance that current hand-held equipment would seem to be perfectly safe in respect of biological heating effects, if properly operated. The maximum power density absorbed by the body of the operator in these circumstances would appear to be slightly less than 1mW/cm² and in practice such transmitters will be used only intermittently with relatively low duty factors.

Nevertheless this research does suggest that rather different results might have been achieved if tests were made with, say, a 150W transmitter feeding a beam antenna in an indoor situation or in some portable situations. Our skins may attenuate a lot of the power but there are limits!

Video on transverters

The new licence regulations allow any amateur to put out fast scan television on 432MHz without all the palaver of a special licence: although the technical aspects may deter all but the keenest. However, Chris Towns, GM8BKE, writes to point out how video can be put out on an existing transverter. He writes:

"Readers may be interested in a method used by Stan Floyd, GM3KXQ, for generating video on 70cm if one already has the video source and a homebrew or commercial 28 to 432MHz transverter. GM3KXQ has built the DJ4LB i.f. and video modulator board (*VHF Communications*, Vol 5, Nos 1/2 of 1973) but using an i.f. of 30MHz instead of the original 38·9MHz. This, when fed into the transverter, produces a very good, linear, 7 to 8W of video on 434MHz which can then be fed into a further valve amplifier to boost the power even more." □

microwaves

Dain Evans, G3RPE*

Beryl on 10GHz

Since 10 March, the London 10GHz beacon GB3LBH has been making some sort of history by transmitting technical details about itself on phone. It is the first beacon which takes advantage of changes in the operating conditions recently agreed with the Home Office, and the intention is to provide more information in a way which is of greater interest particularly to G8---s and non-amateur listeners.

The present speech transmission gives the beacon's callsign, location, NGR, eirp and antenna characteristics. The 1min transmission is repeated every 20min, although it is planned to reduce this to 10min over the summer months. The speech modulation is applied via a closed-loop tape player which so far has survived a reliability test of over 5,000 operations without any problems.

Beryl, as will be guessed, is the name associated with the voice, but it has now also become the local nickname for the beacon itself. Those who would like to hear her should choose a spot giving a line-of-sight path to the beacon site at Romford, NGR 517868, and tune to 10,100MHz. G4ALN will be delighted to receive reports on her signal. Alternatively, come along to the RSGB International Radio Communication Exhibition and Convention next month for a live demonstration.

Microwave round table

A reminder that a microwave round table will be held at 2pm on Saturday 30 April in the Dept of Electrical and Electronic Engineering at the University of Sheffield, Mappin Street. An sae to G8AGN will produce a map giving details of how to get there.

24GHz and above

It would be most useful to hear from those people who are contemplating operating on 24GHz, and at frequencies above 40GHz should the Home Office approve requests to do so. Some indication of the level of interest and technical expertise, and of any equipment they may see becoming available, would be valuable information.

A new world record on 1,296MHz

It is remarkable how often it seems that, having just produced a summary of records, along comes a new record to change it almost before the ink is dry. Belatedly we learn that on 27 January 1975 the record of 1,240km held since 1973 by WA2LTM and W9WCD was beaten by a 1,363km contact between K5LLL and K4NTD.

Now, after almost two years to the day, we hear that this record is also broken. On 25 January 1977 VK6WG in Albany worked VK5QR in Adelaide over a 1,886km path. The signal strengths were 54. Neither used equipment which could be described as large: VK6WG used an all-valve transmitter having as the final stage a 3CX100A5 tripler which gave an output of 10–15W on 1,296MHz. His receiver was a VK3AKC preamplifier into a Microwave Modules convertor. VK5QR used an experimental ssb rig consisting of a 9MHz ssb generator which was mixed to 28MHz, transverted to 432MHz, amplified by a 2C39A, and finally tripled to 1,296MHz by a varactor. The output was about 10W. His receiver front-end was an unspecified mixer diode. The antenna used by both stations was a dish 3ft in diameter. These equipment parameters suggest that the path loss was roughly 60dB greater than the free space value.

In congratulating both operators, it is perhaps worth noting that, of the "terrestrial" records for the six microwave bands, three are held by the UK and one each by New Zealand, Australia and . . . USA.

Microwave awards

The latest awards are: **1·3GHz**—for a first contact beyond 600km, No 2 to GM8BJF, No 3 to G3DAH; **10GHz**—for a first contact beyond 150km, No 23 to F0AKD/P (G3JHM).

Letter from America

Last month's note on the Microwave Associates Gunn transceiver for the 10GHz amateur band has aroused much enthusiasm among those who have examined its specification in detail. It was therefore particularly interesting to receive a letter from Jim Fisk, W1DTY, editor of *Ham Radio*, giving some of the background. Apparently the new G4BRS/GM3OXX 10GHz dx record caused considerable interest in the USA, and was directly responsible for triggering off some action. This involved W1DTY having dinner with amateurs from Microwave Associates, including Dana Atchley, W1CF, their chairman, and conceiving the transceiver, and getting prototypes made. This all occurred between September, when the record was first published, and Christmas when the first units became available. One particularly welcome statement by W1DTY is that he intends as far as possible to have at least one first-class article on microwaves each month. This should provide a valuable stimulus.

For those who are interested, Microwave Associates in the UK will supply details of the Gunn transceiver (christened the *Gunnplexer* by W1DTY) which are given in their bulletin 7624. For those with fairly deep pockets, they expect to be able to supply the units themselves within 8-10 weeks of receiving an order. Their address is: Microwave Associates, Dunstable, Beds LU5 4SX.

Letter from Brunei

One simply must pass on the news that Roy Barling, VS5RB, is building equipment for operation in Brunei! He promises to write again when things are working.

GB3AND

G8ADM reports that he has requested permission to put up the eirp of the 1,296MHz beacon sited at Andover from 5W to 40W. If this is granted, the beacon could be running at the higher power within a few months. Even with its present low power, the beacon has been heard in Swindon, Bucks, High Wycombe, Bournemouth and Ringwood, and is already beginning to stimulate local activity. Other reports will be welcome.

(Continued on p305)

* 4 Upper Sales, Chaulden, Hemel Hempstead, Herts.

4-2-70

Graham Knight, GM8FFX*

Beacons

The pa stage for the Durham beacon, GB3NEE on 144·127MHz, has been repaired by Roger Jones, G3YMK. The power is now up to 18W and the two five-element antennas fire NW and SE simultaneously. Reports of reception at the new power level would be appreciated by G3YMK, QTHR.

Bob McHenry, G3NSM, reports having heard the Angus beacon on 144·977MHz every day this year, no mean feat considering the distance involved is more than 550km. GB3ANG has now completed more than 6,000 hours of trouble-free operation, since it was designed and built by GM3ZBE. The beacon-keeper at the Angus site, GM8BZX, reports the beacon has only been off the air for a short period when the electricity supply failed during a storm.

GB3EM on 432·910MHz continues to give good service and beacon-keeper G8DHD is thinking of extending the range by adding another 8-over-8 slot-fed Yagi firing to the north to complement the present antenna which is beaming to the south.

GB3URS is the callsign to be used by a 432MHz beacon in Northern Ireland. The frequency allocated is 432·930MHz and the beacon will share the same site as GB3GI at Ballynahinch 20 miles south of Belfast at QTH locator XO41J. Steven Ruff, GI8EWM, has just completed the keyer for what will be a most useful addition to the 432MHz beacons.

The following are details of the vhf beacons which are licensed but are not yet on the air. GB3CTC on 70·675MHz, from QTH locator XK64A in Cornwall, will use an erp of 37·5W to an omni-directional antenna. GB3CTC on 432·970MHz, from the same site, will use 100W erp to a stack of four cloverleaf antennas. The Lerwick beacon will be installed soon by GM3ZBE. Details are not yet finalised for a beacon in South Wales but a callsign GB3SGW has been assigned and the frequency will be 144·975MHz. From the GB3GEC site at Borehamwood, Hertfordshire, a beacon on 432·850MHz is planned, the power will be 100W erp.

Brian Bower, G3COJ, who has done such a good job in co-ordinating all the British beacons, has now agreed to update the list of European beacons for the RSGB.

Roel Zwartzes, PA0JTA, sends details of two new experimental beacons which are both located in Rotterdam. The first is PA0CRB on 432·075MHz which runs 6W output to an antenna with 13dB gain beaming towards Britain. The second is PA0JTA which is on 144·135MHz and runs 50W output to a 13dB gain antenna 50ft above ground. Although the 144MHz beacon is beaming towards Switzerland it should be heard here in Britain during lift conditions. Both beacons are using A1 keying identification and are located at the homes of PA0CRB and PA0JTA respectively who would appreciate any reception reports.

* PO Box 49, Aberdeen AB9 8JA.

Repeaters

The Home Office is considering an application from the Grampian Repeater Group to put a vhf repeater on the IBA mast at Durris, which is 10 miles south of Aberdeen.

GB3CS in Central Scotland has been operational on an output frequency of 145·750MHz since 30 January. Recent improvements to the antenna have resulted in a large increase in the coverage area, even the depths of Glen Farg now get GB3CS signals.

The output frequency of GB3NC, the repeater which is located near Newquay in Cornwall, is 145·725MHz. Bill Colclough, G3XC, reports that GB3NC has been in continuous service since last May without a breakdown; it was made by the Newquay club with the assistance of the Pye Telecommunications Amateur Radio Group. The power output is 10W, a single-dipole antenna is used, and six $\lambda/4$ cavity filters are used in the receive and transmit feedlines. Although the terrain in Devon and Cornwall is extremely undulating, mobile stations on elevated ground as far away as Bideford, Okehampton and Torquay have been able to use the repeater with just the usual 10W and a whip antenna. So far stations in eight countries have accessed GB3NC, the most distant station being in northern Spain.

The number of 432MHz repeaters is expanding rapidly and the 16 listed below by input are all operational. The output of all British repeaters on the 432MHz band is 1·6MHz below their inputs.

434·650MHz: GB3CI, Corby, Northamptonshire; GB3EK, Margate, Kent; GB3ST, Stoke on Trent, Staffordshire.

434·700MHz: GB3BD, Bedford; GB3LL, Llandulas, Clwyd; GB3MR, Park Moor, Manchester.

434·750MHz: GB3ER, Danbury, Essex; GB3LT, Luton, Bedfordshire; GB3NS, Banstead, Surrey.

434·950MHz: GB3CB, Birmingham; GB3HR, Bushey Heath, Hertfordshire; GB3PY, Cambridge; GB3SD, Weymouth, Dorset.

Five more 432MHz repeaters have been licensed and operation is expected to commence soon from GB3HU, Hull; GB3IH, Ipswich; GB3LV, Cheshunt, Hertfordshire; GB3NK, Chelsfield, Kent; GB3PH, Portsdown Hill, Hampshire. A further 31 applications for 432MHz beacons are being considered by the Home Office under phase 2.

Other repeater applications under consideration by the RSGB include a 432MHz to 144MHz crossband linear repeater to be located at Clwyd. This application will have to be considered in the light of the recent IARU recommendation that future linear repeaters do not use the 144MHz band.

Two metres

Apart from the auroral contacts reported elsewhere in these pages there has been very little normal dx contacts made on 144MHz. Conditions since the start of the year have tended to be below average but regular contacts of up to 800km have still been made by many stations.

Clive Morton, G4CMV, at Leeds, and Ray Mohamed, G4EGC, at Sheffield, have both been working their share of dx, mainly the occasional station in Paris and Amsterdam. Both has taken time during the winter lull in conditions to modify their amplifiers for a full 400W output on ssb. They will certainly be ready for the good dx conditions which are undoubtedly ahead of us.

Dave Hutchison of Portadown in County Armagh, has been licensed as GI8MIV since September and reports contacts with 89 other GI stations on 144MHz. Dave makes a plea for GM, GW and G stations to beam more often towards GI to take advantage of the large numbers of stations who are now active on 144MHz.

Peter Haylett, G3IPV, at Bacton-on-Sea, reports several contacts on cw with DL, F, PA0 and ON. All the cw signals were received on Peter's home-built direct-conversion receiver.

Alex Gartshore, GD3UMW, from Kirkmichael in the western part of the Isle of Man, is back on the air again after a stay in hospital. Last year Alex experimented with a double-diamond Laporte rhombic as described in the *ARRL VHF Handbook*, but now he thinks he will try a corner reflector for 144MHz. The contest winning team from the Isle of Man Radio Club will be out operating GD3FLH/P in all the major contests this year.

Julian Broadhurst, G8LIC, in Middlesbrough, was surprised to work as far as G8LUF at Winchester, across to GI and to northern GM despite the fairly flat conditions during the first few days of March.

FM operators on 144MHz may wish to note the dates of three fm-only contests organized by the DARC on 16 April, 18 June and 22 October; further details are available from DK6EI, 5620 Velbert 1, Pfeilstr 29.

Four metres

Richard Diamond, G4CVI, now back at Leatherhead after a trip to Capetown, came back on 70MHz in good style. On Thursday 3 March at 2320gmt he worked GM3ZBE near Aberdeen on 70·110MHz cw with 5/5/9 reports exchanged both ways. Richard runs an FT101E as a prime mover driving a home-built transverter with a 4CX250B in the pa, his antenna is a 4-element beam at a height of 50ft.

Operators have been slow to spot a mistake in the 70MHz band plan circulated in the middle of 1976 and republished in *Radio Communication* August 1976 and the 1977 *Call Book*. G6HD noticed that it gave the lower band edge as 70·05MHz when this should of course be 70·025MHz.

Seventy centimetres

Activity on this band is at a very high level mainly due to the availability of high-quality commercial equipment for both ssb and fm. GM8FFX recently made two journeys from Aberdeen to London and back and was amazed at the large number of replies to CQ calls on ssb and fm. Using 40W output to a magnetically-mounted vertical antenna, contacts could be maintained with home stations for about 30 miles. G8HBQ and G8HPW were outstanding among the stations worked while mobile.

Meteor scatter

Dave Price, GW4CQT, in Cwmbran, South Wales, sends details of a ms contact with YU2CBM in QTH locator ID33F at a distance exceeding 1,800km. Dave used a Trio TS700 transceiver and a home-built amplifier for this contact—the best dx contact made on 144MHz meteor scatter this year. Dave's antenna set-up is rather special; see "Dreams do come true, part 2".

Dennis Boniface, G4DSC, at Ripon in North Yorkshire, is another ms enthusiast. He reports cw contacts with OE5JFL in QTH locator GI48H, DJ5MS in locator GII5E, SM0FFS in JT51F, and SM2CKR in KX12G at a distance of 1,632km. Dennis mentions QRM from the Swiss beacon HB9HB via ms.

Those operators who have not heard ms "pings" can easily do so at almost any time by leaving the receiver tuned to a beacon not normally heard, like DL0PR on 144·910MHz, and it will be heard coming up out of the noise for short bursts of time. One word of warning, once ms has been heard the bug soon bites; both GW4CQT and G4DSC admit that they now get up quite happily at 0500gmt to work a new country.

14MHz vhf net

It is not often that this column mentions activities on the 14MHz band but a net of interest to vhf operators takes place on 14·340MHz, starting at noon on Saturday and Sundays, which is very useful for arranging ms skeds and for reports of auroral and tropospheric openings. During the summer information on sporadic-E propagation is exchanged. Many vhf operators throughout Europe take part in this net and can often be heard arranging 144MHz and 432MHz contacts. G4DZU, G3POI, GM4DSZ and G3SEK are among the British stations who take part.

Dreams do come true (2)

The antenna in use by Dave Price, GW4CQT, deserves a special mention. For 144MHz it consists of four 7-element quads in a box formation. On 432MHz a further box of four 12-element quads are used and this inner box is contained within the 144MHz array. All eight quad antennas and a separate multibeam are mounted at the top of a 100ft crank-up tower.

Dave has made all the antennas himself and constructed the quads so that each of the elements is insulated from the boom; he has found that this arrangement helps to get a good match without "power-wasting baluns". GW4CQT is located 200ft above sea level and he is able to leave the lattice tower fully up at 100ft for most of the time, only having to take it down during very high winds.

Are there any other operators using large antennas? Photographs and details would be appreciated for inclusion in "Dreams do come true".

VHF listeners

Reports from listeners are always welcome and both Chris Haigh of Wakefield and Al Osborne from Newcastle write mentioning listening to the weekly Sunday noon sked on 144·350MHz which links G3FPK at Croydon, G4DZU at Leeds, and GM8FFX in Aberdeen. Both report hearing all three stations; Chris uses an FR50 receiver with a MM converter, and Al uses a Drake R4C with an 11-element antenna 300ft above sea level.

Another interesting letter comes from Don Stewart, The White House, Leacklee, Island of Harris. He has a 144MHz receiver, is putting up a 14-element parabeam antenna at 60ft, and promises to keep this column informed of any signal he hears. After all, way out there in the Western Islands any signal is dx. Don also says any amateurs visiting Harris on holiday are welcome to drop in and plug into the beam.

432MHz television

A group of Scottish amateurs claim to be the most active television users of the 432MHz band in Britain. GM3KXM, GM3SAN and GM3YLD in Glasgow are in regular television contact with GM3KJF at Ayr and GM8ARV at Edinburgh. The group now have three portable 12V battery-operated cameras, and portable operation from high sites in Scotland is planned for the summer. The system to be used for these expeditions will be standard 625-line, negative modulation. It is interesting to note that they have already come to an arrangement about time-sharing the band with users of the three proposed uhf repeaters for Central Scotland.

Sim Weir, GM3SAN, mentions modifying a standard television set to receive amateur television by the method described in *Amateur Television*, a new book published by BATC at 65 Showell Lane, Penn, Wolverhampton. One of the chapters describes modifying the Mullard 1043 uhf tuner which is used in most British tv sets. By simply lowering the varicap voltage the standard tuner will give very good results on 432MHz. GM3SAN in Glasgow is able to receive excellent video from GM8ARV in Edinburgh using this technique.

Other sections of this useful book include circuits for atv transmission transmitters, recording techniques, and transmission of both monochrome and colour. Methods of slow-scan transmission are described along with slow-to-fast-scan converters. The book is recommended to the growing number of operators considering atv as their next mode.

"Firsts" and "longests"

From Richard Rimmer, GD3YEO, comes further information to help compile a definitive list of "firsts" and "longests". He reports that on 26 October 1975 the Isle of Man club station GD3FLH/P made what is believed to be the first GD to SP contact by working SP6FUN on 144·042MHz telegraphy.

Dick Madigan, EI9Q, from Waterford sends cards proving contacts with 20 countries from Eire on 144MHz. Dick contacted stations all over Britain and DC, F, HB9, IS, IT, IW, LA, ON, OZ, PA0, SM and SP. Several of these are believed to be firsts from EI: LA6HL on 20 November 1976; IS0PUD on 21 July 1976; IT9TAI on 21 July 1976; SP2AOZ on 9 November 1975. The longest haul recorded by EI9Q is his QSO with IW2AFR/8 in QTH locator HY4OH at a distance of over 2,400km.

Further claims for this section to G5UM, QTHR, who is compiling a list of firsts and longests. Contacts with Moscow on 144MHz have been reported in the past—step forward, claimants.

Aurora

In his excellent article "Monitoring for auroral propagation", *Radio Communication* March, Peter Blair, G3LTF, mentioned keeping a calendar of auroral events so that possible repeats could be forecast. G3DAH was reported in the February *4-2-70* as having worked stations in Sweden via an aurora which took place on 9 January. Those of us keeping a note of this date were not surprised at a 28-day repeat on 6 February. The aurora was first seen by Andy Taynton, GM8DQK, at Thurso at 1930gmt. He telephoned a warning to GM3ZBE near Aberdeen, who could also see the display but did not hear any auroral radio signals until 2000gmt. Among the more distant stations worked by GM3ZBE were LA2PT, SM3BCZ and SM3FGL. The Swedish beacon, SK4MPI, on 144·960MHz is always a good auroral indicator and it peaked 5/6/A at 2016gmt. The opening on 6 February was also noticed by Douglas Parker, G4DZU, at Leeds, but the dx was limited to GM stations. The event was short-lived, lasting only until 2032gmt. No second or third phase were detected by GM3ZBE.

Another aurora was advised to GB2RS as taking place late in the afternoon of 23 February. Reports indicate this aurora was very weak, but it is always another date for your calendar. Auroral events notified to this column this year have taken place on 9, 30 January and 6, 23 February. Put those circles on your calendar now!

REAL DX 1977

70MHz	G4CVI — GM3ZBE	650km
144MHz	G3SEK — UR2RX	1,758km
432MHz	GW4CQT — HB9AMH/P	860km

Activity periods

Chris Bartram, G4DGU, recently made a visit to Devon and Cornwall. He says it was a pleasure to hear the calling frequencies being used properly, and Chris was surprised at the high level of both the cw and ssb activity. Since returning home to Abingdon in Oxfordshire, he has been calling especially to the south-west at 2000gmt and 2100gmt. Frequencies used are 144·045MHz for cw and 144·295MHz for ssb; many stations in Devon and Cornwall are working new stations since this activity period started.

Monday night from 2000gmt is cw activity night and numerous stations are taking part, as the next item indicates.

It was just an average Monday night

G5UM writes: "It was just an average, ordinary night, barometer 29·3 and conditions normal (never let us admit that they are rock bottom: they are either normal line of sight plus, or up, in varying degrees of up-ness). By 2000gmt a few cw signals had appeared on this typical cw activity night. By 2130gmt no fewer than 19 had been identified and that was with the beam held north-west; there must have been many more signals off the side.

"No fewer than seven of the 19 were G4-plus-threes, who had clearly got the message that cw will get them contacts where all else fails. Notable among them was G4EGG of Bolton with only 2W of output laying down a crashing signal, not all that weaker than G4DHF/A from his 1,000ft eyrie near Sheffield, regularly activated on the A1 mode.

"Not far away from G4DHF was G3DRE at a very different site blanked off from all contact with the south by a large hill, yet still S5 on cw in Leicester at 55 miles range when in contact northwards with G5YV at Leeds. This is how to circumvent geography: use the key.

"Some bunching around the cw calling frequency of 144·050MHz, but in addition a welcome trend towards moving very low instead of 'just 10 up'. Nice to converse QRM-free around 144·020MHz. Not forgetting the keyed Liner 2s: never neglect 144·100MHz and up.

"Just one sobering thought from an old time G3-plus-three: 'What a pity it has to be Monday nights only, why not every night?'

"As a postscript, a check was made on the following

Monday; the tally was 16 cw stations identified in 20min of listening from 2030gmt."

Skeds wanted

Rainer Allraun, DB5NA, is looking for high-power operators in Britain who would like to run tropo or meteor scatter skeds on 144MHz. DB5NA is in QTH locator EJ20D and has an excellent take-off towards Britain. During the time of the Perseides shower in August Rainer will be DB5NA/0HO from the much sought after QTH locator square KU. DB5NA can be contacted at Trautenauerstr 12, 8700 Wuerzburg, Germany.

GB2RS news bulletins

Several letters have been received suggesting that the GB2RS news bulletins should be transmitted through repeaters. This was fully discussed at a recent meeting of the Repeater Working Group when G8BXJ gave the results of a survey of repeater groups on their attitudes to the idea. Of those who replied, 38 were in favour in principle and five were against. However, only 16 said they would be able to carry it out in practice.

Pre-amplifier transistors

A new device from Signetics is the SD306 transistor. This is a dual-gate mosfet with a 1·5dB noise figure at 200MHz, 400mV signal for 1 per cent cross-modulation. These characteristics make it eminently suitable for use as a masthead pre-amplifier. The best feature of this transistor is the price, which is less than £1.

Awards

Among the most recent to be awarded FMD Certificates are:

70MHz Transmitting: No 125 to G4AEZ

144MHz Transmitting: No 500 to G3RYV, others in this category are G8FMC, G6UW, G8JEF, HB9AEN/P and G8EBM.

144MHz Senior Award: No 104 to G8HBQ, others in this category are G4DTO, G8EOP, G3GZJ, G4CQR, G4ECQ, G3YSK, and G8CMU/P who receives No 111.

432MHz Transmitting: No 121 to G4DDK, No 122 to G4BYP, and No 123 to GI8HXY.

432MHz Senior Award: No 32 to G4BYV, No 33 to G3HCW.

144MHz Receiving: No 32 to Peter Allen, A8677.

British vhf workers seeking awards often complain about the poor return on QSL cards sent, especially to those sent abroad. It was therefore a somewhat salutary lesson to the vhf awards manager to receive a comment from HB9AEN that his return from the UK was only 30 per cent. "I ought to write again to some of the OMs Anglais who have not yet responded," he told G5UM. This claim was in respect of operations from HB9AEN/P over the last six years, many of the cards being for a.m. contacts. Charles Leuthold of Geneva has now been awarded a 144MHz Standard Certificate. To say that this took *some* doing from Switzerland is an understatement, for the British "new counties" layout is a puzzle for many Europeans. In fact, HB9AEN sent a large pack of British QSL cards to the awards manager with a request to mark them up with their appropriate new county status. The intricacies of the three Glamorgans and the various separations of Yorkshire present considerable difficulties to our European friends if they are not clearly designated on the cards themselves.

