May 1976

radio communication

journal of the Radio Society of Great Britain

17 May 1976

World Telecommunication Day

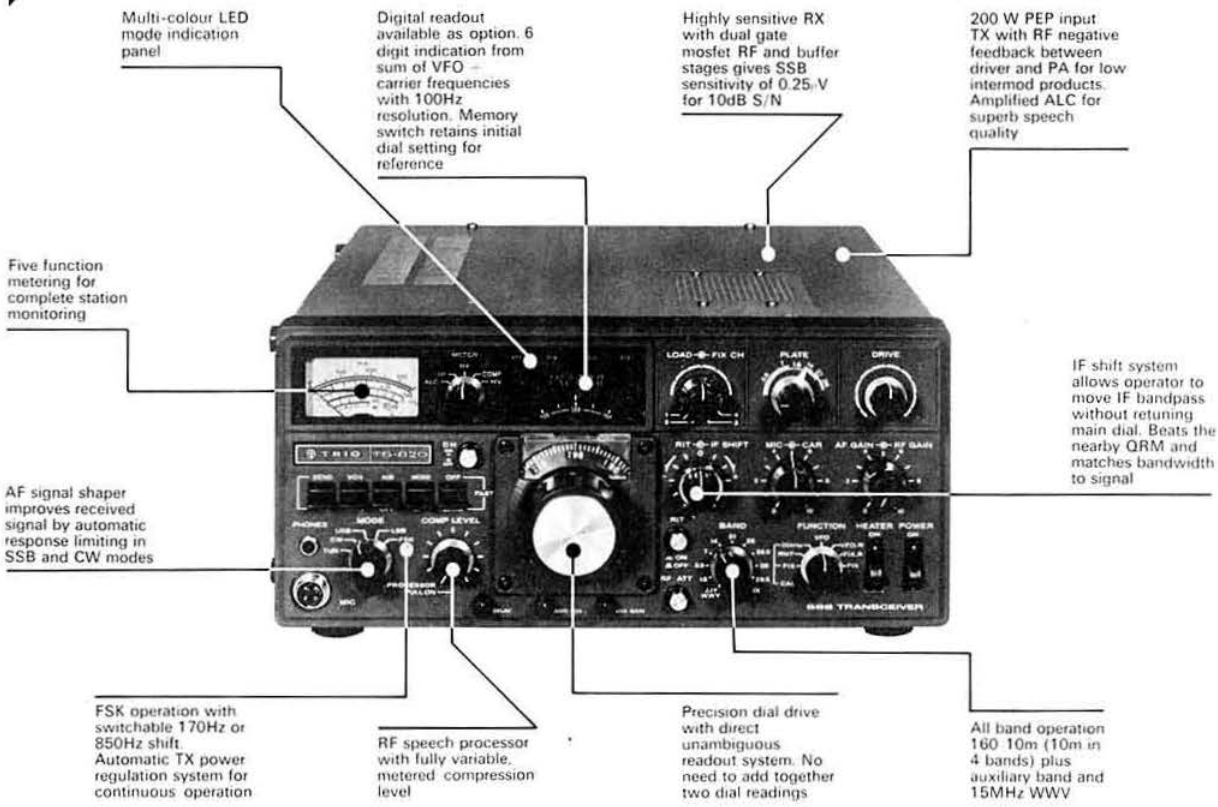
Telecommunication and mass media

International Telecommunication Union

NEW

The DXpert

An all-new big brother for the TS520
TS820 from TRIO



The all new TS820 from Trio completes their HF transceiver range. This is the top-of-the-line transceiver which offers a significant advance in design and construction over all others. This is the "DX pert" from Trio.

- Full transceiver operation on all amateur bands from 160-10 metres (28-30MHz) on SSB, CW and RTTY; optional 2 metre transverter; optional external VFO for full split Tx/Rx operation.
- Outstanding performance on both transmitter and receiver due to fully balanced mixing combined with latest PLL techniques.
- First class frequency stability and large signal handling characteristics.
- All new precision dial drive mechanism with unambiguous mechanical readout. Optional digital frequency readout with memory facility.
- Fixed station or mobile operation with a complete line of matched system accessories for building the best possible complete station.
- RF speech processor with fully metered adjustable compression is built-in.
- IF pass band tuning allows the IF to be tuned across a signal without resetting the main dial.
- Five function metering system together with LED monitoring of all important functions gives unparalleled operator control.

This brief advertisement can only touch upon the main details of the TS820. You have to handle it to appreciate its performance. See it soon at your local branch of Lowe Electronics.

Sole Importers
LOWE ELECTRONICS
Cavendish Road
Matlock Derbyshire
Tel: Matlock 2817/2430

TRIO

ISSN 0033-7803

radio communication

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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	3·6	G2MI, Bromley, Kent (SE England)
1000	3·6	G8ML, Cheltenham (SW England)
	144·5	GM3UAG, Ellon, Aberdeenshire (NNW)
	144·5	G8GGK, Croydon, Surrey (NE)
1015	3·6	GI3GAL, Belfast (N Ireland)
	144·5	GI3TLT, Bangor, Co Down (N)
1030	3·6	G2CVV, Derby (N Midlands)
	144·5	G4DCH, Burnham-on-Sea (NW)
	144·5	GM3UAG, Ellon, Aberdeenshire (SW)
	144·5	G3PWJ, Brierley Hill (NW)
1045	144·5	G8CDP, Middlesbrough (NW)
	144·5	G8GGK, Croydon, Surrey (SW)
	144·5	G8BHQ, Stockport (NNW)
1100	3·6	G5VO, Bridlington (NE England)
	144·5	G3PWJ, Brierley Hill (SW)
1115	3·6	G3LEQ, Knutsford (NW England)
1130	3·6	GM3EHI, Bellshill, Lanarkshire (S Scotland)
1200	3·6	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.

Radio Communication **is published by The Radio Society of Great Britain as its official journal on the first Tuesday 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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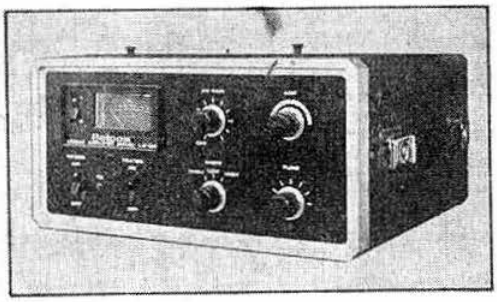
Closing date for contributions unless otherwise notified: 4th of month preceding month of publication.

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).

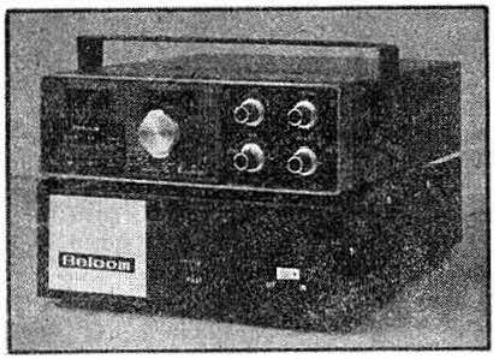
LOWE ELECTRONICS



LA106 £158 +VAT

High power. High performance. Modest cost.
A reasonably priced, compact, high performance linear for 2 metres. SSB/FM/CW operation. 10W of drive for around 180W input gives your signal the extra kick to get it out of the noise. Built in receive preamplifier with adjustable RF gain and helical filters for increased selectivity and reduced intermod from out of band signals. Built in regulated 13V 2·5A supply for Liner 2 or any similar driver.

The LA106 will match any rig such as the TS700, FT221, IC201 in any mode provided that the drive level is around the 10W level. Using a rugged valve in the PA allows you to get away with occasional misuse (just try a high power solid state amplifier into a mismatched load) and gives very low intermod products.



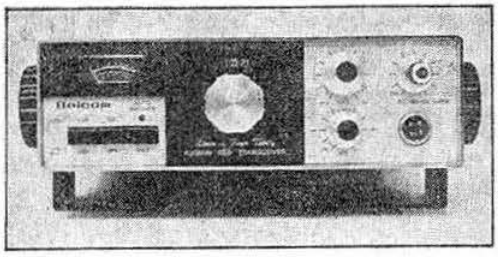
LINER 2 Mk. 2 £145 +VAT

Belcom have just introduced the latest model of the Liner 2 with many detail improvements, notably in the new receiver front end which results in much higher sensitivity, and transmitter modifications which improve the signal quality and lower the level of unwanted signals.

The Liner 2 is still the ideal way to get into real DX operation on 2 metres and continues the Belcom tradition of being one step ahead of the field in amateur radio developments.

Frequency coverage 144·1–144·34. 10W output. Complete with the usual Belcom comprehensive range of accessories including mobile mount etc.

Contact us soon for a demonstration.



LINER 430 £228 +VAT

Two steps ahead comes the Liner 430. Already being used by us to make mobile contacts with the U.S.A., the Liner 430 opens up a whole new dimension of long distance contacts via the OSCAR satellites.
Covering two 480 kHz bands in 20 kHz steps and using the exclusive Belcom Auto watch system which detects the presence of a signal anywhere within VXO range without tuning. No more missing signals, and worn out fingers from control twiddling.
10 watts output. Selectable USB/LSB/CW operation. Dual conversion using 50MHz and 7·8MHz IF's results in excellent image rejection and high sensitivity.
Truly a new dimension in amateur radio from the Liner 430.

FS1007P £176 +VAT

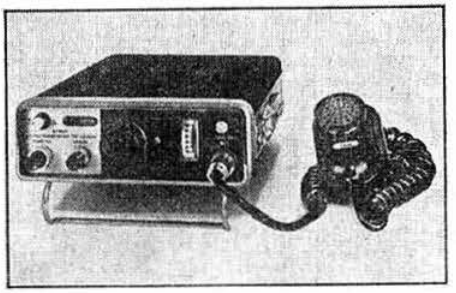
The home station FM transceiver with everything. ★ Mains or 12 volt operation ★ 16 channel scanning ★ channel skipping facility ★ priority channel with front panel crystal sockets ★ manual or auto scan ★ switched high/low power ★ switched wide/narrow deviation ★ S meter ★ RF output meter ★ centre zero tuning meter ★ RX fine tuning control ★ built in SWR bridge ★ built in digital clock with alarm and auto switch on ★ built in loudspeaker ★ 10 watt TX ★ 0·3 microvolt sensitivity ★ superb styling and finish ★
All this and supplied fitted receive crystals for 145, 145·25, S20, S21, S22, 145·6, 145·8, R3, R4, R5, R6, R7 together with transmit crystals for 145, S20, R6 make the FS1007P the most incredible bargain on the FM market. Backed by the combined reputations of Belcom and Lowe Electronics.

1976 LEICESTER SHOW 28.29.30 OCTOBER

LOWE ELECTRONICS

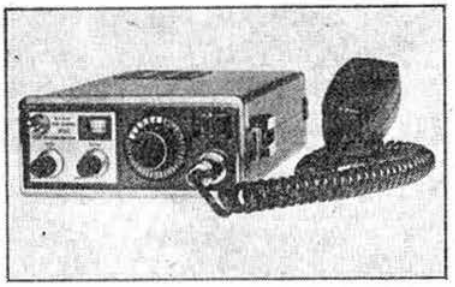
TS700G £340 +VAT

The standard by which all others are judged. Full 2 metre coverage, VFO or crystal controlled. All modes AM, FM, USB, LSB, and CW. Mains or battery operation. Normal and reverse repeater facilities. Trio exclusive tuning fork access tone generator. Plus, of course, Trio quality and reliability backed by Lowe Electronics service. If you haven't seen it yet, go to one of our branches and be prepared to be impressed.
15 Watts output. 0·25 microvolt sensitivity. European standard FM selectivity. This rig has all others beaten.



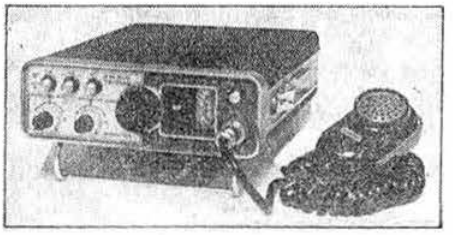
TR7200G £144 +VAT

The TR7200G has set all 2 metre FM operators talking about its outstanding performance on both transmit and receive. Not only is it the best engineered transceiver on the market, but it's also the most sensitive at 0·3μV for 15dB quieting and has the cleanest transmitted signal both in and out of band (the economy transceivers simply lack the interstage filtering to ensure that the owner is not put off the air by the Home Office.)
Supplied complete with microphone, mobile mount, power leads, spare fuses and incorporating the TRIO exclusive tuning fork access tone generator, the TR7200G includes five fitted channels (S20, 21, 22, R6 and R7) or alternatives if requested.



TR3200 £132 +VAT

The newest FM handy transceiver from the TRIO range. Superb performance for the 70cm. operator, 12 channel capability in the range 432-436MHz with three channels fitted (SU8, SU18, SU20). Transmitter output switched 2W/400mW and incorporating the TRIO exclusive 1750hz tuning fork access tone generator. ¼-wave detachable antenna for high gain performance on both transmit and receive.
Supplied complete with all accessories as the TR2200G and with the new miniature handy microphone.



TR7010 £176 +VAT

Following the worldwide success of the TS700, Trio have taken the TS700 basic design and packaged it for 2 metres SSB mobile use.
The TR7010 sets new standards in receiver sensitivity and low spurious emission on transmit. Operating CW and SSB from 144·1-144·3MHz, the TR7010 covers all CW SSB and beacon activity. 40 5kHz channels plus VXO and RIT provide continuous coverage. 8 extra channels can be used, without retuning, in the range 144-145MHz by fitting auxiliary crystals.
Single conversion using an IF of 10·7MHz with a superb crystal filter provides outstanding selectivity. Wide range amplified AGC and newly developed FET devices in RF amplifier and mixer stages allow maximum sensitivity to be used with freedom from overload due to adjacent signals.
Single conversion transmitter with fully balanced mixer system generates a beautifully clean signal with crisp audio quality.

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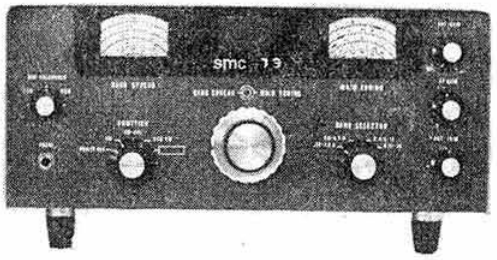


THE SMC 73 available this month

The SMC73 is an all Solid State, Mains and 12V, communications receiver covering 550kHz to 30MHz (without gaps) in four ranges. Frequency readout is by two silk screened illuminated aluminium dials tuned by coaxial spun aluminium knobs, the larger for general coverage, the inner for amateur band (10-80m) band spread (set by use of internal 3·5MHz crystal calibrator).

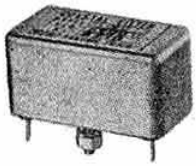
FET's are employed in the R.F. amplifier, mixer, VFO and BFO (these latter two stages being fed from independent stabilised supplies) ensuring good sensitivity, stability (electrical and mechanical), dynamic range (helped by adjustable RF attenuator), and marked freedom from 'pulling', of both the local and beat frequency oscillators. An internal loudspeaker (but with jacks for 'phones and e.ternal speaker), illuminated signal meter, SO239 (UHF) coax socket and binding posts for antenna, switchable envelope (AM) and product detectors (SSB/CW) (provision on switch for possible fitting of FM demodulator), are all features of this exciting new low price receiver.

NEW NAG 144XL

The NAG 144XL-2200 is the finest 2m Linear Amplifier of its type we have yet seen. Identical in size to the FT-221 it produces about 250W RMS of clean stable output from a grounded grid 4CX 350F for a nominal 10W drive. The mains PSU using a large cut-core power transformer is built in and provides a 12V 3 amp fully protected and stabilised output for 12V only exciters.

A switchable, 10dB gain, low noise Mosfet, receiver amplifier (filtered by a large three section helical filter), a large coax change over relay, RF sensing (with adjustable delay) and manual control, an excellent directional coupler (for the inbuilt SWR bridge), thermal delay on switch on (anode current meter illuminated red for first 60 seconds), a thermal cut out situated in the valves exhaust stream (optional timer available to leave blower on for 90 seconds after switch off), a grid current sensing ALC output socket, are but a few of the star features.

HIGH QUALITY LOW PRICE CRYSTAL FILTERS AND CRYSTALS (p & p 20p) VAT 12½%



FOR HOME CONSTRUCTION

Individually supplied with ± 6dB, (25dB), 60dB bandwidths, ripple factor and loss.

YF107M600 600Hz 10·7MHz	cw	£13.00
YF107M2·4 2·4Hz 10·7MHz	ssb	£12.00
YF107M12 12kHz 10·7MHz	fm/a.m.	£12.00
YF90M600 600Hz 9MHz	cw	£13.00
YF90F2·4 2·4kHz 9MHz	ssb	£11.00
YF90F12 12kHz 9MHz	fm/a.m.	£13.00
Carrier crystal HC18/U (each)		£2.00

FT/FR101 FILTERS (3·18MHz C.F.). A SMC exclusive.

Narrow CW (350Hz) only	£16.00
Optimum FM (12kHz) only	£14.50

FM CHANNEL CRYSTALS ONLY £3.50 PAIR (£2.00 single). All simplex, all duplex (normal and reverse) for the: FT2F, -FT224, FT2FB, FT2 Auto. Also TR2200(G)-C146A, C826MB. 6, 8, 12MHz TX, -18, 44, 52MHz RX (10·7 IF).

FT221, FT200, FT75B etc. channel and Band Crystals £2.20 each.

KLM—144 MHz LINEAR AMPLIFIERS

Solid State, SSB/CW/FM, 12V DC 10W Drive. RF sensing with manual override—'microstripline techniques'.

EX STOCK in Totton VAT 12½%.

PA10-70/BL 70W (plus) output	£105
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TWS—COAX SLIDE SWITCHES

Up to: 1kW, 1·5GHz, 0·3dB loss, 1·2:1 VSWR.

50dB isolation. 50 ohm 'N' or 'PL' fittings available.

EX-STOCK P & P 30p, VAT 8%

TWS 120G 1 in 2 out Nickle SO239	£4.45
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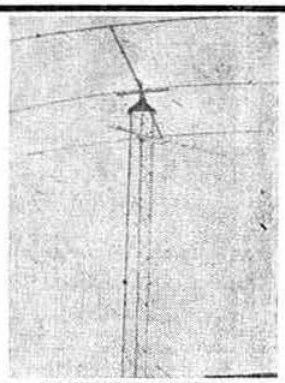
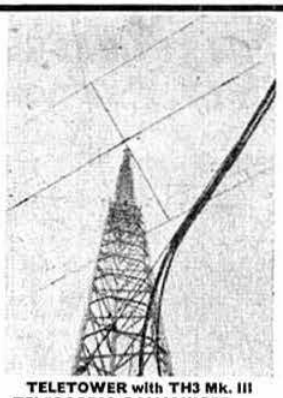
Carriage £2.75, ex-stock VAT 8%
30′ £16.50 or £34.00 c/w rigging
40′ £22.00 or £42.00 c/w rigging
50′ £28.00 or £55.00 c/w rigging



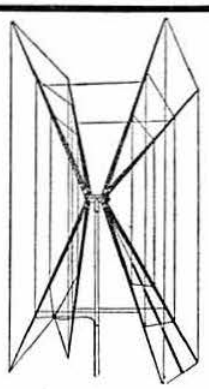
HAMTOWER with TH3 Jnr. SELF SUPPORTING

Galvanised lattice 10′ sections. Free-standing with climbing steps.
Carriage £3.50 ex stock 8% VAT.
30′ c/w base grillage .. £135.00
40′ c/w base grillage .. P.O.A.



TELETOWER with TH3 Mk. III TELESCOPIC GALVANISED

Carriage and rigging (RX) extra.
42′ .. .. £121.00 (RK £28)
57′ .. .. £174.00 (RK £28)
79′ .. .. £224.50 (RK £49)
101′ .. .. £303.50 (RK £76)



GEM QUAD

10-20m., 2, 3, or 4 ele. F/B ratio 25dB low radiation angle.
Tri-dectic fibre glass spreaders with-standing 100m.p.h. winds yet weighing only 21 lbs. (See below for prices)

ALIMASTS

TELESCOPIC LIGHTWEIGHT

1-5, 2 or 3m: Quick Lock Sections 13 versions, 6 to 21m from stock. Rigging extra. Carriage £1. VAT 8%

4 × 1·5m	£13.60	3 × 3m	£17.20
5 × 2m	£21.70	7½ × 3m	£42.00

TELESCOPIC TILTING

VERSATOWERS

SEE FAR RIGHT

BUY NOW!

British Steel has recently announced yet another price increase of at least 10% (18% on tube). This must reflect in price increases in the near future on all masts. We will try and maintain prices as long as possible.

Versatowers: P40 £208.01 P60 £246.84 W40 £162.03 W60 £200.97 + 8% VAT.

ACCESSORIES

ALL YOU NEED

Terylene, galv. or stainless steel ropes, shackles nylon or steel thimbles, steel or all masting, sleeves bracket, cable ties, turnbuckles, earth stakes etc, etc.

CUSHCRAFT VHF OMNI (Car. 80p) VAT 12½%

RINGO RANGER—ARX2—6dB gain over ½λ ground plane. Uses 3 × ½λ in phase and ¼λ stub, ultra low angle radiation, approx 9′ 6″ high, SO239 socket (illustrated right) Why pay more for similar performance?
EX STOCK IN TOTTON

ARX2 6dB Ringo Ranger ..	£19.50	ABW144 2m Big Wheel ..	£14.50
AR2 3dB Ringo Vert ..	£12.00	ABW12S ABW harness ..	£7.30
AR25 QRO AR2	£14.20	ASQ1 2m Squalo	£11.75
CX1000 29MHz Ringo ..	£23.20	ASQ22 Stacked ASQ ..	£24.15

JAYBEAM 70 (4m), 144 (2m), 432 (70) (Car. about 80p) VAT 12½%

D5/2m 5 over 5 slot feed ..	£9.00	D8/70 8 over 8 slot feed ..	£12.00
D8/2m 8 over 8 slot feed ..	£12.00	PBM18/70 18 ele Para. ..	£12.50
5XY/2m 5 element crossed	£9.40	MBM48/70 48 ele Multi ..	£13.90
8XY/2m 8 element crossed	£11.70	MBM88/70 88 ele Multi ..	£18.50
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5Y/2M 5 element yagi ..	£4.90	4Y/4m element yagi ..	£7.75
8Y/2M 8 element yagi ..	£6.40	PMH2/70 2 way harness ..	£3.75
10Y/2m 10 ele long yagi ..	£12.60	PHM2/4m 2 way harness ..	£6.00
14Y/2m 14 ele long yagi ..	£16.25	PMH2/C Circ. phasing ..	£3.25
Q4/2m 4 element quad ..	£9.60	PMH2/2m 2 way harness ..	£4.50
Q6/2m 6 element quad ..	£12.80	2010 Rotator automatic ..	£37.50
PBM10/2m 10 ele Para ..	£14.95	RZ100 Rotator bearing ..	£9.17
PBM14/2m 14 ele Para ..	£19.20	JBL15/59 2″ Joint sleeve ..	£2.50

BANTEX VHF WHIPS (Carriage 75p) VAT 12½%

B5 ¾ 145MHz ..	£6.35	70¼ ¾ 70MHz	£4.00
BGA f.g. ¼ 2m fibreglass	£8.75	Trunk Lip Mount	£5.25
BGA s.s. ¼ 2m stainless steel	£8.50	Magnetic Base Mount ..	£8.50
B5U ¾ 432MHz ..	£5.00	Standard base unwanted deduct	£0.50

CABLES RF FEEDERS (Carriage extra) VAT 8%

RG8/U 50 ohm Heavy	yd.	30p	UR39 75 ohm Medium	yd.	23p
UR57 75 ohm Heavy	yd.	34p	T3278 75 ohm Distribution	yd.	20p
75 ohm Flat twin	yd.	6p	UR43 50 ohm Solid Cent.	yd.	14p
300 ohm Ribbon	yd.	6p	UR76 50 ohm Strand Cent.	yd.	14p

HY GAIN HF RANGE (Car. £1.00-£2.50) VAT 12½%

18AVT/WB—10-80m—wide band, 50 ohm, 1kW. Self supporting, 25′, trapped ¼λ, roof or ground mounted, low radiation angle, vertical.

BN86 1:1 ferrite Balun ..	£11.00	TH2MKIII 10-20m 2 ele ..	£85.60
103BA 10m 3 element ..	£39.60	TH3NJR 10-20m 3 ele ..	£87.60
153BA 15m 3 element ..	£49.60	TH3MKIII 10-20m 3 ele ..	£124.60
203BA 20m 4 element ..	£94.00	TH6DXX 10-20m 6 ele total	£149.60
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PL259 UHF Plug ..	48p	SO239 2 hole socket ..	37p
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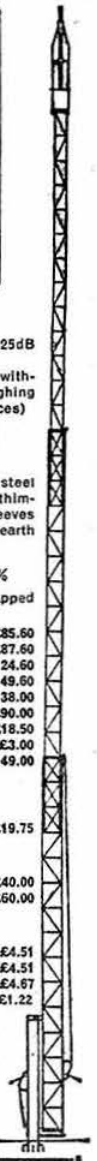

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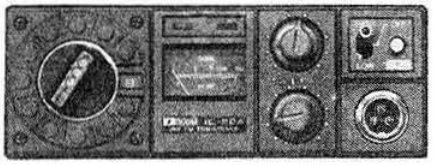

IC-22A
The 22 channel FM mobile rig with 10 channels fitted—these being the most useful 5 simplex channels and the 5 UK repeater channels. The simplex channels are 145·0, S20, S21, S22, and S23. If you buy from us during the next two months we will also offer you S24 at a ridiculous price—thus giving you a 22 channel rig WHICH IS HALF FULL OF CRYSTALS. This is worth thinking about when you consider that 11 pairs of crystals can cost you £6!! There is an automatic CRYSTAL CONTROLLED tone burst fitted which operates on REPEATER CHANNELS ONLY. Ex stock at time of going to press. **£158.63 inc. VAT**

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A NEW MODEL FROM ICOM!
Hand held SSB portable with **3 watts** p.e.p. output. Full VXO over the ranges 144·00–144·2 and 144·2 to 144·4. Two other ranges available with extra crystals. Internal batteries. RIT. True I.F. noise blanker. Add a linear if you want more power, but you'll be surprised what can be done with 3W p.e.p.!

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See January RADCOM for a fair report on this excellent rig. FM/SSB/CW with Full VFO coverage. Very, very stable. Mains or 13·6V supply. A 2 metre luxury! Ex stock at the time of going to press. **£353.25 inc. VAT**

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IC-30A
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(or £162.00 with S24 also)

THE MOBILE WITH THE MOST USEFUL CHANNELS FITTED

The IC-22A offers you the high quality and reliability found in all ICOM products in a compact, robust and attractive mobile rig at a price to suit your pocket. This FM transceiver employs up to date techniques to provide the ideal system for mobile use. Consider these points which all contribute to providing optimum contacts either direct or through the ever growing number of repeaters in the UK:

★ Low noise dual-gate mosfet in the front end of the receiver

★ 5 section helical filter after the front end to provide high rejection of unwanted out of band signals.

★ A trimmer for each crystal for accurate tuning which is necessary to keep ignition noise to a minimum.

★ Dual conversion with IFs of 10·7MHz and 555kHz for excellent image rejection and selectivity, with filters at each I.F. frequency.

★ Narrow filter giving high rejection of adjacent channel signals 25kHz away.

★ Hard IF limiting using an IC.

★ A sensitive, temperature compensated, adjustable squelch circuit with front panel indicator to show when the squelch is open should the gain control be turned back to please the XYL.

★ 1·5 watts of audio from its built-in 3½" speaker giving ample volume for copy on the move.

★ Line voltages are filtered and regulated for reduction of interference from the dynamo or alternator.

★ Excellent clipping and speech tailoring to suit FM requirements.

★ A full 10 watts output from a sturdy PA transistor—switchable to about ¼ watt for local working.

★ A fully automatic crystal controlled tone burst giving an access tone, for operating repeaters, at the beginning of transmissions WHEN SWITCHED TO A REPEATER CHANNEL ONLY. Thus there are no extra buttons to press when driving. Simply switch to the repeater channel you want and the rig does the rest.

★ An additional call button which can be wired as a manual tone switch for rpoviding the very long (≏5 secs) tones required to initially open some continental repeaters.

The accessories include a microphone, dc power cord, spare fuses and the popular ICOM versatile quick release mobile mounting bracket. This makes it a simple job to remove the rig from the car for base station use.

After deciding that this is THE choice in mobile rigs the problem arises as to which channels to fit to give you optimum use, bearing in mind that crystals cost over £4 per channel with VAT at 25 per cent. We put some thought into this, stirred in a little generosity, took a look at the UK bandplan and the frequencies used for FM mobile around the country and decided that with the following channels FITTED you will be unlikely to have to buy more crystals other than for private natter channels and local nets. You will note that we have included ALL the UK repeater channels—it would be silly not to as a mobile is intended to be moved about!

UK Channel	IC-22A Dial No	Use
R3	3	Repeaters in SUFFOLK and YORKSHIRE
R4	4	Repeaters in Central Scotland, Derbyshire, Cornwall and Kent.
R5	5	Repeaters in HAMPSHIRE and Birmingham
R6	6	Repeaters in CAMBRIDGE and S. WALES
R7	7	Repeaters in LONDON, WORCS, Aberdeen, Lancashire and West Wales
SO(145MHz)	9	A widely used mobile calling channel still used by many mobiles in the UK who only have this frequency
S20	10	THE OFFICIAL mobile CALLING channel
S21	11	A simplex channel to QSY to when others are full
S22	12	A widely used simplex channel
S23	13	Another alternative simplex channel often used.

NOTE: Repeaters shown in capitals are in operation NOW, others hope to be on the air before too long. Be ready now and avoid having to wait for crystals when they come into operation.

Thus your IC-22A will arrive nearly half full of crystals when you get it—but there are still spaces for a further 12 channels.

All this for £141 + VAT—with free delivery by Securicor and the full backing of THANET warranty and service.

Subject to availability we intend to stock crystals for the following frequencies: S10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24 and R1, 2, 3, 4, 5, 6, 7, 8 and 9 together with reverse repeater crystals for the UK channels. Other frequencies will be obtained to order PROVIDING THEY ARE IN PORTIONS OF THE BAND DESIGNATED TO FM. Price £4.50 per channel inc. VAT. Single crystals £2.70 inc. VAT.

NOTE: THE CRYSTALS WE SUPPLY ARE OF THE CORRECT LOADING CAPACITANCE FOR ICOM EQUIPMENT: OTHER TYPES MAY NOT BE AND MAY RESULT IN YOU BEING A FEW kHz OFF CHANNEL: THIS RESULTS IN IGNITION NOISE PROBLEMS:

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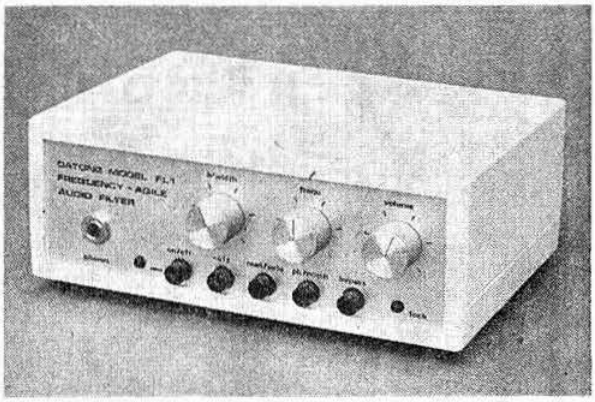
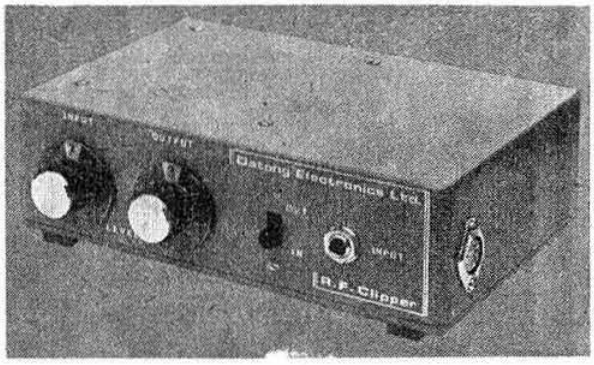


FREQUENCY AGILE AUDIO FILTER — MODEL FL1

Fast becoming a classic, Model FL1 delights and amazes all who hear it in action. This unique product improves any receiver and is installed simply by connecting in series with the receiver's loudspeaker. It offers the following advanced features:

- ★ A notch filter which *tunes itself* for fully automatic removal of unwanted whistles in phone reception. With Model FL1 in circuit you can ignore tune-up whistles.
- ★ Fully variable bandwidth tailoring for enhancing phone reception in the presence of interference and sideband splatter.
- ★ Band pass filtering with fully variable centre frequency and bandwidth (1,000Hz to 25Hz) plus a.f.c., for the kind of CW reception which you would not have believed
- ★ possible.

Supplied with connectors and full instructions. Ready-made connecting leads also available. Price: **£47.50** plus VAT (12½%).

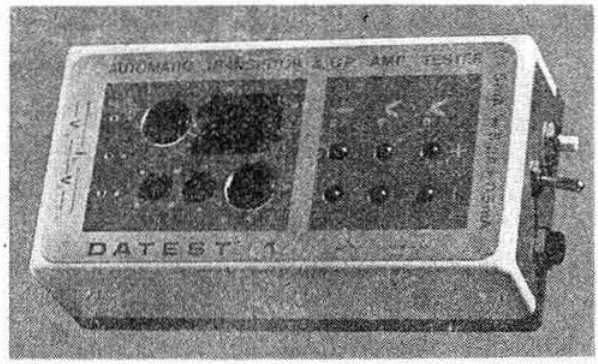


UNIVERSAL RF SPEECH CLIPPER

Still unmatched after two highly successful years, the "Datong r.f. Clipper" has become the standard by which other speech processors are judged. It is used the world over by serious DXers and professionals. As reviewed in *Rad. Com.* (Aug. 1974) and *Short Wave Magazine* (July 1975).

- ★ Comparable to a linear improving your SSB DX potential, the Datong r.f. clipper introduces negligible distortion while raising your average radiated power. A Datong *and* a linear put your signal in the multi-kilowatt class.
- ★ Gives true *r.f.* clipping yet with no installation headaches. Simply connects in series with the microphone.
- ★ Works with virtually any make of transmitter.
- ★ Equally effective for FM and AM as well as SSB.

Model RFC (illustrated). Price: **£38.88** plus VAT (12½%).
Also available with Jap 4 pin input connector and complete with matching output lead, inclusive price **£41.90** plus VAT (12½%). Please state pin connections required.
Fully aligned and tested P.C. Module, Model RFC/M. Price: **£19.50** plus VAT (12½%).



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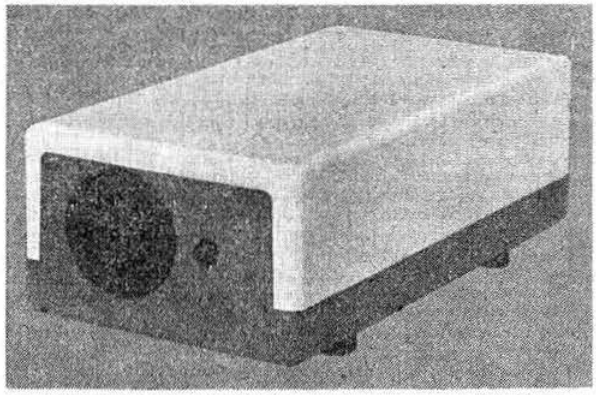
Price: **£49** plus VAT (8%).



DATONG REPEATER TIMER — MODEL DT1

R.F. triggered repeater time-out warning device for mobile or fixed 2-metre F.M. with the emphasis on mobile safety.

- ★ Provides an audible rather than visual warning so that your eyes can stay "on the road". The warning consists of eight "pips" at one second intervals followed by a two second "bleep". The sequence begins fifty seconds from the start of a transmission and ends at sixty seconds.
- ★ No distractions from knobs or switches. Model DT1 has *no* controls, not even an on/off switch.
- ★ No remembering to switch on or off, your radiated signal does it for you.
- ★ No installation worries. Model DT1 requires no external connections. Simply position it where the LED illuminates when you transmit. This means almost anywhere inside car or shack.
- ★ Negligible battery costs. Each battery lasts for about a year; your first year's battery is already installed.

Model DT1 uses four micropower digital ICs and is built into an attractive two-tone polystyrene case. Price: **£13.30** plus VAT (12½%).

All Datong products are designed and built to professional standards using high quality components and glass-epoxy printed circuit boards.
Free data sheets on any product are available on request. Prices include delivery in U.K. only.

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- 10 watts (Hi). 1w. (Lo) output.
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- Single crystal control means you only have to buy 1 CRYSTAL PER CHANNEL.
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- LED (BUSY) indicates whether you have accessed the repeater or not.
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- NEW LEATHER CARRYING CASE/ANTENNA TYPE FCB-OIJ (available later) makes the C828 into a 12 Ch. 1/10w. portable unit.

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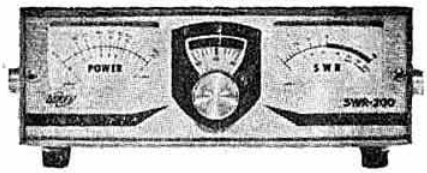

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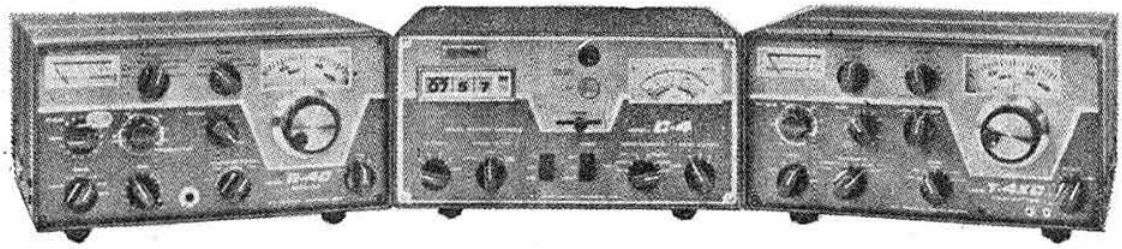

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● Standard Crystals for T-4XC or R-4C ● Accessory I.F. Filters ● AC Power Supply ● Matching Speaker ● Antenna Matching Networks ● RF Wattmeters ● Station Console ● Desk Top or Hand Held Ceramic Microphones ● Noise Blanker

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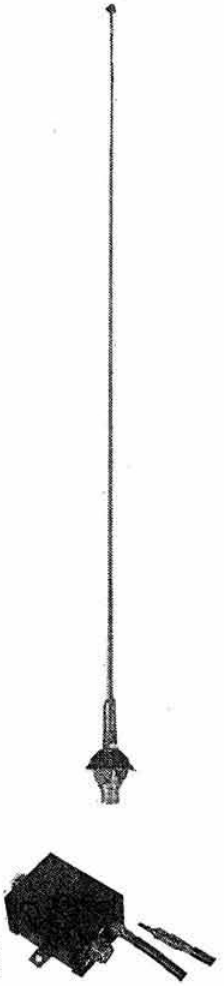

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HEATH Schlumberger

HA-202 2-M FM Amplifier

Delivering 40 watts (nominal) out for just 10 watts in, the HA-202 needs only a 12 VDC supply. So you can easily use it in your car or boat. It features all solid-state design and is a perfect match for the HW-202 Transceiver.

HA-201 2-M Amplifier

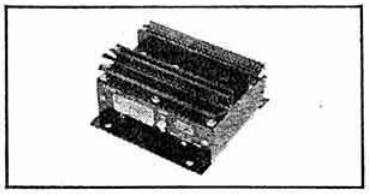
For both mobile and fixed station use from 12 to 16 VDC. The HA-201 operates from 1 to 3 watts FM input in the 144–146 MHz band, giving an 8 watt output for 1 watt input. Supplied in a robust metal case, it features all solid-state design on a single P.C. board.

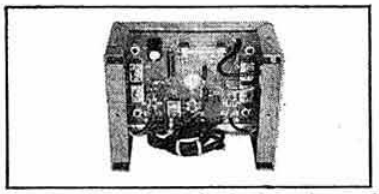
HW-202 2-M FM Transceiver

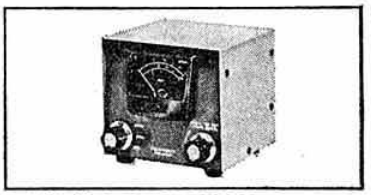
With all solid-state design, multi-channel capability, PTT mike and optional tone burst encoder. The HW-202 has 10 watt minimum output and is designed to operate into even an infinite VSWR without failure.

HM-2102 VHF Wattmeter

With a built-in SWR bridge and 50 to 160 MHz range, the HM-2102 is the perfect tune-up tool for 2-M gear, and covers 2-way commercial, aircraft and amateur communications.







Amateur Radio Department, Heath (Gloucester) Ltd., Gloucester, GL2 6EE. Tel: (0452) 29451.

RADIO SOCIETY OF GREAT BRITAIN

35 Doughty Street, London WC1N 2AE

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.

Annual membership rates: UK—£8 (including VAT); Unlicensed members under 18 years of age, £3. Overseas—£7.50.

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

CURRENT COMMENT

VAT changes

There is the old joke about the chap who, when asked why he was banging his head against a brick wall, replied that it was so nice when he left off. The reduction of the VAT rate on amateur radio equipment from 25% to 12½% gives rise to the same feeling. While we are all glad that the rate has come back to a more sensible level, accepting the fact that we will never be free of VAT from our hobby, there is still scope to reduce the figure to the standard rate. Meanwhile, we still await a detailed list from HM Customs & Excise as to what comes under the 12½% heading and what comes under the 8% heading.

G3DVV, Honorary Treasurer.

COMPOSITION OF RSGB REGIONS

Region 1	Cheshire, Cumbria, Greater Manchester, Isle of Man, Lancashire, Merseyside.
Region 2	All that part of Humberside north of River Humber, North Yorkshire, South Yorkshire, West Yorkshire.
Region 3	Hereford and Worcester, Salop, Staffordshire, Warwickshire, West Midlands.
Region 4	Derbyshire, all that part of Humberside south of River Humber, Leicestershire, Lincolnshire, Nottinghamshire.
Region 5	Bedfordshire, Cambridgeshire, Northamptonshire.
Region 6	Berkshire, Buckinghamshire, Oxfordshire.
Region 7	Greater London south of River Thames, Surrey including that part of London north of the Thames administered by Surrey.
Region 8	Kent, East Sussex, West Sussex.
Region 9	Cornwall, Devon.
Region 10	Dyfed, Gwent, Mid Glamorgan, Powys, South Glamorgan, West Glamorgan.
Region 11	Clwyd, Gwynedd.
Region 12	Grampian, Highland, Island Authorities, Tayside.
Region 13	Borders, Fife, Lothian.
Region 14	Central, Dumfries and Galloway, Strathclyde.
Region 15	Northern Ireland.
Region 16	Essex, Norfolk, Suffolk.
Region 17	Isle of Wight, Channel Islands, Dorset, Hampshire, Wiltshire.
Region 18	Cleveland, Durham, Northumberland, Tyne and Wear.
Region 19	Greater London north of River Thames, Hertfordshire.
Region 20	Avon, Gloucester, Somerset.