As G4BYV has worked 437 different stations on 432MHz it did not take him long to get the cards for his 432MHz Senior Award. He is now working on the cards for a 144MHz Senior which will put him into the Supreme category.

Norman Henderson, GI8HXY, has done well to gain his award from an area well away from the main centres of 432MHz activity. On the same band Ernest Ashby, G3HCW, has made a big effort from his site in West Yorkshire which is only 120ft above sea level. Ernest used only 10W to drive the antenna, but he reckons his 1975 investment in a 70ft Versatower helped considerably.

Bob Matthews, G3ZNZ, from Humberside, has recently sorted through his German cards and was able to find the 200 different DOK numbers to enable him to get the first British UKW DLD 200 Award.

The grapevine

GI3TLT did some tests at the end of last month from the site of the proposed 144MHz repeater in Northern Ireland . . . Interesting to see from the fixed 144MHz contest results that GM8LMA and GM3IBC in the Shetland Islands are active on the band . . . The *VHF/UHF Manual* is proving very popular in America . . . Ray Eckersley is now G4FTJ . . . Bob Henderson, G3ZEM, is building a 144MHz linear using a pair of 4/125 valves to a design published in a 1951 *QST* by Ed Tilton, W1HDQ. Bob likes those big old style amplifiers . . . Ray Bennett, GW8CFQ, took time out recently at his 1,000ft asl QTH to access all the British vhf repeaters—no one answered but maybe this was due to it being 4am . . . GD3UMW reports he can get 5/9 signals from GB3MP and GB3CS depending on which way he points the beam . . . GM8DMZ usually loud on the aurora missed the last two by being on the GB3CS repeater . . . GI8EWM rebuilding his power supply because it has not enough volts or milliamps . . . The CT2BS beacon is not at present on the air as it is being modified for an increase in power from 1 to 15W. The frequency is still a matter of speculation and will be published in this column when details are confirmed.

Late news

Conditions were excellent for the March 144MHz Open Contest. Several operators had more than 700 contacts, and both GW8BHH/P and GW3UCB/P were heard to give serial numbers above 800 towards the end of the contest. I2URN and EA3AR were active and G3DAH worked several French stations, the best being in QTH locator BK. Julian Moss, G8ILO/P, worked F, DL, PA0, ON and HB9 with just 25W p.e.p. GW4CQT worked 12 countries from home during the event, best dx being OE2CAL/2 in locator GH16C. 432MHz was also good during the same period. G3DAH contacted stations in Versailles, and G3AUS worked 15 new QTH squares in France. F9FT worked Spain, while GW4CQT contacted HB9AMH/P in DH66C. A full report of the opening next month.

Tape recordings of meteor scatter and moonbounce contacts sent in by G8DVD and G4DGK will be used by GM8FFX to illustrate a talk at the Alexandra Palace convention in May.

Finally, thanks for all the mail this month. See you at Alexandra Palace. Please send all news, views and photographs to GM8FFX, PO Box 49, Aberdeen. □

the month on the air

John Allaway, G3FKM*

THE dreadful interference from the Soviet Union continues to play havoc with all radio services over a very wide band of frequencies. The writer is beginning to wonder why the ITU exists, and whether the World Administrative Radio Conference in 1979 is really necessary if a member nation is allowed to flagrantly ignore the Radio Regulations and escape retaliation or penalty. Severance of radio communication with the USSR by all law-abiding administrations would seem to be one way of registering protest.

Mention of the legality of 9K3TC in January *MOTA* has brought forth a QSL from that station, and also comment from OE1FF that he definitely was on the air. The significant factor seems to be the location as claimed on the QSL card—this is given as "200km south of Jeddah, Zone 21". According to your scribe's map this would place 9K3TC firmly in the middle of the Red Sea! Kuwait is a compact country and there is no dimension which would enable one to be 200km from anywhere in Kuwait and still entitled to use a Kuwaiti callsign.

Please note that in the list of QSL Managers given in February *MOTA* ZB2CJ's was incorrectly given as G3ATN—this should have read G3ATU.

DX news

There seems to have been some activity from Libya recently. JA1TES/5A was said to have been located 700km SE of Benghazi, and although JA1SNA has left he was also trying to obtain operating permission. DK1AS/5A has also been noted.

FR7AI left Europa Is in January and has been replaced by FR7ZQ/E. FR7ZL/T will be replaced by FR7AI at the beginning of May. FB8WE or FB8WJ may be heard from Crozet Is at the end of March. USA sources report that TN8CC has been worked on 14,215kHz at around 0100. TR8BA is often to be found between 1500 and 1700 near 14,106kHz.

Garth Hamilton, formerly 5H3LV, is now in Umtata, Transkei, and is using the callsign S8AAA. He has been heard on 14,195kHz around 1900.

JH1KSB operated /JD1 from Minami Torishima from May to August 1976, and from October 1976 until the time he returned to Japan he was active from Ogasawara Is. QSLs for contacts with either station should be sent to H. Fukushima, c/o YOKOKAN, DD 102 Yukikaze, Nishi Henmi-cho, Yokosuka City, Kanagawa, Japan.

KG6RL has an excellent signal from Saipan and is using a 7-el Wilson beam with a Henry 2K linear. He reports that there are some 11 amateurs on the island at the present time.

Those looking for a contact with the Kermadec Is will be interested to learn that ZL1AJL/K was scheduled to be active from there by early March. VK0AC, on Macquarrie Is, is often to be found around 14,235kHz at 0500. The weather station on Heard Is is believed to be automatic, and it is therefore unlikely that there will be many visitors to the island in the future, or that their stays will be prolonged. ZL3OG/C, on Chatham Is, has been heard around 14,195kHz. VK0TB seems to be heard fairly regularly on Wednesdays/Saturdays/Sundays on 14,250 or 14,315kHz between 1600 and 1700.

Iris and Lloyd Colvin, W6QL/W6KG, who are currently on expedition in the Caribbean area

The Norwegian survey ship which was expected to visit Bouvet Is did so on 24 February. 3Y1VC (cw) and 3Y3CC (ssb) were activated for about two hours during which some 50 contacts were made. A return trip may be made next year.

Canadians of Japanese origin are being allowed to use the CJ prefix during 1977. This celebrates the centenary of the arrival of the first Japanese settlers in 1877. CK3UOT is a special callsign issued to the University of Toronto ARC.

The Antarctic summer has resulted in increased VP8 activity. A group may often be found in the vicinity of 14,125–14,130kHz from 2000. VP8PL is located on the S Orkney Is and is often to be found around 14,220kHz. He was hoping to erect V-beams for 3·5 and 7MHz directed to the UK, so should have an excellent signal on those bands also. VP8PF is located in S Georgia.

W6YO will be on Pitcairn Is during late April and has permission to operate as W6YO/VR6. As VR6TC is mostly to be found on ssb, Jules will try to use cw as much as possible during his stay.

Iris and Lloyd Colvin made 10,000 QSOs from W6QL/VP2A and worked 126 different countries. This is an all time record for them, made possible largely by participation in part of the ARRL DX Contest when they made 4,000 contacts in 48 hours.

News from overseas

Stan Herbert, (ZB2CJ) G3ATU, has supplied information on the current activity in Gibraltar. It seems that at the present time things are very quiet, and regular activity is confined to Ray, ZB2DG, and Jimmy, ZB2BL. The former (who was ZB2DG/MM on board the *Roaming Melody* for many months) is on 14,120kHz almost daily around 1200. ZB2BL is on nearly every Saturday afternoon, and is also interested in Oscar and 144MHz. ZB2DL left Gibraltar on 6 February for the UK, and the RAF club station ZB2A was off the air at the time that Stan's letter was written but

* 10 Knightlow Road, Birmingham B17 8QB.

expected to be active again in March with much improved equipment. Former ZB2A operator Martin is now G4FQL, and Graham (ZB2GF) G8LUV.

Tony Hook, A4XGZ, has been hearing many UK stations on 3·5MHz and was erecting a triple phased vertical at the beginning of February. He was also awaiting the arrival of a linear amplifier. He is usually to be found around 3,750kHz at between 2200 and 0400 on Thursday/Friday.

Col Kamchai Chotikul, HS1WR, president of the Radio Amateur Society of Thailand, points out that this year's SEANET convention will be held in Bangkok during the second week in November. He would be pleased to hear from any visitors to Thailand and his office telephone number is 5852681.

Welcome

The following became members of the society during February: DJ2EK, EA3ACJ, EA3AIG, EA4OQ, WB4WXE and W4TMO/5.

Expeditions

The Augsburg and Gersthofen sections of DARC are planning an expedition to Liechtenstein during the period 7 to 12 April. There will be 13 participants—including three ladies—and they hope to be on the air with several stations operating simultaneously for 24 hours daily. They will use cw, ssb and rtty on all bands from 1·8MHz down, and on vhf/uhf up to 1,296MHz. Callsigns will be: DB3CV/HB0, DB3MR/HB0, DF1CB/HB0, DJ2CW/HB0, DJ7LH/HB0, DJ8NS/HB0, DK1YG/HB0, DK5CI/HB0, DK6XH/HB0, DK8CK/HB0, DK8MO/HB0, DK9MO/HB0 and DL3GX/HB0. All incoming QSL cards will be answered and should be sent via the DARC bureau (to the respective German callsign), or c/o DK8CK, PO Box 10 20 01, D-8900 Augsburg 1, Fed Rep of Germany.

ZK1BA expects to arrive at Manihiki Is at 0300 on 12 April and to be on the air until his departure on 14 April. He will visit the island again in July and October.

VR3AH and VR3AR hope to make an expedition during late spring to a number of rare countries in the Pacific area. Tuvalu (VR8), Gilbert Is (VR1), Fiji (3D2), New Caledonia (FK8), Wallis Is (FW8), Western Samoa (5W1) and Niue (ZK2) have all been mentioned as possible stopping places.

KM6EB is reported as aiming for a week of operation from Kure Is during April, possibly during the week of 18 to 24th.

A group of American and Korean amateurs hopes to visit Iwo Jima for a week commencing 12 April. Operation on 14, 21 and 28MHz is planned, and on the 3·5 and 7MHz bands if permission is granted. Frequencies to be watched are (cw) 30kHz above band edges, and on ssb 14,260, 21,300 and 28,580kHz.

Top band news

G3IGW reports a rather disappointing CQ WW 160m Contest in which he operated with G4MH as GM3IGW/A. A strange occurrence was the complete disappearance of a 1,100ft aerial during the night! This meant that only an inverted dipole was available and to add to the difficulties the local power supply broke down and was off for over four hours during the night. The total bag was 301 contacts, 21 states and 22 DXCC countries (EA8CR, K6DX, PJ2VD, ST2AY, YV5OB, ZE7JX and 9H1CG were "getaways").

GU4EON is willing to arrange schedules with those seeking a Guernsey contact on 160m. Please write to Mike Allisette, Spring Bank, Les Ozouets Rd, St Peter Port, Guernsey.

During the period 2100 to 2200 on 12 February A9XBC heard G3MYI, GD4BEG and YU1PCF. A little earlier he logged ZC4IO. The aerial used consisted of his three-band beam and associated feedline.

JOTA 1976

The UK report on the 19th International Jamboree-on-the-Air, received from G3BHK, indicates that the event encountered very poor conditions indeed. The fact that no GB calls had been issued to Scout stations in the UK resulted in some groups appearing on the air with several calls and this resulted in a total of 331 British calls on the air in 1976 as opposed to 221 in 1975. The numbers of overseas contacts were 208 and 246 respectively. It seems that some 261 stations were active from a total of 46 different countries. It is estimated that between 8,000 and 10,000 Scouts, Guides, Cub Scouts and Brownies (plus parents!) were involved—surely a wonderful public relations exercise for the amateur radio service. A further boost to increasing interest in radio matters is being given by a feature on how to build simple "foxhunting" equipment which will appear in *Scouting* during 1977.

The 1977 JOTA will be held on 15 and 16 October. Readers with Scouting connections are reminded that there is a UK Scout net held on 3,740kHz at 0900 each Saturday. World Scout frequencies are: 3,590, 7,030, 14,070, 21,140 and 28,190kHz (cw), and 3,740 (3,940 in USA), 7,040, 14,290, 21,360 and 28,990kHz (phone).

Contests

Ten Metre Activity Day Contest

0000 to 2400 1 May.

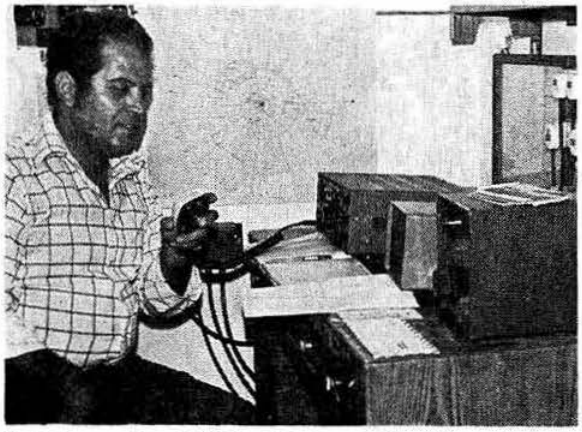
This is the last of the special 10 metre activity days organized this year to test propagation and band usage at sunspot minima. In order to encourage further activity the May test will be run as a contest and several prizes have been donated; they will be awarded to the winners of each mode of operation (cw and phone). Exchanges consist of RS/T and signal report, plus serial QSO number (from 001). Contacts with stations within the UK count one point, with others two. Logs should show time, station worked, serial number sent/received and points. Suggested frequencies to use are: 28,000–28,100kHz (cw) and 28,500–28,600kHz (phone). Logs should reach RSGB, c/o D. A. Whitaker, Hillcourt, 57 Green Lane, Harrogate, N Yorks, no later than 31 May. (Note that only single-operator entrants qualify for prizes.)

Prizes donated so far include a Hansen swr bridge (Lowe Electronics), tunable audio notch filter (Cambridge Kits), vhf wavemeter (Polar Electronic Developments), and a *Radio Communication Handbook* (Amateur Radio Shop).

The Helvetia 22 Contest

1500 23 April to 1700 24 April.

1·8 to 28MHz. Cw-cw, phone-phone. Contact stations in Switzerland and exchange RS/T plus serial QSO number (from 001). Swiss stations will denote their canton with a two-letter abbreviation. Each station may be worked once per band—either on cw or on phone. Each contact counts three points and the multiplier consists of the sum of cantons worked on each band (a maximum of 6 × 22). Certificates



Andy Panayotiou, 5B4BM, CARS contests and awards manager. Active on all bands 80-10m using an FT200 with a wide range of home-brew antennas from verticals for the lower frequencies to monobander beams for the higher frequencies. All these antennas are connected to an antenna exchange unit just visible on the wall behind 5B4BM

QTH Corner

C5AR, C5AU	via G3LQP, 11 Fircroft Close, Tilehurst, Reading, Berks, RG3 6LJ.
CK3UOT	via VE3UOT, Hart House ARC, University of Toronto, Toronto 5, Ont, Canada.
FK8CO, FW8CO	via F6AXY or direct to BP 3956, Noumea, New Caledonia.
HK0TU	LCRA QSL Bureau, PO Box 584, Bogota, Colombia.
KG6RL	via W6IAE or Box 189, Saipan, Mariana Is, 96950.
PJ8KG	(see W6QL/VP2A).
JE1TWG/S2	Mr Takashima, c/o Embassy of Japan, PO Box 458, Dacca, Bangladesh.
S8AAA	G. Hamilton, Postmaster, Umtata, Transkei Republic.
VE3FXT/S8	G. A. Collins, R. R.1, Dundas, Ontario, L9H 5E1, Canada.
TR8BA	BP 3853, Libreville, Gabon.
W6QL/VP2A	YASME, PO Box 2025, Castro Valley, Calif, 94546, USA.
VP5CNL	via W8CNL, 763 Graham Lake Terrace, Battle Creek, Mich, 49017, USA.
VP8PL	via G3LIK, 21 Sandyfield Crescent, Cowplain, Portsmouth, Hants.
ZB2CT	via G3ATU, Roker House, Roker, Sunderland, SR6 0PH.
ZD8RR	via G4FIY.
ZK1BA	via WA7HRE, 4725 N. 70th St, Scottsdale, Ariz, 85251, USA.
ZK2AT	INDXA, Box 125, Simpsonville, Md, 21150, USA.
I2DGG/5V	Box 1170, Lome, Togo.
5N2WBF	via 5N2NAS.

RSGB QSL Bureau, G2MI, Bromley, Kent BR2 7NH.

are awarded to the highest scorer in each country, USA and Canadian call area. Canton abbreviations are: AG, AR, BE, BS, FR, GE, GL, GR, LU, NE, NW, SG, SH, SO, SZ, TG, TI, UR, VD, VS, ZG and ZH. Logs should be posted before 24 May to: TM USKA, HB9AHA, im Moos, 5707 Seengen, Switzerland. This contest is an excellent opportunity to make contacts needed with the rarer cantons for the purpose of applying for the Helvetia 22 Award (see "Awards").

The ITU World Telecommunications Contest

15 May (Phone). 22 May (CW).

Copies of the brochure describing this contest may be obtained from G2MI, QTHR on request. Please enclose an sae—minimum size 9 by 7½in.

The Bermuda Amateur Radio Contest

0001 16 April to 2400 17 April.

3·5 to 28MHz. (Only 36 hours operation may be undertaken, and off periods must be clearly logged—they must each be of not less than three hours). This year the phone and cw modes have been combined and each station may be contacted once on each band, either on cw or phone. UK stations work as many VP9, W and VE stations as possible, and each contact counts five points. The multiplier is the total number of VP9s contacted on each band. The same VP9 may be worked on all bands. UK stations should send RS/T plus county indicator (see official list on page 55, January *Radio Communication*), USA and Canadians send state or province. The top scorer in the UK will receive a trophy to be presented at the Radio Society of Bermuda's annual dinner in October —transportation and accommodation will be provided. Note that all stations must be *single operator* and *must be operated from the entrant's own private residence or property.*

1975 and 1976 winners are ineligible for the top award. Logs must be in gmt and must be checked for duplicates. All contestants must sign a statement that they have complied with the rules and terms of their licence and each page must be clearly marked with callsign, name and address. Logs must reach the Contest Committee, PO Box 275, Hamilton 5, Bermuda, by 30 June 1977.

Awards

Greater Manchester County Silver Jubilee Award

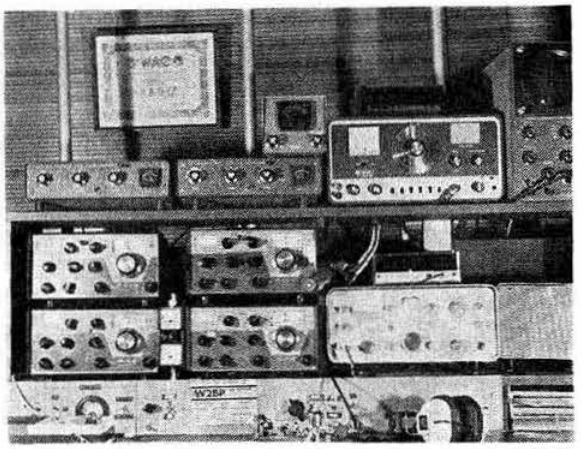
This is being made with kind co-operation from the GMCC and requires a check log list of contacts with at least 50 stations in the county during 1977. Applicants from outside the UK need only 25 contacts. They may be made on any band/mode but *not via land based repeaters.* A specially endorsed award will be made for those who make five contacts via satellite. Applicants should send the check log (showing the name of the town or city in which each station was located) plus a large sae to Don Aitchison, G3BSA, 28 Avondale Drive, Astley, Tyldesley, Manchester M29 7ES. Overseas applicants should include three IRCs. Listeners may apply on a "heard" basis. (From the end of 1977 the award will be continued without the Silver Jubilee endorsement.)

The San Jose Bicentennial Award

Celebrates the 200th anniversary of the city of San Jose, California. It is awarded to applicants who accrue a total of 200 points between 1 July 1976 and 1 January 1978. Contacts with members of the Santa Clara County ARA (of which there must be at least two) count 50 points, and with W6UW or W6UU (but not both) 100 points. Other stations in Santa Clara County count four points and others in the Pacific Division of ARRL two. Send a list of contacts with log data and US $1 or five IRCs to: K6TXR, PO Box 61241, Sunnyvale, Calif, 94088, USA.

The Helvetia XXII Award

No apologies are offered for drawing readers' attention to this most attractive certificate once again. It may be obtained by licensed amateurs and requires proof of contact with each of Switzerland's 22 cantons since April 1948. A list of QSL cards held, certified by the awards manager of a national society, should be sent to: Walter Blattner, HB9ALF, Postbox 450, CH 6601 Locarno, Switzerland. There is no fee, but it is suggested that several IRCs should be included to defray the cost of postage etc. Note that the award is available for all cw, all phone, or mixed-modes, and also that the certified list of contacts should show callsign,



Neat 1·8MHz dx station of W2BP, Al Segen, Pleasantville NJ, who has worked over 80 countries and WAC! He has also dx-peditioned at VP2G, FG0ADT/FS7, VP2LH, FM0ADT, VP2-MAD and VP2DAE, giving a "new one" on 1·8MHz to many. *(W1BB photograph)*

canton, signal reports and mode. The annual Helvetia XXII contest (see "Contests") is an excellent way of working the rarer cantons, some of which appear to have very few resident amateurs.

Band reports

A general improvement has been seen on the higher frequency bands during the past month, and it is beginning to look as though the new sunspot cycle began during 1976.

G4DLB reports a contact with K1PBW at 0430 one morning when he was operating /M and using an 8ft whip aerial. This was on 1·8MHz and he wonders if it may be the first mobile dx contact on that band.

The 14 and 21MHz bands have suffered dreadfully from the deliberate interference emanating from the USSR, but openings on the latter have been more frequent and ZLs have been noted. 28MHz has not been very active but is certainly worth using—G3RMF had already heard 37 countries on the band this year by the first week in March.

Many thanks to the following for information: G2s ASF and HKU, G5JL, G6GH, G8KG, GM3s CFS, IAA, LYY and OXC, G3s AAE, KSH, NKQ, RCA, RMF, SVW, UOL and YTW, G4s RZ, DLB, DXE and EAN, BRSs 17567 and 31301, and As 8312 and 8961.

Stations listed in italics were using cw, the others ssb.

1·8MHz. 0000 *FY0BHI, K1PDW, VE1AXT, VO1KE, K4CYU, W1BB.* 0500 W4BRB/C6A. *K1PBW.* 0600 *PT2CW,* W7RM, *W9CL, W9MAL, YV1DB.* 0700 *HK4EB, HK0BKX,* KP4EAS, *PY1RO,* VE3BBN, *VP2VL,* W4EV/VP9. 2200 *4U1ITU.* 2300 *YUs.*

3·5MHz. 0000 AP2KS, *C31FK,* FP8ZZ, JT0ICB, UM8MAA, W0CW/ZF1. 9K2DR. 0100 *CN8CF, FG7XA, 8R1J.* 0500 VP2DQ. 0700 *C6ABA,* FO8EX, VP1s BG, HE, W6QL/VP2A, *XE1OE,* ZL2/ZL3/ZL4, 5W1AU. 0800 *WA8TOB/C6A, HC5EE, HK2DP, PY0ZP, ZLs.* 1700 *JAs, UA9s, UA0s, ZL4GU.* 1800 DJ9YY/HB0, 7X2DG. 1900 FL8SD, JA6BSM, 9D5A, 9M2KM. 2000 *VK3MR, VK3XB, ZC4IO.* 2100 DU1REX, JA1KXY, JY3ZH, *VU2AU,* YK1AA. 2200 *TR8MG, UA0AG,* 9L1NP. 2300 *EL2T,* VP2GQ, *K4BRC/VP9,* W1-W4, *9D5B.*

7MHz. 0000 *PY7,* TU2GK, 5T5KJ. 0700 KG6JAN, VKs, *W6QL/VP2A, ZLs.* 0800 *VK3MR, W6JQS.* 0900 *W7KBI.* 1900 *TR8MG.* 2000 *CT2BZ.* 2100 *VK3MR.* 2300 EA9FH, W6QL/VP2A.

14MHz. 0000 VP8ON. 0700 JT1KAA, VK9ZM. 0800 FK8s AH, CO, JAs, KL7s, VR4DX. 0900 EA9FL (PO Box 354, Melilla), FK8CD, FK0TX, HM0U, JT1AT, P29KE, ZL3OC (Chatham Is). 1000 *FL8ND,* KG6RE, *PY0ZAE,* VKs, VP8HZ, VS6s, YJ8RD. 1100 JAs, P29BS, UA0YAA (Zone 23). 1200 FK8CG, 9N1MM. 1300 JW7FD (Bear Is), *6W8FOC.* 1400 KC6SP (QSL to KG6JFX), P29JW. 1500 FR7ZL/T, VE3FXT/S8. 1600 FR7ZK, *3Y1VC* (Bouvet Is). 1700 FL8BF, KL7IAN, ST2TR, VK0TB, VR3AR, *XE2MX,* 5N2WBF. 1800 KH6s BB, *IJ,* S8AAA, ST2SA, 9G1PL (Box 1332, Kumasi). 1900 FH0BKZ, KC4AAA, LU1ZA, *WA7BSZ* (Mont.). 2000 *SM1FRE/4U* (Gaza), VP8JB, ZL3GG. 2100 KC4USD, KH6BB. 2200 PJ8CO. 2300 KC4USD, TR8BJ, VK6s, VP8s.