Proposed purchase of a data processor

THE CASE FOR A DATA PROCESSOR

by

C. H. PARSONS, GW8NP, Chairman, Finance & Staff Committee

THE preliminary announcement of the proposal to purchase a data processor published in the March issue of *Radio Communication* was intended to inform members that the Society was taking real steps to increase efficiency and economy in handling its routine work.

For too many years the Society has limped along giving ever-increasing membership services while having the outward appearance of business viability. This position was only made possible by the dedicated work of a number of members who freely gave their time and energies in carrying out administrative work or in the production of publications which benefited Society finances. Thus the real cost of running the Society was not apparent; in the publications field alone the philosophy of giving maximum service to members resulted in books being sold at prices which were below the realistic market value. In short, voluntary work, plus the fact that the Society owns its Doughty Street headquarters building, have made it possible to maintain subscriptions at a lower level than the escalating cost of living. This is well shown in Fig 1. Raging inflation has, however, made the position untenable and urgent steps must now be taken to increase efficiency in the operation of Society headquarters.

The main problem lies in the near chaotic state of the membership records section, and immediate steps must be taken to correct the situation. Coupled with this is the necessity to improve the operation of the publication sales organization which is also out-dated and labour intensive. The common factor in both problems is that they are too reliant on costly labour and have minimal modern business aids. A study of how best to bring this about has been carried out by management and the Finance & Staff Committee since mid-1975, and the work was only completed and presented to Council in January 1976. A report by the honorary treasurer which forms part of this article summarizes the results of this study and sets out four alternative solutions which were considered. Before examining these in detail it is essential to keep in mind that membership record maintenance is the all-important problem and that the capability of near-instant read-out of individual membership records must be attained.

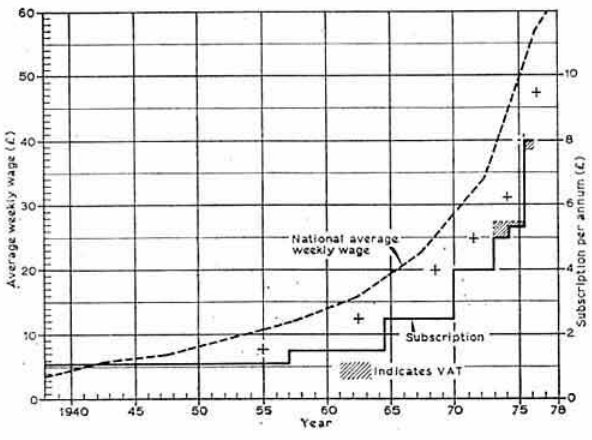


Fig 1. Graph showing relationship between national average weekly wage and RSGB subscription since 1940

The job to be done

There is a recorded membership of 20,000. The membership rate of increase at present is about 2,000 per year and between 75 and 85 subscriptions are dealt with each day—even if there are no queries an average time of five to six minutes is needed to deal with each of these. Altogether there are around 3,000 changes of address per year to be recorded, and during the year about half the members order some material such as call books, log books or other publications.

The present system was set up some years ago in times when the Society was significantly smaller and labour costs were very much lower, and it is not generally realized that under it the name of each new member has to be typed eight times and his address typed six times. This includes the typing of address stencils from which 20,000 wrappers for the mailing of *Radio Communication* have to be addressed each month—this operation alone takes two persons at least two full days to feed and supervise the present machine, while at the same time approximately one-twelfth of the wrappers have to be separated from the rest so that renewal notices can be inserted. There are 150 drawers of address stencil cards, each containing varying quantities, and the contents of each drawer have to be kept separate. The addressed wrappers must reach the printers precisely on time, otherwise the posting of *Radio Communication* would be seriously delayed.

The other major job is the sale of books, orders for which result in some 500 mailings per week, including trade orders from home and overseas. We have about 500 trade outlets throughout the world; for example there are 25 outlets in Australia alone. The processing of individual orders is often confused by some books being temporarily out of stock, and this doubles the amount of work to be done.

What is the problem?

Our main concern is to provide an adequate service without continually increasing the annual subscription rate.

The Society has two major expenses, *Radio Communication*

and wages. Last year wages increased 40 per cent over the previous year and we are still under-staffed in the subscriptions section—this shows up when a member does not receive a subscription reminder or his copy of *Radio Communication*, or sometimes he receives more than one copy. There are also delays in supplying books because an item is out of stock and the rest of the order has to be held up, or in the forwarding of mailing instructions and cash transfer for foreign book subscriptions.

How can the problem be tackled?

There are four possible methods of dealing with the problem:

1. Continue with the present arrangement, employing more staff and yet with continued dissatisfaction of members.
2. Purchase adequate accounting machinery as a partial solution.
3. Use a computer bureau to deal with the members' subscription records and mailing of the journal.
4. Purchase an in-house data processor.

All these courses of action were considered over the eight-month period and the conclusions may be summarized as follows:

1. Continuance of the present or modified manual set-up will become more and more costly and prevent the management devoting sufficient time to the real needs of the Society.
2. If a data processor were not purchased, some accounting machinery must be purchased and it would cost £5,000–£7,000 for an adequate machine.
3. The computer bureau approach was investigated in detail but the annual cost would be about the same as purchasing a data processor, but without rapid access (except at increased cost) and no facility in respect of the book sales accounting.

   Also it would require additional labour to prepare the material to be fed into the bureau. The cost of rental of an "on-line terminal" would be prohibitive.
4. Detailed examination of an in-house data processor provided the only likely solution to our problems which would be least affected by inflation and would allow immediate access to the records.

What are the figures?

If we buy an IBM32 the cost will be as follows:

	£
Machine	21,000
Delivery, education and application development	3,800
Master file and record back-up	1,000
	£25,800

In addition there will be other capital costs such as:

Structural alterations to 35 Doughty Street ..	3,000
Write-off present machine	1,000
	£4,000

Our bank has agreed to purchase the machine and to lease it to us for five years at £5,622 per annum. After that the machine, in effect, would be ours. Therefore, we would acquire the machine on "easy-terms" but have to meet the other capital costs ourselves. If we write off the above capital costs excluding the machine over five years (this represents an extreme position as a longer period would be more appropriate) it works out at £1,760; but let us be cautious and say £2,000 per annum. There will be other running costs, as follows:

	£
Software rental	260
Maintenance (probably only first year, then on call basis)	1,500
Salary of machine operator	2,500
Additional stationery	500
	4,760
Add: "Rent" to bank for IBM32	5,622
Write off capital cost	2,000
Total cost per annum for each of the first five years	£12,382

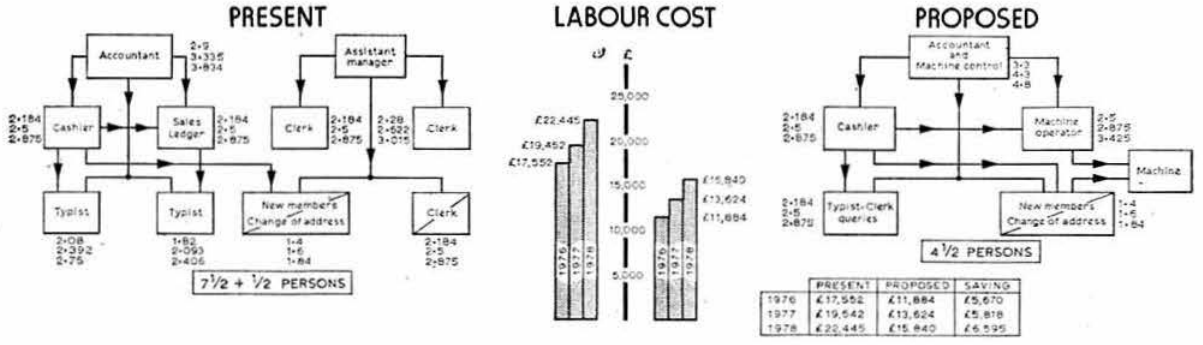


Fig 2. Membership record costs. The figures alongside certain boxes are the estimated salary costs for the next three years

After the first five years (ignoring inflation—but only in this instance) the total annual cost will be only £4,760. This must leave the Society in a very strong position or, to be more precise, we should see the following benefits:

(a) a pegging or slowing down of subscription increases;
(b) a vastly improved service to members;
(c) the ability of Council and management to concentrate on major policy matters affecting amateur radio instead of present day-to-day running problems.
(d) Information on sales and membership which will enable more efficient running of the Society.

What are the savings?

Projected figures by the management show that the purchase of the machine will enable us to dispose of four staff.

Even more important are the postal savings—the total approximate cost of posting *Radio Communication* 12 times a year is over £21,000. With our present machine we are unable to pre-sort the magazine wrappers by postal code and cannot qualify for any rebate, but under the Post Office PPA Contract rebate scheme the calculated cost will be less than £13,000 a year. An immediate saving of £8,000 per annum!

Additionally, the saving on the cost of wrapping and despatching the magazine is calculated at £650 per annum, together with a further saving of £475 by using a thinner wrapper which the present machine cannot handle.

Summing up the various savings we have these figures:

	£
Staff reductions (say 4 × £1,750 pa)	7,000
Postal savings	8,000
Saving on wrapping and despatching ..	650
Saving on wrappers	475
	£16,120

Compare that figure with the running costs figure of £12,382 shown above and this shows that even while paying for the machine we will be saving nearly £4,000 per annum.

Are there any problems?

We are going to have a cash problem. Financing the project will strain our bank balance, partly as a result of other projects. We have to finance the production of the new *VHF/UHF Manual* (£16,000) and the new edition of the *Radio Communication Handbook* (£20,000). However, we will be selling the first book before acquiring the machine and possibly not be fully involved in the second book quite so soon. We had a £13,000 deficiency last year, and will have the same again this year. That is why the subscription has been increased—we cannot pay our way without the increase which came into effect on January this year. The proposed purchase of the data processor was announced as soon as possible (in the March issue) but could not have been reasonably announced earlier as the project was still being investigated.

Members will appreciate that the investigation has involved a great deal of work and time in order to ensure that all factors have been taken into account. The task was finalized at the meeting of the Finance & Staff Committee on 18 December 1975 and the findings were presented to Council at its meeting on 23 January 1976.

The IBM32 machine was selected after a study of similar "in-house" systems available. It is small and compact, of reasonably light weight, provides all the facilities required now or in the foreseeable future, it fits accommodation available at 35 Doughty Street and runs from any 13A single-phase supply.

With the facilities offered by this machine, the Society will be able to face the future with confidence and without the problems that have bedevilled it for the last 10 years.

QTC

amateur radio news

Propagation Studies Committee

The RSGB Propagation Studies Committee invites any member of the Society who would be willing to act as secretary, and who is interested in the committee's work, to write to Tim Hughes, G3GVV, QTHR. Meetings are held at two-monthly intervals at Society headquarters. Enquiries from younger members would be particularly welcome.

Area Representative, Channel Islands

Nominations are requested for a member resident in the Channel Islands to act as the Society's representative for that area. All nominations should be addressed to the general manager at RSGB headquarters.

ITU news

The latest member of the International Telecommunication Union is the Republic of Guinea-Bissau. The ITU now has 148 members. Contributions to ITU expenses by Guinea-Bissau will be in the half unit class. Highest unit class is 30, which includes UK, USA and USSR. In accordance with United Nations principles the latest ITU member will have one vote at conferences, as do all nations who take part.

The cost of the second session of the Regional Administrative LF/MF Broadcasting Conference (Geneva 1975) was 3,496,022 Swiss francs (£1 = 4.8frs). One can only view with amazement the probable cost of the 1979 WARC which will last at least 10 weeks and involve probably three times as many delegates.

Gibraltar exhibition

The 30th anniversary of amateur radio in Gibraltar will be commemorated by an exhibition between 25 and 29 May at the John Mackintosh Hall in Main Street. There will be a special activity station working all bands and all modes, including Oscar and sstv. Application has been made for a unique callsign for this activity.

RSGB Region 11 ORM & Mobile Rally

Royal Lido, Bastion Road
Prestatyn, Clwyd
Saturday 15 May 1976

PROGRAMME

11am : event opens
12.30pm : official opening
2pm : business meeting commences

The RSGB Council will be represented by the President, Dr E. J. Allaway, G3FKM; the Immediate Past-President, Mr C. H. Parsons, GW8NP; and the Zone E manager, Mr D. M. Thomas, GW3RWX

Trade stands **Refreshments**

Talk-in on 145 and 145·5MHz fm, 144·32MHz ssb, 3,760kHz 1,980kHz and 432MHz

Postage rates

Once again the Post Office has increased postage rates, this time to overseas destinations from 26 April 1976. The increases affect surface mail letters above 100g, full-rate printed papers, some reduced-rate printed papers and all air and surface parcels. These increases will cost the Society more for distribution of *Radio Communication* and despatch of publications. Some of the increases are penal, eg a full-rate printed paper of not more than 250g will cost 24p (16p formerly) and of not more than 500g will cost 43p as against 28p. One wonders if the ultimate aim of the Post Office is to effectively stop all distribution of books and periodicals through the mail.

QSL Bureau

The RSGB QSL Bureau will be closed from Friday 11 June to Friday 2 July, inclusive. Members are asked not to send QSL cards to the bureau during that period.

Spot frequencies freed

The Society has been advised by the Home Office that the spot aeronautical frequencies in the 144MHz band are now free, with the exception of 144·00 and 144·54MHz which should be avoided.

"Digital frequency counter and timer"

The authors of this article advise readers who have difficulty in obtaining certain of the ICs that the Motorola MC10116P, Motorola MC10131P and Signetics NE529K can be obtained from Sales Dept, Lock Distribution, Neville Street, Oldham, Lancs OC9 6LF, at a cost of 44p, 62p and £1.50 respectively, plus 50p for postage and packing, and plus 8% VAT.

FM Convention prize-winners

The lucky programme numbers drawn at the FM Convention on 13 March were: 1, 325; 2, 209; 3, 289; 4, 306; 5, 409; 6, 236; 7, 395; 8, 199; 9, 389; 10, 421; 11, 379; 12, 355; 13, 194; 14, 110; 15, 423. Anyone whose programme number is in the above list should send the front cover to Mr D. S. Smith, 151 Hampermill Lane, Oxhey, Watford, Herts, to receive their prize.

BARTG CONVENTION

Village Hall, Meopham, Kent

11am to 5.30pm, 22 May 1976

Lectures **RTTY open forum**
"Auto start" by G3YKB **Tape factory**
"VDUs" by G3PLX **Trade stands**
"Contests" by G8CDW **Bring and buy**

Refreshments

Everyone welcome; not confined to BARTG members

National Wireless Museum open

The National Wireless Museum situated at Arreton Manor, near Newport, IoW, is now open from 10am to 6pm on weekdays and on Sunday afternoons. It is under the auspices of the Wireless Preservation Society, a non-profit making organization exclusively devoted to the collection, restoration and preservation of wireless, television and sound reproduction equipment for purely historical, educational and cultural purposes. The curator is G3KPO, QTHR.

Among the exhibits is a still-working 30-line televisor made by J. Logie Baird in the 'twenties, crystal sets, receivers with bright-emitter valves, curved horn loudspeakers, "Catkin" valves, and "portables" of great size and weight.

Grafton RS 30th anniversary

To celebrate this event there will be a reunion on Friday 7 May at the Jacksons Lane Community Centre, Highgate, London N6, commencing at 7.30pm.

Members, their wives and friends are cordially invited. There will be a buffet with wine, and a licensed bar. Tickets at £1 each are obtainable from Mr I. Norton, Archway Road, London N19 3TX.

Radio Fraternity Lodge No 8040

This lodge recently celebrated its 10th anniversary, and any amateurs who are Freemasons and interested are invited to contact Mr S. Howard, G8TY, 92 Arlington Road, Southgate N14 5AT.

North Staffordshire Polytechnic ARS

MINI-CONVENTION

6.30 to 10pm, 16 October 1976

Four lectures (two streams)

Demonstrations **G3VZI Talk-in**
Buffet **Licensed bar**

Tickets (with map and programme) 35p from NSPARS, Lab D2, North Staffordshire Polytechnic, Beaconside, Stafford.

Numbers limited due to space.

New prefix

The ITU has provisionally allocated the callsign series D6A-D6Z to the State of the Comoros.

Kent vhf repeater

With the assistance of the Kent Repeater Group, the Society recently resubmitted the proposal for GB3KR to the Home Office, and it is pleasing to report that as a result of the negotiations the Home Office has agreed in principle to the licensing of GB3KR.

Facts and figures

The Home Office advises that the following numbers of amateur licences were in force at 29 February 1976:

Class A	15,819	Class B/M	2,151
Class B	5,843	Class F/M	21
Class A/M	3,954	Television	306

The callsign record received from the Home Office dated 2 April 1976 gives the latest callsigns issued in the G4 and G8 series as G4EWG and G8LMZ respectively.

At the end of March 1976 RSGB membership totalled 20,068, made up of 16,827 UK corporate, 1,128 UK associate and 2,113 overseas members.

RSGB Radio Communication Exhibition

Alexandra Palace, London
30 July – 1 August 1976

The RSGB will be organizing and running this exhibition through its Mobile & Exhibition Committee, with Mr J. Hitchins, G8GBN, as exhibition manager.

Times of opening will be 1000-2000, 30, 31 July, and 1000-1600, 1 August.

There is easy access to the site, ample free parking and a frequent bus service between Alexandra Palace and the London Underground.

Several thousand square feet space have already been reserved. Further details will be sent on receipt of an sae at RSGB.

Suppression of vehicle interference for mobile radio operation

by D. W. MORRIS, CEng, MIEE, G3AYJ*, Lucas Electrical Ltd

Introduction

In the normal operation of many items of motor vehicle electrical equipment, energy is generated which can be distributed over a wide range of frequencies; this energy being recognized in a receiver as interference or radio noise. While modern amateur mobile radio equipment is usually of advanced design, with the necessary high orders of sensitivity, it can still be affected by radio interference generated by motor vehicle equipment. It is the purpose of this article to describe some of the methods that can be adopted to reduce this interference to tolerable levels.

Depending on the interest of the individual, an amateur mobile radio unit operates in one of the frequency ranges 3·5—30MHz (hf band), 70—145MHz (vhf band) or 432MHz and higher (uhf band); the majority of the units being based on a.m., fm or ssb modulation modes. Because of the many transceivers, transmitters and receivers available, it is not possible in this article to refer to them by individual type number. However, when one or more radio units employing a.m., fm or ssb modulation modes are installed on a vehicle, the suppression requirements for a particular item of electrical equipment are very much the same.

The various forms of suppressor and simple arrangements described in this article have been employed extensively to suppress mf, hf and vhf interference on vehicles fitted with commercial or amateur radio equipment and have given satisfactory performance. Interference to uhf reception is not often encountered, but where this occurs adequate suppression can usually be obtained by fitting suppressors designed for operation in the range 30-400MHz. Military and similar radio installations demand a higher standard of suppression over a wider frequency range than commercial or amateur radio equipment and are usually the subject of individual design exercises.

Typical sources of interference

Abrupt changes or interruptions in the flow of direct or alternating currents occur in the normal operation of many items of vehicle electrical equipment, and it is the transient currents and associated electromagnetic fields arising from these changes or interruptions that cause radio interference.

The continuously generated transients constitute the most annoying sources of interference. Such transients are usually associated with the ignition system; machines having commutators or slip-ring brush gear such as dc generators, alternators, windscreen wiper motors and fan motors; voltage and current regulators, instrument voltage stabilizers and electric petrol pumps. In addition, semiconductor devices such as silicon diodes and transistors must not be overlooked since they perform functions similar to switches or vibrating contacts and are thus liable to create radio interference. These devices are used in automobile alternators, electrical output control units and electronic ignition systems.

On a petrol-engined vehicle the major source of interference is the ignition system. Energy is stored in the ignition secondary circuit capacitance (50-100pF) which is charged to a voltage in the region of 10-25kV. Each time a plug and distributor spark gap breaks down, this energy discharges in an oscillatory manner as a result of resonance between the secondary circuit capacitance of the ignition system (including spark plug, distribution cables and distributor) and the attached lead inductances. The magnitude of these oscillatory currents, which may attain peak values of 200A or more and flow for a few milliseconds, results in electromagnetic fields being set up which can cause serious interference to radio communication systems over a wide frequency range. The rf energy is radiated from the ht circuit and from the lt wiring due to mutual and direct coupling with the ht system. In a typical saloon vehicle the interference amplitude increases with frequency to a maximum in the region of 40-100MHz and then reduces with increasing frequency, although it may remain seriously appreciable up to at least 600MHz. If copper-cored ignition distribution cables are employed, then the interference field in the hf and vhf bands at a distance of 10m from the vehicle would be of the order 800-1,000μV/m: this value can readily exceed the field value set up by many radio transmitters.

Electric motors and generator control units are further items of vehicle equipment which left unsuppressed can produce appreciable interference fields at a distance from the vehicle. Consequently, they can often be troublesome to radio equipment on the vehicle or on other vehicles in close proximity.