21MHz. 0800 *A9XS, D2AAI, EA8s, JAs,* WB2CJF/HZ1 (QSL to WB2JDS), *VUs,* 3B8CS. 0900 *JAs,* VK6s, VS6s, *ZL3GQ,* 9M2DQ. 1000 VK6s, WB6EWH/VQ9, VU2LQA (QSL to DK6TU), 9V1SV, 9X5SM. 1100 D2s *AAI,* ALB, S79D, *VK8, XW8AZ*(?). *ZD8TM,* 9G1JN. 1200 EA8OA, SM2FRE/4U, YB0. 1300 JY5RBA, VK5, VK6, *3B8CV,* 5V7WT, 6W8FOC. 1400 A6XP. 1500 ST2SA, VP8PC, 5N2AAV. 1600 *A2CED,* FR7ZL/T, W6QL/VP2A, W6/W7s, ZD7SD. 1700 C5AAB, W6/W7s, 5N2WBF. 1800 FY7, VE7s, VP8HA. 1900 VE4-VE7s, W6/W7s, ZL2NY. 2000 C6ABA, W1-W5s, W7, 8, 9s. 2100 LUs, PYs, S Americans. 2200 LU, PY.

28MHz. 0900 UP2. 1000 JA, VK8HA, 4X4. 1200 9G1JX. 1300 9J2s. 1500 ZE1EV. 1600 EL2T, D2AAI, VP8AI. 1700 UB5, CX7DB, LUs.

Acknowledgements to the authors of the following for items obtained from their publications: The *West Coast DX Bulletin* (WA6AUD), *DX'press* (PA0TO), *CQ Magazine* (W1WY), the *Ex-G Radio Club Magazine* (W3HQO), the *29DX Club Bulletin* (VK6RV), and *Long Skip* (VE1AL/3).

Please send all items for **May** issue to reach **G3FKM** no later than **8 April**, and for **June** by **7 May**. □

HF PROPAGATION STUDY

Predicted HPFs (MHz × 10) for April 1977

GMT =	00	02	04	06	08	10	12	14	16	18	20	22	24
Aden	131	130	150	210	248	258	271	282	285	201	152	131	131
Ascension	124	131	119	79	220	258	258	288	301	331	258	162	124
Bahrain	133	133	158	206	234	243	252	258	257	209	168	130	133
Bangkok	114	103	164	191	208	219	219	219	158	153	154	126	114
Barbados	125	112	106	105	124	201	225	225	242	239	244	202	125
Bermuda	124	103	98	97	107	167	204	205	220	214	216	181	124
Bogota	122	106	101	102	129	163	220	220	235	230	234	191	122
Buenos Aires	124	125	115	121	130	238	242	258	274	274	266	181	124
Cape Town	121	135	111	190	243	266	274	298	301	286	213	141	121
Colombo	125	130	164	205	232	233	239	247	233	158	136	133	125
Cyprus	122	122	135	182	219	225	230	242	242	230	218	133	122
Dakar	117	129	115	133	206	252	251	272	285	295	260	196	117
Denver	125	107	102	98	100	105	149	169	176	187	178	154	125
Fairbanks	128	124	125	136	134	138	139	147	154	148	148	141	128
Falklands	124	126	116	128	147	232	247	266	282	282	266	174	124
Gibraltar	79	89	77	107	138	158	162	163	174	174	167	110	79
Hong Kong	103	91	161	181	200	206	206	188	149	139	144	114	103
Honolulu	129	122	121	134	150	138	129	117	149	171	162	144	129
Iceland	81	74	75	96	124	139	147	144	150	141	131	102	81
Jamaica	126	105	103	103	124	149	209	211	225	220	223	192	126
Lagos	124	131	117	168	234	266	271	296	308	345	208	134	124
Las Palmas	108	121	105	122	183	219	223	235	242	247	233	159	108
Lima	125	116	108	108	143	121	229	230	251	248	256	201	125
Los Angeles	126	110	105	105	98	87	119	163	177	182	174	152	126
Malta	94	103	94	139	171	187	191	200	205	202	190	116	94
Mauritius	130	110	133	205	247	260	277	286	288	243	192	140	130
Mexico	125	102	97	102	124	120	169	197	209	199	196	167	125
Moscow	89	73	111	149	169	183	182	183	185	173	154	106	89
Nairobi	131	129	130	206	252	266	284	294	308	266	182	133	131
New Delhi	122	119	166	195	219	223	224	227	225	154	140	129	122
New York	125	116	103	103	103	150	186	188	205	204	204	169	125
Osaka	103	97	150	167	186	190	187	164	130	129	129	116	103
Perth	129	130	164	205	230	233	200	154	145	145	141	129	129
Rio de Janeiro	124	126	116	126	128	246	245	265	282	281	267	202	124
Salisbury	129	129	126	204	252	268	284	299	314	331	232	141	129
Seychelles	131	106	136	194	251	260	281	284	298	258	206	143	131
Singapore	122	119	166	195	219	223	224	227	229	204	177	121	122
Suva (s)	126	125	128	147	167	178	181	163	138	140	154	134	126
Suva (l)	117	131	119	162	163	131	129	128	133	128	229	152	117
Sydney (s)	103	91	161	181	200	186	157	155	155	147	130	114	103
Sydney (l)	124	117	110	111	158	117	117	108	103	108	181	196	124
Teheran	129	130	164	205	232	233	239	247	247	213	185	133	129
Vancouver	128	115	111	125	111	108	138	153	163	152	162	148	128
Wellington (s)	120	115	131	157	174	161	147	145	152	122	150	130	120
Wellington (l)	115	129	115	138	128	107	110	117	120	120	180	163	115

For information on the use of this table, see page 284, *Radio Communication* April 1976. Please send reports to Mr J. Spurling, G4AQI, 15 Tibbs Hill Road, Abbots Langley, Watford, Herts WD5 0EE.

swl news

Bob Treacher, BRS32525 *

10m Activity Contest

David Whitaker, BRS25429, has been the brain behind the successful venture to designate certain days in the year as 10m Activity periods to assess the 10m band during the current sunspot minima. The next test in May will be the last and Dave is making it a contest with prizes to the leading transmitter and swl. So book the date, Sunday 1 May from 0000 to 2400gmt. SWL logs should show: gmt, station heard, serial number sent, station being worked and points claimed. One point should be claimed for each G heard in QSO and two points for stations outside G. There is no multiplier system. Logs should be sent to RSGB, c/o D. A. Whitaker, Hillcourt, 57 Green Lane, Harrogate, N Yorks, to arrive no later than 31 May 1977.

Forming another club

Barrie Parsons, BRS33798, has written stating that he is hoping to form a radio society in the Widnes area of Lancashire. Any swl or licensed amateur is invited to contact Barrie at 33 Baguley Avenue, Halebank, Widnes, Lancashire WA8 8UY. We hope this venture is as successful as the Dumfries venture for Crosbie Rodgers, BRS32286.

New correspondents

There are four new correspondents this time: Don Osborne, BRS31551; Chris Garner, BRS37223; Stuart Hammond, BRS37583, and A. R. Darby, BRS37587. Don runs an FRDX400 with a 120ft inverted-L, and a 9RS9D with various other wire aerials. He is a cw addict and has a large selection of dx QSL cards; an ex-Royal Corps of Signals man, he has been addicted to cw since 1942.

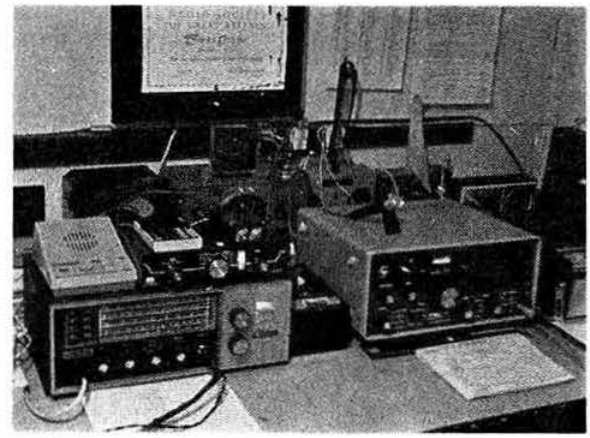
Chris and A. R. Darby send figures for the table. Chris also forwards an entry for the all-time table to be published next time, but an entry of 370 for 14MHz ssb looks more than a little dubious as there are only 320 amateur radio countries and at least 20 of these have not been active in the last 10 years. Please let us have accurate, honest and reliable figures in both our tables—after all, it is only a hobby!

Stuart runs a 9R59DS using a 30m long-wire 6m above ground and is mainly interested in 3·5MHz.

News from the regulars

Ray Williams, BRS6072, writes to thank the efforts of this column (and RAIBC) in finding him a "Bandscanner" receiver. Where all Ray's previous efforts had failed, these pages brought him success. His collection of rather old types of wireless is now that bit larger.

Robert Maskill, BRS35454, has spent a great deal of time on 144MHz, which is why he has not been reporting to these pages of late. Now he is back and has a healthy 1977 score appearing in the new table. Robert still uses the FRDX400 with a long wire which has been performing very well so far in 1977.



The shack of Austin C. Geer, BRS35586, showing the recently acquired Yaesu FRG7 receiver

Keith Morrison, A8883, passed the RAE in December and is struggling with the morse. Keith reports three all-time new countries, 5VZWT, XT2AS and FR7ZL/T. Also heard was S79P (S79 is the new prefix for VQ9—Seychelles). Keith has also been listening through Oscar but these contacts do not count for the tables. David Homes comments on the lack of 7MHz ssb dx and the fact that there are only Gs and Italians on 28MHz!

David Sharred, A8312, has collected five new countries on 1·8MHz from early January to mid-February. These were YU, F, KZ5, VP2V and HK. This takes his 1·8MHz totals to 54 heard, 34 confirmed. The latest confirmations are HB0 and VP9. Dave has entered for the May RAE and hopes to be successful enough to be able to work some of the 1·8MHz goodies which he now hears.

Robert Small, A8841, writes praising the improvement in band conditions but bemoaning the bc QRM encountered in the ssb portion of 7MHz. However, Robert has heard 3A0, ZL and 7X0, and his first USA stations courtesy of W4MII and W7RM. On 14MHz, Robert has heard FR7ZL/T and VK9JD on Norfolk Island for new ones, while 21MHz provided PY1RO/0 on Fernando de Noronha. Robert has also some interesting QSL returns in the shape of CE0AE, FG0CXV/FS7, FK8CK and CE9AT (South Shetland).

Neville Spry, BRS17567, had been monitoring 14MHz to good effect with LU1ZA on South Orkney, 3YIVV and FR7AI/E. He has modified his 3·5MHz New Year resolution so that he does not miss too much dx, but he does switch off when the "weird noises" start. Neville will be holidaying in

1977 HF Countries Table

Station	10m	15m	20m	40m	80m	160m	Total	Mode
BRS17567	6	95	171	49	102	5	422	ssb
BRS32286	2	116	134	45	99	0	396	ssb
A8312	1	61	118	69	92	31	372	ssb/cw
BRS35943	2	73	114	57	82	7	335	ssb
BRS35454	1	54	124	41	79	11	310	ssb
A8841	2	66	140	29	52	0	289	ssb/cw
BRS37587	2	16	32	23	55	4	132	ssb
BRS37884	0	22	29	21	43	2	117	ssb
BRS37583	1	7	9	3	35	3	58	ssb
A9107	1	3	25	4	15	1	49	ssb
A9199	0	6	12	4	8	2	32	ssb

* 392 Rochester Way, Eltham, London SE9 6LH.

the USA in July so his listening activity will be nil—at least from this side of the "pond".

Keith Kerr, BRS35943, wrote his contribution at 0125 after completing some college work. His activities have been curtailed also but he added FO8EX to his 3·5MHz total before returning to college. Very little real dx to report apart from this—the best of the rest being JA1TES/5A on 14MHz. Keith is looking forward to returning home to his receiver in the middle of March when he hopes to make up some valuable lost time on the hf bands.

Letters are acknowledged from BRS37583 and A9199.

CVRS Contest results

Roger Smith, now G4FSZ, has forwarded the results of the Cray Valley Radio Society's 8th SWL Contest. Participation was a little sparse with only 10 entries, compared with two or three years ago when over 60 entries were received. The winners of the various categories were K. Murphy, single-operator ssb; R. W. Thomas, single-operator cw; M. Wright, multi-operator ssb and cw.

Finally, comments and views for inclusion in the August edition should reach your scribe by 1 July 1977. □

Propagation predictions

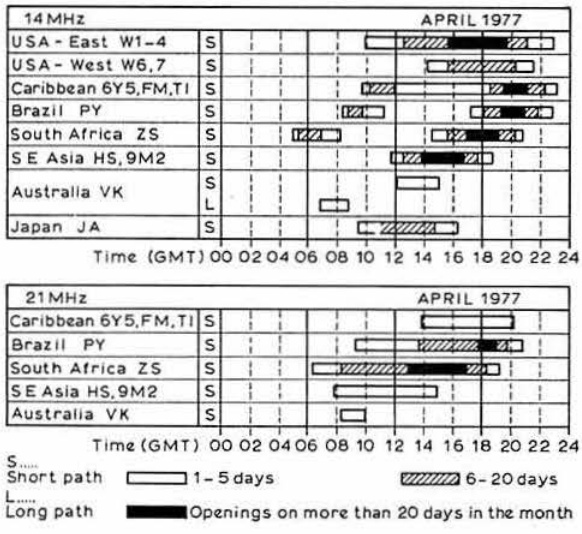
It appears that the period of minimum sunspot activity has been passed, so from now on activity will increase, but as this will be slow not much of it will be noticed in the coming months on the hf bands. **28MHz** will continue to be of little practical value for dx, but short-skip conditions will liven up this band as well as **21MHz** over distances of about 700-1,800km from May onwards. Traffic with North America and Japan will be almost impossible. Traffic with Africa and South America will be possible only for very brief periods.

As the season advances, **14MHz** will remain open noticeably longer than in previous months, while traffic with Australia will become more difficult from now on and continue so during the summer months. Only in about September/October will this get better again. During June and July the most favourable conditions for traffic with Australia seem to be the hours before noon via the indirect path. The times for traffic with Japan will change during the coming months more and more to after rather than before noon. In high summer there will also be a chance for traffic with Japan during the early hours of the morning. Traffic with KH6 will be possible on days with above average MUFs from about 1630 to 2100gmt on the direct and from 0530 to 0700gmt via the indirect path. On the whole, chances for dx via the indirect path on 14MHz during April will be relatively poor. This will improve in high summer.

Shorter nights and rising F2 night frequencies will lead to an improvement in traffic with North America on **7MHz** during the second half of the night. Traffic with South America and South Africa will also improve as the month goes on. The F2 daytime frequencies are mostly well below 7MHz, causing interruption of local traffic by the dead zone. During May there will be an improvement in the sporadic short-skip conditions which will continue throughout the summer.

On 3·5MHz, traffic will be possible if the whole of the path lies in darkness. This applies even more to this band than to 7MHz. The advancing summer and increased static will shorten the distances covered. Local traffic will seldom be interrupted by the dead zone.

The provisional sunspot numbers from the Swiss Federal Observatory for January and February 1977 were 15·7 and 22·6 respectively. The yearly mean of the definitive sunspot numbers for 1976 was 12·6. The predicted smoothed sunspot numbers for June, July and August are 19, 21 and 23 respectively. This is an almost 100 per cent increase on previous predictions and is evidence of the steep increase in solar activity that may be expected during the next year.



Microwaves

(Continued from p295)

Technical news

In the 4/76 issue of DUBUS-INFO, DL7QY begins a short series on narrow-band equipment for the microwave bands. Part 1 describes a varactor quadrupler which produces about 1W at 576MHz from 2W of drive at 144MHz, and an amplifier/doubler which first generates 9W at 576MHz and then about 5W at 1,152MHz. Also described are two further units which will take this output and produce either 3W on 3,456MHz or 1·5W on 5,760MHz. Part 2 will cover convertors for these bands. In the same issue, he gives an improved version of the Gunn psu/modulator which was briefly described in December's *Microwaves*.

SM6GPV reports what could be a serious fault in the Gunn psu/modulator shown in Fig 8.59 on p 8.32 of the current edition of the *VHF/UHF Manual*. The inverting and non-inverting inputs to the μA741 ic are interchanged, with the result that the output is either 0 or 12V. The fault is corrected simply by calling pin 2 pin 3 and relabelling pin 3 pin 2. He also points out that, if the output voltage needs to be increased beyond the present range of adjustment, the value of R14 should be reduced to, say, 2·7kΩ.

SM6GPV also says that he has been doing some short range tests on 10GHz using equipment best left undescribed but weighing 50kg and consuming 300W. Currently he is building some rather more portable equipment. Other Swedish amateurs are building for this band, and he promises to identify them.

The 4/76 issue of *VHF Communications* contains two articles on simple 10GHz equipment. The first, by G3RPE, regrettably perpetuates the error described by SM6GPV. The second gives details of a Gunn oscillator and pcb versions of psu/modulators originating from the Munich area.

Particularly welcome is an article by F8TD in *REF* for February which describes his 10GHz equipment. This appears to be a beautifully made "standard" transmitter and receiver based on directional cross-couplers, with large horn antennas, which no doubt reflects the efforts of G3JHM to encourage the spread of activity to that side of the Channel. Best dx so far seems to be 53km. □

council proceedings

A brief report of the Council meeting held on 26 February 1977

Present: Lord Wallace (*President, in the Chair*), Mr A. M. Allan, Dr E. J. Allaway, Messrs D. J. Andrews, J. Anthony, P. Balestrini, J. O. Brown, Dr D. S. Evans, Messrs W. F. McGonigle, B. O'Brien, C. H. Parsons, D. M. Pratt, W. A. Scarr, R. F. Stevens, G. M. C. Stone (*members of Council*), G. R. Jessop (*general manager/secretary*) and Mrs H. M. Allin (*minutes secretary*).

Apologies for absence were received from Messrs J. Bazley, C. J. Thomas, D. M. Thomas and A.W. Hutchinson.

GB2RS

Mr Brown read an extract from a letter he had received from Mr E. Yeomanson, G3IIR, stating that having recently transmitted the bulletin on fm he had received reports saying how nice it was to have news on a mode that could be copied and adding that it was hoped the Society had changed its mind about the use of fm for GB2RS.

Mr Stevens replied that the Telecommunications Liaison Committee had discussed this letter and at its last meeting had decided that if there was a demand for fm then the M & R and VHF committees should agree to have a GB2RS transmission on fm in addition to the present bulletin.

Financial report

The hon treasurer circulated copies of the interim results for the six months ended 31 December 1976. He reported that there was a surplus of £9,700 and, after detailed examination, he had confidence in the accuracy of this figure. Provisional figures for January showed a surplus of £2,200, mainly due to the continuing high sale of books.

Mr Jessop said that the first printing of the 3rd edition of the *VHF-UHF Manual* (8,000) had sold out in nine months and a reprint was due in mid-April. The *Radio Communication Handbook* Volume 1 had already sold 4,700 copies.

Membership and representation

The following total membership based on *Radio Communication* circulation was reported:

	January	February	March
UK members	17,281	17,397	17,541
Overseas	2,200	2,347	2,526
BFPO	65	69	74
Air mail	81	82	87
Total	19,627	19,895	20,228

It was resolved:

(i) to waive the subscriptions of four members;
(ii) to accept reduced subscriptions from 10 members;
(iii) to grant life membership to Mr A. D. Patterson, GI3KYP;
(iv) to grant affiliation to: Durham University Radio & Electronics Society; Great Lumley Amateur Radio & Electronics Society; Midlands Electricity Amateur Radio Club; Sheffield Amateur Radio Club; University College of Swansea Radio Society.

Mr Scarr said he was anxious to arrange a meeting of the M & R Committee but it was proving very difficult to convene a meeting at which there would be a quorum.

After some discussion as to the problem of the statutory two-thirds required for a quorum, a motion that item 3 of the Standing Orders be withdrawn in respect of the M & R Committee, thus eliminating the requisite number to be present, was approved.

Council was informed of the intention of Mr D. Andrews, G4CWB, to resign from his post as regional representative for Region 6, with effect from July 1977, due to a change of employment area.

The area representative for the Lothians, Mr F. Benson, GM8EKF, had resigned because of domestic reasons.

Mr A. Givens, GM3YOR, had been nominated to fill the vacancy of Region 13 representative. Closing date for nominations was 28 February.

The following nominations of area representatives were approved:
K. A. Crouch, G8KEN, Folkestone/Dover/Deal;
J. Heywood, G8BHQ, Stockport & South Manchester;
N. Horrocks, G2CUZ, Southport & District area of Lancs & Merseyside;
A. C. A. Newman, G2FIX, Salisbury;
R. Sharland, G4EHE, Bristol;
R. E. J. Staples, G3MMD, Warrington.

Society organization

Dr Evans gave a detailed account of the matters under consideration by the new working party—The 1977 President's Committee: day-to-day problems; WARC; operation of the Society, structure etc.

The minutes generated by Dr Saxton's committee in 1973–4 had been examined carefully and it had been agreed to consult as many people as possible to obtain their ideas and comments. He felt that the working party would be particularly involved with such questions as "Is there a need for re-organization?" and "Are we satisfying present Society members and attracting new ones?"

Mr O'Brien said it could be beneficial to hold a Regional Representatives' Conference this year.

After considerable discussion it was agreed to hold a Regional Representatives' Conference on 1 October 1977* subject to accommodation arrangements. The working party would produce a document setting out the purpose of the conference.

It was decided that the Council meeting due to be held on 29 September would now be held on 30 September.*

Mr Jessop called for contributions from Council for RR/AR newsletters as all the reports had so far been generated by HQ, with the exception of items from Mr Stevens. It was very difficult to produce newsletters without news from outside HQ. Practically no feedback had resulted from the newsletters, although the number of ARs had increased considerably since their introduction.

Honorary officers' terms of reference

The terms of reference for the vhf manager, microwaves manager and emergency communications manager were approved.

Council accepted a recommendation from the VHF Committee that Mr D. A. Evans, G3OUF, be vhf manager.

It was proposed and approved that Mr P. Balestrini, G3BPT, be emergency communications manager.

Committee minutes and recommendations

Council accepted the minutes of the following committee meetings: HF Contests (9/12/76), Repeater Working Group (6/1/77), Raynet (15/1/77), Finance & Staff (27/1/77), VHF Contests (27/1/77), Mobile & Exhibition (1/2/77), VHF (7/2/77), Propagation Studies (8/2/77), Repeater Working Group (Open meeting) (22/1/77).

The Mobile & Exhibition Committee had recommended that the Woburn Mobile Rally be reinstated this year. A budget had been submitted, and after consideration of the figures Council agreed to accept the recommendation to reinstate the rally.

Repeaters

Some discussion took place on the applications for 144MHz repeaters at Bacton and Torbay. The general manager had made the following statement to the Bacton group:

"A vhf repeater located at Bacton is not in accordance with the guideline agreed in 1974 which laid down a minimum spacing of 100 miles between stations unless unfavourable terrain intervenes.

East Anglia is almost ideal terrain for uhf repeaters and a suitably sited station would illuminate a considerable area. As had been previously stated on several occasions, the Society would strongly support the establishment of uhf repeaters in East Anglia. The Home Office are prepared to give priority to an appropriate application(s)."

Regarding Torbay, the matter was still in the hands of the Home Office who at present saw no reason why permission for a 144MHz repeater should be granted, but they would consider a 432MHz application. The general manager would write to the group concerned.

It was pointed out that other groups had changed to 432MHz but that these two groups were apparently still hoping for reconsideration of their applications.

** Subject to approval at the next meeting of Council, these dates have since been amended to 24 and 23 September, respectively.*

RSGB committees, 1977

(The President is an ex-officio member of all committees)

Education: G. L. Benbow, G3HB; T. Darn, G3FGY; J. W. Hill, G3JIP; R. J. Hughes, G3GVV*; L. E. Newnham, G6NZ; G. C. Oxley, G8MW; D. M. Pratt, G3KEP; R. Wallwork, G3JNK; F. C. Ward, G2CVV.

Finance & Staff: E. J. Allaway, G3FKM; D. J. Andrews, G3MXJ; J. Bazley, G3HCT; J. O. Brown, G3DVV; D. S. Evans, G3RPE; G. R. Jessop, G6JP; L. E. Newnham, G6NZ; B. O'Brien, G2AMV; C. H. Parsons, GW8NP; R. F. Stevens, G2BVN.

HF Contests: E. J. Allaway, G3FKM; D. J. Andrews, G3MXJ; J. Bazley, G3HCT; D. S. Booty, G3KKQ; R. L. Glaisher, G6LX; M. Harrington, BRS20249; C. A. P. Henderson, G4FAM; P. A. Miles, G3KDB; E. L. Mollart*; A. M. Smith, G3IAS; D. Thom, G3NKS.

IARU Working Group: E. J. Allaway, G3FKM; D. J. Andrews, G3MXJ; J. Bazley, G3HCT; D. A. Evans, G3OUF; R. J. Hughes, G3GVV; A. M. Smith, G3IAS; R. F. Stevens, G2BVN; D. Thom, G3NKS*; R. M.Warner, G3SAR.

Interference: S. R. Allen, G4CYR; D. J. Andrews, G3MXJ; P. F. Jobson, G3HLF; J. E. Martin, GU3YIZ*; A. H. Othen, G8FSZ; K. H. C. Parker, G8HTA; J. E. Swayne, G3BLE*; J. W. Swinnerton, G2YS; C. L. Turner, G3VTT; P. Waters, G3OJV.

Membership & Representation: A. M. Allan, GM3ZBE; D. J. Andrews, G3MXJ; J. Anthony, G3KQF; G. R. Jessop, G6JP; W. F. McGonigle, GI3GXP; B. O'Brien, G2AMV; W. A. Scarr, G2WS; D. M. Thomas, GW3RWX.

Mobile & Exhibition: P. Balestrini, G3BPT; T. Darn, G3FGY; J. S. K. Hitchins, G4FGN; W. J. McClintock, G3VPK; N. O. Miller, G3MVV; G. W. Norris, G3ICI; P. A. Thorogood, G4KD; R. S. Hewes, G3TDR.

Propagation Studies: L. R. Barclay, G3HTF; B. Chambers, G8AGN; T. Damboldt, DJ5DT*; W. M. Dunell, G3BYW; D. S. Evans, G3RPE; R. G. Flavell, G3LTP; R. A. Ham, BRS15744*; M. Harrison, G3USF*; R. J. Hughes, G3GVV; C. E. Newton, G2FKZ; A. M. Pomfret, G3LZZ/9G1LZ*; J. Spurling, G4AQI; A. Taylor, G3DME; R. C. Whelan, G3PJT*.

Raynet: P. Balestrini, G3BPT; Mrs J. Balestrini; M. Barker, G8CAC; E. R. L. Bassett, BRS16075; R. Bullard; L. A. Crane, G3PED; S. W. Law, G3PAZ; T. I. Lundegard, G3GJW; S. J. Scarborough, G3MBQ; E. W. Yeomanson, G3IIR.

Technical & Publications: R. J. Eckersley, G4FTJ; D. S. Evans, G3RPE; T. Giles, G4CDY; J. P. Hawker, G3VA; R. S. Hewes, G3TDR; P. J. Horwood, G3FRB; A. W. Hutchinson, editor; G. R. Jessop, G6JP; M. H. McFadden, GI3VCL*; J. W. Mathews, G6LL*; R. O. Philips, G8CXJ; H. W. Rees, G3HWR; R. F. Stevens, G2BVN; D. M. Thomas, GW3RWX*.

Telecommunications Liaison: E. J. Allaway, G3FKM; P. Balestrini, G3BPT; S. A. G. Cook, G5XB; D. S. Evans, G3RPE; G. F. Firth, G3MFJ; R. J. Hughes, G3GVV; G. R. Jessop, G6JP; D. M. Pratt, G3KEP; R. W. Price, G4BSO*; R. F. Stevens, G2BVN; C. J. Thomas, G3PSM; F. C. Ward, G2CVV.

VHF: G. C. Badger, G3OHC; R. J. Baker, G3USB*; A. H. B. Bower, G3COJ; A. H. Dormer, G3DAH; T. P. Douglas, G3BA; D. A. Evans, G3OUF; D. S. Evans, G3RPE; P. J. Gowen, G3IOR*; J. Hum, G5UM*; G. I. Knight, GM8FFX; C. J. Morcom, G3VEH*; M. J. Sparrow, G3FQJ; G. M. C. Stone, G3FZL; R. J. Taylor, G4BEL.

VHF Contests: L. N. G. Hawkyard, G5HD; W. J. McClintock, G3VPK; F. Mathews, G8ACJ; C. Sharpe, G2HIF; C. W. Suckling, G3WDG; R. J. Taylor, G4BEL; L. V. G. Turner, G4CUT; I. F. White, G3SEK.

** Corresponding member.*

obituaries

The Society records with regret the deaths of the following radio amateurs:

Rev F. C. Dorken, GW3GCZ
Francis Dorken died on 15 February aged 63. He worked with an O-V-1 in the 'fifties and operated mainly on top band cw.

Mr T. S. Eakins, GI3VFW
Stanley Eakins died on 28 February after a long illness, aged 32. Handicapped from birth, he was an active and highly popular amateur and was a member of RAEN and several local clubs.

Mr H. Grist, GD3FBS
Harry Grist died on 17 February. He taught morse to many amateurs, and after a stroke which paralysed his right side taught himself to use his left hand to handle the key.

Mr A. E. D. Moss, BRS36985
Alan Moss died on 25 January aged 24. He was a member of the South Manchester RC and despite a severe physical handicap participated fully in club activities. He had hoped to take the RAE in May 1977.

Mr H. J. Sherry, G6JK
Bert Sherry, who died in November 1976, was the first RR after the second world war for the Buckinghamshire and Bedfordshire area. He was active on 5 and 10m before and after the war, and more recently on 2m. A keen constructor, he always found time to help others.

Mr W. J. S. Squire, G3EBV
William Squire died on 13 January aged 75. He operated mainly on 14·0 and 21·0MHz, and made many dx contacts on cw.

Mr G. Slaughter, G3PAO
George Slaughter, who died on 8 February, was a founder member of Verulam ARC and served in several capacities over the years. He was also a member of the RSGB Interference Committee.

Mr C. Tinkler, G8CKO
Cyril Tinkler died on 17 February. Although only recently licensed, he had been active and interested in radio for some time, and was an inveterate constructor and experimenter. He was deputy controller for Raynet in the Norfolk area.

Mr G. R. Webster, CEng, FIMechE, MIEE
George Webster died on 20 January aged 72. He was the original holder of 2UX and was active in the 'twenties and 'thirties, but later had to relinquish the callsign because of business responsibilities.

Mr G. Weston, G3GLZ
Gordon Weston died recently aged 52. He was a keen constructor although he had not been active on the air for some time.

Mr R. Woodman, G3YZC
Raymond Woodman, who died on 7 February aged 53, was active on top band and cw on the hf bands.

The Society has also been notified of the deaths of:
Mr D. Adams, G3GJE, Mr D. M. Boot, G8JVY, Mr G. Horton, BRS38374, Mr A. Harding, BRS36641, Mr H. E. Putman, G3REJ, Mr H. W. Prendergast, WA1SBN, Mr H. Swinson, G4AVG, and **Mr J. E. Williams, G4BKX.**

A VAT SNIPPET

The statement issued by the VAT authorities concerning the higher rate of VAT for electronic components contains the following information: "Product categories to be charged at the higher rate of VAT: (L) Capacitors excluding: (III) Sintered tantalum capacitors of greater than 300microcoulombs."

A letter from the RSGB to HM Customs & Excise included the question: "Section L (III) reads unusually, as microcoulombs are not normally related to capacity. Should this be microfarads?"

The reply from HM Customs & Excise reads as follows: "The Radio and Electronic Components Manufacturers' Federation are satisfied that use of the term "microcoulombs" under (L) (III) is appropriate and we have not so far received any reports of difficulty in applying this particular product category."

In order to ascertain how appropriate the unit was, I asked the gentleman behind the counter of one of the surplus radio component shops in Harrow Road (where they now seem to congregate in London) how wide a range he had under that heading. The reply was to enquire a little belligerently "what was I getting at". The next step was to look up my "Scroggie". The capacity (C) in farads, it said, equalled the charge (Q) in coulombs, divided by the potential difference (V) in volts. As we are dealing with microfarads, the microcoulombs are not too difficult to handle. Presumably, therefore, if we buy a tantalum capacitor rated for 300V we cannot obtain one of more than 1μF without going into a higher rate of VAT, or if we want one of 50μF then we have to keep to a 6V rating unless we want to pay more tax.

Microcoulombs! They should be put back into the physics books, together with microjars. *G3DVV*

your opinion

TECHNICAL TALK

The Editor
Radio Communication

Sir—I was very interested to see the circuit of the Dutch receiver, Radio Rotor Model IV, described by G3VA in your December issue. To many readers, no doubt, these details will bring back memories of the "good old days" when similar receivers were the main stay of short-wave reception.

When building the receiver a screen was found essential over the grid leak and capacitor of V1 in order to minimize the pick-up of "ticky" hum which would mar the excellent performance of this circuit where audio gain is very high.

The 10kΩ resistor leading to the top of RV1 should be in the region of 200kΩ to give the quoted voltages at pins 1 and 7 of V1 and a correct voltage drop on the smoothing resistor (2kΩ). The 2kΩ resistor need only be of 0·5W rating and half-wave rectification may be employed with a slightly reduced line voltage.

Denco DP (valve type) coils may be used with the winding between pins 3 and 4 as a continuation of the main tuned coil. This lowers the frequency range of the coil a little. If this is thought inadvisable these coils can also be connected with pin 3 of V1 connected to No 4 of the coil with No 3 of the coil connected to earth. It is also possible by connecting pin 9 of the coil to earth to connect an aerial to pin 8 as is usual with these coils. However, the aerial input circuit of the receiver effectively forms a stepped differential capacitor; in other words a capacitive input potentiometer.

Sensitivity and selectivity are very good and the little receiver will provide much enjoyment to the swl. The good performance on ssb makes it a useful standby when the main receiver is undergoing repair or modification.

I have details of layout adopted if any reader would find them of assistance.

C. M. Lindars, 41 Blenheim Gardens, Wallington, Surrey

Sir—In connection with my article "A 1·8MHz direction finding receiver" (*Radio Communication* March 1976), I have heard of several cases where constructors have had difficulty in getting the oscillator to function. This is probably due to a less compact coil than that of the prototypes. Two or three extra turns on coil L5 have cured all known cases.

I believe that the Denby Dale Radio Club can supply roller tinned and drilled pc boards for this receiver at £1.20 the pair; enquiries to Mr M. Heeley, G8DTB, 5 Moorcroft Park Drive, New Mill, Huddersfield, Yorks.

P. Dowding, G3XQA

Sir—Many of your readers may wonder who is (or was?) the Mr Smith of "Smith Chart" fame; Phillip H. Smith of, I believe, The Bell Telephone Laboratories, USA. This "calculator" was originally published in *Electronics* (USA) in January 1939.

N. Ashton, GW3DQU

QSL BUREAU COSTS

The Editor
Radio Communication

Sir—In reply to G8WS's letter, I feel I must report a QSO I had with an American. He told me that the percentage of licensed radio amateurs who were members of ARRL was *much* lower than the percentage of licensed radio amateurs who were members of their national societies in almost any other country. He intended, he said, to do some "deep research" into the matter.

I told him he need not bother. The ARRL had no outgoing QSL Bureau. I expressed the opinion that if RSGB were to abolish its QSL Bureau, it would lose a lot of members. The QSL Bureau is one of the finest services offered by the RSGB. Members had uncomplainingly accepted steadily increased subscriptions in many cases *because* of the QSL Bureau.

Mr Stallworthy suggests exempting cards for specific awards. The bureaucratic work involved in this distinction would be very time consuming and possibly costly. He also suggests stamps bought from the RSGB and presumably stuck on the cards. This too would involve more work for the members, more work for QSL managers in checking if the stamps are correct, more work in bookkeeping, accounting etc.

Some societies have tried this and seem to have given it up; this may be the reason. The French bureau (REF) used to demand stamps for QSLs going outside France, but have since abandoned this idea and only ask for stamps from non-members of REF. As I believe our QSL Bureau does not handle QSLs for non-members, we see in the French example that the stamp idea has been tried and abandoned.

The RSGB has a superb QSL service *free* to members. It is one of its greatest services to the amateur.

Please do not tamper with it, lest you lose members as a result.

E. M. Wagner, G3BID

Sir—Re G8WS's letter in the February issue, I would be most disappointed if RSGB were to charge for the QSL Bureau. It is one of the most useful privileges of membership, and I am sure that it attracts a great number of newly-licensed amateurs to join the RSGB. Also, if Mr Stallworthy's idea was adopted I fear that 1p or 2p would not even cover the cost of distributing and organising the "sticker service".

Perhaps some Continental members of RSGB would care to express their views on this subject, as it would certainly be interesting to find out "first hand" the systems in use on the Continent re QSLs.

A vote of thanks to G2MI and his sub managers for providing a first class service, may it long continue.

R. W. Hammond, G4DBW

Sir—I would like to point out to your Feb 77 correspondent, G8WS, that while, in principle, a levy per QSL outward bound is a reasonable idea, there are a few drawbacks, viz:

(a) A fair number of members use the QSL Bureau extensively, among which many are senior citizens or students. A levy may cause them to forego the exchange of QSLs.

(b) It certainly would not endear our QSLers, who would normally QSL, to the countless out-of-country stations seeking a particular "G" QSL.

(c) As for cards required for a specific purpose such as our award, this I can see would be abused if they were exempted.

Perhaps one solution would be to register with the QSL Bureau. Members wishing to avail themselves of the outgoing services of the bureau could pay a registration fee of, say, £1 or £2. It would mean extra work checking the register, but as calls would be alphabetic it should be minimal. Any station knowing himself to be unregistered would have to pay a small handling charge, eg 25p per envelope.

D. Dhuglas, GM4ELV

Sir—A paid QSL Bureau as suggested by G8WS needs much thought before being introduced.

1. A large percentage of our members join to gain the QSL services offered. Would membership drop?
2. Surely G8WS remembers the QSL fiasco of the 'thirties as a means of boosting *SWM* sales. Do we want to see a repeat performance?
3. How complicated would exemptions for specific awards be to carry out—perhaps G8WS has a practical solution. May I suggest abolition of awards!
4. Would a much larger number of uncollected cards result if stations are charged to reply to a QSL sent for confirmations. How will BRS members fare?
5. Could the deficit be reduced by introducing a paid service to non-members? Members to be allowed to send one envelope of, say, 30 cards free if accompanied by a *Radio Communication* addressee label each month, with extra cards at non-member terms.

The QSL will always remain an essential part of amateur radio. The fact that you have entered a rare QSO in your log book is not very convincing to a station visitor—like showing a well-filled-in cheque book stub to prove you are in the millionaire credit class.

George A. Hook, G2CIL

Sir—I read with alarm the comments of Mr Stallworthy in the February edition of *Radio Communication* suggesting that the Society surcharge members who use the QSL Bureau. I, along with many other members, regard this service as a major attraction of membership, and without it membership would have little to offer to many G(M)8 members who live away from the metropolis.

While I can appreciate the desire to keep down the cost of membership, one wonders where such a process would end. After all I never listen to beacons or the news service, enter contests, attend Society functions, talk to my regional representative, consult the

Interference Committee and, until last weekend, had an opportunity to use a repeater. Perhaps all these services should be available on a surcharge basis—and what about those who could live without *Radio Communication*?

No! Surely the spirit of the Society is all for one and one for all, and these facilities should be available to all if they wish to use them as once such individual penny pinching starts who knows where it may end.

Thank you Mr Milne and your team of sub-managers, and long may you continue to provide your much appreciated service without having to check for tuppenny stamps.

Douglas McLag, GM8FVC

Sir—About 40 years ago I joined the RSGB, mainly for the QSL Bureau. Now I too am rather blasé about the cards. However, I remember the great thrill of receiving those early cards and even yet I get some pleasant surprises.

The QSL Bureau has never been free to members, any more than the National Health Service has been free to British taxpayers. Although *Radio Communication* is probably the main reason for my continued subscription, a charge for the QSL Bureau might alter my sense of values.

A. Stuart McNicol, GM3UU

Sir—Mr Stallworthy, G8WS, suggests that a charge of 1p or 2p per card should be made for using the QSL Bureau. While this would raise considerably more than the present cost of the QSL Bureau, it is not true that the Society has to bear the cost and work involved. By far the biggest expense is postage, but all the work is carried out voluntarily by G2MI and his xyl, who receives a small salary, and a team of 25 sub-managers. If this had to be paid for, it would cost the Society several times the present figure of £1,868 (which includes beacons and Intruder Watch). It may help to get this into perspective by comparing it with the cost of *Radio Communication* (£47,765 in 1975-6).

I do the job of QSL sub-manager because I regard it as a service to my fellow amateurs and I know they appreciate it. I would not wish to be paid for the work. If the RSGB were to introduce a charge, this might well lead to a QSL Bureau with paid full-time staff which would be much more expensive, and possibly less efficient.

How, by the way, could one distinguish cards for awards and thereby exempt them from charge? And who is going to spend time looking at individual cards to see whether they should be stamped or not? And what happens to cards without stickers?

When I had been licensed for three months I could not wait to get my first QSL cards. After 10 years I still look forward to them. If I am still here in 30 years' time, the arrival of a rare card will still give me pleasure, I expect. I am not a 100 per cent QSLer (very few are) but I think the present system works well and should not be changed.

Deryck Buckley, G3VLX, G4D+3 series sub-manager

Sir—Referring to F. E. Stallworthy's letter on the cost of running the QSL Bureau and to QSL sub-manager Dave Borne's comments on the correct size of QSL envelopes leads me to suggest that a possible solution might be for the RSGB to sell QSL reply envelopes suitably over-printed. The cost of the right-sized envelopes could be in the order of 10p–20p each and include a contribution to the cost of running the QSL Bureau.

This scheme would seem to have the following advantages:
(1) the small additional administration would fall on RSGB Publications (Sales) who are obviously the best equipped to handle the financial arrangements, ie collect the cash;
(2) the scheme could be introduced gradually, perhaps even on a voluntary basis to start with;
(3) if the scheme was advertised at exhibitions and rallies both members and non-members who have not placed envelopes with the QSL Bureau would be encouraged to do so. The card wastage figure of 40 per cent would be reduced.
(4) Eventually Mr Borne would have a drawer full of the correct size envelopes and therefore a more efficient system to operate.

Any snags?

R. Keith Taylor, G3WWH

Sir—We are very sorry to learn that it is no longer a pleasure for Mr Stallworthy to receive a QSL from rare dx. No doubt the day will come when we too will cease to be enthusiastic about QSLs and perhaps find interest in other aspects of our diverse hobby. Perhaps just rag-chewing on 3·5MHz or via vhf repeaters will satisfy our needs but, for now, pursuing new countries and obtaining QSL cards is the one aspect of our hobby which we enjoy and gladly share with a large number of other RSGB members. Whatever the Society's expenditure might be on QSL Bureau, beacons, Intruder Watch—even repeaters or special subscription concessions, we just do not mind so long as the Society aims reasonably to satisfy the needs of each significant element of its membership no matter what their particular interest may be.

Contrary to what Mr Stallworthy says, the largest amateur radio organization in the world, the ARRL, has just introduced an outgoing QSL bureau to complement its incoming service and it is free to all ARRL members, if free is the correct term. For our money we are pleased that our Society provides representation and a QSL Bureau. Thanks!

J. D. Forward, G3HTA; A. T. James, G3RUV; B. V. Marshall, G3RUX; J. E. Bright, G3TJW

Sir—I should like to comment on the letter from G8WS in the February issue concerning a small payment for cards sent to the bureau.

First, although I would not enjoy sticking a stamp on every one of the 1,000 plus cards I send each year, a small charge would not cause me even to consider leaving the Society. The bureau is only one of the many reasons for my membership. However, is my reaction really relevant when any decision is made?

My experience suggests that the QSL Bureau, along with *Radio Communication*, are the two major attractions of the Society to non-members; this being particularly noticeable among newly-licensed amateurs. Only after a few years of reading *Radio Communication* and enjoying the other benefits of membership is a loyalty and deeper appreciation of Society work built up. Of course, without the initial reason for joining, this more balanced attitude—and regular subscription fee—is not possible.

Before changes are made to one of the "reasons for joining" it would be wise to consider the effect on would-be members as well as existing members. If the free bureau attracts 400 extra members each year I would consider its cost a successful investment. We all benefit from an increased membership, QSL Bureau users or not.

P. Chilcott, G4BBA

G8+3s ON COUNCIL

The Editor
Radio Communication

Sir—Mr Brown asks ("Your Opinion," Feb 1977) why there are no G8+3 representatives on Council.

Could it be that very few Class B licensees qualify in that one needs to be (a) over 70 years of age and (b) a founder member of the London Wireless Society. **Obviously this is an exaggeration** but it is equally valid to say that it is what many people outside London are led to believe.

Those of us who have attended the AGM in 1975 or 1976 will know that formal approval of the membership (well the half per cent who attend the AGM in London anyway) is required for anyone aged over 70 to be elected to Council. Maybe the Companies Act is trying to drop a hint!

This letter may sound bitter and even (dare I say it) anti-RSGB. I wish this were not so. I held a G8+3 callsign for 10 years (and now a Class A licence since January this year!). I take an interest in Society affairs (I have even been known to attend AGMs). I am chairman of a radio club affiliated to the RSGB and consider the Society essential to the future of our hobby (cave WARC '79).

When a prominent G+2-letter callsign at HQ tells me that people are not "real" amateurs unless they can receive 3·5MHz a.m. on a tuneable receiver then maybe it is better that G8+3s continue to enjoy their hobby rather than become embroiled in Council affairs.

Finally, I do find it refreshing that Mr Brown considers the matter important. Perhaps the editor could spare two or three pages in a future issue to allow ALL members of Council to air their views on the future of the Society. G8+3s, gentlemen, are here to stay.

Graham Murchie, G4FSG (ex G8AXU)

CITIZENS' BAND

The Editor
Radio Communication

Sir—Every time the possibility of a British citizens' band is mentioned in amateur radio circles someone alleges that anyone who really wants personal radio has only to pass the Radio Amateurs' Examination and become a Class B amateur.

This allegation appears to suggest that anyone who wishes to do so can pass the RAE, which is surely not true. Although the syllabus of the RAE is not very demanding it does require more background knowledge of science and mathematics than many quite intelligent people (particularly women who tend not to have studied them at school) possess. Without this background much of the technical

syllabus is meaningless and almost impossible to study. As an amateur I know SWLs who have tried for many years to pass the RAE and become transmitting amateurs—if mere work were sufficient they would have been licensed long ago.

If these motivated people fail the RAE is it reasonable to suppose that potential CB users—who are not interested in radio as such but in short range communication by whatever means—will be able to pass?

James M. Bryant, G4CLF
Citizens' Band Association

Sir—Please allow me to express my feelings toward the citizens' band question in England.

First, I would strongly advise that you cast an eye towards the USA to observe what will occur if care is not taken in dealing decisively with the cb problem.

The amateur population in the USA increased 15 per cent last year. Lest one thinks that this is a blessing for our hobby, let me assure you that is not welcomed by me. The radio amateurs here have been informed by ARRL, an organization of which I am proud to be a member, that this expansion was needed in order to prepare for the up-coming international frequency allocations conference in 1979. Perhaps so, but the expansion was more of an ultimatum issued by FCC than a need to convince the world of our expansion rate. Perhaps FCC should have been challenged more initially. The fact of the matter is, the economic situation in the USA has backed ARRL against the wall, and ARRL has wisely decided to join rather than fight the powers that be.

An expanding radio equipment market has placed great pressure on the radio amateur. There is a real threat that amateur bands might be shared with cb. It is *not* true that amateurs must account to the world our expansion tendencies as ARRL implies, but it is true that the amateurs must account to FCC, who in turn determine the direction its one vote takes in the approval or lack thereof in its amateur radio decision, in 1979.

Even that is not so bad *per se*. After all, everyone has a boss. What is alarming is that FCC has made a conscious effort to ease requirements for amateur licences. The result will yield an increased market for amateur goods, and the ultimate equating of cb and amateur radio. FCC *has* completely reversed its decisions on matters concerning all grades of amateur licences in the last decade. Make no mistake about it, FCC intends to, sooner or later, abolish the code requirement, and the written test, largely for economic reasons. I predict those days are not far off.

Do you think FCC believes in "Anything worth having is worth working for?" I say without hesitation they could not care less. The financial consideration alone is not worth the moral consideration. The 11m cb band is a zoo, which FCC admits, yet they move ahead in "acquisition" of the amateur 220 and 420 bands so that cb could share it with us. Instead of arresting 7 out of 10 cb operators for improper and wilful misuse of their frequencies, more is given them! It appears that the liberalism which has affected our judicial system is now affecting our radio bands.

Of course, amateur radio is not perfect either, but the conversation is of a different nature. I know several amateurs who run commercial kWs and arrays at 60ft or better, eagerly discussing the "challenge" of DXCC. These people are not malicious, just stupid, but I suppose a person cannot be blamed for that.