In addition to the item of equipment which forms the source of radio interference, the magnitude of the field radiated from a motor vehicle depends on several other factors, for example the length and positioning of the vehicle wiring. Also, the screening effect of the vehicle body can have a pronounced influence. Its effectiveness is extremely variable and unpredictable, however, since it depends on the manner in which the various metal panels are joined and the nature of the joint. This in turn depends on how well the joints are welded; or if they are bolted, on the number and position of the bolts, whether serrated washers are used, and how much insulation in the form of paint is included in the joint. The effectiveness of the body as an electrical shield also varies over the rf spectrum due to resonances which can be set up within the panels. For example, the hinged bonnet of a typical saloon vehicle can resonate in the frequency range 80-120MHz, and if not effectively earthed (or bonded) will radiate interference which may cause serious problems to the reception of vhf signals.

*20 Welford Road, Sutton Coldfield, B73 5DP

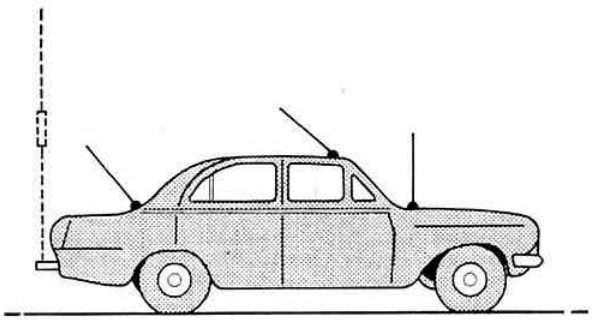


Fig 1. Alternative fixing positions for vhf aerial, and hf aerial position (shown dotted)

Radio frequency interference associated with the electrical equipment on a vehicle can be introduced into a receiver in a number of ways. The most important of these can be summarized as follows:

(a) By direct radiation from the electrical equipment to the radio aerial.
(b) By conduction along the wiring from the equipment to the supply lead of the radio receiver or its power supply.
(c) By conduction along the vehicle wiring and then by radiation to the receiver aerial.
(d) By radiation to mechanical devices such as control cables, rods, wires, tubes (exhaust pipe) which are not associated with the electrical system but located in close proximity to it, and then by re-radiation to the receiver aerial.
(e) By direct radiation from the vehicle wiring to the radio receiver circuits when receiver screening is inadequate.

Thus in any vehicle installation, apart from there being more than one source of interference which can create annoyance, an interference signal can arrive at the receiver by a number of different routes.

Other sources of radio interference received via the vehicle aerial which are worthy of mention, but beyond the scope of this article to discuss at length, are overhead electrical transmission lines, some underground cables, neon signs, electrical equipment in factory areas, trolley-buses and some older vehicles with inadequate suppression schemes. While radio interference from these sources may be annoying to radio equipment users, it is usually only of a temporary nature in a moving vehicle. It is important to ensure that none of these sources is responsible for interference at locations where an attempt is being made to diagnose vehicle equipment as the source of radio interference.

Control by legislation of radiated interference from vehicles

The matter of radiated interference from motor vehicles has been studied in many countries, and national and international legal standards now exist which place maximum permitted limits on the radiated field. These mandatory standards, however, relate only to radiated interference from ignition systems—the major source of interference.

Early legislation varied from country to country. In the UK the first legislation regarding the suppression requirements to be met by motor manufacturers was based on British Standard BS 833: 1953, which was implemented in part in Statutory Instrument No 2023 (1953) of the Wireless Telegraphy Act of 1949. BS 833: 1953 was aimed at limiting radiated interference having frequencies which affected medium and long-wave domestic radio reception, short-wave communications, and television reception in Band 1 (40-70MHz).

In 1964 a common international standard was recommended by a group of experts comprising a working party of the Comité International Spécial des Perturbations Radioelectriques (CISPR). The technical recommendations of the standard (CISPR Recommendation No 18) were later adopted by Working Party 29 set up under the auspices of the UN Economic Commission for Europe to study constructional aspects of motor vehicles. As a result Regulation No 10 of the ECE, namely "Uniform provisions concerning the approval of vehicles with regard to radio interference suppression", was issued in December 1968. The equivalent European Economic Community Directive is EEC 72/245.

The technical standards of ECE Regulation No 10 have now been implemented by many countries, for example all the EEC countries, plus Spain, Sweden and Czechoslovakia etc. In the UK the British Standards Institution has issued an updated standard (BS 833: 1970) which, unlike the previous standard, includes recommendations for achieving the specified new limits. New legislation (Statutory Instrument No 1271: 1973) based on the new British Standard has also been instituted, and became mandatory in April 1974.

The new limits of radiated interference from ignition systems are based on quasi-peak measurements at 10m distance from the source and are as follows:

(i) 50μV/m in the range 40-75MHz.
(ii) 50μV/m at 75MHz increasing linearly with frequency to 120μV/m at 250MHz.

Item (ii) covers the limitation of radio interference frequencies likely to cause annoyance to reception of domestic vhf radio in Band 2, and Band 3 television. This represents an extension of the previous legislation in force in the UK under the Wireless Telegraphy Act 1949 which only specified interference limits up to 70MHz.

In addition to a vehicle manufacturer having to comply with the above limits, owners of vehicles purchased since the new legislation came into force must by law maintain the same ex-works standards of suppression.

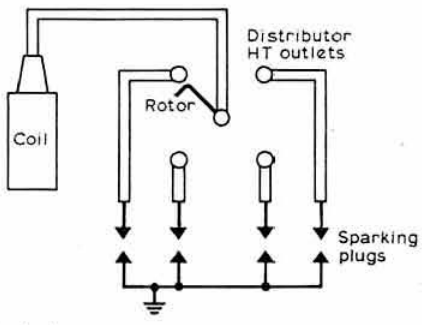


Fig 2. Typical arrangement for high voltage ignition suppression using resistive or inductively wound cables

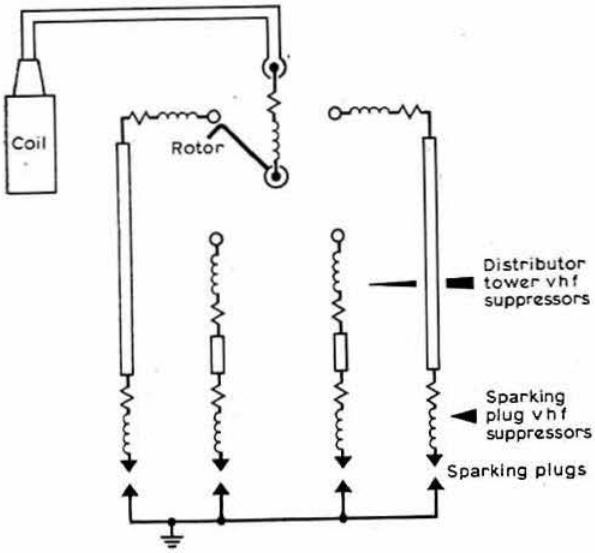


Fig 3. Typical arrangement for improved suppression at vhf using wire-wound resistors and resistive cable

A prototype sampling technique and production conformity tests based on an 80 per cent confidence level ensure that the performance of ignition suppression equipment fitted to 80 per cent of a vehicle manufacturer's production is consistent and complies with the legal requirements. These procedures, which have been employed in the UK since 1970, together with the knowledge gained from the batch sampling techniques of measurement used for the previous 17 years, have provided greater understanding of the pattern of interference from vehicle ignition systems and the subjective effects on radio communication.

Reception of hf and vhf communication signals in vehicles

In its simplest form a commercial or amateur vhf communication system may consist of a single fixed base station and a number of associated mobile units operating in a fairly well defined service area; for example, a private mobile radio service or an amateur Raynet system.

Four frequency ranges are allocated to commercial communication, low-band 71·5-88MHz, mid-bands 105-108MHz and 131-141MHz, and high-band 156-173MHz. In addition there are special Home Office frequency allocations for the police service in the range 94-100MHz. Two frequency ranges (70·025-70·7MHz and 144-146MHz) are in common use in the amateur service.

All modern commercial units, such as those used by taxi and ambulance services, are essentially narrow-band voice communication equipments employing amplitude or phase (angle) modulation and comply with the 12·5kHz channel spacing requirements of the Post Office Specifications W6770 and W6771. Modern amateur units may employ a bandwidth of as little as 2·4kHz, approximately half the bandwidth of commercial systems. SSB is used extensively as well as a.m. and fm. Both commercial and amateur vhf communication receivers have high orders of sensitivity and incorporate either variable frequency or quartz-crystal control of the operating frequency, and agc of certain amplifier stages. Provision is thereby made in the receiver design for likely variations in the received signal strength, due to the screening effect of hills and some types of building, encountered within the transmitter service area. This phenomenon can have a direct bearing on the minimum interference suppression required.

Amateur hf band equipment, for example ssb transceivers, differs considerably from its vhf counterparts in that intercontinental and world-wide communication is possible direct from the vehicle installation. Long-distance communication is carried by ionospheric reflection so that the service area of a mobile unit cannot be predicted as for vhf units. Five frequency ranges are used by the amateur service between frequencies 3·5MHz and 30MHz. A further lower frequency allocation (1·8-2MHz) is sometimes used for local mobile work.

Normal practice with fixed and mobile commercial vhf stations is to use vertical polarization for transmission and reception. With regard to hf and vhf amateur communication systems, however, the majority of the higher power fixed transmitters employ horizontally polarized aerials. Thus, when mobile installations employing vertical aerials are in contact with such fixed stations, cross-polarization of signals occurs. This can result in a wide variation in the received signal strength even within the expected service area of the transmitter. While quite satisfactory reception in a vehicle is still possible under these conditions (hf reception being less affected than vhf) where a weak radio field is encountered, interference from electrical equipment can cause considerable annoyance unless suitable suppression measures are adopted. Obviously reception would be improved and the necessary degree of suppression reduced if the fixed transmitter aerial was vertically polarized; or, in the case of vhf systems, the mobile aerial was of the slant type (ie mounted at 45° to the horizontal).

While a vhf aerial on a vehicle is usually sited on either a rear wing or the roof, an hf aerial, because of its larger physical size, is invariably sited at the rear of the vehicle (Fig 1). Normally this will mean the aerial is well away from the engine compartment and the ignition system, but in the vicinity of such secondary sources of interference as the wiring system to the rear lamp assemblies and the rear section of the exhaust pipe.

For vhf mobile installations, $\lambda/4$ aerials are easily adjusted to be resonant at the operating frequency of the associated communication equipment. HF aerials are constructed from light-gauge tubing with a tuning or loading coil arrangement either in the centre or at the base of the aerial to produce a $\lambda/4$ resonant system at the frequency of operation.

In general the susceptibility of a communication receiver to interference noise, and thus the degree of suppression required, increases with distance from the transmitter.

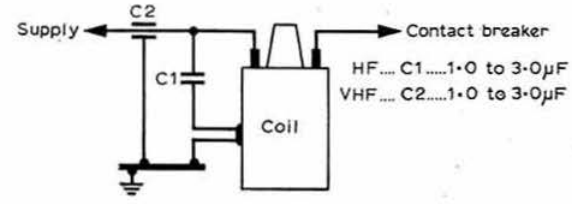


Fig 4. Arrangement of shunt and feedthrough vhf capacitors for ignition coil primary circuit

When operating in regions of high radio field strength, the sensitivity or gain of a receiver will automatically be reduced through its design and interference suppression requirements will be minimal. Nevertheless, when fitting radio communication apparatus to standard production vehicles for operation under such conditions, all possible sources of radio interference still have to be investigated: a standard production vehicle has only its ignition system suppressed and that only sufficient to meet the legal limits established for the protection of domestic radio and television, and communication equipment not associated with vehicles. Thus, when radio communication equipment is installed on a vehicle, additional radio interference suppression is usually required, particularly when the equipment is to be operated in areas of weak radio field strength.

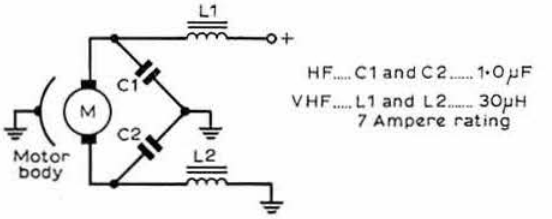


Fig 5. PM fan motor, electric pi pump motor

While, in general, suppression requirements for reception of hf and narrowband vhf communication signals on vehicles are easier to satisfy than those for reception of vhf radio broadcasts, they are more difficult to meet at an acceptable cost than those necessary to receive long and medium wave radio broadcasts. Practically all items of electrical equipment on a vehicle capable of causing interference will need some suppression to receive hf and vhf communication signals, whereas screen wipers, fan motors, voltage regulators and instrument voltage stabilizers etc, need only occasional suppression for reception of lower radio broadcast frequencies. Suitable radio interference suppression schemes for operation of mobile hf and/or vhf communication equipment are shown in Figs 2-13 and in the table.

General principles of radio interference suppression

When mobile radio equipment is installed in a vehicle, consideration must be given to the siting of the equipment and to the suppression requirements of each part of the vehicle electrical system, so that little or no interference is generated within the frequency range of the radio equipment.

The siting of the radio aerial and the routing of the feeder cable should be studied so that as far as possible they are clear of known sources of interference such as ignition and

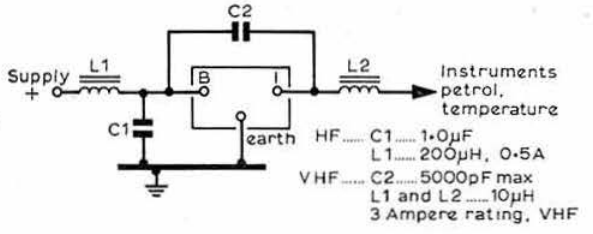


Fig 6. Instrument voltage stabilizer

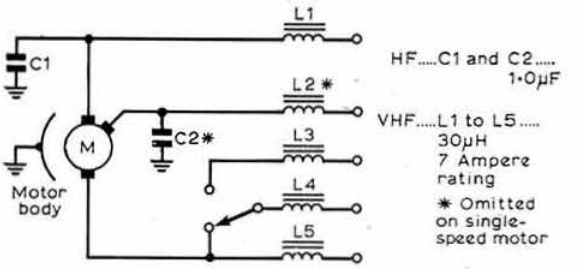


Fig 7. PM screen wiper, 2-speed with regenerative braking

generator circuits and long cable runs in the vehicle wiring harness.

A good earth bond of the feeder cable screen direct to the vehicle chassis at the aerial base is important. Usually, poor feeder cable bonding at this point results in interference to the receiver from most items of ancillary equipment (starter, direction indicators, wind-screen wipers, horns etc). Salt corrosion of earthing bonds can also be responsible for similar interference problems if the vehicle has been in use for some time during adverse winter weather conditions.

It is vital that amateur mobile equipment is installed in accordance with any instructions supplied by the manufacturer, particularly with regard to receiver position and earthing to the vehicle chassis. An unsatisfactory installation in respect of high frequency circulating currents set up by poor earthing connections, high impedance supply lines to the equipment, and the use of inferior aerial feeder cable with poor screening can create many problems when undertaking interference suppression. With correctly installed equipment on the other hand, it is very much easier to identify each source of radio interference and determine how the interference reaches the equipment.

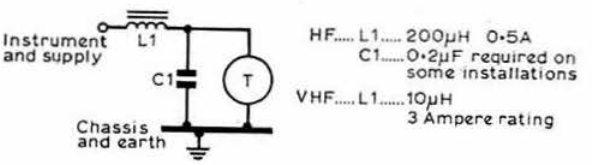


Fig 8. Oil pressure transducer

In general the aim is to reduce interference from each offending item of electrical equipment through the fitting of suitable suppression components, so that the ratio of signal to interference at the receiver is better than 30dB (approximately 30:1). Suppression components vary considerably in their characteristics, and consist of resistive, inductive and/or capacitive elements. Each of these elements is employed in a different manner to obtain the desired interference suppression, and each is of such a value that optimum performance of the suppression component occurs in one of the two frequency ranges 0·15-30MHz and 30-400MHz.

For example, resistive or inductive suppressors having high ohmic values are inserted into ignition plug leads (Figs 2 and 3) to attenuate the high frequency transient currents responsible for interference. Such a suppressor will have little or no effect on the ignition function. On the other hand, where electrical circuits conduct heavier currents (eg battery charging systems) the introduction of such high

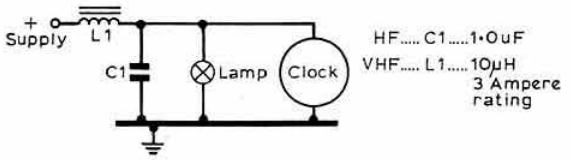


Fig 9. Clock

resistance would be unacceptable. Instead, low resistance inductors constructed on iron cores are used, designed to present a high impedance to either low frequency currents (for example, due to alternator ripple) or radio frequency currents which otherwise would flow into the vehicle's wiring system or radio equipment.

The capacitor presents a low impedance path to high frequency currents and is of great value in restricting their flow to small non-radiating circuits (Fig 4).

Circuits giving high attenuation of radio interference over certain frequency ranges can be constructed utilizing the characteristics of resistive, inductive and capacitive suppressors. These circuits are known as rf filters, examples of which are shown in Figs 5, 6, 7, 8 and 14.

When selecting such suppression components as inductors wound on ferrite cores, the current rating of the equipment to be suppressed is a guide to the size of suppressor required. Many of the commercially available inductors designed to be resonant at vhf communication frequencies, however, may have a greater current rating than that of the equipment with which it is intended to operate. Such suppressors produce an attenuation of interference of some 30dB when mounted close to the terminals of the offending equipment (Figs 5-9).

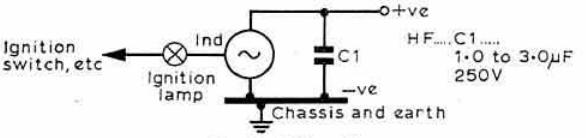


Fig 10. Alternator

The complexity of suppression components and their arrangements will depend upon the interference frequencies, the magnitude of the interference and the lowest value of radio signal which the receiving equipment can be expected to resolve. *It must always be ascertained that the suppression component does not impair the function of the equipment or circuit to which it is fitted.*

Any suppression components that have to be fitted in addition to the standard suppression parts already installed by the car manufacturer represent an increase in the cost of the overall radio installation. Thus the cost of the extra components has to be correlated with the degree of suppression obtained and the performance requirements for the radio equipment.

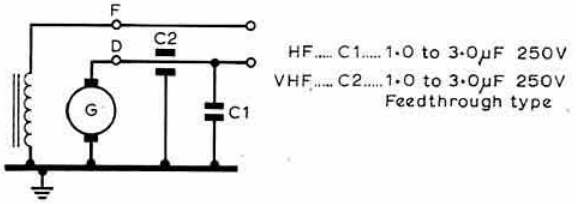


Fig 11. Dynamo

Methods of interference suppression

There will be few installations where the level of interference from certain items of electrical equipment will not warrant the fitting of suppression components. Moreover, these installations cannot be predicted with any certainty as conditions may vary between vehicles of a particular model.

The more involved suppression problems arise when the radio receiver is subjected to interference from several sources; for example, interference from the ignition system may be heard simultaneously with that from the screen-wiper and the instrument voltage stabilizer. In such cases it is usual to adopt a separate suppression scheme for each item of equipment, starting with the equipment which is the source of interference having the highest amplitude. It is usually possible to arrange for most electrical equipment to be disconnected while assessing the suppression required by the ignition system; afterwards each piece of equipment is separately reconnected to the supply for individual assessment.

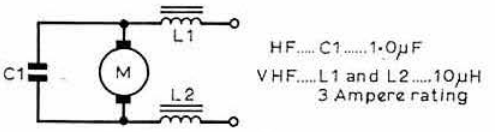


Fig 12. PM electric screen washer

A reliable indication of the effectiveness of each suppression scheme can be made by detuning the main receiver to the upper or lower sidebands of the received signal to an extent where some considerable distortion occurs in the loudspeaker. When detuning is not possible, some indication of the suppression level achieved can usually be made by manually switching out the audio muting circuit and advancing the volume control toward maximum.

A reliable assessment of the effectiveness of supply line filtering can be made by substituting the aerial with a dummy one inserted into the radio receiver aerial socket, and turning the audio gain control to rear maximum. Some receiver supply line filters may need to be improved by fitting either an inductor and possibly a capacitor, or a pi-section filter (Fig 13) outboard of the receiver but close to the supply inlet terminal. Supply line filter components should not be mounted within the receiver housing unless they are adequately screened from other components and circuits in the receiver.

Ignition system

In some instances the amount of built-in suppression may be adequate for reception of hf and vhf signals in the vehicle, but this depends on how well the vehicle bodywork is assembled to form an electrical screen around the ignition circuits. However, experience shows that more often than not the

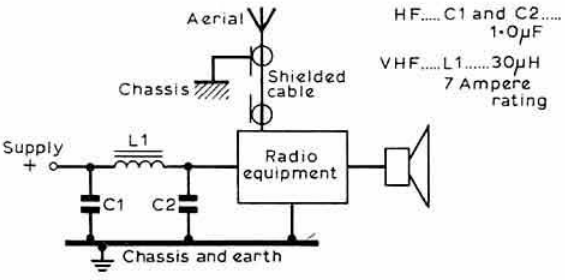


Fig 13. Radio equipment

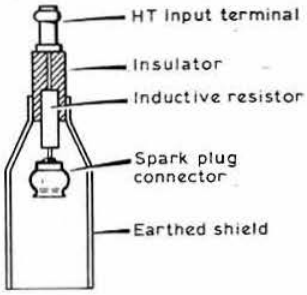


Fig 14. Sparking plug suppressor for vhf applications

ex-works level of suppression needs to be improved, particularly where weaker hf and vhf signals are encountered.

Most vehicle manufacturers fit as initial equipment a resistive-type cable with distributed capacitance which operates as an RC filter network to produce a high attenuation of rf oscillatory currents. Fig 15 shows resistive suppression cable to have a rising impedance characteristic with increasing frequency. This can be compared with the impedance characteristic of the lumped composite carbon type of suppressor, also shown in Fig 15, which falls with increasing frequency above 40MHz. It follows that this latter suppression component, usually made in the form of spark plug "elbow" units and distributor "plug-in" or "screw-in" units, is generally unsatisfactory for suppressing vhf and any uhf interference, but can be useful on the hf bands.

Inductively-wound resistors assembled into screened units for sparking plugs (Fig 14) and "push-in" units for distributor ht outlets (Fig 16) are further types of ignition suppressors. The impedance characteristics of these types is also shown in Fig 15. It will be seen that they give maximum attenuation of interference in the vhf broadcast frequency range, and adequate protection for frequencies up to approximately 300MHz. If suppression units of this design are used in conjunction with resistive cables, the arrangement exhibits wide-band attenuation characteristics of interference frequencies in the long-wave, medium-wave, hf and vhf bands. If

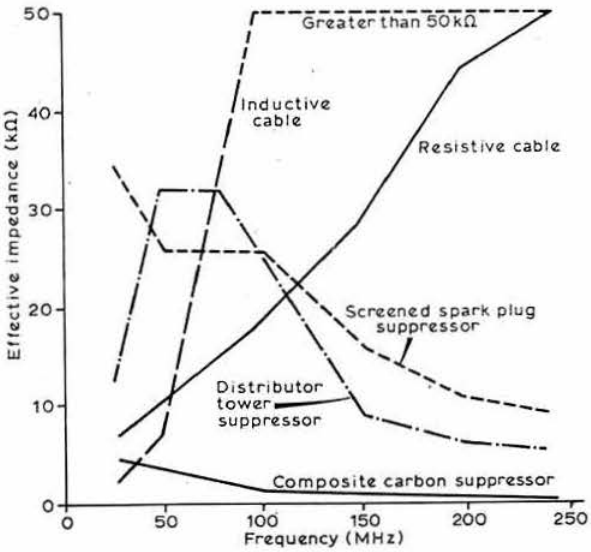


Fig 15. Comparison of suppressor impedance values

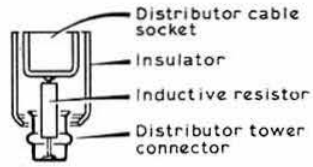


Fig 16. Distributor spark suppressor for vhf applications

copper-cored ignition cable is employed instead of the resistive type, a less effective result is obtained, although in most instances the vehicle will meet regulation standards at frequencies of 40-250MHz.

On no account should the lumped composite carbon-type suppressors be used with copper-cored ignition cable because their effective impedance reduces with increasing frequency. In some cases the radiated ignition interference from the vehicle will meet mandatory requirements (ie ECE Regulation No 10), but it is more usual for the specified limits at 90MHz and above to be exceeded. Also, the increase in radiation generally creates added problems for the satisfactory installation of hf, vhf and uhf radio communication equipment on the vehicle.

A common fallacy which exists in the motor vehicle service trade is that the increased ht resistance resulting from the use of resistive cables, and/or the insertion of suppressors in resistive cables, produces a deterioration in the performance of the ignition system and hence in that of the engine. Consequently, it is not uncommon to find that the manufacturer's original equipment has been replaced with copper-cored ignition cable. Such practice raises the level of radiated interference from the vehicle concerned and infringes the law.

It is often found that ignition interference is evident even when suitable suppression methods are applied to ignition sparking plugs and their connecting leads. In many vehicles this can be shown to be due to radiation from the distributor on account of the jump-gaps between the rotor arm and outlet tower electrodes. This problem can be overcome by the use of a cylindrical metal shield (eg tinplate) which surrounds the distributor cap, and extends to about 0·5in above the top of the outlet towers. This shield must be earthed to the distributor base plate.

The inductively-wound distribution cable and the suppressed distributor rotor arm used on some European production vehicles are worthy of mention. The inductively-wound resistive distribution cable is characterized by its low resistance (200-1,000Ω/ft and by its high impedance at frequencies of 30-300MHz (Fig 15). The cable has therefore

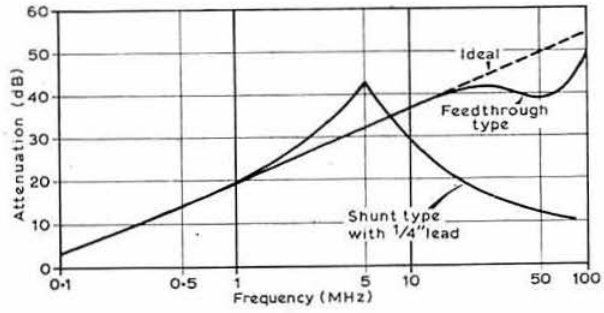


Fig 17. Suppression capacitor frequency characteristics

Summary of equipment recommended for suppression of hf and vhf radio interference

Equipment to be suppressed	Suppression components Up to 30MHz	30-400MHz	Comments
Ignition system			
HT cables (coil-distributor and distributor-sparking plugs)	Resistive core ht cable (Fig 2)	Resistive core ht cable (Fig 3)	Standard fitting on most production vehicles.
Sparking plugs		Screened plug—suppressor (Fig 3)	Screened wirewound resistor (Fig 14).
Distributor ht towers		Unscreened distributor suppressor (Fig 3)	Unscreened wirewound resistor (Fig 16).
Distributor ht cover		Metallic shield (if required)	A cylindrical metallic shield mounted to surround the distributor cap. It is attached to the metallic body of the distributor.
Ignition coil supply terminal ("SW" or "+")	Suppression capacitor 1μF 250V dc wkg (Fig 4)	None usually required: otherwise feedthrough suppression capacitor 1μF 250V dc wkg (Fig 4)	Suppression capacitor secured by earth terminal and ignition coil fixing bolt.
Charging system			
DC generator (dynamo)	Suppression capacitor 1-3μF 150-250V dc wkg (Fig 11)	Feedthrough suppression capacitor 1μF 250V dc wkg (Fig 11)	Fit close to "D" or output terminal of generator.
Alternator	Suppression capacitor 1-3μF 150-250V dc wkg (Fig 10)	None usually required	Fit in recess provided on slip-ring end casting. Connect between "+" output terminal and earth.
Control boxes for dc generators			
RB106-2	Filter unit	None usually required	Filter units available only from manufacturer of control box.
RB310	Filter unit	Special order only from manufacturer	
RB340	Filter unit		
Electronic regulators for alternators			All electronic regulators incorporate some degree of rf suppression.
Types built-in to alternator	Suppression capacitor 1-3μF 150-250V dc wkg (Fig 10)	None required	Fit in recess provided on slip-ring end casting. Connect between "+" output terminal and earth.
Externally mounted types	Suppression capacitor 1μF	None required	Connect across "+" and "—" regulator terminals. Fit short earth lead to "—" terminal.
Screen wipers			
Permanent magnet field	Suppression capacitor(s) 1μF (Fig 7)	Ferrite-cored inductors 30μH 7A (Fig 7)	Inductors fitted in supply leads. Capacitors connected between brushes and earth.
Wound field	Suppression capacitor(s) 1μF	Ferrite-cored inductors 10μH 3A	For frequencies up to 30MHz earthing straps may be required on motor body assembly.

Equipment to be suppressed	Suppression components Up to 30MHz	30-400MHz	Comments
Electric clocks (continuously driven types)	Suppression capacitor 1μF (Fig 9)	Ferrite-cored inductor 10μH 3A (Fig 9)	Fit components close to clock supply terminal: capacitor in parallel and inductor in series with clock.
Screen washer (pm field)	Suppression capacitor 1μF (Fig 12)—if required	Ferrite-cored inductors 10μH 3A (Fig 12)	Fit components close to motor terminals, capacitor in parallel and inductors (usually two) in series with motor.
Heater fan motor	Suppression capacitors 1μF (Fig 5)	Ferrite-cored inductors 30μH 7A (Fig 5)	Fit components close to motor terminals; inductors (usually two) in series with motor and capacitors between brushes and earth.
Instrument voltage stabilizer	Suppression capacitor 1μF and/or inductor 200μH 0·5A (Fig 6)	Ferrite-cored inductors 10μH 3A (Fig 6) and 5,000pF (maximum) capacitor	1μF suppression capacitor is connected between "B" terminal and earth, and inductors in "B" and "I" leads. The 5,000pF capacitor is connected across stabilizer contacts.
Oil pressure transducer	Ferrite-cored inductor 200μH 0·5A and (if required) a 0·2μF capacitor (Fig 8)	Ferrite-cored inductor 10μH 3A (Fig 8)	Fit components close to transducer terminals, inductor in series and capacitor in parallel with transducer.
Petrol pump			
Solenoid types	Suppression capacitor 1μF	None usually required	Fit capacitor close to pump supply terminal.
Immersed, motor driven	None usually required	Ferrite-cored inductors 30μH 7A (Fig 5)	Inductors connected in each supply lead and close to motor.
Petrol injection pump motor	Suppression capacitors 1μF (Fig 5)	Ferrite-cored inductors 30μH 7A (Fig 5)	Fit components close to motor terminals, inductors in each supply lead and capacitors between brushes and earth.
Other electrical equipment			
Starter, Horn, Flasher unit, Switches	None usually required	None usually required	Suppression of items listed not usually attempted due to their low duty requirements.
Non-electrical items			
Bonnet, Engine block, Gearbox, Exhaust pipe, Rear suspension, Front suspension (two units)	Braided earth straps	Braided earth straps	It is recommended that all the metal parts of a motor vehicle body are bonded together, ensuring good metal-to-metal connections. Thus interference may be reduced by bonding the bonnet and engine block to the bulkhead, gearbox and exhaust pipe to chassis, and the front suspension (both side units) and rear suspension (rear axle) to suitable points on the vehicle body.

found use where vhf and uhf communication equipment is carried on the vehicle as well as being extensively employed to meet legislative limits. Its low resistance is usually a disadvantage for suppression of interference at frequencies in the long and medium wave and hf bands, when it is necessary to introduce some additional impedance in the form of composite carbon suppressor units at the sparking plugs and distributor ht outlets. The suppressed distributor rotor arm has an inductively-wound resistor mounted in the rotor moulding so that it is electrically in series with each distributor spark gap in turn during rotation. The suppressed rotor arm is used in conjunction with resistive cables to obtain improved suppression of vhf and hf interference emanating from the ignition distributor. However, neither is generally available in the UK.

Ancillary equipment

Figs 5-13 show the suppression components it may be necessary to fit to various items of ancillary electrical equipment if both hf and vhf communication equipment is to be operated from the same vehicle. If either hf or vhf equipment only is to be operated from the vehicle, then not all the suppression components indicated in each figure will be required. Instead, it will be necessary to fit only those components which provide the appropriate hf or vhf suppression as specified in the table.

Suppression techniques used for electric motor-driven equipment are illustrated in Figs 5, 7, 9 and 12, and those for alternators and dynamos in Figs 10 and 11 respectively. Alternators having in-built electronic circuits rarely cause interference problems at vhf, although there may be diode

commutation and regulator noise over the frequency range 0·15-10MHz. Diode commutation noise may also be present in the audio frequency range. The suppression arrangement shown in Fig 10 takes account of these eventualities, attenuating any interference at the above frequencies that may enter intermediate and audio frequency stages of a receiver by one or other of the routes suggested earlier.

Figs 6 and 8 show methods of suppressing such contact-operated devices as instrument voltage stabilizers and oil pressure transducers.

All inductors and capacitors used for suppression purposes should be connected as near to the source of interference as possible. In particular the leads of capacitors must be kept very short in order to keep the resonant frequencies of capacitor circuits as high as possible (Fig 17) and thereby obtain the best possible attenuation. The value of a feed-through capacitor for vhf and uhf suppression as opposed to a shunt type can be seen in Fig 17 where their frequency characteristics are compared. Each capacitor has a value of 1μF. □

A simple magnetic base

by R. S. MCMILLAN, GM8JUY*

AFTER the author had obtained a mobile licence, the need soon arose for an effective 2m aerial for his company-owned vehicle. This aerial had to be secure, vandal-proof, easily and quickly fitted and, above all, reasonably cheap.

An old 10in speaker (of unknown age) was to hand, and after dismantling it there seemed very little work required to convert it to a functional magnetic base. Various experiments were tried with the bare magnet but the holding power was very low.

The original pole piece was approximately $\frac{3}{8}$in longer than the magnet itself; see Fig 1(a). This extra length had to be removed, and this was accomplished by sawing through the pole piece a little above the level of the magnet and then, with the magnet in place, filing down the pole piece until the file touched the magnet all the way around. The magnet was then removed and the pole piece dressed off smooth.

Because the original retaining screws were steel and therefore magnetic, these were discarded in favour of brass BA screws. As can be seen in Fig 1(b), the bolts were fitted with their heads inside the magnet in the rough slot for the original bolts. The magnet is a rough casting and these slots are far from smooth or even. This is fortunately just what is required, because the bolt heads fit tightly against the magnet when pulled through the end plate by the lock nuts (Fig 2), thus holding the device together.

At this point the construction of the base was tested by an attempt to separate the magnet and the back plate. This could not be done and it was therefore felt that the base would stand the strain of an aerial.

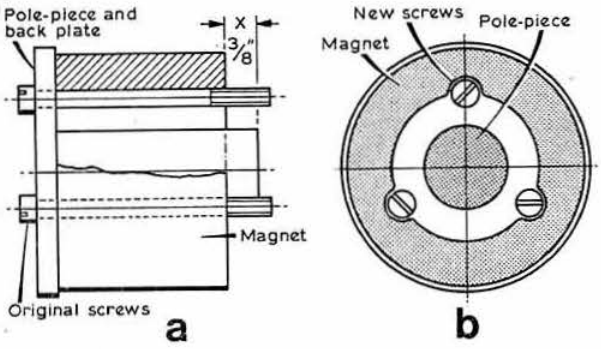


Fig 1. (a) Original magnet and pole piece assembly and (b) position of the new screws

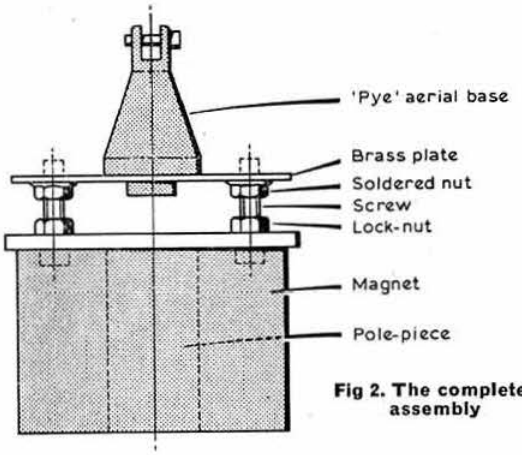


Fig 2. The completed assembly

The next step was to cut a brass (or steel) plate of the same diameter as the back plate. This was drilled to fit the three brass BA screws. A hole was also drilled exactly in the centre for the aerial base insulator. A brass nut was run down each of the three screws and the brass plate was lowered on to them. The three nuts were then adjusted to give the required clearance under the plate. In the author's case this was $\frac{1}{8}$in below the lowest part of the aerial base assembly but it does depend on the aerial base used.

The nuts were then soldered to the brass plate and the screws cut off flush with the top of the plate. This gave a rigid and effective magnetic base, but one which was unfortunately open to the elements. The solution to this problem was to cover the bottom of the assembly with an old balloon, the neck of which had been cut off, and to stretch it tight over the magnet. The top was sealed using the rubber "boot" which covers the drive-shaft joint of BLMC 1100 cars. This was a stretch fit over both the aerial base and the magnet, and no retaining device was required to keep it in place.

The magnetic base has been in use for some time now and has given no trouble at all. It will carry a $\lambda/4$ or $\lambda/2$ whip and has been tested at speeds of up to 85mile/h with no detrimental effects being found. It will not, however, withstand the "whip" effect of a $5\lambda/8$ loaded aerial. Since all components except the rubber boot were to hand, the total cost was less than £1.

On-the-air tests have shown no difference between this aerial and an ordinary aerial fitted into the roof, and it shows greatly improved radiation compared to a $\lambda/2$ aerial mounted on the rear wing of a BLMC 1100 car. □

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Mobile with glass-fibre cars

by K. HARDMAN, G8ICM*

THIS article deals with the installation of a 5λ/8 aerial on the author's glass-fibre three-wheeler car. Several unsuccessful prior attempts were made to obtain the ground plane for such an aerial and these included aluminium sheeting, baking foil and wire radials.

The first possibility would have entailed drilling or riveting the sheeting to the roof of the vehicle, and this was most undesirable as it would have lowered its resale value. The second idea was a little better, but it was still unsatisfactory as the foil had to be glued in place and it was difficult to get a good electrical contact. The possibility of using wire radials was also dismissed as they too had to be fixed in some way.

After inspecting the base station ground-plane aerial, the author had the following idea. Instead of having the supports underneath the radials, why not suspend rigid radials from the aerial using a small plate fitted in some way to the roof of the vehicle? This idea seemed feasible, and the configuration shown in Fig 1(a) was tried first.

This was satisfactory as long as the speed of the vehicle was kept below 35mile/h. When this speed was exceeded, however, the bend of the whip was sufficient for the aerial to cause a mismatch with the ground plane, thereby creating a very high swr which sometimes actuated the protection device incorporated in the transceiver.

Bearing this in mind, the configuration shown in Fig 1(b) was devised and this solved the problem. Even at motorway speeds in excess of 60mile/h the swr remained quite low, with very little flutter observed by the receiving stations.

Construction

Three lengths of ⅜in diameter aluminium tubing are cut to length (approximately 19in) and are drilled as close to one end as possible to take 4BA screws; see Fig 1(d).

The plate is prepared by drilling eight holes, again to take 4BA screws, and countersunk on the roof side of the plate. The author used the plate supplied with his commercial aerial, but a similar one can easily be made up if a home-constructed aerial is used. The countersunk screws for the radials are passed through the plate, and nuts are screwed down really tight. The radials are not, however, fitted at this stage.

The next stage is to fit the aerial in the usual manner as for a steel-bodied vehicle, leaving the radials and cable to the last. The hole in the roof should be very carefully drilled and cleaned to take the centre electrode (and possibly a flange) of the aerial base. It is a good idea at this point to smear a little petroleum jelly around the hole to form a better weather seal, and to use all the rubber or plastic seals supplied with the aerial. The aerial should then be fitted, less radials and

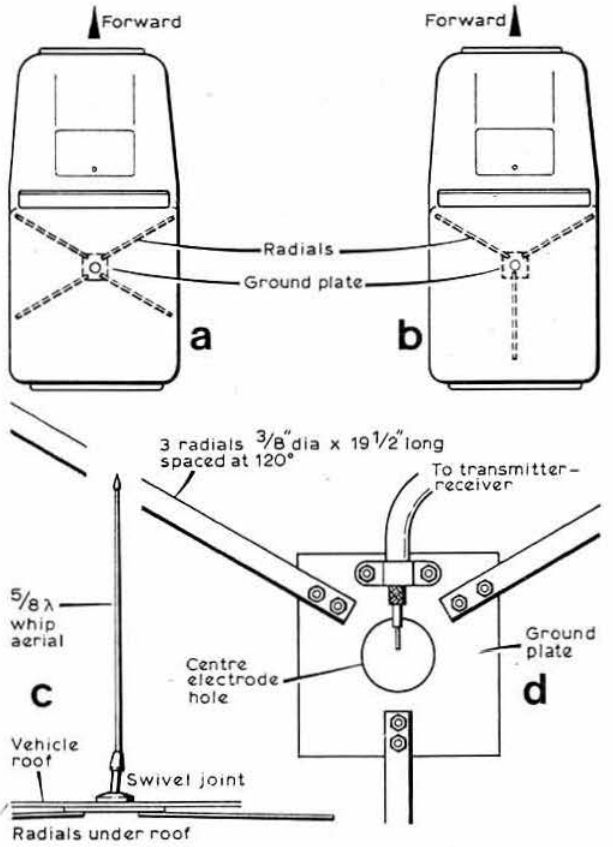

Fig 1. (a) Unsuccessful and (b) successful configuration of radials. (c) Side view of fixing. (d) Ground plate detail

cable. All insulating bushes as supplied with the aerial should be used or it may become short circuited.

The radials should be placed 120° apart, fixed into place over the protruding screws, and tightened down using plain washers, followed by locking-type washers and finally plain 4BA nuts (it is better not to use locking nuts as this will help if the aerial has to be removed at a later date). The nuts should not be over-tightened as this will tend to crush the tubing and possibly cause a slack and floppy radial with a high swr.

Finally, the coaxial cable should be connected, using the centre screw of the aerial for the inner conductor and the fixing clamp for the outer braiding. The support of the cable depends on the vehicle in use. The author fixed the cable by carefully trapping it beneath the roof light fitting and then running it between the roof and roof covering.

Conclusion

The author has used this system with complete success. It has an swr of less than 1·5:1 at all speeds up to 60mile/h or more. Someone else should be monitoring the swr meter while the operator is driving at that speed, of course!