It is a well-known economic tendency for a *successful* business to grow slowly, typically a few per cent a year. Amateur radio is no different. Not only at stake is economic growth, but band occupancy growth. The USA is a believer of uncontrolled expansion, "what the market will bear," etc. As I believe the economic practicalities of life must far outweigh the moral convictions of the masses in most countries anyway, I would wish to convey my advice to you thus:

You will have to give ground in the UK, but drag your feet as hard as you can! And bark when you have to! Do not sell yourself to government. Do not be cajoled into thinking there are new frequencies to be had, because the improvement will not be a real one. I hope the "Mother Country" has enough guts left to save the greatest hobby/service in the world, because nothing is left of it in America. If you fail, it is true the economic picture in the electronics industry will improve, and there is nothing wrong with that, *per se*. But you will find that if expansion of cb is not handled properly, it will be your funeral.

Vince Biancomano, WB2EZG, member ARRL, RSGB

Sir—For many months now I have listened to and read many views expounded by numerous sources on the subject of a citizens' band and the forthcoming WARC 79.

First, I am puzzled why anyone should want a citizens' band under any name when there is an adequate telephone service for regular local chats, and an amateur licence available to anyone willing to spend a little effort memorizing a very basic part of radio theory, practice and regulations. Agreed, many amateurs—myself included—resort to the inevitable black boxes and understand very little of what makes them tick, but that does not mean that the RAE was unnecessary. On the contrary, I feel that now is probably a suitable time for a more exacting test rather than creating a "non-technical amateur band"—after all, car drivers are soon to be faced with a more critical examination.

Second, as I see it, WARC 79 offers the threat of less air space to amateurs due presumably to overall lack of frequencies, but still the lobby for a citizens' band continues. I notice in the photography press that there is also a possibility of radio cameras which "allow you to record natural sound"—could this be another threat to our treasured bands? If so, why stop there; there must be hundreds of ways of using a radio transmitter in almost as many amateur hobbies, all of which will need a frequency allocation(s).

I thought there was a shortage of air space!

B. J. Greatrix, G8CZT

Sir—I feel that I must comment on the rather peculiar way that many radio amateurs are regarding their hobby at present.

A lot of rather hysterical comments are being made about the ogre of a possible UK citizens' band and the possible disruption this may cause to amateur radio. While I strongly agree that cb should be vigorously discouraged, having experienced its bedlam last summer in Canada and the USA, I feel that we radio amateurs are presenting our case very badly.

It is high time we showed the public that we know something about, and are capable of contributing to, the field of (amateur) radio rather than being a band of black-box operators, albeit sophisticated ones. Perhaps the RSGB could give a lead by publishing a series of complete designs of easily-built hf equipment to rival the increasingly expensive Japanese equipment. Would anyone like to take up the challenge?

F. R. Leslie, G4DGE

(*Such articles would be very welcome*—Ed)

SEND A STICKER!

The Editor,
Radio Communication

Sir—I recently had the pleasure of applying for an RSGB hf award, alas only to find that I had to provide proof of membership by sending a recent address label from a *Radio Communication* wrapper.

Now, as I was always taught that it was dangerous to children and animals to leave polythene bags lying around, mine are always carefully disposed of—it is torn off and thrown in the bucket. So, not having a wrapper, I got very depressed at the thought of not being able to prove I was a member. Now in an effort to cheer myself up I thought I would buy a new radio book to read; so, a quick look through *Radio Communication*, pick my book and away with my money. Alas, it is not that easy, as, to get my discount, once again it took proof of membership. By this time I was feeling so low, as *Radio Communication* only has one sticker—and I had thrown that away. In a fit of depression I decided to give amateur radio up and sell all my gear. Now what better place to advertise than the Members' Ads column; yes, you have guessed, it takes a sticker to do so.

To prevent any other people from this dreadful fate, I thought we could start a "Save It Campaign", and with that thought my mind went wild at the possibilities. We could start a Sticker Club, have a Sticker Award Scheme "WORKED ALL STICKERS" to be won by members swopping stickers, swop ratio to depend on callsign. Dealers would give a discount for so many stickers. I wonder if they showed their stickers to get into the House of Lords? The Society could have a lucky sticker every month with a cash prize, a sticker news page in *Radio Communication*, maybe even an issue with three stickers on it—in fact the possibilities and permutations are infinite, and it would need a computer to work them out. I was thinking of asking the RSGB if I could use their computer but it seems to be having trouble printing members lists for the various departments within the Society, so I guess it would not be up to the job.

If you have any further ideas for the "Save It Campaign", please send them to the editor, as he is one of the few things you don't have to send a sticker to "yet" apart from subs, hi.

George Burt, GM3OXX

FINALE

The Editor
Radio Communication

Sir—Instead of going "silent key" will we in future simply "time out"?

C. Davis, G3ZFC

raynet

S. W. Law, G3PAZ *

We have mentioned on many occasions the interest shown by countries outside the UK in our Raynet organization. The latest enquiry hails from the Union Schweizerischer Kurzwellen-Amateure (USKA), the Swiss equivalent of our RSGB. Needless to say we are only too delighted to supply the information requested. So much for the somewhat parochial attitude which unfortunately seems to exist among a small number of Raynet groups in the UK. Disaster knows no boundaries over the face of the globe, and while it is obvious that a group must necessarily concentrate its activities on an agreed area, we should be aware at all times that we are not alone and that the reputation of Raynet is world-wide. Let us remember that our twenty-fifth anniversary is rapidly approaching and endeavour to raise our standards yet higher.

Lectures

Requests for Raynet lectures continue to be received from various sources and can usually be satisfied, but matters would be eased greatly if there were more volunteers and more material available. Suitable photographs and slide transparencies of exercises (and, if possible, actual emergency operation) are always welcomed by the Raynet Committee, and sound tapes or films are in very short supply.

A lecture was recently given to the Sutton & Cheam RS by G3PAZ at which the Anglia TV film of the remarkable "train crash" exercise laid on by the local authorities with the co-operation of BR and attendance of all user services plus the Norfolk Raynet groups was shown. The 16mm projector was loaned and operated by the club president, G3MES, and the meeting was attended by the controller of the SW London sector, G3ZZY, and other Raynet members. This film may be loaned for lectures at only the cost of postage. It should be pointed out, however, that the major part is mute owing to the nature of the tv commentary technique, but a Red Cross interview is on the optical track; a 16mm optical projector is therefore required. The film gives a very good idea of what may be expected in a major rail crash emergency under night-time conditions.

That 1976 record

As we had surmised, the record number of operational hours has been well and truly challenged by the County of Stafford group. Between 18 and 31 August 1976 this group were on 24-hour standby alert (14 days!) and clocked up 642 hours among 72 members during the fire hazards consequent on the summer drought, often under dangerous conditions. Between them the mobiles clocked over 1,000 miles on call-outs, even turning out from work to operate from 2pm to 4am on some occasions!

Good use of repeater GB3BM was made for contacting off-duty members for new alerts. User services were the county police, the county emergency planning team and, via the latter, all Midland fire brigades taking part. Understandably group members were enduring considerable stress as time went on, but county controller Colin Edmonds reports that not one member opted out during the period of the emergency. A fine record indeed in the true Raynet tradition. Those prospective members in the Stafford area may contact Colin, G4CFR, QTHR, for details.

Groups in formation

Interested parties in the Peterborough area should contact G8FXY, QTHR, who is organizing a new group. Those in the E Sussex area should likewise contact organizer F. J. Christensen, 19 Gore Park Rd, Eastbourne, who is trying to revive Raynet in this part of Sussex. We are always prepared to publish the address of any prospective organizer of a new group who first sends a notification to our chairman G3BPT, QTHR, for consideration. In Shropshire the newly appointed controller is G8IYK, QTHR, who would be glad to receive further applications.

Hon Registrations Secretary: Mrs L. A. Crane, "Greta Woods", Bromley Road, Ardleigh, Colchester, Essex.

*130 Alexandra Road Croydon, Surrey CRO 6EW.

S. W. Law, G3PAZ, operating a 4m base station used for Raynet *(Photo: Frazer Ashford)*

The sstv scene

by R. F. G. THURLOW, G3WW*

Most of the Americans among the estimated 3,000 sstv operators in the world would seem to be using the new type slow-to-fast scan and fast-to-slow scan converter to display sstv on a normal tv set. G2BAR has the first of the new ROBOT 400 converters in the UK and several are operational in Europe. Provided export delivery dates are kept, the 400 will be demonstrated at the White Rose Rally, Leeds, and at the NRSA Convention, Belle Vue. Look out for the writer's WB9LVI design converter, now with fast-to-slow scan facilities added, at the Suffolk Wireless Revival, Ipswich. W3LY and W3GKW are adding three extra memories to their LVIs for colour transmissions.

DL6GS has been operating DL2RZ's swift answer to the 400 with his SC-420 model providing similar facilities plus electronic pencil etc. Venus Scientific of New York promise their digital converter in September. The Jet Propulsion Laboratory ARS in Pasadena now have their Mariner sstv pictures by N6V available on a C60 cassette for $3.75 from W6VIO. Their reception and retransmission by USA amateurs was the subject of a special NBC TV programme. The pc board and "paperwork" for the W0LMD sstv keyboard is now available from MK Products, Belmont, Co Durham.

New sstv operators continue to appear on the bands in the UK, with five in February on the hf bands alone.

The Italian-organized sstv contest "Albatross", jointly sponsored by BATC, attracted only 24 entries (and four SWLs), of which two only were Gs, and of these only G8PY (4th) was a member of BATC. Results of the BATC UK SSTV contest have not yet been sent to non-member entrants. It is at least known, "over the air" that it was won by G8PY.

Only two days after W8YEK (110) reported he had found no new countries active on sstv, two XEs and a TG2 appeared on 14MHz; G3IAD still lacks one QSL card (now 104 two-way sstv countries) to obtain the *CQ Magazine's* SSTV DXCC certificate. W8OZA again promises to send the writer a cassette copy of the proceedings of the sstv forum at Dayton Hamvention 1977 to be held during the last weekend of April.

The inclusion of sstv in the new UK Amateur Licence A or B from 1 January 1977 on A3J *and F3* also requires *definitely* voice/cw station identification before and after each sstv transmission and during every 15min thereof.

* 2 Church Street, Wimblington, March, Cambs.

contest news

1976 21-28MHz Telephony Contest results

The winning margin of a little over 200 points represents the difference between a mistaken or correct callsign. That was the final separation between G3MXJ and G3UML after exhaustive checking of the respective logs. Making more contacts than G3MXJ, G3OZF took a very creditable third place though he suffered from a loss of time through a twice-jammed antenna rotator.

The contest was well supported and activity continued throughout the whole period, though 28MHz was restricted basically to a N-S path and faded away about an hour before the contest closed. 21MHz carried the brunt of the traffic, with well over 90 prefixes being worked by UK competitors. Notable countries were Japan, Pakistan and South Africa, with considerable activity from Eastern Europe and North and South America. Virtually nothing was heard from Australasia though the Antarctic stations supplied quite a lot of points.

First position for the overseas table was also closely contested, with 9G1LZ, 9H1CH and 9J2WR working a tremendous number of G stations between them. Not so well supported, unfortunately, was the receiving section, where BRS32525 again wins the Metcalfe Trophy by a very handsome margin. Regrettably only one overseas receiving entry was received.

Logs were of the usual good standard, though some entries had to be rescored due to misinterpretation of the scoring rule. It is total points multiplied by total multipliers. If totals and multipliers for individual bands are computed separately the answer is incorrect. Use of the accepted phonetic code would be helpful as quite a lot of points were lost through linguistic misunderstandings.

No adverse comments were received regarding the rules, but the receiving section requires a shot in the arm to increase the entry total. Any useful ideas would be appreciated by the adjudicator of this contest.

Check logs were received from G3WP, G3FVA, G4DV, OK2SPS, UA3TCH, UL7GAA and W9KXW, and are gratefully acknowledged.

M.H.

OVERSEAS TRANSMITTING

Posn	Callsign	21MHz Contacts	21MHz Multipliers	28MHz Contacts	28MHz Multipliers	Points
1	9G1LZ	198	15	142	14	29,551
2	9H1CH	206	14	148	10	25,416
3	9J2WR	154	13	160	14	25,245
4	ZE1BL	110	11	122	11	15,246
5	UA6LBC	220	16	—	—	10,496
6	9J2CB	25	6	128	13	8,645
7	UK5IAZ	168	15	—	—	7,560
8	ZC4AU	99	11	28	4	5,700
9	UK6LEZ	130	14	—	—	5,460
10	UA6BV	131	11	—	—	4,323
11	AC4WSF	117	11	—	—	3,861
12	7P8AC	31	7	49	8	3,570
13	UY5OQ	59	12	—	—	2,112
14	UA6AAS	68	10	—	—	2,020
15	YU2CBK	64	8	2	2	1,980
16	VP8HA	51	8	14	2	1,940
17	PY2ELV	39	5	22	5	1,830
18	K2LE/1	63	9	—	—	1,701
	VE3GCO	63	9	—	—	1,701
20	UK4WAB	56	10	—	—	1,680
21	UB5LU	51	10	—	—	1,530
22	LU1BAR/W3	49	10	—	—	1,470
23	UA6LXZ	58	8	—	—	1,392
24	AA4SHL	51	9	—	—	1,368
25	K4WVT	40	10	—	—	1,200
26	EL2T	3	2	54	5	1,197
27	UA4HAL	59	5	—	—	885
28	UL7NW	35	7	—	—	735
29	W2HXF	29	8	—	—	696
30	HI8MOG	38	6	—	—	684
31	AA8VZO	28	8	—	—	672
32	YU1ELM	40	5	—	—	600
33	K4KQ	24	7	—	—	504
34	UK5QBE	33	5	—	—	495
35	UW9WB	27	6	—	—	468
36	UV9WF	22	6	—	—	396
37	LZ1AB	21	6	—	—	378
38	AC0MHK	23	5	—	—	345
	VP8ON	23	5	—	—	345
40	AP2AL	24	4	—	—	288
	UA3TN	24	4	—	—	288
42	UO5OWS	16	5	—	—	240
43	UK9FER	8	4	—	—	96

UK TRANSMITTING

Posn	Callsign	21MHz Contacts	21MHz Multipliers	28MHz Contacts	28MHz Multipliers	Points
1	G3MXJ	289	65	60	34	103,455
2	G3UML	342	63	46	26	103,240
3	G3OZF	307	63	55	31	101,990
4	G3FXB	315	58	36	25	87,316
5	G3NAS	276	67	29	21	79,992
6	G4CNY	286	54	23	15	63,894
7	GW4BLE	240	54	38	22	63,308
8	G4APL	245	51	32	21	59,760
9	G3SEM	199	40	18	13	34,503
10	G8MY	140	48	31	18	33,792
11	G2FUU	164	43	18	12	30,030
12	G3IAS	112	33	33	20	23,055
13	G4AFJ	93	42	31	18	22,320
14	G4BHE	107	39	23	17	21,840
15	G3KMI (operator G4DZC)	125	40	13	10	20,700
16	G3YJI	100	36	20	15	18,360
17	G3XBN	99	43	12	9	17,316
18	G3TOE	82	41	15	13	15,714
19	G4DUW	89	34	18	13	15,067
20	G4BWP	87	34	17	14	14,976
21	G3TTJ	87	31	17	14	14,040
22	GW4BIQ	132	35	—	—	13,860
23	GC3YIZ	103	20	21	17	13,764
24	G3RTU	100	34	8	6	12,920
25	G2QT	69	28	18	11	10,140
26	G2FNK	66	30	13	9	9,243
27	G3YMC	47	25	16	11	6,804
28	G3TMA	47	29	11	9	6,612
29	G4AZN	67	28	—	—	5,628
30	GM3PIP	52	28	—	—	4,368
31	G3DNQ	30	16	17	12	3,892
32	G3VPS	29	21	12	9	3,690
33	GW3XNS	43	20	1	1	2,772
34	GM4AWA	37	19	3	3	2,618
35	G4DDL	32	15	6	5	2,280
36	G4ALG/P	30	16	6	5	2,268
37	G4BTI	23	13	11	9	2,244
38	G4CHZ	38	19	—	—	2,166
39	G3ZDW	26	15	4	4	1,710
40	G8KU	30	16	—	—	1,426
41	G3MSB	20	14	4	4	1,296
42	GW3YFD	25	17	—	—	1,275
43	G3IRM/M	27	15	—	—	1,215
44	G2AJB	26	14	—	—	1,078
45	G4DBW	23	12	1	1	936
46	G3SWX	19	10	3	3	858

UK RECEIVING

Posn	Callsign	21MHz Contacts	21MHz Multipliers	28MHz Contacts	28MHz Multipliers	Points
1	BRS32525	223	59	46	25	67,284
2	BRS33823	88	44	30	19	22,239
3	BRS35943	97	50	13	11	19,764
4	A8547	95	37	20	15	17,264
5	A8713	79	39	17	14	15,211
6	BRS36940	64	35	18	14	11,858
7	A8312	57	31	7	5	6,876
8	BRS35191	57	29	7	6	6,720
9	BRS26407	58	25	9	7	6,432

OVERSEAS RECEIVING

Posn	Callsign	21MHz Contacts	21MHz Multipliers	28MHz Contacts	28MHz Multipliers	Points
1	DARC P34/151663 2	50	10	22	4	3,024

7MHz Contest 1976 results

The HF Contests Committee is pleased to see once again an increase in the number of logs submitted from the UK and Europe, but disappointed in the considerable reduction from overseas participants, particularly North America, as during the last contest a considerable number were contacted in that continent by leading stations. The changes in the rules this year appear to have been appreciated by well over 90 per cent of participants submitting logs.

Last year quite a number of contestants asked for details of the leading stations (which, incidentally, have changed very little during the past 12 months) so rather than repeat ourselves we thought a general survey of antennas used in each section would be of interest, and the results certainly surprised us in the number of large antenna systems being used.

Again we have included a list of the multipliers to enable participants to see what was worked when and by the leading contestants in the hope that the information will enable other people to increase

their scores in 1977. Antennas and receivers still seem to be the major performance factor (assuming operating techniques to be equal), but we feel it worthwhile mentioning that on 7MHz, even with modern expensive receivers, a step attenuator as described on page 4.22 of the *Radio Communication Handbook* can make the difference between losing and copying a rare multiplier. With certain receivers the effect can be dramatic.

The committee would once again like to thank the participants submitting logs for the many letters enclosed and regrets that it is not possible to reply individually in every case. However, thanks are appreciated and constructive comments are noted and will be considered when formulating the rules for next year. *FKM/HCT*

UK CW TRANSMITTING

Posn	Callsign	Points	Posn	Callsign	Points
1	GI3OQR	5,160	26	G3APN	1,325
2	G3LNS	5,065	27	G3AWR	1,315
3	G4BUE	4,055	28	G4CCQ	1,290
4	G3VMW/A	3,545		GM3PIP	1,290
5	G3XKR	3,405	30	G3SJE	1,270
6	G6CJ	3,210	31	G4FDC	1,255
7	GM3CFS	3,100	32	G3KMY	1,240
8	G3ORH	2,965	33	G3UFY	1,175
9	G3KLH	2,690	34	G2AJB	1,145
10	GW3KSQ	2,470	35	G2FNK	1,135
11	G4BXT	2,120	36	G4DBW	1,125
12	G3NKS	2,100	37	G4DUW	1,120
13	G3KSH	2,075	38	G4DDL	1,065
14	G3YMC	2,035	39	G3JZG	1,025
15	G3XWZ/P	2,015	40	G3ZDW	975
16	GI3JEX	1,965	41	G3ZZD	965
17	G3ESF	1,920	42	G3JKY/A	765
18	G4FAM	1,815	43	G8KU	750
19	G4DIX	1,805	44	G8DI	600
20	GM3OXC	1,765	45	G3SWX	575
21	GD4AM	1,700	46	G6GH	520
22	G4EOK	1,610	47	G4ETS	505
23	G3VDL	1,405	48	G4EBK	250
24	G3MWP	1,330	49	G3ZLR	175
	GM3ZXE	1,330			

UK SSB TRANSMITTING

Posn	Callsign	Points	Posn	Callsign	Points
1	GI3OQR	3,515	13	GM3PIP	915
2	G3NAS	2,605	14	G3UAS	890
3	G3NLY	2,320	15	G3YMC	745
4	G4ALG	1,615	16	G3MWP	695
5	G4BXT	1,510	17	G3SWX	675
6	G4DMN	1,415	18	G2FNK	645
7	G4FAM	1,405	19	G4DBW	480
8	G3SEM	1,365	20	G4ECY	455
9	G4CVC	1,340	21	G4EBK	450
10	G3KAA	1,010	22	GW3XNS	350
11	G4ACQ	1,000	23	GW3YFD	110
12	G3KSH	995			

REST OF WORLD CW TRANSMITTING

Posn	Callsign	Points	Posn	Callsign	Points
1	UA9WBY	1,450	7	PY1NEW	565
2	VK3MR	810	8	UA9VK	515
3	K4KQ	750	9	OX3RA	510
4	UA9CAL	665	10	VE1EP	500
5	UA9CFV	625	11	W1BV	430
6	UJ8JAS	570	12	ZL2AMP	180

REST OF WORLD SSB TRANSMITTING

Posn	Callsign	Points
1	UA9CBO	195
2	VK3MR	180

UK SSB RECEIVING

Posn	Station	Points
1	BRS32525	2,140
2	A8547	1,355
3	A8713	1,245
4	BRS15822	1,030
5	BRS28198	920
6	BRS20249	795
7	A9199	635

UK CW RECEIVING

Posn	Station	Points
1	BRS15822	2,010
2	BRS33923	1,050

EUROPE CW RECEIVING

Posn	Station	Points
1	OK326327	630
2	UP2-038-521	530
3	UA4-148-117	185

EUROPE SSB RECEIVING

Posn	Station	Points
1	DL3-A33-131090	1,280
2	SM3-5384	660
3	FE3060	370
4	UA6-096-11	280

REST OF WORLD CW RECEIVING

Posn	Station	Points
1	BCRS195	160

EUROPE CW TRANSMITTING

Posn	Callsign	Points	Posn	Callsign	Points	Posn	Callsign	Points	Posn	Callsign	Points	Posn	Callsign	Points
1	DK5LH	850	27	UB5ZBB	620	50	F6EEM	515		DL1OW	380	99	OZ1W	300
2	YU1PCF	840	28	DL1OM	605		OH5PT	515	75	PA0TA	380	100	UT5LF	290
3	HA0KLE	810		OH7NW	605	51	UA6AKK	505		UR2RWA	380	101	OZ4HW	285
4	F9KP	775		YU2QFK	600	52	F2VO	495	78	UR2RGH	370	102	DK6FG	280
5	UP2BAR	770	30	UB5NS	600	53	F6CXJ	490		HA5HN	365	103	UC2AW	270
	UK6LAZ	770		SM6EUZ	600		DJ6RX	490	79	OH1FM	365	104	DK1IN	265
7	SM5DHF	755		UP2PCW	595	55	OK2PAE	480		UK2BBF	365	105	EA2CR	260
8	UC2ABT	745	33	DF3QN	595	56	UA3IBR	465		UR2RAF	365	106	DK9TZ	255
9	DJ4AN	735		YU1BCD	595	57	DK4HD	460	83	LZ1NG	360	107	LZ2GS	250
10	DJ8IZ	710	36	SM5CIL	590	58	DK6MW	455	84	OZ1LO	355	108	UB5WAG	245
	DK9PB	710	37	F6EID	580	59	OK3CTB	450		UQ2GCN	355	109	OZ9OI	240
12	UB5WCJ	690	38	F3IM	560		OE1TKW	450	86	SM0BDS	345	110	HB9DX	225
	SM0GMG	690	39	I2BWW	555	61	UY5OW	445	87	UT5EH	340		UW4NP	225
14	LA8O	670	40	UP2BAO	545	62	OK3YCA	435	88	OK3EQ	335	112	OK3YCV	210
15	F6EBN	665		DJ0WJA	540	63	EA4BV	425	89	OK1DAM	325	113	UA3XAW	205
	DF4QW	665	41	DK8BI	540	64	DJ9NX	420		SP3IPB	320	114	UB5HCM	200
17	SP2HL	660		EA7TH	540		YU1SF	420	90	ON5WL	320	115	EA3ALV	195
	DJ6OZ	660	44	UW1YY	535		UQ2GGM	420		UB5QK	320	116	OK2BJU	190
	HA0LJ	660	45	UA3QAQ	525		UB5TAM	420		F6API	315	117	PA0WAC	180
20	DK9FE	640		DJ7LI	520	68	UB5QFB	410		LZ1KRA	315	118	OK3KFO	170
21	DK9LG	635	46	DJ5GW	520	69	F6EKR	405	93	OK2BBJ	315		I5BYL	170
	UB5FAP	635		UK2WAF	520	70	UT5AA	400		OH1AR	315	120	OK1KZ	155
23	OH2BN	630		DF5FD	520	71	YU2OBK	395		YO6EX	315	121	OH9TD	100
	ON4XG	630				72	UC2WAN	390		UA3AFL	315	122	LA4EU	25
25	OK1GO	625				73	OK1FCA	385	98	ON6OS	305			
	YU1NZW	625					UA4SM	385						

EUROPE SSB TRANSMITTING

Posn	Callsign	Points	Posn	Callsign	Points	Posn	Callsign	Points	Posn	Callsign	Points	Posn	Callsign	Points
1	F9KP	745	15	DK4II	385	29	YO6EX	285	43	UK2WAR	210	57	DL1YA	160
2	DJ6OZ	730		UV3FD	385	30	OZ3KE	275		UR2MO	210	58	LA4YF	150
3	I6BQI	660	17	UK2WAO	380	31	UC2WAS	270		UP2BAR	205	59	SM0BDS	145
4	HA7KLG	620	18	OZ4RP	370		DK5KJ	270	45	UR2QD	205	60	OK3YCA	140
5	SM4DHF	585	19	UA4HBW	360	33	UA2FBZ	265		OK2SPS	205		LZ1AB	140
6	DK9JJ	580	20	UP2OU	345	34	SP9FSH	250		LA2D	205	62	UA3AAU	125
7	DF1KT	575	21	HA0KLE	330	35	F6BVB	240	49	OZ4LX	190	63	UR2QI	120
8	I3BBZ	520	22	LA2YT	325		UQ2GCN	230	50	UK6LEZ	185		F6DRP	120
9	DJ6JD	510	23	DK1YU	320	36	DF2KD	230	51	OZ9OI	180	65	SP9ZAZ	110
10	DJ6ZJ	450		DL1OW	320		DF2RG	230	52	F8WE	175	66	OH7NW	105
11	I3REH	440	25	UA3QAQ	315		OH2EX	230		UR2RJ	175	67	F6DLM	85
12	I1EFC	420		OZ4HW	315		HB9DK	220		OE1TKW	165		OK1KZ	85
13	DK8AX	415	27	DK8KC	305	40	OZ8ZB	220	54	UY5DP	165	69	OK1KOK	80
14	F3IM	390	28	DJ0TP	290		F6ELM	220		OZ2YC	165	70	OH3XZ	65

ANTENNA CW SECTION

UK: (4) 3-el, (3) 2-el, (12) dipoles, (6) inverted-V, (1) 3/2, (10) lw, (1) 3/8 vertical, (19) gp, (1) delta, (4) 5RV.
Europe: (1) 3-el, (5) 2-el, (4) 2-el quad, (2) double ext zepp, (16) dipoles, (14) gp, (2) Windom, (1) V-beam, (14) lw, (8) inverted-V, (5) delta, (1) T2FD, (1) 5RV, (1) DL7AB, (15) W3DZZ.
Rest of world: (1) 2-el, (1) 2-el quad, (1) rhombic, (1) dipole, (2) inverted-V, (3) gp, (1) delta, (1) 5/8 vertical.

PREFIXES WORKED (Times in gmt)

1200: SP, DK, ON4, YO, F, SM, OE, OH, HA, LA, UB5. **1300:** UA, UC2, PA0. **1400:** I, DM. **1500:** OZ, UL7, UA9, UP2, LZ. **1600:** JA, EA, UR2, UQ2, LX, UJ8. **1700:** VK3, ZL1, OK. **1800:** OX, W2. **1900:** YO. **2000:** UF6, W1, VE1, W4. **2100:** W8, VE3, PY1, W0, VO. **2200:** IS0, W9, CM, W5, VE, W9, W1, W2, W4, CO. **2300:** YV, CX, VU, W4, VE3, W1, W8, W5, W1, VE2, VP2V, YV. **0000:** EP, 5T5, VE3, W9, W8, W3, W4, W2, W5, VE1. **0100:** CT1, W2, FG7, W4, W6, W8, PY, W5. **0200:** ZS2, LU, W2, CO, PY. **0300:** T1, CO, YS. **0400:** HC, VP2S, YS, PY, ZL2, HK4. **0500:** ZL2, FS7. **0600:** UO5, VK3. **0700:** VK3, JA. **0800:** W6, VP9, W7, VK5, VK4, JA, ZL3, W5, W4. **0900:** VK6. **1000:** W3.

Check logs: VE3KZ, UB5KAK, UR2EGM, UA4YAU, UA3HK, UK6LDN, UA3TCI, UA3LM, SM5AGI, LA3UG, DK5HH, LZ1WZ, G3DYY, G3FAS, DL8YT, DK9NH, G3MWZ, G2AJB, DM3BE, DM5IG, DM2GDL.

January 1977 70MHz CW Contest results

There was almost universal approval for this contest, and in spite of very poor conditions the entry of 31 stations indicates the level of interest. Good dx QSOs were made but the poor conditions resulted in GM participants having a very disappointing contest. For many stations the most northerly contact was G3JYP, who can be guaranteed to participate in 70MHz cw events.

A checklog from G6HD pointed out an error in the general rules for vhf contests regarding the lower end of the 70MHz band. It is in fact 70·025MHz and not 70·05MHz.

The winner will be awarded a certificate. *G3FZL*

Posn	Callsign	Points	QSOs	Best dx	Km
1	G3OHH	281	39	G3DAH	295
2	G3WRA	244	37	G3JYP	—
3	G4AEQ	238	35	G3WKF/P	380
4	G3UKV/P	230	34	G3WKF/P	280
5	G3JYP	178	19	G3JEQ	395
6	G5RP	162	36	G3JYP	370
7	G3JEQ	159	43	G3JYP	383
8	G3LVP	134	35	G3OHH	255
9	G3FJE/A	131	36	G4AEQ	210
10	G4BBA	123	26	G3OZT	202
11	G3NPI	121	36	G3JYP	330
12	G3FIJ	119	23	G4AEQ	285
13	G3TCU	111	37	G4AEQ	275
14	G3MXH	108	26	G4AEQ	274
15	G3SFG/A	103	33	G4AEQ	260
16	G5HD	104	20	G3OHH	257
17	G3ZRF	101	26	G4AEQ	—
18	G5UM	100	24	G3JYP	223
19	G3LXP	99	32	G3OHH	195
	G3JEI	99	17	G3WKF/P	—
21	G8GP	96	30	G4AEQ	275
22	G3BTO	82	28	G4BBA	160
23	G3RQZ	71	27	G3OHH	220
24	G3WKF/P	69	8	G4AEQ	320
25	G3TCT	70	24	G4AEQ	266
26	G3XWZ	58	12	GM4CXP	260
27	G3KSU	57	17	G3OHH	274
28	G3VPS/M	56	18	G3XBY	170
29	G3UES/A	51	25	G3OHH	230
30	GM4CXP	31	5	G8KB	240
31	G3RAF	10	4	G3WKF/P	—

1976 Listeners VHF/UHF Championship

This year's winner has deserved the trophy; he took part in four contests and finished up with a commanding lead. It is possible on rare occasions to win the championship by having a large score from one contest, but it is by no means certain that this will always happen. Equipment was very similar so no advantage was gained in this respect. The winner of this year's event was Ron Thomas, BRS15822; and Brian Dubbins, BRS35974, will receive a certificate as runner-up. *G4CUT*

Posn	Score	Station	Posn	Score	Station
1	1,663	BRS15822	10	396	A8713
2	937	BRS35974	11	360	A8932
3	916	A8677	12	314	A8163
4	624	BRS31038	13	275	A8597
5	573	BRS36843	14	220	A8927
6	566	A9199	15	199	BRS28198
7	551	BRS36940	16	139	A8088
8	511	BRS28005	17	116	A8859
9	426	A9183			

SSB Field Day 1977 rules

Entrants should note that the scoring system has been amended.

1. The general rules for RSGB hf contests, published in the January 1977 issue of *Radio Communication*, will apply.
2. When. From 1500gmt Saturday 3 September to 1500gmt Sunday 4 September 1977.
3. Eligible entrants. Any group of RSGB members resident in the prefix zones G, GU, GJ, GD, GI, GM and GW. This is a multi-operator contest (see general rule 5b).
4. Stations. Each group must operate one portable station only.
5. Contacts. SSB only in the 3·5, 7, 14, 21 and 28MHz bands.
6. Scoring. Each completed contact with Europe scores five points, outside Europe 15 points. The total number of points on each band is added together and multiplied by the *total number of countries* worked. The same station may be worked on each band. The total number of countries worked is the sum total of countries worked on each band.
7. Logs. Separate logs for each band are required, together with a check list showing the countries worked on each band.
8. Entries. To be sent to RSGB HF Contests Committee, c/o J. Bazley, G3HCT, Brooklands, Ullenhall, Solihull, West Midlands B95 5NW.
9. Awards. Certificates will be awarded to the three highest scoring groups, and also to the leading check log from each continent.
10. Entries from mobile stations defined in general rule 4c will be welcomed.

Queen's Jubilee Contest rules

TRANSMITTING SECTION

1. The general rules for RSGB hf contests, published in the January 1977 issue of *Radio Communication*, will apply.
2. Eligible entrants. All paid-up members of the RSGB resident in the British Isles (G, GU, GJ, GD, GM and GW) holding a Class A licence. Single-operator entries only may enter. Operation must take place from the home address shown on the entrant's licence, and must not be from a station belonging to a club, college, company or other organization. Callsigns issued to club stations, colleges, companies etc, may not be used.
3. When. Telephony contest: 0600gmt 22 May to 1800gmt 22 May 1977.
CW contest: 0600gmt 1 May to 1800gmt 1 May 1977.
4. Contacts. 1 May: cw (A1) only. 22 May: Telephony.
IARU Region 1 band plan must be observed.
Bands: 3·5MHz and 7MHz. Entrants are requested on 3·5MHz to confine their operation to: CW (A1)—3·510-3·590. Telephony—3·600-3·750.
Reports, RS or RST and serial numbers must be exchanged. The serial number may start anywhere between 001 and 500 and must then continue consecutively followed by R and the operator's RSGB region, eg R07 on cw or Region 7 on telephony.
5. Scoring. Three points for each completed contact with a station within the British Isles (G, GU, GJ, GD, GI, GM and GW). Each station may be contacted for points once only on each band. The final score is the total points on each band added together and then multiplied by the total number of RSGB regions contacted. (An RSGB region worked on each band therefore counts as a multiplier of two.)
6. Entries. (a) Each entrant must make at least 30 contacts. (b) Separate log sheets must be used for each band, with the score for each band clearly shown. A cover sheet with the combined score and a signed declaration must accompany the logs, which must be sent to RSGB HF Contests Committee, c/o Dr E. J. Allaway, 10 Knightlow Road, Birmingham B17 8QB. Comments and photographs suitable for publication are invited.
7. Awards. The winner in each section will be awarded a special certificate and plaque. The top 50 per cent of entrants will receive a Jubilee certificate.

RECEIVING SECTION

1. The general rules for RSGB hf receiving contests, published in the January 1977 issue of *Radio Communication*, will apply.
2. When. As transmitting section.
3. Operation. As transmitting section.
4. Logging. A station may only be logged once in the column headed "Station heard" and not more than 10 times in the column headed "Station worked" on each band. Where both sides of a

Members of the Shefford & DRS, taken after the 144MHz Open Contest on 6 March 1977. Standing (l to r): G8NBZ, son of G3WKR, G3EUS, Maureen (xyl of G8MHH), G3WKR, G8MHH, Robin, G4DNI, G8KHI, G4BWU, Lynne (yl of G4DAQ), G4DAQ, G3TVG, G8CTB and G4EIY. Seated: G4EYR, G8MXF, G4BWP, G4DRS, G8EKU and G8HHO. Using an FT200/Europa B over 400 reports were sent in 24h via a pair of 8el Yagis at 35ft. The site, in ZM79c, is at 250ft asl. (Photo: G5BQR)

contact are heard, claim for points may be made for one station only, not both.

5. Scoring. Three points for each contact heard. Other details as transmitting section.

6. Awards. The winner of each section will receive a certificate and plaque. The top 50 per cent of entrants will receive a Jubilee certificate.

7. Entrants must operate from their home address, and not from a club or other special station.

144MHz CW Contest rules

0900-1700gmt 24 April 1977

All entries and check logs to: VHF Contests Committee, c/o Mr G. M. C. Stone, G3FZL, 11 Liphook Crescent, Forest Hill, London SE23 3BN.

The following general rules, published in the January 1977 issue of *Radio Communication*, will apply: 1, 2, 3, 4a, 5a, 6b, 7a, 8, 9a, 10a, 11-22.

1·3GHz Open Contest rules

1700-2400gmt 14 May

All entries and check logs to: VHF Contests Committee, c/o Mr R. Taylor, G4BEL, 12 The Rampart, Haddenham, Cambs.

The following general rules, published in the January 1977 issue of *Radio Communication*, will apply: 1, 2, 3, 4a, 5a, 6a, 7b, 8, 9b, 10a, 11-22.

432MHz Open and Listeners Contests rules

0900-1700gmt 15 May

All entries and check logs to: VHF Contests Committee, c/o Mr F. Mathews, G8ACJ, Easedale, Woodway, Merrow, Guildford, Surrey GU1 2TF.

Open contest. The following general rules, published in the January 1977 issue of *Radio Communication*, will apply: 1, 2, 3, 4a, 5a, 6a, 7a, 8, 9a, 10a, 11-22. The 1951 Council Cup will be awarded to the leading station.

Listeners contest. The general rules for vhf/uhf listeners contests, published in the January 1977 issue of *Radio Communication*, will apply.

IARU Region 1 144/432/1,296MHz Open Contest rules, 7-8 May

It is an IARU Region 1 agreement that all member societies will arrange or participate in vhf/uhf/shf 24h contests on the first weekends of March, May, July, and September (144MHz only). This year however, the RSGB has not organized a contest during the first weekend of May as this would clash with its International Radio Communication Exhibition and Convention, its date being determined by the availability of Alexandra Palace. However, the non-participation of UK operators during this weekend will affect our European neighbours. Consequently, the VHF Manager of VERON, Henk van Amersfoort, PA0HVA, has asked the RSGB to organize some participation and has offered to check logs if required. UK operators are therefore urged to operate on the 144, 432 or 1,296MHz bands during the period 1600-1600gmt on 7-8 May and to submit check logs to the RSGB vhf manager based upon the following general rules, published in the January 1977 issue of *Radio Communication*: 1, 2, 3, 4a, 5a, 6a, 7b, 8, 9a, 10a, 11b plus QTH locator, 12-21.

All check logs to: D. A. Evans, G3OUF, "Westerleigh", Chestnut Close, Amersham, Bucks HP6 6EQ, postmarked not later than 23 May. Separate check logs should be submitted for each band and if enough are received a list will be published in *Radio Communication*.

1977 RSGB Direction Finding Contests

The full programme of eight qualifying events is published in "Contests calendar" and competitors' attention is drawn to minor changes to the rules which are distributed before the start of each event. Details of the first two events are given below.

DF Qualifying Event High Wycombe

Date: 1 May 1977.
Map: OS Sheet 175 Reading and Windsor.
Assembly: 1300bst for start at 1320bst.
Location: Car park on NW side of Pinkneys Drive off the A423(T) road, Maidenhead Thicket, NGR 854815.

Intending competitors requiring tea are asked to notify Mr T. C. Gage, 28 Aldbourne Road, Burnham, Bucks (tel 06286 63363), not later than 24 April.

DF Qualifying Event Dartford Heath

Date: 15 May 1977.
Map: OS Sheet 177 East London.
Assembly: 1300bst for start at 1320bst.
Location: Denton Road, North side of A2 adjacent to footbridge, Dartford Heath, NGR 513733.

Intending competitors requiring tea are asked to notify Mr P. G. Wells, 25 St David's Road, Hextable, Swanley, Kent (tel 0322 62726), not later than 7 May.

Grafton Radio Society Top Band Contests

Phone: a.m. 16 April, ssb 30 April, cw 23 April

The rules are similar to those for last year's contest.

Logs, postmarked not later than 25 May, to G8JGE, QTHR, from whom further details may be obtained by sending an sae.

In last year's contest, certificate winners were: G3ZYY (overall), G4BWP (a.m.), OK1DKW (leading overseas), and OL5AT2 (leading OL).

Verulam ARC 1976 Contests results

In the 144MHz contest, G3VRE/P won the transmitting section, and BRS34740 the receiving section. In the 1·8MHz contest, G3YMC came first in the transmitting section, and A8312 in the receiving section.

Contests calendar

16-17 April	Bermuda AR Contest (phone/cw)
17 April	Low Power (Rules in February issue)
24 April	144MHz CW (Rules in this issue)
1 May	Queen's Jubilee CW (Rules in this issue)
1 May	DF Qualifying Event High Wycombe (Details in April issue)
7-8 May	IARU Region 1 144/432/1,296MHz Open (Rules in April issue)
14 May	1·3GHz Open (Rules in April issue)
15 May	432MHz Open (trophy) and SWL (Rules in April issue
15 May	DF Qualifying Event Dartford Heath (Details in April issue)
22 May	Queen's Jubilee Phone (Rules in April issue)
22 May	10GHz Cumulative
28-29 May	144MHz Portable
29 May	DF Qualifying Event Medway
11-12 June	HF NFD (Rules in February issue)
18-19 June	Microwave (3·4-24GHz)
19 June	DF Qualifying Event Rugby & Coventry
19 June	10GHz Cumulative
25-26 June	Summer 1·8MHz
2-3 July	VHF NFD and SWL
10 July	DF Qualifying Event Salisbury
17 July	3·5MHz FD
17 July	10GHz Cumulative
24 July	DF Qualifying Event Stratford
31 July	144MHz QRP
7 August	DF Qualifying Event Chelmsford
13-14 August	70MHz Open (trophy) and SWL
14 August	RSGB Region 1 VHF
21 August	DF Qualifying Event Slade (Birmingham)
21 August	10GHz Cumulative
3-4 September	SSB FD (Rules in April issue)
3-4 September	144MHz Open (trophy) and SWL
18 September	DF Final South Manchester
18 September	10GHz Cumulative
1-2 October	UHF Contest (432MHz-2·3GHz)
8-9 October	21/28MHz
15-16 October	7MHz Phone
23 October	70MHz Fixed
October-November	432MHz Cumulative
5-6 November	7MHz CW
5-6 November	144MHz CW
12-13 November	2nd 1·8MHz
4 December	144MHz Fixed

Mobile rallies calendar

17 April	North Midlands Mobile Rally, Drayton Manor Park, nr Tamworth, Staffs. Trade stands, competitions, talk-in stations on 2m, 70cm and 160m. Details from G8DEM, G3ZKQ or G8BHE.
1 May	Spalding Tulip-time Rally, Gleed Boys School, Halmer Gardens, Spalding. The picnic site at Surfleet (on the A16 four miles north of Spalding) will be available for overnight camping and caravan parking for visitors arriving on Friday or Saturday. Trade stands, open-air displays, bring and buy stall. Talk-in station G4DSP on S0 and S20 from 10am. Details from G3VPR, QTHR.
22 May	Welsh Mobile Rally, Barry Rugby Football Ground, Merthyr Dyfan Road, Barry, South Glamorgan. Trade stands, raffles, talk-in by GW3VKL on 2m, S20 and via GB3BC on R6. Details from GW2DPD.
22 May	Northern Mobile Rally, Victoria Park Hall, Keighley.
29 May	Hull & D ARS Rally. Details and venue later. Full details from G3LZQ, 73 West Hall Garth, South Cave, Brough, Humberside HU15 2HA.
29 May	East Suffolk Wireless Revival, Civil Service Sports Ground, Bucklesham Road (four miles SE of Ipswich, near A45). Demonstrations, home constructors' competition, vhf/uhf antenna gain testing, df hunt, drive-in test facility for mobiles, trade stands. Talk-in on R3, S22, SU8, 144·28, 70·28. Details from G3XDY, QTHR.
29 May	Southend & D RS Mobile Rally, FitzWimarc School, Hockley Road, Rayleigh, Essex. Details from M. Daniels, 25 Sweyne Avenue, Southend, Essex SS2 6JQ.
5 June	Maidstone Mobile Rally, "Y" Sportscentre. Details from G3WXL, QTHR, or Maidstone (0622) 890031.
12 June	Longleat Radio Rally, Longleat House, Longleat, nr Warminster, Wilts. This year the rally will take place in conjunction with the Silver Jubilee events at Longleat House, where the band of the Royal Signals and the Royal Marines Reserve Unarmed Combat Display Team will be in attendance. The band of the Royal Signals will "beat retreat" on the forecourt of Longleat House at 6pm. The President of the RSGB, Lord Wallace of Coslany, will be present. Talk-in stations will be operational on 160, 80 and 2m (callsigns to be announced). As well as trade stands there will be a grand raffle, RSGB bookstall and a bring and buy stand. Overnight camping is permitted from 6pm on Saturday 11 June. No charge is made for entrance to the rally, but visitors must pay for entrance to Longleat Park. Details from G3ULJ, QTHR.
12 June	Elvaston Castle Rally, near Derby. Further details from P. Neal, G3WFU.
19 June	Royal Naval ARS Mobile Rally, HMS *Mercury*. Organizer: M. Puttick, G3LIK, 21 Sandyfield Crescent, Cowplain, Portsmouth, Hants PO8 8SQ.
10 July	Upton Radio Rally, Hill High School, Upton-on-Severn. Details from G8ASO.
16 July	Hornsea ARS Mobile Rally, Hornsea School and Hall Garth Park, Hornsea, N Humberside. Held in association with Hornsea Carnival. Details from G4CHH, QTHR.
17 July	Cornish RAC Mobile Rally, Truro Rugby Club Ground. Details from G3NKE, QTHR.
7 August	**RSGB National Mobile Rally, Woburn Abbey** (This rally has been reinstated)
14 August	Derby Mobile Rally. Lower Bemrose School (Rykneld School). Details from G3FGY, QTHR.
14 August	Pembroke RSGBG Bucket and Spade Party, Regency Hall, Saundersfoot. Details from GW3XJQ.
21 August	Preston ARS Mobile Rally, Walton le Dale County Secondary School, Bamber Bridge, Preston (one mile from junction 29 on the M6). Talk-in on 2m. Trade stands, raffle, bring and buy stall, plenty of parking space. Doors open at 11.30am. Details from G8KTM, QTHR.
28 August	Torbay ARS Mobile Rally, Haldon Racecourse, nr Exeter. Details from G3UIQ, QTHR.
18 September	Peterborough Mobile Rally, Walton Secondary School, Mountsteven Avenue, Peterborough. Talk-in station G3DQW on 2m. Details from G3EEL, QTHR, tel Peterborough 62881/65423.
25 September	Harlow & D ARS Rally, Netteswell Comprehensive School, Harlow. Details from G3WUX, G8FRG, G3YDI, QTHR.

Looking ahead

24 April—NRSA Convention, Belle Vue, Manchester.
6-8 May—RSGB International Radio Communication Exhibition and Convention, Alexandra Palace, London.
10 September—Scottish Amateur Radio Convention, Adam Smith Centre, Kirkcaldy.
17-18 September—NW Amateur Radio Convention, University of Lancaster.
15-16 October—Jamboree on the Air.
27-29 October—ARRA Exhibition, Granby Halls, Leicester.

members' ads

These subsidized flat-rate advertisements are accepted as a service to members of RSGB. They must be submitted on the Members' Ads order form printed in alternate issues of *Radio Communication*, or on a postcard similarly laid out. Each **must** be accompanied by a **recent** *Radio Communication* wrapper addressed to the advertiser, as proof of membership, and a remittance by postal order or cheque for 50p (stamps not accepted). They will not be acknowledged. Those not clearly worded or punctuated will be returned. No correspondence concerning this service can be entered into.

The closing date for each issue is the 1st of the preceding month, but no guarantee of inclusion in a specific issue can be given. Valid advertisements not published in the issue following receipt will be held over until the next issue.

Trade or business advertisements, even from members, will not be accepted for Members' Ads but should be submitted as classified or display advertisements in the usual way. Traders who are members must enclose a signed declaration that the items for sale or wanted are part of, or intended for, their own personal amateur station.

The RSGB reserves the right to refuse advertisements, and accepts no responsibility for errors or omissions or for the quality of goods offered for sale. Advertisements may be edited or abbreviated as necessary.

Post to: MEMBERS' ADS, "RADIO COMMUNICATION", 35 DOUGHTY STREET, LONDON WC1N 2AE.

FOR SALE

Pye base a.m. tx, 145·8 xtal, £20. 3in Cossor scope, model 1039M, £5. Buyer collects. G3PIX, QTHR.

FT200, FP200, mint cond but has intermittent fault hence low price, £190. FT2FB, 145, S20 to S23 and R5, £99. S20 walkie-talkie, converted GEC Courier, £15. G4AWL, QTHR.

Belco ARF-100 wideband sig gen, rf section 100kHz–300MHz, audio section 20–200,000Hz sine wave, 20–30,000Hz square wave, perf cond, with handbook, £35. *Wanted:* Bases and anode caps for 813s. G3WLX, QTHR. Tel 084 46 643.

Woden modulation transformers, three UM1 and one UM3, no reasonable offer refused, prefer buyer collects. G8AMU, QTHR. Tel Reigate 46622 evenings after 7pm.

Pocketphones, 433·2, nicads, leather cases, £25. R107, £5. Stereo teleton reel to reel plus tapes, £25. Car cassette player, £5. Sedic pocket camera with autoflash, £20. All wkg well but cheap to clear. G4CKN, QTHR. Tel 01-790 3123.