If one wishes to sell the vehicle at a later date, it is a simple matter to remove the aerial complete and to fill the single hole using the many fillers available on the market. □

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EQUIPMENT REVIEW

MK Products slow scan monitor PCBs

by P. J. HORWOOD, G3FRB*

ALTHOUGH the original work on sstv was carried out principally in the USA in the late 'fifties, it is only in the past few years that it has caught on, as any listener can confirm by tuning to 14·225MHz. The uninitiated probably view the peculiar noises with the same suspicion which was met by early ssb signals. In the beginning it was necessarily a do-it-yourself exercise; now commercial sstv equipment is available for those prepared to pay £500 or more. A new generation of equipment operators has arisen, while the build-it-yourself man is dissuaded from "having a go" because of unfamiliar techniques or suspected cost.

Luckily cost is not necessarily a limiting factor if a monitor section is constructed around the PCBs available from MK Products, 5 Lancashire Drive, Belmont, Durham, from whom a price list can be obtained. With the addition of components from an old tv receiver and a long-persistence crt, a monitor can be constructed for about £30.

In the same way that the serious swl equipped himself to receive ssb, it is now possible to open up a new field of "listening" for an inexorbitant sum. The listener who has heard everything will find new interest in receiving video from all over the world. There is an undeniable fascination in seeing a picture slowly scanned on the tube, not knowing its content until almost the last line. The reviewer does not suggest that a monitor based on MK PCBs is not of interest to the transmitting amateur, but its relatively low cost does commend it to the swl. All amateurs will find the MK PCBs a welcome alternative to the expensive commercial product.

SSTV is a method of transmitting picture information within a normal voice channel approximately 2·5kHz wide. One attraction of the system is that pictures can be recorded on a standard cassette tape recorder. The internationally agreed standards are:

Lines per frame 128 ± 8
Line frequency 15 or 16Hz (depending on mains frequency)
Frame frequency ½Hz Aspect ratio 1:1.

The transmission of sstv pictures is accomplished by modulating an ssb transmitter with an audio frequency corresponding to the light intensity at a particular part of the picture. The audio frequency range involved and the duration of both the video signal and the line and frame sync pulses are shown in Fig 1.

The video signal occupies the range 1·5 to 2·3kHz and is followed by either a 5ms line sync pulse or a 30ms frame sync pulse. 2·3kHz corresponds to peak white, and 1·5kHz to peak black. The sync pulses at 1·2kHz are blacker than black.

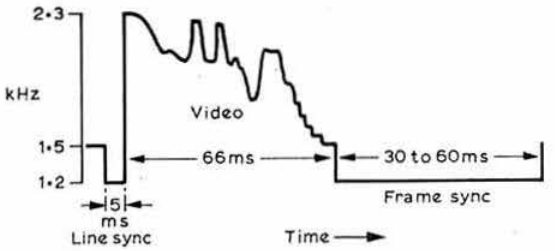

Fig 1. The frequency range, and duration of the video signal and the line and frame synch pulses

Because the picture information is frequency modulated the ssb transmitter produces F4; at the monitor the audio frequency is heavily limited.

A block diagram of a typical monitor is shown in Fig 2.

The section inside the dotted box is the area covered by the MK PCBs. Five separate boards plug into a mother board via edge connectors, thus allowing flexibility and the incorporation of modifications or refinements as they become available. (MK can now supply boards for eht and 12-0-12 PSUs—*Ed*).

Power supplies required for the crt and PCBs are as follows:
3-5kV eht. 250V dc (from which 100V dc is also taken).
+ 12-0-12V (the current rating depends on the scan coils used; 1A should be sufficient).

The booklet provided by MK Products gives useful information on component types, construction and alignment. MK will align a constructor's boards after he has built them if he does not have the facilities. All in all, a very practical approach to the construction of an sstv monitor is given. The project would be practical for any home constructor, even if he had no experience of sstv.

Using the monitor on the air

Because the audio information is heavily limited, the input level is not critical and any phone socket will drive it.

Good signals were received from Europe and the USA. QRM can be a problem; because the time bases are not free running, the line and particularly the frame time base can be retriggered before completing their scan. The reviewer intends to build a monitor in the near future and hopes to incorporate locked-oscillator time bases to avoid this problem. However, having operated an sstv monitor in the shack for the first time he recommends to readers this cheap but excellent solution from MK Products. □

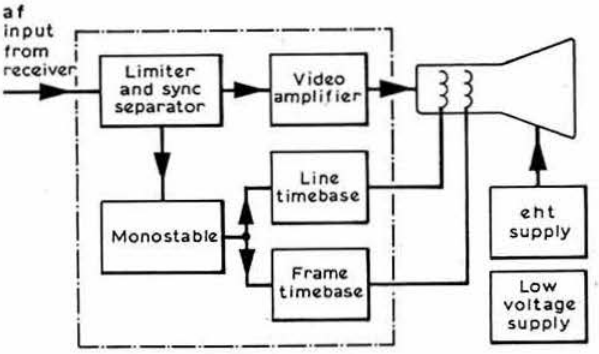

Fig 2. Block diagram of a typical monitor

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C

28MHz sporadic-E

by MARTIN HARRISON, G3USF*

AT any time now, the return of S9 short-skip to the hf bands will serve as a reminder that while sporadic-E may be less exotic than meteor scatter, and less spectacular than aurora, it is surely the most useful of all the "anomalous" propagation modes available to the UK amateur. This article will explore its usefulness through the analysis of intensive observations of 28MHz at Keele during the 1975 summer season. While in the very nature of sporadic-E no two seasons or locations would produce identical results, those reported here should be reasonably illustrative of the possibilities at many UK sites in a typical season.

What sporadic-E is

Sporadic-E (E*s*) is the term given to thin strata of intense ionization occurring from time to time at mean heights of about 100 to 120km, which reflect signals to earth well within customary F-layer skip distances, whether by direct reflection or by scatter at much reduced strengths. This is easily said, but in fact E*s* is a complex phenomenon which raises a variety of intriguing problems in ionospheric physics. The mid-latitude E*s* experienced in the UK has different characteristics and production mechanisms than varieties occurring near the equator and in the auroral zone. The most favoured explanation of mid-latitude E*s* production in recent years has been the wind-shear theory. Basically, this suggests that the structure of ionospheric winds in the presence of the earth's magnetic field can be such as to redistribute ionization into a thin sheet of between 500m and 2km in thickness, and extending horizontally anywhere from tiny patches to clouds of several hundred kilometres. However, as the current formulations of wind-shear theory do not appear to account entirely satisfactorily for all mid-latitude E*s*, it may have to be further refined, supplemented or even replaced.

Nevertheless E*s* occurrence has been intensively studied, with results reviewed, notably, by Thomas and Smith (1955) [1], Smith and Matsushita (1962) [2], and Matsushita and Smith (1972) [3]. Some relevant findings may be summarized briefly. Although E*s* may occur at virtually any time, in northern mid-latitudes it has a characteristic peak near the summer solstice, a smaller and less-defined sub-peak in midwinter, and reaches a minimum around the spring equinox. Daily maxima in summer are in mid-morning and later afternoon, and minima around 0200 lmt. E*s* is mainly a daylight phenomenon, but not exclusively so. Occurrence in the temperate zone is greater towards the equator than away from it. The relationship to the solar cycle is as yet not completely elucidated. Yet although it is erratic to the point that its occurrence over any particular path cannot be satisfactorily predicted for a *specific* day, time and frequency, E*s* is nevertheless frequent and regular enough to allow the statistical assessment of its probable availability, even at frequencies as high as 28MHz, within limits which are helpful to amateurs if not to the point-to-point operator.

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The strong frequency dependence of E*s* is well established. For example, during May–August 1974 the Dourbes Observatory recorded 1,635 hourly critical frequency (foE*s*) readings ⩾3MHz, of which only 291 were ⩾5MHz, 17 ⩾8MHz and just two exceeded 10MHz. While the precise relationship between such vertical incidence data and oblique propagation at the higher frequencies is still the subject of some discussion (Beynon) [4], CCIR [5, 6], this is why E*s* is often present throughout the day on 7MHz and 14MHz during the summer, but makes only rare if spectacular appearances at 144MHz, where propagation depends on critical frequencies of over 20MHz. At 28MHz a 2,000km contact would seem to require foE*s* of at least 5MHz at the midpoint, while ultra-short skip of 500km calls for foE*s* of over 8MHz. Since even during the peak hours of the summer maxima monthly median foE*s* values recorded at ionospheric stations lying at E*s* midpoint range for UK stations tend to lie well below 5MHz, it is clear that E*s* working over even an optimum 2,000km path is likely to be the exception rather than the rule, and that roughly speaking the shorter the path the less the likelihood of its being open.

The Keele observations

With this in mind, the investigation described followed two lines: to determine the availability of a specific circuit, and to assess the general usefulness of 28MHz E*s*. The path chosen was from Mt Predigstuhl (47.41N, 12.52E) near Salzburg, to Keele (53.0N, 2.16W), 1,222km along 302°. This was selected because the DL0IGI beacon at the summit of Mt Predigstuhl (1,613m asl) provides a continuous A1 signal on 28,195kHz (switching for 5min each half-hour to 28,200kHz). This was monitored continuously from 1 May to 31 August 1975 with an operational efficiency of 99 per cent, using an FT-101 and ground plane supplemented by an R1475 with Burns converter into a Varian chart recorder.

Of the 123 days during this period, DL0IGI was audible on 103: 20 in May, 25 in June, 30 in July and 28 in August. As nine of the nil days fell before 15 May, it can be said that once the season was really under way the path opened at some time almost every day. It was heard for 81h in May, 100 in June, 148 in July and 83 in August, a total of 412h or 13·96 per cent of available time. But of course possibilities were by no means evenly spread over the day. Reception rose rapidly after ground sunrise at the midpoint to peak at about 40 per cent around 1200gmt (a little later than one might have expected, but one would need the results of several seasons to determine whether this was characteristic of the circuit). The midday peak was followed by an afternoon decay and a rather less defined evening peak in three months, falling rapidly away after ground sunset. Night openings were few and tended to be brief.

For communication purposes the duration of openings is as important as total path availability. Disregarding those lasting under 2min, 422 openings occurred. No fewer than 113 lasted under 10min and a further 127 lasted from 10 to 30min. However, the 182 openings exceeding 30min accounted for 88·2 per cent of total reception time, while

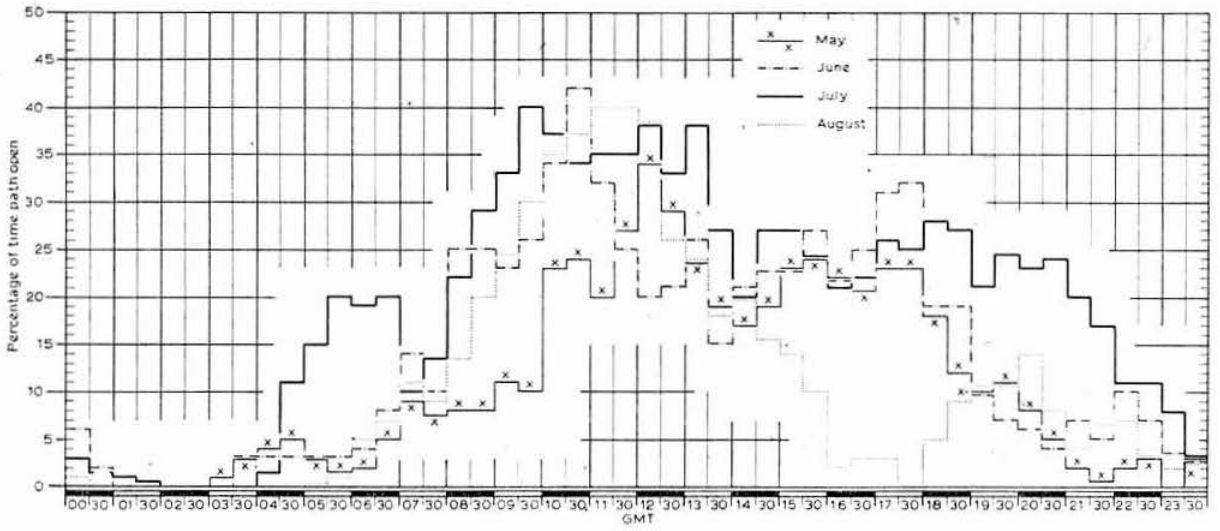

Fig 1. Reception of DL0IGI at Keele, May-August 1975

54·8 per cent of time related to events of over 2h—the longest being 11½h. The mean observed duration of events was 87min in May, 69 in June, 53 in July and 45 in August, or 59min over the season—in other words quite ample to be useful in terms of amateur communication.

While extended analysis must await results for more seasons, two tentative comments may be hazarded. First, reception looks to have been better than predicted from a strict application of theory: the secant law indicates a circuit M factor of ≈ 4·9, requiring a midpoint fo*Es* ⩾ 5·8Hz—a high value which seems unlikely to have occurred often enough to give rise to 412h of oblique propagation. The results in fact seem in line with Soviet findings for a 1,050km path at 27·6MHz in conjunction with a midpoint ionosonde, that experimentally the M factor was 1·2 to 1·3 times the value given by the secant law [7]. If this is translated to the DL0IGI–Keele path, it suggests an M factor of ≈ 5·8, and a correspondingly lower midpoint fo*Es* requirement of, say, 4·9MHz, which could more readily be expected to have been present often enough to fit the observed oblique data. However, in the light of other studies, the apparent "betterment" could also have been due to reflection from points somewhat removed from the midpoint as well as directly at it [8]. Second, during this period of relatively low solar activity, between 15 May and 15 August, DL0IGI was heard for an average of 208min on the magnetically quietest days with Ap < 10. For the 37 days when Ap was 10 to 19 reception averaged 217, and for the 12 disturbed days when Ap ⩾ 20 it was 300min. Here again, though, one awaits more data and the possibility of fuller analysis.

While the behaviour of the DL0IGI–Keele circuit is characteristic of 28MHz E*s*, care must be exercised when generalizing about propagation possibilities from the single example. For instance, in 1974 the number of hourly readings of fo*Es* ⩾ 5MHz at Dourbes (Belgium), Poitiers and Lannion (France), Freiburg (West Germany) and Graz (Austria) were as follows:

	May	June	July	August	Total
Dourbes	55	118	70	48	291
Poitiers	56	173	92	92	413
Lannion	33	121	79	40	273
Freiburg	72	135	74	64	345
Graz	123	265	196	124	708

The practical communication implications of this variability —which may assume a quite different pattern from one season to the next—need hardly be spelled out. All but Graz, in fact, serve as midpoints for many circuits from the UK. What, then, can be said about the overall communication possibilities of 28MHz E*s*? This of course depends not only on ionization, but on activity which is spread unevenly through the day and geographically: even if the band were open, contacts at 0300 or with stations in mid-Atlantic would be rare. The communication achieved must inevitably fall well below the theoretical possibilities, but what actually *is* achieved is nevertheless of interest to us as amateurs. With this in mind, 28MHz was monitored daily from 0700 to 2200gmt between 1 May and 31 August; the overall outcome is shown in Fig 2.

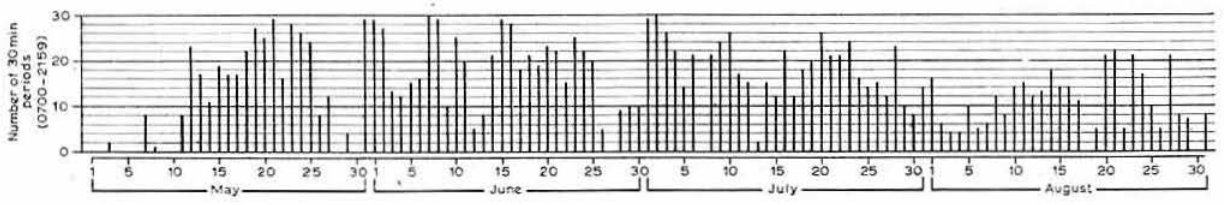

Fig 2. Es observed at 28MHz, 1975

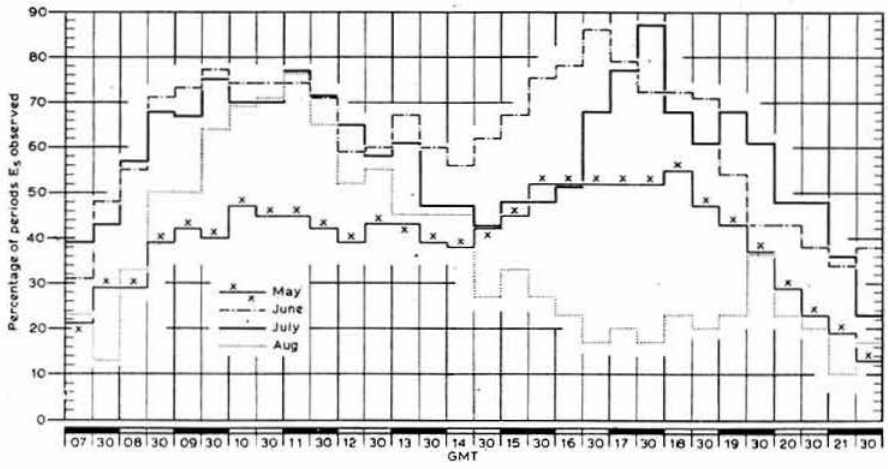

Fig 3. Overall Es occurrence

After scattered occurrences in late April, openings became more frequent and extensive during May, peaking in June and early July before a gradual, uneven decline. Only 13 days produced no Es, and Es was present in 48 per cent of the half-hour periods over the four months, 40 per cent in May, 62 per cent in June, 58 per cent in July and 37 per cent in August. In the nature of Es, a day providing 15 hours of strong signals could be followed by one with just a few scrappy openings to some quite different area. Accepting this inevitable "lucky dip" aspect, the results showed that this mode could provide contacts during roughly half the hours of normal amateur operation over the summer—and in fact there were a good many hours early and late in the day or at the beginning and end of the season when the band was almost certainly open but no activity could be logged to prove it. So the detailed hourly lines of Fig 3 should be seen as a "floor" and not necessarily as a "ceiling". Incidentally, late evening openings were often typified by lower noise levels and more stable signals than daytime events.

But what, precisely, could be worked? The outer-range for single-hop Es for a layer height of 110km and a minimal radiation angle of 0·5° may be considered to lie at around 2,300km, though on days when the layer is particularly high or with tropospheric enhancement greater ranges may be achieved. So from the Midlands, virtually all western Europe, the northern fringe of Africa, Malta, northern Greece, most of Bulgaria and a long swathe of the western USSR are within reach. As to the inner range, although the author once logged a G at only 96km on 28MHz, in 1975 the shortest skip recorded was 275km, and contacts below 600km were rare. Over the season the ranges of 2,613 stations whose locations were known were: under 600km, 1 per cent; 600 to 1,000km, 9 per cent; 1,000 to 1,400km, 32 per cent; 1,400 to 1,800km, 42 per cent; 1,800 to 2,200km, 16 per cent. While the scarcity of ultra-short skip partly reflects the fact that much of our surrounding sea is at this range, it is mainly due to the rarity of the high foEs values needed for working ON, PA or inter-G from Keele. This is also why there are relatively few loggings in the 600 to 1,000km range despite the fact that this contains areas of high amateur activity in DL, F and HB. Even the 1,000 to 1,400km range seems rather under-represented in relation to amateur population (it includes Bavaria, northern Italy, and parts of OK, OE, DM and SM). The optimum range appears to be roughly 1,400 to 1,800km (which includes much of YU, HA, CT and north-central Italy).

Within this there is some evidence that, for any given range, communication possibilities were better for some directions than for others, allowing for the variable distribution of activity. Thus, FC and IS produced almost as many loggings (88) as SP and OK (94) at comparable ranges despite a smaller amateur population. Again, CT with 54 loggings matched OH (57), and EA (139) appeared as often as SM (135) or DM, OK and SP combined (130). This is not surprising, for given the greater occurrence of Es towards the equator one would expect the more southerly paths to show more strongly. In fact, over the season, Italy accounted for 29 per cent of loggings, West Germany for 15 per cent, HA for 8 per cent, YU for 7 per cent, and EA, F and SM 5 per cent each. A reasonable working conclusion would be that in 1975 the best possibilities for Es arose over paths of around 1,800km which were more likely to lie to the south or south-east than to the east or north. But if this boils down to a slightly humdrum picture, over the season 48 DXCC countries were heard by Es and they included C3, CN8, EA6, EA9, FC, HB0, HV, LX, M1, OH0, OJ0, OY, TF and 3A.

Conclusion

This article has concentrated on summer Es from within single-hop range. Multiple hops have not been considered, either within 2,200km or at greater ranges, or the occurrence of complex Es/F-layer modes, though these factors produced some of the most interesting propagation of the summer. Es seems to have contributed both to the regular reception of the Cyprus beacon and to several openings deep into the USSR, to West Africa and most notably to the USA and Canada. Quite apart from this, Es contributes to 28MHz propagation outside the summer months, though at a much reduced level, and during major ionospheric storms auroral Es on 28MHz can provide openings to Scandinavia and North America, usually in association with auroral back-scatter on 144MHz: the late evening opening from Europe to W/VE on 10 January 1976 was a notable case in point. All these occurrences would repay further exploration. Here one may simply note them as adding further weight to the two main themes: that Es is really of quite substantial use to the

amateur, and that even with basic amateur equipment and techniques it can be usefully explored.

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Acknowledgements

This project is conducted under the auspices of the RSGB Propagation Studies Committee. The author gratefully acknowledges help from F8SH, G3DME, G3VSA, G4BPY, Brian Hartley, the World Data Centre (C1) and the Appleton Laboratory, Slough. □

NEW PRODUCTS

Coaxial relays

A new range of imported coaxial relays is now being offered by South Midlands Communications Ltd. Claimed performance figures of three units available from stock are:

Type	Breaking current capacity at 500MHz	Max frequency	
CX120	50	1·2GHz	cable entry
CX230	300	2·3GHz	bnc sockets
CX600N	600	1·5GHz	N sockets

Prices and further information can be obtained from SMC Ltd, Osborne Road, Totton, Southampton, Hants S04 4DN; tel Totton 2785 and 4930.

FM base station

A new unit is announced by Essex Telecomms which has 12W power output, 10-channel capability and the choice of ac mains or 12V operation. Channel spacing and frequency range are at the choice of the purchaser. The use of pcb techniques with dc test points throughout has resulted in easily serviceable equipment. For the commercial user the station complies with Home Office specification W6771, and there are a variety of ancillary facilities available.

Further information can be obtained from Essex Telecomms, Industrial Estate, Claydons Lane, Rayleigh, Essex; tel 03742 79674.

Heathkit code oscillator

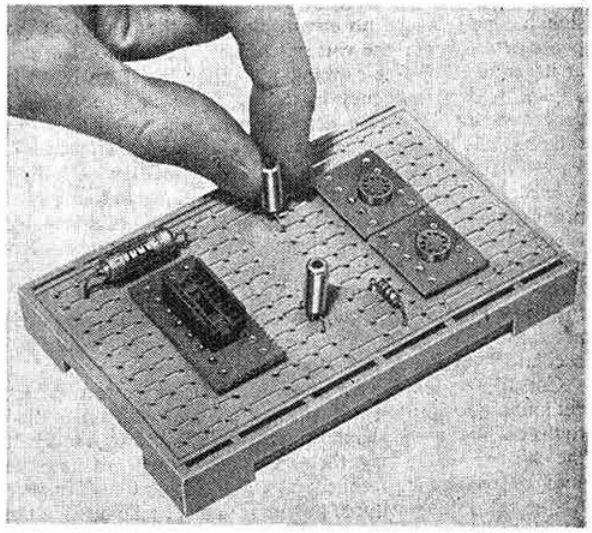
This inexpensive Heath product consists of an astable multivibrator giving an audio signal from an inbuilt speaker. A jack is provided for headphone listening, and volume and tone are variable. Power is supplied by a 9V PP3 battery. A morse key is provided with the kit. Assembly is on a single board, and with the usual Heathkit instructions is a quick and easy task. The unit can also be used as a side-tone oscillator with any transmitter using grid block keying, −400V dc maximum. An ideal oscillator for club morse classes.

Kit HD-1416 price £9 (inc 12½% VAT) obtainable from Heath (Gloucester), Gloucester, GL2 6EE.

PB Electronics breadboard and pcb

A new two-part system for circuit assembly is now available from PB Electronics (Scotland) Ltd. This consists of a simple-to-use solderless breadboard and a complementary printed circuit board. The breadboard contains parallel rows of small holes and beneath each is a phosphor-bronze socket. The sockets are electrically interconnected according to the circuit design on the upper face. With such a system, component substitution during construction presents no difficulties. The PCBs duplicate the breadboard designs and labelling, but employ copper tracks for interconnection using conventional pcb design. Thus when a circuit is proven on a breadboard layout it can be transferred into the same reference holes on the ots and ssb PCBs and the components soldered in to provide a complete prototype board. There are four different types of breadboard available and more than 20 ots and ssb PCBs.

A typical price for an S-DEC breadboard is £2.08 (including postage and VAT), while a super solder board for use with S-DEC circuits costs 79p. Data sheets and prices can be obtained from PB Electronics (Scotland) Ltd, 57 High Street, Saffron Walden, Essex CB10 1AA. Tel 0799 22876.



A typical breadboard with one dil socket, two TO5 sockets and discrete components

An introduction to phase-locked loops

by I. D. POOLE, BSc(Eng), G3YWX*

NOWADAYS, with amateur equipment becoming more sophisticated, the use of phase-locked loops is increasing, and with a greater number of integrated circuits on the market it has become easier to construct more complicated circuits. In fact, the building blocks for phase-locked loops, or the complete loops themselves, are easily available, saving much time-consuming experimentation with discrete components.

Basically, a phase-locked loop is a form of servo-system which consists of a phase detector, a low-pass filter, and a voltage-controlled oscillator. The phase detector compares the phase of the voltage-controlled oscillator with the incoming reference signal, giving an output proportional to the difference in phase. This is then filtered to remove unwanted high frequency components, and the output from the low-pass filter is used to control the frequency of the voltage-controlled oscillator, locking it to the incoming signal. Therefore the voltage applied to the voltage-controlled oscillator is a function of the reference frequency, and the output from the low-pass filter can be used to obtain demodulated frequency modulation.

At this stage it should be noted that phase is the integral of frequency (with respect to time), and there can only be a frequency difference between two signals when the phase between them is changing. When locked to a reference of constant frequency a steady corrective dc voltage is applied to the voltage-controlled oscillator, proportional to a constant phase difference between the two signals. Therefore there is no phase change, and the frequency of the oscillator must be exactly the same as that of the reference.

Qualitatively, a phase-locked loop can be explained with reference to Fig 1. Consider the circuit with no applied signal. There will be no error voltage at the output of the phase detector, and the voltage-controlled oscillator will run at its natural, or free-running frequency F_o. If an input is applied with a frequency F_r there will be an error voltage generated by the phase detector, which is proportional to the phase difference between the two signals. This output is $F_o + F_r$ and $F_o - F_r$ and is filtered through a low-pass filter to leave $F_o - F_r$, which is amplified and applied to the control point on the voltage-controlled oscillator. This error voltage is such that it reduces the phase, hence the frequency difference between the two signals. Once the loop has locked, the frequency of the oscillator will be exactly the same as that of the reference, but there will be a net phase difference which is necessary to generate the required error voltage to keep the oscillator running at the reference frequency.

Consider once again the phase-locked loop when it has not yet had a signal applied; it will have no error voltage applied to the oscillator. If a signal is then applied and swept towards the oscillator frequency, the phase detector will generate the sum and difference frequencies $F_o \pm F_r$. If the difference frequency which produces the error voltage falls outside the passband of the low-pass filter, no correction will be applied to the oscillator, but as the reference is swept nearer the oscillator frequency there comes a point where it does fall within the passband and causes the loop to lock. Therefore what is called the capture range of the loop can be defined as the frequency range over which it can gain acquisition. It can be seen that the capture range depends largely upon the characteristics of the filter.

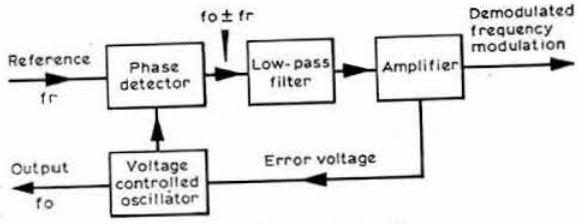


Fig 1. Basic phase-locked loop

There are advantages in making the filter passband fairly small. First, the narrower the filter the less likely the loop is to be disturbed by noise. Second, if the filter time constant is made long the loop can "store" the reference frequency if it is lost temporarily due to a short break in transmission or if the signal is chopped for any reason. However, if acquisition is lost it does make it more difficult to regain lock, as the capture range will be reduced and one has to make a compromise between "remembering" the frequency and being able to regain acquisition if it is lost. It should be noted that the ability to store the frequency also means that the tracking rate will be reduced, ie the rate of frequency change for which the loop will remain locked will be reduced.

Once acquisition has been gained the loop will remain locked over a certain range, the lock range. There are two main factors which affect this. First, the range over which the voltage-controlled oscillator can swing will be limited and if the reference goes beyond this lock will be lost. Second, the output from the phase detector is sensitive to both phase and amplitude in most cases. Thus if the signal amplitude decreases, the phase difference between the two signals must increase to compensate for this. Therefore at low signal levels the effective lock range is reduced and the phase errors will be larger. Conversely a large-signal will permit use of the full oscillator swing and gives smaller phase errors.

It is interesting to see that the low-pass filter does not alter the lock range, but does alter the maximum rate at which tracking can occur, as the capacitor voltages in the filter cannot change instantaneously. If one does want to track at high frequencies the cutoff of the filter should be relatively high, but this will mean that unwanted sum frequencies from the phase detector will be attenuated less, giving rise to a signal at twice the reference frequency. Increasing the cutoff frequency of the low-pass filter increases the possibility of the loop being disturbed by noise or other unwanted signals. The effect of

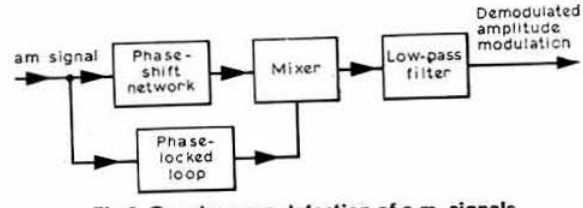


Fig 2. Synchronous detection of a.m. signals

* 81 Peregrine Road, Sunbury-on-Thames, Middx.

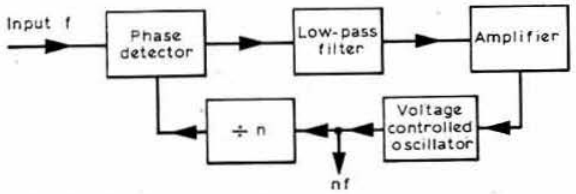


Fig 3. Frequency multiplication using a phase-locked loop

noise is somewhat difficult to predict, but components near the centre frequency pass through the low-pass filter and appear on the control terminal of the voltage-controlled oscillator. If this noise on the error voltage causes the phase difference between the reference and loop oscillator signals to exceed $\pm$ 90° then lock may be lost. Therefore at the extremities of the lock range the effects of noise become more important.

Applications

(i) FM demodulation. If a phase-locked loop is used to demodulate an fm signal the voltage-controlled oscillator tracks the instantaneous frequency. The error voltage used to keep the oscillator tracking is used to give the demodulated output. The linearity of the output depends only upon the linearity of the voltage-to-frequency characteristic of the oscillator.

(ii) A.M. demodulation. Using a phase-locked loop, a.m. demodulation may be accomplished as in Fig 2. The loop locks onto the carrier, giving an output with no modulation on it. This is then phase shifted and mixed with the a.m. signal to give demodulation which is far more linear than that obtained from a conventional diode detector. The phase-shift network has to be included because the output from the detector is proportional to cos ϕ (where ϕ is the shift introduced by the network), and hence the maximum output is obtained when $\phi = 90°$.

(iii) Frequency synchronization. With a phase-locked loop the frequency of its oscillator can be accurately controlled from a low-level but highly stable source. The oscillator will reproduce the same frequency as the reference but at a higher power level. In many cases the loop can be locked onto a pulsed reference signal and used to store the frequency between pulses. This principle is used in the regeneration of the chrominance reference from the colour reference burst which appears on each line just after the sync pulse in a colour tv transmission.

(iv) Frequency multiplication. This can be achieved in two ways. The first is to lock the oscillator to a harmonic of the reference. This is the simplest and cheapest method, and it usually suffices, but it does have the disadvantage that the range becomes smaller with increasing harmonics. The more elegant method is to insert a divider into the loop between the oscillator and the phase comparator (Fig 3). In this case the oscillator runs at a specific harmonic of the reference, but unlike the previous method comparison takes place at the reference fundamental frequency. When it is used in frequency multiplication applications great care has to be taken in designing the low-pass filter. This is because the phase comparator produces both sum and difference frequencies and, when locked, the difference frequency is just dc, but the sum is twice the fundamental. If this is not adequately filtered there will be ripple on the error voltage, resulting in some frequency modulation on the output.

It can be seen that there are a great many possibilities for phase-locked loops, just a few having been outlined here. Details of the mathematics have not been included because it is felt that they would only complicate the picture and not add much to understanding the subject. □

BOOK REVIEW

The Radio Amateur's Handbook (1976). 53rd edition. By the HQ staff of the ARRL. 704 pages, copiously illustrated and with many tables. Obtainable from RSGB Publications (Sales), 35 Doughty Street, London, WC1N 2AE. Price £5.13 (paperback), £7.44 (hardback), including postage and packing.

With nearly five million copies distributed since its first publication in 1925, this distinguished book must be a leading best-seller in any field. It is highly valued by professional engineers as well as amateurs, and caters for the beginner and the advanced amateur alike. Its reputation is based on its reliable accuracy and description of proven circuits, and on its reflection of technical progress.

The chapters on wave propagation and station assembly have been completely rewritten to comply with modern thinking, and many new constructional projects and amendments appear in other departments. Among these one notices a new regulated power supply suitable for operating transceivers of the 10W output variety or for general purposes requiring 2A continuously at 12V or less. The voltage is adjustable between 9 and 13V, and current limiting is included to obviate damage if output terminals are shorted.

A construction which should interest British amateurs is a 1·8MHz transmitter with 8·5W output at 13·5V dc; it is designed for a cw cycle only and has a short permissible keydown time. It employs three low-cost transistors as Clapp vfo, source follower buffer, and amplifier; from cold start to stabilization the change is only about 15Hz. The power strip uses three 2N5320s as driver, and push-pull amplifier in Class C. Zener diodes as clamps protect the output transistors if maladjustments occur. A harmonic filter cleans the output waveform.

There is also a two-band solid-state transmitter, 7 and 14MHz, vfo driven and 7W output, for the more experienced amateur.

A bandpass tuner for adjustable selectivity is described which converts the i.f. signal to a lower frequency where sharp-skirt filters increase selectivity. After filtering, the signal is converted back to the original i.f., so, if the conversion oscillator is altered in frequency the received signal is unchanged, but the position of the signal in the lower frequency filter system is altered.

A communication receiver with digital frequency readout is a new design which is described in very considerable detail. It covers the amateur bands from 1·8 to 28MHz in 500kHz segments. It is entirely solid-state, and the counter reads and displays the received signal frequency to the nearest 100Hz. Constructional details are not shown minutely, but the design is afforded 15 pages and will surely attract many experienced constructors.

There are many changes in the vhf and uhf receiving techniques, and a treatment of double-balanced mixing with its new terminology and advantages should be mentioned. There is also an Oscar up-converter, and an inter-digital converter for 1·3 or 2·3GHz.

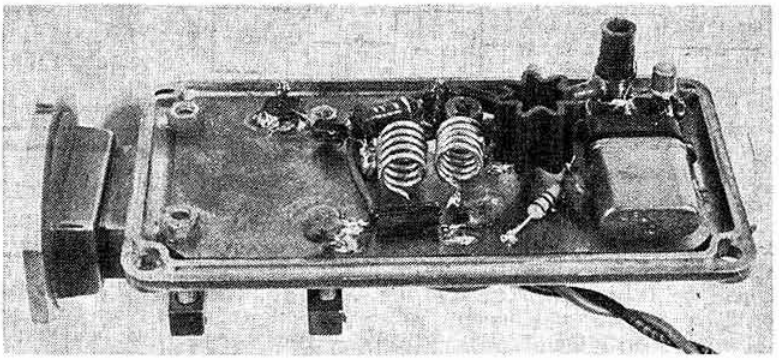
Mobile work gets a new solid-state receiver, and there is a transmatch suitable for 5W transmitters and the wide range of impedances which arises in using emergency aerials.

A new item is a memory for the Accu-keyer; it permits storage of 200 letters of text in up to four messages. An unlimited number of pauses may be programmed into a message to permit manual interpolations such as RST. This is exceedingly interesting technically, but one has an uneasy feeling that critics may consider this to be a further step in the artificiality of contests.

The ssb department has a new audio processor employing neither compression nor clipping, but breaking new ground. The testing of an ssb transmitter has been rewritten.

Filters for tvi harmonics, a two-tone audio generator for ssb testing and general work, a calibrated field strength meter, an audio oscillator of selectable frequency range, an economy aerial coupler, and a 7MHz half-sized beam, are all new items. *T. P. A.*

A crystal-controlled frequency marker for 10GHz



by C. W. SUCKLING, BSc, G3WDG*

Introduction

A characteristic of operating wide-band equipment on 10GHz is that by the time one multiplies the uncertainties in frequencies of both transmitter and receiver and in the pointing of the highly directional aerials normally employed, the number of permutations that need to be covered before contact is established can be very considerable. The more skilled operators tend to be more successful mainly because they can set their frequencies more precisely and can direct their aerials more accurately, and this can reduce very considerably the number of permutations that need to be covered.

The simple unit to be described generates a large number of signals at precisely known frequencies which can be used to calibrate wide-band receivers and transmitters accurately, thus effectively eliminating uncertainties from this source. Although the output power of individual harmonics is very low, signals are detectable with efficient receivers even with up to 45dB attenuation between the unit and the receiver. This means that the unit can provide a rough check on the sensitivity of a receiver; signals should be detected by even the most inefficient of receivers. The output power is more than adequate for use as a frequency reference for an afc system, but is insufficient for the unit to be employed as a signal source for tuning up aerials. The range of the unit as a transmitter is only about 10m when aerials of 15dB are used.

Constructional details

The circuit diagram and layout of the marker unit are shown in Figs 1 and 2. TR1 is a crystal oscillator on 48MHz, and this is followed by a doubler to 96MHz and by a mixer diode used as the final multiplier. TR2 should be fitted with a small heat sink and its emitter lead kept as short as possible, typically about $\frac{1}{8}$in. Its output is via a bandpass filter to reduce 48MHz feedthrough. This vhf circuitry is mounted on a piece of single-sided pc board which is bolted to the inside of the lid of a $4\frac{3}{8}$ by $2\frac{3}{8}$ by 1in die-cast box. The final multiplier consists of a length of WG16, at least $2\frac{3}{8}$in long, which is closed at one end, with a 1N23 mixer diode mounted centrally 0·29in (7·5mm) from the closed end. The waveguide is clamped to the outside of the lid, connection to the diode being made using the inner of a Belling-Lee socket which passes through holes drilled in the pc board and the lid, as shown in Fig 3.

In setting up the unit, L1 is adjusted to produce the maximum voltage across R; C1 and C3 are adjusted and readjusted to maximize the diode current measured at TP1. The value of R is then changed as necessary to set this current to 20-25mA. Finally, the frequency of the crystal oscillator can be checked on a counter via the optional output connector or using, for example, a 144MHz receiver. Some useful performance parameters are given in Table 1.

Table 1. Performance figures for the 10GHz frequency marker

V supply	12V
I supply	25-40mA
$\frac{\Delta f}{\Delta V}$ (at 10GHz)	8kHz/V (change in final frequency as supply voltage is varied)
Rf level of 96MHz harmonics in range 10·0–10·2GHz	—75dBm (approx.)
Rf level of intermediate 48MHz harmonics in range 10·0–10·2GHz	—95dBm (approx.)

The choice of 48MHz and 96MHz as stage frequencies represents a compromise between generating a reasonable number of signals within the tuning range of most receivers, while minimizing the risk of confusion due to difficulty in identifying each of the harmonics. Other crystals may of course be used, but there is an obvious advantage in using "round number" frequencies, and especially those at such frequencies as 36, 54 and 72MHz which also produce harmonics at other amateur frequencies and are therefore more easily measured.

Using the frequency marker

The unit as described produces relatively strong signals at 96MHz spacings, with signals about 20dB weaker spaced every 48MHz. Note that no provision is made for modulating the output. This is unnecessary if the local oscillator of the receiver can be frequency modulated with a tone, which greatly assists finding signals. In calibrating a receiver it is essential that its local oscillator is already calibrated to within about 20MHz using a wavemeter. The self-calibrating wavemeter described in "Microwaves" (*Radio Communication* February 1973, p 106) is more than adequate for this purpose. The marker is preferably connected directly to the receiver via a variable attenuator, but alternatively it can be spaced from the receiver input by a few feet. With 20-30dB

* 31 Oakwood Road, Chandler's Ford, Hants SO5 1LW.

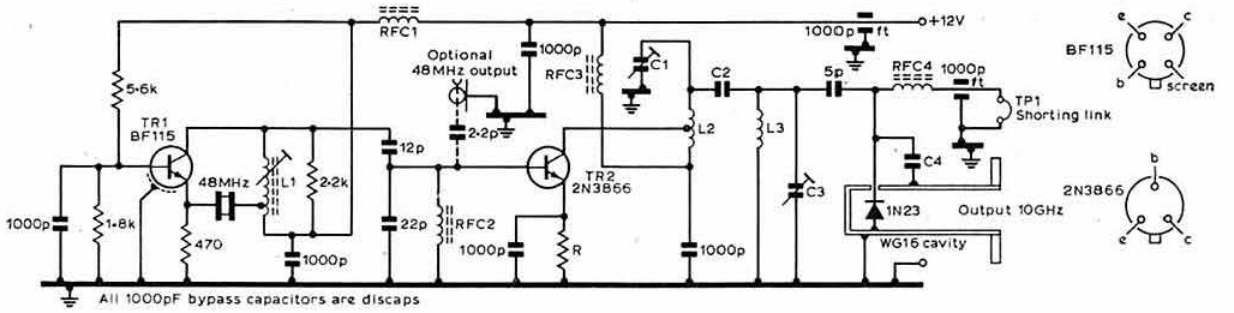


Fig 1. Circuit of the 10GHz frequency marker

Components list

L1	10t 28g enam copper on 0·3in former tapped 1t from cold end.
L2, L3	5t 18g ¼in id ¼in long, L2 centre tapped.
RFC1, 3	2½t 28g enam copper on two FX1115 ferrite beads.
RFC2	2½t 28g enam copper on one FX1115 ferrite bead.
RFC4	10t 28g enam copper on one FX1115 ferrite bead.
R	68–100Ω, adjust during alignment to set 1N23 current to 20–25mA.
C1, C3	30pF trimmer: can be 20pF trimmer + 10pF fixed capacitor.
C2	Two lengths thin single-strand insulated wire twisted together for ¼in.
C4	formed by a 0·005in ptfe or polythene sheet between the end of the 1N23 diode and the waveguide wall, as shown in Fig 3.

attenuation, the receiver should detect weak signals which are harmonics of 96MHz only. If the attenuation is reduced to around 10dB, the 48MHz intermediate harmonics should be heard as weak signals, together with the now strong signals corresponding to 96MHz harmonics.