R1475 rx, plus 12/240V psu, not wkg 12-20MHz, £10. Codar PR30X preselector, £7. Ranger 2m, £10. KW Valiant tx for spares, £2. Psu, various lt/ht dc/ac outputs (heavy), £10. All ono. Carr extra or collect. Harding, G3YHG, 31 Shepherds Hill, Reading.

Property of the late G3YZC. KW2000A, £180. Power meter and swr, £10. Dummy load, £5. Lpf, £5. KW E-zee match, £5. Buyer to collect. Tel Hythe 843438.

Heath HR10B amateur bands rx, with xtal calibrator, £55 ono. Pye Pocketfones, xtalled and wkg 433·2, £25. Teleton STC106 stereo cassette deck, £15 ono. GM4FBD/GM8HWK, QTHR. Tel 031-667 2504.

100W modulator PPKT88, with power pack, £25. Heathkit SW717 rx, £25. RAE postal course, £20. *Wanted:* fm tx/rx, h/b considered. G8MVN, QTHR. Tel Newbury 41613.

CR100, good wkg order, comp with manual and spare valves, £15. Buyer collects. Brown, 1 Perryn House, Bromyard Avenue, Acton, London W3. Tel 01-749 0322.

Icom IC22A, fitted 10ch, one month old, £140 ono. G3ZKJ, 55 Priest Avenue, Canterbury, Kent.

Keyer ETM3C, perf cond, £50 ono. Lockwood, G3XLL. Tel Mellis 596 evenings/weekends.

Jaybeam 4Y/8, £7. MBM48, £9. 23cm quad loop, £11. 888A, £50. Filter, XF9B plus usb xtal, £15. H/B 23cm ssb transverter, £40. Wharfdale Super-10, £10. 2-off 630N Marston heatsink, £3.50 each. 2–6ft diameter solid aluminium dishes, offers. 600V, 250V, 300mA invertor, £12. 8008 microprocessor cpu board, offers. G3WOS, QTHR. Tel Rugby 890517 weekends.

Recording tape, ¼in wide, suitable video or audio, easily split by razor blade into ¼in, approx 2,400ft on 9½in reel in plastic case, £1.55 inc p&p. Approx 2,000ft on 7in video reel, ¼in centre hole, £3 inc p&p. G3AZI, QTHR.

HW30 2m tx/rx, xtal, mic, manual, exc cond, £25 ono. G8LXW. Tel Peterborough 55571.

Impoverished radio club must sell surplus gear. Rxs—AR77E gen cov plus amateur bandspread, wkg. Pye uhf base station rx. Amplifier. Twin blower. Breakdown tx with wide spaced variable capacitor, offers. G8JBH, 63 The Drive, Edgware, Middlesex HA8 8PS. Tel 01-958 5113.

Heathkit SB300 rx, 80–10m, a.m./ssb/cw, good cond, £70 ono. G4DJJ, QTHR. Tel 0602 263834.

QM70 solid state transverter, comp with wires and plugs for Yaesu tx/rx, manual, relays in separate case, £35. G8JTK, QTHR.

Shack clearance. High and low band mobile and base a.m./fm tx/rxs, ideal for 2 and 4m, from £8. 2m/70cm txs, a.m./fm/cw, from £20. 2m converters from £6. HF rxs from £10. Many components. Elliott, G4ERX. Tel Brentwood 225736.

Immac JR599CS rx, matching spkr, £140 ono. C146A tx/rx, fitted S0, 20, 22, R6, R6 i/p receive, helical and ¼ wave, carrying case, £85 ono. Clunk-click rotator and 8XY, £40 ono. G8JFD. Tel Leicester 782225 evening, 707111 day.

Raytheon CSB-15 lsb/usb/cw tx/rx, 2–10MHz, 15W p.e.p., manpack /M equipment, loaded whip, nicad packs, charger, rucksack, manual, 4ch operation, set up for 80, 40m, £99 ono. G3ZOX, QTHR. Tel 0272 835602.

FT200, inc ac power pack, spkr, as new, little used, boxed, £200. G3GMN, QTHR. Tel Gloucester 31365.

Microwave Modules 144MHz transverter, type MMT144/28, brand new and unused, £78. G4CGV, QTHR. Tel Littlehampton 6161 ext 55.

Creed 75 teleprinter, with manual, £20. Microwave Modules 2m converter, 28/30MHz i.f., £12 or exchange 70cm converter. G4FDR. Tel Albrighton 3793.

Racal ssb unit for RA117 rx, comp with xtals, £25. Redifon GR410 tx/rx, mod for 80, 40, 20m, 100W p.e.p. with matching vfo and Redifon 12V dc psu, ideal mobile, £65. Eddystone EC10, immac, £40. G3ZDB, QTHR. Tel Epsom 24814 evenings.

Trio JR310, narrow 10AZ (extra) mech filter and 29·6, exc cond, revalved, looks as new, not regulated as now interest bc bands only, £90 ono. Bennett, 1 Whitehaven Road, Bramhall, Stockport, Cheshire. Tel 061-439 1346.

Yaesu FR50B, vgc, cov 80–10m with WWV and a 100kHz xtal calibrator, £75 ono. Emac 2m converter, 28–30MHz i.f. with mains power supply, £8. *Wanted:* FRDX400 rx, must have cov of 2m. P. Allen, 21 Woodlands Drive, Ruishton, nr Taunton, Somerset TA3 5JU. Tel Henlade 442602.

Sphinx ssb tx, 70W p.e.p., 160, 80, 20m, and Delta AE changeover ptt unit, both in exc cond, £40 ono inc carr, or £38 buyer collects. GW8HKY, QTHR. Tel Carmarthen 6016 after 6.30pm.

IC22A, exc cond, only few months use, £145 ono. SSM 2m Europa with cable for FT101, £60. GM6XW, QTHR. Tel Larbert 2604.

Mini Products C4 vertical antenna, 10–15–20, brand new, £30. 4m gear, must clear shack, 4·0MHz i.f. Nuvistor converter, Pye base tx, Pye Handi-Ranger mobile tx/rx, £25 the lot. 2m tx, no psu, £10. G3TQY, QTHR. Tel 0403 752933.

Trio TS510D PS510, vgc, with cw filter, blower, fan, original packing, £175. Heath HM102 power/swr meter, as new, £22. Hamgear PM2 preselector, £5. Cadenza ribbon mic in case, £8. MM 2m converter, 28–30MHz, £12. G3UCE, QTHR. Tel Heysham 51760.

Yaesu FT101EE tx/rx, with speech processor and FV101B external vfo, only three months old, offers. G3NKW, QTHR. Tel 061-962 1758.

TS700, fitted preamp, reverse repeater, auto toneburst, tailored fm audio, £285. IC22A, 15ch, £140. Regulated psu, 4–15V, 10A, manual, £25. G3UGK. Tel 0582 600358.

IC22A, 13ch, R2–R8, S0–S24, xtal toneburst, 55s timeout indication, £160 ovno or exchange for IC215. TTC transistor checker, mint cond, £6.50. G8LZP, 9 Dinas Road, Cheltenham, Glos. Tel 0242 53368 after 5pm.

FRDX400, £150. FLDX400, £150. Spkr, £10. 18AVT, £25. E-zee match, £15. Heathkit HM102 swr/power meter, £15. Lpf, £5. Balun, 6:1, £5. Heathkit scope, 0-12-U, £20. Converter 70cm/28, £15. Converter, 70cm/144, £15. Tripler, £18. TS700, £300. GM4BNZ, QTHR. Tel Johnstone 22769.

TCS rx, £15. BC348 miniature valve front end, manual, £15. Pye base rx, suitable 4m, £5. Sig gen, 0·15–28MHz, modulated, audio o/p, £5. HRO, mod, faulty but comp, £7.50. Coils, 3·5–7·3MHz, 10m bandspread, 0·48–0·96, 0·9–2·05MHz, 180–430kHz, £2.50 each. G3VHX, QTHR.

Decca radio, mains and battery, three wavebands, pocket battery calculator in case, both may require attn, price for both, £18. W. H. Smart, 33 Parkfield Road, Willesden, London NW10.

IC22A, 11ch, £135. 6ch hiband dash Cambridge on S20, £35. Coaxial relays, 951–170–12, ok to 1·3GHz, £3.10. PT4176D transistors, £1.70. Lowband fm dash Westminster, £45. 70cm varactor tripler, £12. 38·666 converter xtal, £1.50. G4EVZ, QTHR. Tel Romford 45733.

RAE National Radio School manuals, £32 post free. Tel 0232 658001 (Belfast).

Eddystone 940 gen cov rx, good cond, £105 inc Securicor delivery. 2m QM70 solid state linear amp, fm/ssb/a.m./cw, £30. G3MWV, QTHR. Tel Cromer 2872 evenings.

SSTV sampler unit, DJ6HP design, regulated psu, converts fast-scan video to sstv signal, £12 post paid. Labgear uhf tv antenna, masthead, preamp, £1.50. Liner 2 with regulated psu, offers. *Wanted:* Hand-held fm tx/rx. G8CGK, QTHR.

Heathkit SB401, with xtal pack. SB303, all filters. Spare tubes, relays. SB600. Will exchange for commercial linear with cash adjustment or sell, £375 the lot. Will divide or haggle. G2DVA, QTHR. Tel Frodsham 33407.

4CX250B, with base chimney and cooling fan, £5 inc carr. *Wanted:* Codar AT5 tx with ac psu in good cond/appearance. GI3GTR, QTHR. Tel Holywood 3890.

Trio R300 rx, five months old, £140 or swop for good amateur bands rx, value approx £50, with cash adjustment, 9R59DS, AR88, EC10, JR310 etc, considered. 39 West Beech Avenue, Wickford, Essex. Tel Wickford 4317 evenings.

Yaesu FTDX560(400), with matching spkr, mic and dual meter, all with boxes, manuals and virtually unused (only three QSOs), £260. G3ZYB, QTHR. Tel 0323 28495.

Liner 2, 144·1–144·33 and for Oscar 145·67–146, exc rx, mic, mobile mount, manual, £120. G4CDN, QTHR. Tel 0692 80439.

Xtals, FT241 500kHz, 666kHz, FT243 5,650 every 25kHz to 8,650, 7,106·66, 7,506·66, 8,006·66, 8,040, 8,106·66 HC6U 10,660, 10,675, 10,685, 10,695, 10,705, 10,725, 10,740, 10,790, 15,300, HC18U 10,245, 11,155, overtone 33·425, 38·33, 69·900, £1 each. G3LHA, QTHR. Tel 0203 414333.

KW204 tx, with vox unit. U10B Cambridge with xtals for 433·2, remote control unit and all cabling. G3WMU, QTHR. Tel Brighton 688105 day, 65704 evening.

BC221, charts, handbook, stabilizer, psu, £20. 16V *Bulletin/RadCom,* July 61 (Vol 37) to Dec 76 (Vol 52), £10. Z match atu, h/b, top quality, comp cabinet, 10–160m, £5. Eddystone 3Ω spkr, diecast case, £3. Buyers collect or pay carr. G3RWY, QTHR.

Genuine sale. FT101EX and t/band, purchased Dec '76, never on air, mint, boxed, £399 or offer. Lowe 1420C 2m fm Monitor, S0, S20, S22, R5, R7, 144·48, little used, £15. Manual for FT2 Auto, £1. G8KOP, QTHR. Tel 01-349 1122 days, 01-200 0466 evenings/weekends.

IC210 2m vfo-controlled tx/rx, and EC10 Mk2, both in mint cond. Tel 01-486 4376 after 7pm.

Storno Viscount hybrid mobile fm tx/rx, >10W on 2m, 40673 rf amp, 4ch shift unit, seven xtals fitted, R7, S20, S22, and R R7 rx, control box, mic, circuit diagrams, £45 ono, carr inc. J. L. Bone, G8KKJ, Dormers, Frittenden, Cranbrook, Kent TN17 2DB.

Heathkit SB634 kit, £100. GR54 rx, £15. HF tx/rx xtals and filters, ssb, just a few. GR110 vhf rx, £50. DX40 and vfo, £20. Hustler whip 15/20/80, £30. Creed 7RP/E and perforator, £25. Wind up tilt over lattice tower and base, 40ft, £70. Adana hand printing press, £20. All ono, buyers collect. G4BZU, QTHR. Tel Cheltenham 26530.

Drake 2B, 2BQ, £90. Samson ETM-4M, similar to ETM-3, but with 512 bit memory, new and unused, £50. *Wanted:* Original FYO keying paddle. Coull, Domel, Elham, Kent. Tel Elham 244 evenings.

Koyo 1770 mains/battery a.m./fm rx, 150–350kHz, 540–1,605kHz, 1·6–4, 4–8, 8–12, 12–18, 18–30, 76–86, 88–108, 108–136, 148–172MHz, BFO S-meter, can deliver Cheltenham, Bournemouth, Basingstoke areas, £45. G8CEZ, QTHR.

Xtals for standards and ladder filter experiments, 5·000MHz HC6U, 8·950MHz HC18U, also some 8·000MHz HC18U, all at £1 each. Send sae with remittance and order to Richard Bowell, 16 Margarite Way, Wickford, Essex.

Mullard Modules, LP1186, LP1185, LP1400, stereo fm tuner plus decoder, £15. Many more components, eg xtals, semiconductors, send sae for list. *Wanted:* Murphy Rover handbook, buy or borrow. G8MOC, 32 Bunker's Hill Close, Blackburn, Lancs.

Tempo 6N2, 2m 2kW linear, as new, bargain, £350. TS700, brand new cond, comp, perf, £280. 2200GX, as absolutely brand new, five months old, nicads, £110. Ch S19, 24, R7. Buyers inspect and preferably collect. Davies, GW8EHR, Brynsworth, Dandorlan, Burryport, Dyfed.

2m ssb tx/rx, 2–5W out, £50. CR100, £15. 5 digit counter, £30. 70cm wavemeter, £5. 23cm wavemeter, £5. Weir 12V 0·25A psu, £3. BICC 4m a.m., £10. H/B 14MHz ssb generator, £5. *Bulletins,* £1 per year. OH2CD bilateral i.f. pcb, £7. Carr extra. G3PJT, QTHR. Tel Comberton 3137.

Trio 9R59DS, good cond, handbook, voltage stabilizer, £45. G4ERO, QTHR. Tel 0202 522779.

Various old monochrome tvs, most require attn, from £1 each. A few used tv aerials, offers. Tel Andoversford 523.

1944 TBS-7 60–80MHz US Navy rx. W1624 wavemeter, sig gen. WW2 R220 4m rx, less gas valve, exchange for communicator or sim tx/rx with psu. German WW2 rx, 1·5–24·5MHz, collector's item, exchange for 2m linear. Buyer collects. Mike, 87 Mayfield Road, Derker, Oldham, Lancs.

Hammarlund HQ110AE, LG300 rf section, h/b power unit, lpf, atu, spare valves, handbook, circuits, wavemeter, sig gen, h/b preselector, swr meter, h/b rack/desk, going vhf, offers around £130. G3UBE, QTHR. Tel 061-330 9538 after 6pm.

Drake SSR1, in mint cond, original packing case, approx 18hr use, £150. 18AVT/WB, nine months old, used for receiving only, £40. 16 Erracht Road, Inverness IV2 4RE.

Hallicrafter SX110, converted, mod with addition i.f. stage plus usb/lsb selection, fully wkg, no known faults, comp with mains transformer, ideal for the newcomer, £35. Will deliver free within 50 miles, £5 for delivery anywhere else in UK. Components—having trouble getting that awkward item? Contact me, I hold personal stock oddball items such as ¼% resistors, 1% capacitors etc. I am not a trader, but may be able to help you, eg 2μF 1,000V non-electrolytic for CD ignition, £1.75 post free. No reply without sae. P. V. Hodson, 43 Thorpe Road, Melton Mowbray, Leics.

Pye U450T, solid state, 70cm, wkg on 433·2 and 433·5, 4W rf rx, preamp, £50. Taylor 62A a.m./fm sweep gen, good wkg order, with manual, £40. G8EPQ, QTHR. Tel 0553 61554 after 6pm.

Liner 2, fitted preamp, immac cond, £115. G4DUE, 18a Spencer Close, Potton, Sandy, Beds. Tel 0767 260552.

H/B top band tx, a.m./cw, 10W, £1. Collins TCS12 tx and psu, £20. Class D wavemeter, 5 by 7 by 7¼in, £7. Pye Ranger tx, 2m 10W a.m., psu, 12V, £15. G3ZMN, QTHR. Tel 01-660 9404.

Liner 2 with preamp, £120. G8AWN, QTHR.

TR2200GX, S0 S20, S22, R3 R6 R7, all accs/helical, £140. E-zee match, £20. 12V/1A psu, £5. 300V 50mA 6·3V 3A, £5. Miscellaneous components, metalwork/coaxial, need space, cheap, offer for all. Lockwood, G3XLL. Tel Mellis 596 evenings or weekends.

Trio JR310, fitted all filters, xtal calibrator, manual, £70. Hamgear PMIIE preselector, £10. Codar PR40 preselector, £9. STJ atu, £10. Tel Kenilworth 54609 after 5pm.

RTTY station, comp, Creed 75RP teleprinter, Spacemark SRDI terminal unit, auto-tape sender, three plugs into FT101 to transmit/receive, £120. Creed 7B 230V, £15. Creed Solinoid tapesender, £8. SSTV 5FP7A tube, boxed, £10. G3RQY. Tel 0603 42967.

MHW602 Motorola, 2m 25W pa module, 100mW drive, sae for data, £20. Quantities of SL612, SL641, TDA1200 (CA3089E), LM567 MC1355, all at £1 each. Above are new. Unused xtals. 1MHz, 100kHz, £1.50. GW8JOJ, 12 Black Barn Lane, Usk, Gwent.

Telford TC10 Mk2 144MHz tx, fully tunable, cw/fm/ssb, will deliver up to 100 miles, as new, £130. G4FAI, QTHR. Tel 01-807 3537.

NCX5 tx/rx, psu, 10–80, ssb/cw/a.m., ptt/vox, digital readout, 200W p.e.p., in exc order and appearance in original cartons, manual etc, £195. Sae for colour photo. Millar, 16 Kilnburn, Newport-on-Tay, Fife. Tel 3069 after 6pm.

Racal RA117E rx, exc cond, £310. Tel 05304 4626.

Trio JR310 rx, 80–10m, a.m./ssb/cw, vgc, unmod, spkr, manual. *Wanted:* 144MHz gutter mounted whip. George Noble, 22 Addison Way, London NW11 6AJ. Tel 01-455 9468 after 5pm.

Pye W15U multi-channel boot mount, xtalled and aligned on 70cm, comp with all controls, £95. F460T base/repeater, £55. Zycomm coaxial base station, 70cm colinear, various models available from £29.50. Send for full details. G3ZYC, QTHR.

BC221, stabilizer, psu, charts, £14. 898 dial, slightly damaged paintwork, £7. 2m tuned lines, £1.50. 640A with base, £1. Consider swop for 70cm/2m walkie-talkie, wkg or repairable. John, G4DYK. Tel Stourbridge 71246.

70cm a.m. tx, 3/20 pa and psu, xtal controlled with vxo, £30. 2m a.m. tx, 3/10 pa plus psu, £10. G8EDG, QTHR. Tel 763617.

Standard C146A walkie-talkie, cw helical whip, nicads, battery charger, toneburst fitted S20, S22, R5, R6, R7, £95. G8KNO, QTHR. Tel Yeovil 5909.

Mosley Atlas trap vertical, 40–10m, exc cond, only £25, plus carr at cost. Approx 50ft UR67 50Ω coaxial with plug, for use with Atlas, £3. Younge, Ipswich. Tel 0473 310442.

Pye uhf compact tx/rxs, £40 each. Multi-2000 144MHz ssb/fm tx/rx, £250. FLDX500 tx, £130. G8BCL. Tel 0274 883448.

Liner 2 filled with preamp and new mic, £100. MM 5W a.m. 5ch tx, easily converted to fm, £15. G8HXD, QTHR. Tel Bagshot 73896.

Liner 2, extra cov 144·1–144·53 with mains psu, £120. ZCV board with all components, filter, £50. XF9E, £25. G8FPT, QTHR. Tel 01-504 4942.

Trio TS520 hf tx/rx, comp with matching TV502 2m transverter and SP520 spkr, exc cond, £465. Would prefer to sell as a comp station but may consider splitting. G4CTZ, QTHR. Tel 0332 71875.
Heathkit HW202 tx/rx, with mobile mount and HWA-202-1 mains psu, fitted Shure mic, insert toneburst, xtals for S0, S20, S21, S22, R6 R7, £125. Revco ½λ mobile antenna with feeder, £4. Both plus delivery costs. G8JHE, QTHR. Tel 063872 545.
FT101, immac cond, very little used, fixed or mobile, mic, plugs, cables, manual, as supplied plus fan, reason for sale operator gone vhf, inspect anytime, £250 ono. GM3ZNC, QTHR. Tel Airdrie 65507.
Tower, 40ft wooden two-section home-made tower, £25. Grundig mains tape recorder, £20. National battery portable tape recorder, £20. J. Bryant, G4CLF, QTHR. Tel 0242 23834 after 8pm.
Split stator caps, 200pF/section, £3. Atu, comp, £4. Single caps, 200pF, £1.50. All ex-T1154 and electrically good, prices inc p&p. Sae for other wanted spares, for funds of Reading ARC. G4CWB, QTHR.
Multi-2000, six months old, fitted xtal toneburst, original packing etc, £250 delivered. Pye AM10D on a.m./fm/cw, vfo rec, £25. Marine Sea Star portable vhf with nicads etc, MPT approved, £200. G4DIW. Tel Harwich 3642/6518 day, 2029 evening.
QM70 28/144 high power transverter, unused, maker's carton, £75 ono. Jaybeam, 2m, 5 over 5 and slot, varnished, £5. Joystick with mobile mounting, £6. Tel Leeds 863058.
Heath SB101, cw filter SB600 and HP23 supply, £185. Heath SB220 amp, 80–10m, uses pair of 3-500Z for 2kW p.e.p., £230. TA speech processor, £14. GM4ASY, QTHR. Tel Bishopton 2941.
FDK Multi-2000 2m tx/rx, comp with cables, mic and handbook, as new, no mods, £250. Will deliver 25-mile radius. G4EBL, QTHR. Tel 021-777 4901.
Trio 7010 2m ssb tx/rx, new and in absolutely mint cond, with mic and car mount, £165. G3XFB, QTHR. Tel Brewood 850033.
Eagle WI3 wireless intercom, brand new set of two with guarantee card, offers. Armitstead, Morven, Achiltibuie, Ullapool, Ross-shire.
Heathkit Marauder HX10 ssb tx, 80–10m, 180W p.e.p., immac cond, £175 ono. Hammarlund HQ170 amateur band rx, 160–6m, good cond, £100. G3NAS, QTHR. Tel Aldridge 53718.
Heathkit RA1, needs aligning, £10. Pye AM10D, £17. Side-view Nixies on pcb and 20 transistors and resistors, £1 (6 off). G3WUN. Tel Rochdale 57353.
Hansen transistor tester, as new, £6. Grundy and Partners transistor tester, used with AVO meter, ideal for matching transistors, as new, £5.50. Heathkit V-7AUK with probe and manual, £6.50. Class D meter, converted to ac supply, £5.50. G3NLD, QTHR.
Standard C146A 5ch fitted toneburst, telescopic and heliwhips, basecharger, £100. Codar Q-multiplier, £5. Last 7 years *RadCom*, few missing, offers. G4BJM, QTHR. Tel 0908 72463.
Marconi TF428B/1 valve voltmeter, £10. Marconi sig gen TF867, £50. Transformer, 50Hz 240V, 0-1,500-2,000V twice, at 500mA, £5. Old valve tester, £2. Mains carbon pile regulator, £4. View evenings, weekends. G3SDK, QTHR.
50ft lattice tower, 5 by 10ft sections, will split, offers. Large 240/110V isolation transformer, offers. 300V 1A stabilizer psu with heaters, £8. G3NKL, QTHR. Tel Longridge 2511.
Liner 2, with PA3 preamp, £105. 40W linear/preamp, combined 12V o/p, £35, or £130 for both. G3PLI, 46 Park Drive, Bradford BD9 4DT. Tel 0274 41405.
Hallicrafters SR400 cyclone tx/rx, 80–10m, 1kHz readout, 400W p.e.p. i/p, precision equipment with all refinements, inc HA20 sep vfo, 117V pp/spkr unit and 230/110V transistor, full instruction and service manual, spare valves, new, £325 comp. G3PLI. Tel 0274 41405.
Microwave Modules 2m converter, exc cond, a mere £15 ono. Pete Tovey, 36 Northville Road, Bristol BS7 0RG. Tel 0272 693665 after 6pm.
KW Atlanta with fan fitted by KW, perf, with manual, £220. G4BBA, QTHR. Tel Peterborough 65213.
2m station comprising Trio JR500 rx, Pye base station tx (145·8), and Emsac converter (28–144MHz), offers around £85, carr extra. GI8IFP, QTHR.
IC22A, as new, 11ch and toneburst, £150. G3DNX, QTHR. Tel 061-480 9994.
Collins KWM2, ext vfo, psu, mint. GI3CDF, QTHR. Tel 0247 812449.
2m tx/rx, xtals suit Cambridge etc, 8MHz tx, 44MHz rx, R3, R7, S0, S20, S22, HC6U, £15 the lot. G3XVA, QTHR.
1975 DX/USA Callbooks, plus supplements, effectively 1976, £4.50 each. Large roller coaster, 2½in d, 45 t, offers. 30W 50Ω dummy antenna inc rf ammeter, £3 plus p&p. Unused HC13U CHC 100kHz xtals, £1.80 each. *Wanted:* TA31, details age, cond, price. G3IZJ, QTHR. Tel 48561.
FR50B, mint cond, no mods, xtal calibrator, £65. Buyer arranges carr. GW8FJS, QTHR. Tel Cardiff 890665.
Shack clearance. Ultravox dictaphone, ideal station recorder, £8. Two Ferrograph 2A recorders, dismantled, £14. Each master oscillator, £10. Cossor twin beam scope, £35. LM14 (BC221), £20. Garrard record deck, £5. Vintage Victor 16mm sound projector, exc cond, offers. G4BQY. Tel 01-337 4508.
SSB filters, 9·0MHz, YF90F, £12. QC1246AA 5·2MHz with carrier xtals, £15. 1·4MHz usb carrier xtal, £12. 10–2m bilateral converter, £15. CR100 knobs, 5p each. Carr extra. *Wanted:* FV401. G3PLP, QTHR. Tel 021-744 3187.
KW2000 dc psu, £20. Sentinel 2m converter, 4–6MHz, £10. AM25B Vanguard, comp leads and controls, £20. Ranger PTC 2,207V, £5. Base station PTC, 2,702V, £20. All ono, lowband, unmod. *RadCom*, *SWM*, Sept 69–Sept 76. Igloo 4 tent, £70. GM4BBL, QTHR. Tel Lerwick 3138.
Codar AT5 tx with mains psu and mobile psu, mobile remote control unit, £30. Codar T28 rx, £15. Both first class cond, with manuals. Prefer buyer collects or carr extra. G3KZU, QTHR. Tel Oxford 63000 evenings.

WANTED

813 valve base and heater transformer, 10V 10A centre tapped secondary, primary 220–230V ac. C. Renshaw, 51 Osgodby Crescent, Scarborough, N Yorks. Tel Cayton Bay 882493.
Marconi Marine morse key. Swop Heathkit HR10B hamband rx, 3·5–28MHz, with xtal calibrator HRA10-1, exc cond, for Eddystone 850/4 rx, 10–600kHz, or Eddystone 770R, 19–165MHz, with cash adjustment. Robert Williamson, GI3RNY, 13 Avonmore, Antrim Road, Ballymena, Co Antrim, N Ireland. Tel 41468.
Heathkit HW101, with psu and cw filter if possible, other similar tx/rxs considered. G4FHF. Tel Stockton 64106.
Lattice tower tilt over or mast sections to about 40ft. G8BCL. Tel 0274 883448.
Old radio equipment, xtal sets, valve sets, txs (spark or valve), horn spkrs, valves and components, boxed, or in good cond, military or civilian, must be commercially manufactured, years 1914 (or before) to 1927, photographs or sketches and written information please. Good home guaranteed. Ronald Irving, G3SYX, Fir Glen, Alford Road, Maltby-le-Marsh, nr Alford, Lincs LN13 0JJ.
AR88D in wkg order, preferably not mod, will collect within reasonable distance. P. G. Bower, Cawdermill, Bishopbriggs, Glasgow G64 3QA.
Disabled swl requires lattice tower for 14-el. L. Sadler, 81a West End, Street, Somerset. Tel 0458 42170.
Swan 350 tx/rx, and small oscilloscope. GW4EUJ, QTHR. Tel Clydach 3948.
FL50B, mint cond. J. A. Newport, 10 Poolmans Road, Windsor Berks. Tel Maidenhead 25764.
KW107 atu. Bird thruline. G3UPB. Tel 089-425 3323 office hours.
Information, circuits, manual, for Cossor rx type 121 Mk2 vhf, buy or pay for loan to copy. S. Wardle, 109 Woodville Road, Overseal, nr Burton-on-Trent, Staffs DE12 6LU.
Bird thruline wattmeter model 43, or models 4430, 611 or why? With or without inserts. Will pay fair price or swop. B. F. J. Davies, G3PHL, 39 Markhams, Stanford-le-Hope, Essex.
Versatower or telescopic tower, 50–60ft, prefer wall mounting. Geoff Barnes, 5 Prospect Drive, Halebarns, Cheshire. Tel 061-980 2415 or 061-941 2121.
Cash awaiting fb ssb rig, FT101 etc. GW3DRK, 23 John Street, Porth-Rhondda, Mid Glam CF39 9SD. Tel Porth 4671.
Yaesu FL2500 linear, top price paid. G3OQT, QTHR. Tel 0829 260708.
Old radios, pre-war types, valves, books, components wanted by collector (civilian only), any cond considered. Especially wanted, Marwin V3, V2, GECO phone equipment, Philips, Pye, WW1 military equipment etc. C. Sawyer, 210 Gordon Avenue, Camberley, Surrey. Tel 0276 29460.
FR100B rx, must be in good cond. GM4BDJ, 39 Douglas Road, Longniddry, East Lothian. Tel 0875 53025.
2m cw/fm/ssb tx/rx. Datong FL1 filter. IC22A or similar. G4BRZ, QTHR. Tel 0502 66660.
AR88, will accept non-worker if manual supplied. T. A. Haines, 6 Festival Close, Bexley, Kent DA5 3JE. Tel Dartford 29590 to leave message.
Triband hf beam, quad or Yagi, why? Rotator to suit. Collect reasonable distance. G3UKV, 9 Sleapford, Long Lane, Telford, Salop.
2m linear with or without one or two 4CX250B and/or psu. G3WW, QTHR.

Very junior member, age 13, requires rx to get started. Lots of enthusiasm but very little money, can someone help please. Lawrence Straus, 31 West Hill Road, London SW18 1LL. Tel 01-874 6923.

FV101B. VFO for IC21. FL2100B linear. SSM Europa B 70MHz transverter. KW1000C linear. Matching tx for Trio JR310. QM 2FM70. Slow scan monitor. *For sale/swop:* PFIs, Pye Compacts comp with batteries and chargers. G4DYY, QTHR. Tel 021-588 2043.

Urgently required, Trio TX599, T599 or KW Viceroy series 3 or 4. 50Ω lpf, dummy load, coaxial cable. Shure 201 or 444 mic. 2m Yagi. All items must be fb cond. Books on amateur radio. G3WXT, QTHR.

SEI 9MHz QC1246AX filter, with sideband xtals. G8KKQ, QTHR.

KW107 52Ω. 2m fm rig. Mobile/hand-held, Bantam/Cambridge, prefer with R3 S20/22. Datong/TA speech processor. *For sale:* Night storage heater, comp, wkg, £10 ono. Lockwood, G3XLL. Tel Mellis 596 evenings or weekends.

Correct Octal 1MHz xtal for BC221, must obtain for my frequency measurement, price or info, as mine faulty. C. T. Fairchild, G3YY, 4 Chalkland Rise, Brighton, E Sussex BN2 6RH.

14-el Parabeam 2m. Ham-M rotator with control unit. Heathkit vhf power and swr meter HM2102. G3NAS, QTHR. Tel Aldridge 53718.

AR88 Buo and other military equipment. 9R59DE, JR310 etc. I will collect during holiday trip. Send full details and price. F. S. Koster, PA0FSK, Eddingtonlaan 7, Hoogeveen, Netherlands.

Ham-M Ω Emoto rotor. El-bug. 70cm converter (i.f. 28–30). 2m transverter. 70cm transverter. Should be prof built. Drake lpf. G. P. Brenkelen, c/o Clark, 11d Witch Hill Place, Kilmarnock, Scotland.

B2 rx, price and cond please. G3PEC, QTHR. Tel 01-570 7152.

Heathkit HW101, SB102 or other good hf bands tx/rx, must be in good order, comp with power supply. HW12 single bander with ac power supply. G3WY. Tel Evesham 45497.

Information on radio amateur activities in Ireland, wanted by swl/dxer. W. Scheidges, 135 Phibsboro Road, Dublin 7. Tel 786611 ext 11 8am–8pm.

813 valves. G3RUX, QTHR. Tel Exeter 69909.

Circuit diagram of Tiger 100 a.m./cw tx, for loan or purchase. Vertical antenna 40–10m, 14AVQ or similar. G3MCA, 1 Mosslea Road, Orpington, Kent. Tel 0689 56497.

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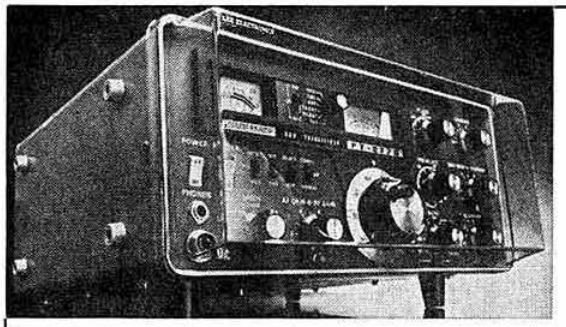

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35 DOUGHTY STREET, LONDON WC1N 2AE.

FOR SALE

G.I. AMATEUR SUPPLIES GI3ZIA for Trcvrs, Rx, Tx, Antennas, Mics, etc. Trade-in's welcome. Large stocks at 10 Church Street, Enniskillen, N. Ireland. Tel: (0365) 22955.

BARLOW WADLEY XCR 30 Receiver available in South West at £144 inc. VAT or with FM at £162 inc. VAT, from Ryland Huntley, 15 Old Bond Street, Bath. Tel: Bath 4332.

RCA VALVES 7360, £6.90 ea; 6146A, £4.65 ea. (price in Feb. advert incorrect); 6146B, £5.50 ea; matched pairs, 50p extra. Prices inclusive. A. E. White. G3HCU, QTHR. Tel. 0306 730 215.

U.H.F. MOBILES READY FOR PHASE 2. Pye W15U bootmount Westminsters, all fitted with narrow filters, complete with 10 channel control units, and all hardware. Aligned on 70cms supplied with one SU/RB channel of your choice. Fitted 3 channel oscillator boards £95 or 6 channel oscillator boards £115. Both these units are easily extended to 10 channel capability by wiring extra oscillator boards into the sets, since the provisions are there to allow this modification. A CMOS toneburst can be fitted for £5, and should a mains power supply be required this can be supplied for £31.50. Carriage £3.00. Extra crystals £5.20 per channel. M. I. Sneap, G3ZYC, Farm Close, Pentrich, Nr. Ripley, Derbys., DE5 3RR.

PYE AM10B CAMBRIDGE. Two HP1 AM Bantams, all unmodified, high band. Manuals. £35.00 each. G3YQN, Guildford 70082.

STORNO VISCOUNTS. 520 with controls and microphone, £35.00 + £4.00 carriage. Storno 10W bases S20 with controls, £35.00 collect. G8AKA, Reading 332582.

HEATHKIT 30 MHz COUNTER type 1B-1100. Heathkit 200MHz prescaler type 1B-102, £125.00 the pair. G3YFZ. Tel: Kingswear 511.

RTTY PICTURE PERF. TAPES. Dozens to choose from. Standard 5-level paper tape. Send 9" × 4" sae for free catalogue. M. Watson, G3WMQ, 74 Bowrons Avenue, Wembley, M'sex.

QSL CARDS printed on glossy cards, competitive rates. The Caswell Press, 11 Barons Way, Woodhatch, Reigate, Surrey. Reigate 44916.

FT101E £400.00. Atlas 180 £200.00. Both in good condition. Daytime 051-638 3736. Evenings 051-677 1268. G4ERH.

ANTENNA WIRE, 14 swg, PVC insulated, 100 metres £9.10, 50 metres £5.25 incl. VAT & postage. D.G. Electrical Supplies, 24 Huntly Avenue, Giffnock, Glasgow. 041-638 3386 (after 6.15 pm).

QSL CARDS. Sae for samples. Bailey & Co, 35 Whitecross Road, Weston-super-Mare.

SOLID STATE Ae. C/O Relays. Few still available. 30 watts up to 23cms. Boxed 1·5" sq. × 1" deep. 12 volt op. £6.48 each Inc. VAT and PP. Telford Communications, 78B High Street, Bridgnorth. WV16 4DS. Salop.

COMPLETE STATION (£400.00) comprising HW 101 transceiver, Z Match, SWR Meter etc. Possible split considered. Contact G4DAB. 01-440 1208 evenings.

WANTED

HANDBOOK, TILTING BLOCKS, 'S' meter unit for Eddystone 5640. Handbook BRT400E. Your prices paid. Rowbottom, Legion St., S. Milford, Leeds.

INDEX TO ADVERTISERS

PUBLICATIONS OBTAINABLE FROM RSGB

RSGB members *can obtain a* **10 per cent discount** *on the prices listed below (excluding* Ham Radio Magazine *and* Ham Radio Horizons). *To obtain the di count, deduct 10 per cent, calculated to the nearest penny, from the total value of the order (using the latest price list) and enclose a remittance for the balance. Also enclose an address label from a recent* Radio Communication *wrapper as proof of membership.*

RSGB PUBLICATIONS

Technical books

Amateur Radio Awards	£2.07
Amateur Radio Techniques (5th edn)	£3.47
Guide to Amateur Radio (16th edn)	£1.35
Morse Code for Radio Amateurs	52p
NBFM Manual	£1.35
RSGB Amateur Radio Call Book 1977	£2.31
Radio Amateurs' Examination Manual	£1.35
Radio Amateurs' Examination Revision Notes	61p
Radio Communication Handbook 5th edn, Vol 1	£9.20
Radio Data Reference Book (*Out of print*)	
Service Valve and Semiconductor Equivalents	46p
Teleprinter Handbook	£8.73
Test Equipment for the Radio Amateur	£2.71
TVI Manual (*Out of print*)	
VHF/UHF Manual	£6.65
World at their Fingertips (Paperback)	£1.55
" " " " (De-luxe)	£2.65

Log books

Standard Log	£1.31
Receiving Station Log	£1.42
Mobile Mini-Log	£1.00
De-Luxe Log	£2.89

Maps, charts and lists

Countries List/HF Awards List	24p
Great Circle DX Map (in tube)	£1.26
Oscar map (in tube)	41p
QTH Locator Map (Western Europe) (in tube)	£1.13
QTH Locator Map (Western Europe) (on card)	55p
RSGB Amateur Radio Prefixes (World) Map	64p
UHF repeater planning map	38p
UK Beacon List	17p
UK Repeater List	17p
IARU Region 1 Beacon List	17p

Members' sundries

Callsign lapel badge (5 weeks' delivery)	£1.30
Lapel badge (RSGB or RAEN emblem, pin fitting)	50p
Tie (Maroon or Blue)	£1.94
Radio Communication Easi-binder	£2.96
Car window sticker (RSGB or RAEN) (self-adhesive)	30p
Members' headed notepaper (50 sheets) quarto	73p
" " " " octavo	49p
Radio Communication back issues	83p
RSGB Contest log sheets (100)	70p
RSGB teeshirt (large, medium or small)	£2.22

Prices include postage, packing, and VAT where applicable. For air mail despatch, please ask for price before ordering. Goods are obtainable, less p & p, at RSGB headquarters between 9.15am and 5.15pm, Monday to Friday.

POSTAL TERMS: Cash with order. Stamps and book tokens cannot be accepted. Cheques and postal orders should be crossed and made payable to "Radio Society of Great Britain". Giro A/C No 533 5256.

Please write your name and address clearly on the order.

ORDER FROM:

OTHER PUBLICATIONS

American Radio Relay League

Antenna Book (13th edn)	£4.00
Course in Radio Fundamentals	£2.89
FM and Repeaters for the Radio Amateur	£4.00
Hints and Kinks	£2.55
Radio Amateurs' Handbook 1977 (Paperback)	£8.05
Radio Amateurs' Handbook 1977 (Hardback)	£11.31
Ham Radio Operating Guide	£4.40
Single Sideband for the Radio Amateur	£3.80
Specialized Communication Techniques	£4.00
Understanding Amateur Radio	£3.79
VHF Manual	£4.00
Electronic Data Book	£4.00

Radio Amateur Callbook Inc

American Callbook (USA listings) 1977	£10.05
American Callbook (DX listings) 1977	£9.55
World Atlas (Amateur radio prefixes)	£1.70

Radio publications Inc

Beam Antenna Handbook	£4.40
Better Short Wave Reception (3rd edn)	£3.38
Cubical Quad Antennas	£2.74
Simple, Low-cost Wire Antennas	£3.43

"73 Magazine" publication

SSTV Handbook	£3.14

Miscellaneous

RTTY the Easy Way	£1.00
Radio Amateur Operators Handbook	£1.09
Radio Valve & Semiconductor Data	£2.76

MORSE INSTRUCTION AIDS

G3HSC Rhythm Method of Morse Tuition—	
Complete Course (two 3-speed lp records and one ep record plus books)	£5.50†
Beginner's Course (one 3-speed lp record and one ep record plus book)	£4.06†
Beginner's lp (0–15 wpm) plus book	£3.39†
Advanced lp (9–42 wpm) plus book	£3.39†
Three-speed simulated PO test 7in ds ep record	£1.12†

† *Overseas orders: add* £1.12.

MAGAZINE SUBSCRIPTIONS

QST (including ARRL membership) (Per annum)	£7.78
CQ (Per annum)	£6.89
73 (Per annum)	£6.60

Subscriptions for the magazines listed above should be sent to RSGB, 35 Doughty Street, London WC1N 2AE.

Ham Radio (Per annum) (Includes air delivery)	£7.50
Ham Radio Horizons	£6.50

Subscriptions and changes of address for *Ham Radio Magazine* and *Ham Radio Horizons* should be sent to: Ham Radio Magazine (UK), PO Box 63, Harrow, Middlesex HA3 6HS.

RSGB Publications (Sales), 35 Doughty Street, London WC1N 2AE

THE AMATEUR RADIO EVENT OF SILVER JUBILEE YEAR

RSGB INTERNATIONAL RADIO COMMUNICATION EXHIBITION AND CONVENTION

ALEXANDRA PALACE, LONDON N22
6–8 MAY 1977

Official opening by Councillor Vic Butler, Mayor of Haringey, at noon on 6 May

LARGE EXHIBITION COVERING OVER 8,000ft OF GRAND HALL

The following traders have confirmed bookings at the time of going to press:

Aarvak Electronics
Amateur Radio Exchange
Axial Products Ltd
B. Bamber Electronics
J. Birkett
S. J. Branson
Catronics Ltd
C & C Electronics
Clarbrook Engineering Co Ltd
Cobham Engraving Co
Corbett Television
CP Developments
Crayford Electronics
CSE Electronics
Datong Electronics
Doram Electronics Ltd
Garex Electronics Ltd
T. R. Galka
Greenweld Electronics
Home Test Co
JMG Electronics
Lowe Electronics
Microwave Modules
Modular Electronics
PM Electronic Services
Polar Electronic Developments
Radio Shack Ltd
Radiotronics
SGS Electronics
South Midlands Communications Ltd
Thanet Electronics
Waters & Stanton Electronics

Organizations which will also have stands:

Radio Society of Great Britain
Members of RSGB committees and of HQ staff will be present to deal with queries and subscriptions.
RSGB publications will be on sale.
Live demonstrations of London's 10GHz beacon GB3LBH and of rtty.

Amateur Radio Mobile Society
British Amateur Television Group
Radio Amateur Invalid and Bedfast Club
Raynet
Royal Corps of Signals

Members' Mart

A Members' Mart will be held in the West Corridor on Sunday. Members of the RSGB not engaged in "the trade" and affiliated societies may hire space for one trestle table at £10 for the day. Number of spaces limited to 40. Bookings with remittances to be made to Mr J. Hitchins at RSGB headquarters before 26 April.

FOR THE FAMILY

Eighteen-hole pitch and putt golf course. Boating lake. Children's playground. Park trail. Ski slope. Open-air roller skating rink (bring your own skates). Rose garden (open throughout the exhibition).

Creche for children over three years of age supervised by fully qualified staff. 11am–4pm, Saturday and Sunday.

Wheelchair facilities for the disabled.

Most of the above facilities are provided free of charge in

Alexandra Park and Palace

CONVENTION PROGRAMME

FRIDAY

Films in the cinema from 3pm: *One Man's Meat*—RSGB; *This is Ham Radio*—ARRL; *Hams Wide World*—ARRL; *Microwave Fantasia* and *Glypton Revisited*—by courtesy of EMI-Varian.

SATURDAY

Alexandra Room

2–3.10pm "VHF—the American viewpoint" by Ed Tilton, W1HDQ
3.15–4.15pm "Radio Astronomy" by R. Lascelles, G3AKX, of Jodrell Bank
4.30–6pm "Aerial circus" by "Dud" Charman, MBE, G6CJ

Cinema

2–3.10pm "Synthesizers and phase locked loops" by T. D. Giles, G4CDY
3.15–4.15pm "Getting started on rtty" by D. Beattie, G3OZF
4.30–6pm "SWL—getting started" by B. C. Bond, G3ZKE

West Bar

2–3pm "Antenna Planning" by R. Thexton, senior planning officer, and R. Jackson, Planning Committee member, London Borough of Enfield
3.13–4pm "Masts—some aspects of design, manufacture and installation" by D. Clarke, CEng
4.20–5pm "Some confessions of a vhf columnist" by G. I. Knight, GM8FFX

Roller Rink Bar

2–3.05pm "Raynet" by P. Balestrini, G3BPT
3.15–4pm "GB3LBH—London's 10GHz beacon"*
4.05–4.50pm "Getting started on 10GHz" *
5–5.45pm "General microwave techniques" *
* by the Microwave Group

EDINBURGH ROOM
7.15 for 7.45 until midnight. Convention dinner and dance
Guest speaker to be announced

SUNDAY

West Bar

1130–1245 "Repeaters, where are we going" by Repeater Working Group
2.30–3.30pm "Electronic rtty and data transmission" by P. Martinez, G3PLX

Roller Rink Bar

1130–1245 Seminar on 24GHz by the Microwave Group

Cinema

2–3pm "Raynet" by P. Balestrini, G3BPT
3–4.30pm "SWL—getting started" by B. C. Bond, G3ZKE

OPENING HOURS

Friday: 11am–7pm. Saturday: 11am–6pm. Sunday: 11am–5pm

ADMISSION CHARGES (at the door)

Adults (single day) **40p**; (three-day season) **£1.**
Children under 14 20p.

DINNER/DANCE TICKETS

£5.50 each, obtainable only in advance. Ticket applications with remittance to be sent to Mr J. Hitchins at RSGB HQ before Friday 29 April.

DAILY DRAW

A draw will be held on each day for one of three portable television sets. Entry forms will be available at the door.

CATERING

Bars and buffet restaurants will be open throughout the exhibition opening hours.

HOW TO GET THERE

Alexandra Palace is easily reached by road. See front cover of this issue for maps and talk-in details. Free car and coach parking facilities.

Bus services 29, 41, 102, 123, 134, 212, 221 and 244 are within easy walking distance, and service W3 connects with the underground at Wood Green (Piccadilly Line) and Finsbury Park (Piccadilly and Victoria Lines).

For those staying overnight, the following hotels are in close proximity:

Raglan Hall Hotel, 8–12 Queens Avenue, N10. Tel 01-883 5700.
Queens Hotel, 7 Queens Avenue, N10.
Highgate Lodge Hotel, 9 Waverley Road, N8.
Fairlight Hotel, 12 Shepherds Hill, N6.

RSGB PUBLICATIONS ORDER FORM

RSGB MEMBER ☐ TICK BOX IF YES	Please use this form when ordering
CALL-SIGN or ORS/BRS/A ►	NAME ►
ADDRESS	Full details of conditions of sale can be found on the RSGB price list. Please check the latest price list when ordering as incorrect pricing causes delay.

Post your order to.....

RSGB PUBLICATIONS (SALES),
35 DOUGHTY STREET,
LONDON WC1N 2AE

Telephone.....
01-837 8688

QUANTITY REQUIRED	ITEM CODE	ITEM DESCRIPTION	PRICE EACH	TOTAL FOR QTY. ORDERED	OFFICE USE ONLY

I enclose cheque, giro cheque, postal orders to the value of £

MEMBERS' AD ORDER FORM

FOR SALE ☐ WANTED ☐ (Tick as appropriate)

- **See Members' Ads page for conditions of acceptance.**
- **Not more than 40 words, including name, address, etc.**
- **Do not forget 50p remittance plus wrapper.**
- **Please write in block capitals, or type.**

Licensed members are asked to use their callsign and QTHR, meaning that their address in the current call book is correct. BRS and A members will, of course, have to provide their name and address.

I enclose cheque/PO for **50p** to cover the cost of this advertisement.

Signed .....

Date .....

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