The number of signals heard will be more than perhaps expected because the receiver will almost certainly have no protection against second channel signals. Thus a receiver which is fitted with a 30MHz i.f. will respond to the relatively strong marker signals at 9,984MHz (104 × 96MHz) when its local oscillator is tuned to either 9,954 or 10,014MHz, and to signals at 10,080MHz (105 × 96MHz) when tuned to either 10,050 or 10,110MHz. The receiver will also respond to the relatively weak marker signals at 10,032MHz (209 × 48MHz) when the local oscillator is tuned to either 10,002 or 10,062MHz, and so on. The receiver local oscillator may therefore be calibrated precisely at several points, from which the (two) corresponding signal channels may be determined (provided that the i.f. is known accurately). If a larger number of calibration points is required, then either the i.f. may temporarily be changed, or a different crystal may be used in the marker.

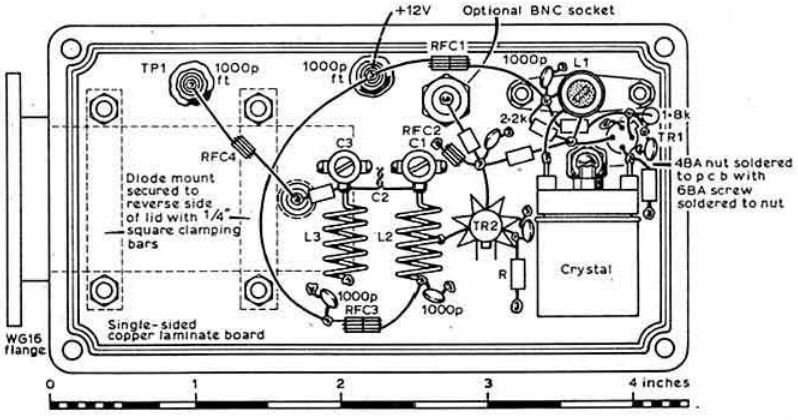


Fig 2. Practical layout of circuitry

The unit is small enough to be used "in the field" on a regular basis by simply waving it in front of the aerial. Alternatively, it could easily be built into the receiver, coupled by a 10dB directional coupler, to provide an instant check on its calibration, and in turn that of the transmitter.

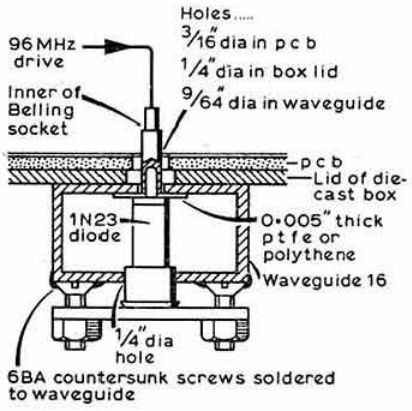


Fig 3. Section showing construction of the diode multiplier

Acknowledgement

The author wishes to acknowledge the help of G3RPE in the production of this article. □

Calculation of distances from QRA locator codes with the aid of the HP-65

by C. VAN DIJK, PA0QC*

IN the last few years various amateur magazines have published computer programs for calculating distances between locations indicated by QRA locator codes. To make use of these programs, access to a large computer is required, and this may not always be easy. It is far easier to obtain the use of one of the many types of scientific pocket/desk calculator now being widely used.

One way of employing such a calculator for the determination of distances has been described in *CQ-DL*†, but unfortunately the SR-50 used is a non-programmable calculator. In the author's view, following the many steps required for each distance calculation, as outlined in that article, may be fun for those not accustomed to working with this type of machine but it is certainly more time-consuming than just measuring the required distance on a map: he feels that only the use of a programmable pocket calculator is worthwhile for the purpose of calculating distances from QRA locators. One type of programmable calculator most widely used is the Hewlett-Packard HP-65 and the author has therefore investigated its possibilities for this purpose, with the following results.

*Van Zaeckstraat 99, The Hague, Holland.
†"Berechnung von Entfernungen aus OTH-Kennern mit den Elektronenrechner," Dipl-Ing Harald Jirikowski, OE2JIL, *CQ-DL* December 1975.

Table 1: Program for calculating distances from QRA locators

f PRGM			
DSP	g R ↓	÷	sin
.	g R ↓	RCL 1	STO 2
0	2	+	RCL 5
R/S	×	CHS	×
2	RCL 1	STO 1	+
×	+	g R ↓	f^{-1}
1	STO 4	3	cos
+	R/S	5	1
3	2	+	1
0	×	RCL 1	1
÷	1	+	.
CHS	+	STO 1	1
STO 1	4	f	8
g R ↓	8	cos	×
0	÷	STO 3	.
g x = y	STO 1	RCL 6	5
1	g R ↓	×	+
0	RCL 3	RCL 4	f
+	1	RCL 7	INT
STO 3	0	−	STO 1
5	÷	f	RCL 8
÷	f	cos	+
RCL 1	INT	×	STO 8
+	−	RCL 1	RCL 1
STO 1	8	f	

Great circle distance calculation

Distance = $\cos^{-1}$ [sin(lat 1)sin(lat 2) + cos(lat 1)cos(lat 2) cos (long 1 − long 2)] × 60 × 1·853km

Table 2: QRA locator coding

C	M	7	2	j
I	I	I	I	∧
α	β	γ	δ	$\epsilon\zeta$

Longitude
First capital letter
West Eire ⟶

U	V	W	X	Y	Z	A	B	C	D	E	F	G	H etc.	
0	1	2	3	4	5	6	7	8	9	10	11	12	13⟶	α
Second number ⟶														δ
Last lc letter								2	1	0	⟶			ϵ
								h	a	b				
								g	j	c				
								f	e	d				

Latitude
Second capital letter
Naples ⟶

Z	A	B	C	D	E	F	G	H	I	J	K	L	M etc.	
5	6	7	8	9	10	11	12	13	14	15	16	17	18⟶	β
First number ⟶														γ
Last lc letter								h	a	b	0	⟶		ζ
								g	j	c	1			
								f	e	d	2			

Calculation in decimal degrees

Longitude*: $2\alpha + 0{\cdot}2\,\delta - \frac{2\epsilon + 1}{30}$ { if $\delta = 0$ the program substitutes $\delta = 10$

Latitude: $\beta + 35 - \frac{\gamma}{8} - \frac{2\zeta + 1}{48}$ { if $\delta = 0$ the program takes $(\gamma - 1)$ for γ

*As only the difference in longitude plays a role in the distance calculation, no shift correction is required.

Table 3: User's guide

Step	Instructions	Input	Keys
1	Enter program*		
2	Initialize		R/S
3	Enter own longitude code	α	ENTER
4		δ	ENTER
5		ϵ	R/S.
6	Store own longitude		STO 7
7	Enter own latitude code	β	ENTER
8		γ	ENTER
9		ζ	R/S
10	Store sine and cosine of own latitude		RCL 2
11			STO 5
12			RCL 3
13			STO 6
14	Prepare register for sum of distances		0
15			STO 8
16	Enter codes of QSO partner	α	ENTER
17		δ	ENTER
18		ϵ	R/S
19		β	ENTER
20		γ	ENTER
21		ζ	R/S
	Read distance in kilometres and repeat 16–21 for codes of other locations		
	When all distances have been calculated, read total score		RCL 8

Notes 1. After pressing R/S, wait until HP-65 is ready before entering the following set of numbers.
2. Longitude and latitude of a location must be entered in that order. If any mistake is suspected, press RTN and R/S and start again with the introduction of the two sets of numbers for a QRA locator. Note, however, that a mistake may have ruined the contents of the total score register. Check by carrying out a separate addition.

* Two possibilities:
(a) Key in program with switch in W/PRGM position. When finished, switch to RUN and continue with the steps indicated.
(b) Enter a pre-recorded program via slit with switch in RUN position. Continue with steps indicated.

The accompanying program (Table 1) is suitable for calculating great circle distances between one station and any other in Europe, when both locations are designated by QRA locators. The HP-65, which only uses numbers, cannot accept QRA locators as such, but a simple code has been devised (Table 2) which translates any QRA locator into a set of three numbers for longitude and a second set of three numbers for latitude. This encoding should be done first; with the aid of Table 2 a log is quickly and easily provided with the two sets of numbers in the correct order.

When the HP-65 has been programmed and the QRA locator data stored according to the user's guide given in Table 3, the introduction of the two sets of numbers for any location will—after the HP-65 has been busy for a short time—yield the distance rounded off to kilometres. Provided no errors have been made when entering the many sets of number codes for the many stations that have been worked, the final score will also be available in a memory register. The time required for entering the two sets of numbers and calculating the pertaining distance is approximately 15s: hence quite large logs can be easily handled in this manner.

For those skilled in the art, the whole operation is, of course, very simple. The charm of the HP-65, however, is that even if one knows next to nothing about its operation, following the simple instructions set out in Table 3 will give the same excellent results. This is especially true if a pre-recorded program is available.

As a check on the correct operation of the program the following example may be used. It shows the author's QRA locator as well as that of four other stations. Introducing the whole set in the manner shown in Table 3 should give the indicated answers. At the end the total score can be recalled from the pertaining memory as indicated in Table 3.

QRA locator	Longitude			Latitude			Distance (km)
	α	δ	ε	β	γ	ζ	
CM72j (own)	8	2	1	18	7	1	—
DJ44e	9	4	1	15	4	2	341
ZM16h	5	6	2	18	1	0	367
IT50j	14	0	1	25	5	1	1,178
PU72h	21	2	2	26	7	0	1,823
					Total score		3,709

Some notes on /MM operation

by P. J. Aitchison, RD, MRIN, G3LSQ/MM, 8P6GF/MM*

IN November 1974 the author and his family left England on their 44ft steel-built sailing yacht *Lucina*, bound for the West Indies via Gibraltar and the Canaries. Equipment used as far as Barbados was a Yaesu FT75, which in practice was found to run about 25W p.e.p. After Barbados, where the 8P6 call was obtained, an FT101b was used and the extra power gave about 3dB discernible improvement in the UK. However, the ability to use a vfo was a much more significant improvement in dodging the QRM—"G"/MM licences are for crystal control only. Even with the smaller rig a daily sked was worked with the UK across the Atlantic, as well as the odd VK and ZL—proving yet again that kilowatts are not everything. All operation was on 14MHz.

Aerials, however, are everything, and much experiment was done with them. All ship aerials are "bent" from their electrical length due to the presence of other rigging, which will vary from boat to boat. Aerial No 1 was the yacht's standing mast backstay with insulators top and bottom. This was some 75ft long, at an angle of 60° from the stern to the masthead. Feed was from a purpose-built monoband pi-tuner located below deck under the aerial.

Two preset 300pF variables were used with a 15-turn 14swg freespaced coil wound on a 1¼in former, which was then loaded up and pruned half a turn at a time for minimum swr. Whatever other aerials are used, one of this sort is a "must", as it will always be there while the mast is still standing. Aerial No 1 was used throughout the short-skip zone, including one afternoon in the Bay of Biscay when the wind was off the anenometer at over 60 knots: the boat was battened down and there was nothing to do but keep a look out and chat on the air, with the crash of seas sweeping over the boat and the howl of wind in the rigging coming over in the UK at S9+.

Aerial No 2 went up in Tenerife. This was a λ/2 dipole suspended from the upper mast crosstrees and terminated with a rope "tail" so that it could be moved around to keep out of the way of the mainsail. This produced improved reports and would no doubt have been better still on a boat with a wooden rather than an aluminium mast. The problem in a marine environment is that it is flimsy and likely to be carried away in heavy weather. An improvement in electrical terms would be to insert insulators in the boat's standing rigging to make a permanent dipole, but be cautious from the viewpoint of safety, as every extra insulator must introduce another weak link.

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As expected, up went the swr, as no balun was used in the phototype. Adjustment of this sort of aerial on a boat is difficult without a large skyhook, and even a small toroid balun up aloft is extra windage. Therefore a certain amount of coaxial cable was sacrificed, cut and trying with stub baluns, with about 13ft taped to the feeder eventually doing the job of bringing the swr back to unity.

The expiry of the transmitter section powerpack in mid-Atlantic brought home to us the concern friends can be caused—two skeds were missed while the author was cannibalizing other equipment to get back on the air, and as the receiver was still in operation they could be heard discussing what should be done. The possibility of our suddenly vanishing off the air had been discussed with them, and all had agreed that the most likely cause would be equipment failure and that nobody should worry, but in practice that is not quite so easy. From mid-Atlantic onwards regular skeds were held with 8P6BG in Barbados, who on our arrival assisted with permanent repair of the powerpack and in many other ways. He also set the author thinking about Aerial No 3.

This took shape as a λ/4 vertical, fed at deck level and driven against the boat's hull as a ground plane. Again, practical length proved very different from optimum electrical length and gdo resonance was with 14ft 2in of vertical, but with a feedpoint impedance well below the comfortable tolerance of the pi-tank and feeder coaxial. For anyone not too concerned about matching, it would still have been possible to load up and get better results than the dipole, provided the boat is at sea and can properly utilize the low-angle radiation. In harbour the height of a dipole gives better results. Once more, proper matching is a matter of cut and try, and best results were obtained by reducing the vertical to about 13ft to give capacitive reactance at the base. The latter was then balanced out by inserting inductive reactance to restore resonance and bring the feedpoint impedance back up to a level that the pi-tank could handle. Twelve turns spaced across a plastic aerial insulator worked for us with the coaxial feedpoint tapped about 2½ turns up, and the vertical element about four turns down from the top. Although it was the most effective dx aerial, being at deck level this was also the one most subject to damage, as well as to salt water ingress however careful the encapsulation. Necessary attention may not always be possible in the heavy weather encountered on a major ocean voyage.

Ideally, one should have two of everything in a boat—including /MM rigs. The small commercial sets intended for /M operation in the warmth of a car do not take kindly to a constant fine salt spray accompanied by tropical temperatures. As far as test gear is concerned, once again lack of space dictates what can be taken. The author's view is that a gdo, swr and pwr meters, a Multimeter and soldering iron are essential mariner's equipment, together with as much of the junk box as one can stow.

In conclusion the author would like to thank the many hundreds of stations throughout the world who worked his station on the trip. So many were involved that this is not the place in which to thank them, but their interest certainly added another dimension to his family's personal adventure. □

technical topics

Pat Hawker, G3VA

SHOULD this month's notes appear rather more disjointed than usual, please accept my apologies. But as copy deadlines loomed I was fortunate enough to make a fleeting visit on behalf of the IBA to attend the enormous National Association of Broadcasters' convention and exhibition in Chicago. While this gave an opportunity to see all those fabulous skyscrapers (and to look at the city from the 103rd floor of the Sears Tower), to experience the sudden changes of temperature and the driving Chicago winds—as well as to realize the current domination of the two-way radio scene by citizen's band, which is held in bitter detestation by those American amateurs I met—it did unfortunately also bring me into contact with what appears to be a virulent strain of flu, though not the one, I hope, that President Ford is suggesting all Americans should be inoculated against.

The result is that these notes are being hurriedly completed while my internal dissipation is such that I should perhaps be sitting on a heat sink—but I will try not to let that influence the choice of items!

Simple af filter

John Roscoe, G4QK, feels that in these days of complex and sometimes expensive cw filters, it is useful to remember how much can be done with just two capacitors: a series capacitor to attenuate low frequencies and a parallel one for rolling off high frequencies: Fig 1. He finds that with a typical low-impedance output socket and 3Ω impedance headphones, two 0·25μF capacitors give a marked improvement, notably in reducing fatigue. The slight loss of volume is of no consequence with any receiver capable of driving a loudspeaker. It will also be found that the series capacitor should successfully clean up any remaining hum in the output of older receivers which can be unpleasant when using headphones.

As we have mentioned on previous occasions the use of some of the very sharp and sophisticated cw filters that are now available ideally requires the use of receivers of impeccable linearity right up to the filter itself; very good stability; and not least the partial abandonment of the natural filtering processes of the ear. This is not to say that cw filters are not useful—but merely to warn that the advantages in practice may sometimes turn out to be less than might have been expected from consideration of the theoretical reduction of bandwidth.

Incidentally, G4QK was born in Japan and has some interesting views on how we in the west should really spell or at least pronounce, the name "Yagi". In effect this should, he feels, be "YAngI" and not with a hard G. His full explanation, however, makes it sound as difficult as the Japanese morse which defeated so many intercept operators in the second world war.

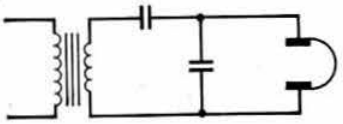

Fig 1. The simplest af filter. For low-impedance applications the capacitors can be 0·25μF

Two-in-one power supply

A power-supply dodge that is so simple that it is difficult to believe that it is new—yet one that I cannot recall seeing before—is described by Charles R. Winchester (*Electronic Design*, No 4, 16 February 1976): Fig 2. With the aid of a single-pole-double-throw switch, a centre-tapped transformer and a bridge rectifier it is possible to switch between two output voltages, one roughly double the other.

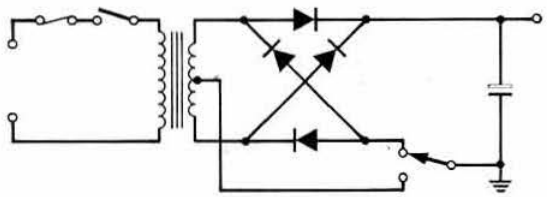

Fig 2. Power supply arrangement providing a 2:1 variation of voltage output by switching from bridge rectifier to full-wave rectification

With the switch as shown in Fig 2, the arrangement is that of a bridge rectifier using the full output across the transformer secondary. When the switch is thrown, the circuit becomes a full-wave arrangement, using the two halves of the secondary winding and so providing only about half the output voltage.

Points to note. The filter capacitor must of course be rated for the higher of the two voltages. In the second configuration two diodes remain unused, but as they are reverse-biased there is negligible leakage current.

OZ7BO keyer updated

One of the keyers that made a real impact on electronic keying in the 'forties and 'fifties was that by the late OZ7BO using relays and triodes. In various forms it remained popular for many years—and one still remembers with pleasure the sound of Bo's crisp and beautiful "fist": a very much missed "silent key".

Bob Heaton, G8JFY/G3JIS, has recently put together a keyer (Fig 3) using a couple of transistors but which is essentially the originally OZ7BO approach. When one notes the rising cost of some of the more complex keyers now on the market there is a lot to be said for a return to some of the simpler arrangements. Bob Heaton writes:

"I realize that relays are viewed with the gravest suspicion but sealed units are capable of millions of operations and can be acquired very cheaply. Relay A is a miniature sealed relay made by Magnetic Devices Ltd, 12V (HC6U size); Relay B is a reed relay, in my case from an ex-computer panel, 12V.

"When the paddle is operated 'both relays A and B operate; contact A1 breaks the supply and C1 discharges through RV2 and RV3; when the potential between the base of TR2 and earth falls below 0·6V, relay B releases. Dependent upon the setting of RV3, relay A will release

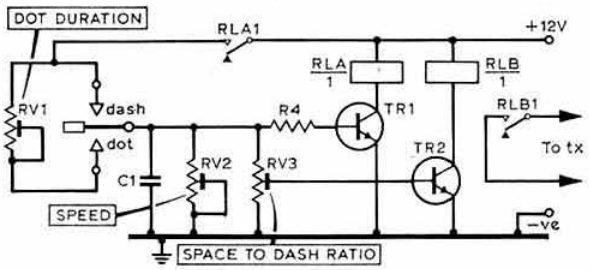

Fig 3. Transistorized version of the OZ7BO keyer. Component values are: C1 50μF (25vw); RV1 470Ω skeleton preset; RV2 2·5kΩ skeleton preset; RV3 10kΩ skeleton preset; R4 10kΩ ¼W; TR1, TR2 BC108a

shortly after B and this determines the 'space' period. When A releases, the cycle starts again.

"The quantity of charge in C1 decides how long B will hold up and this is adjusted by RV1 to determine the 'dots'.

"The keyer can be adjusted from about 5w/min up to around 30w/min and it should be found that at about 18 to 20w/min all the presets are very close to mid-positions. The usual mark-space ratio checks can be made using an ohmmeter (ie 50 per cent of fsd on dots and 75 per cent on dashes); this is a check worth making since it is surprising how sensitive the ear is to incorrect dot/space ratios!

"The keying paddle is a piece of suitably-shaped double-sided copper-clad board attached to a small piece of junior hacksaw blade damped with small blocks of foam spongy material."

Digital timer circuit

Mervyn Stanton, G4CGQ, suggests that readers may be interested in a simple timer arrangement which is being used in conjunction with the "Digital Morse Code Generator" as described by P. W. Bacon, G3ZSS, in *Radio Communication* February 1974, page 86, for the 70cm beacon station, GB2UJ, of the West Kent Amateur Radio Society. The circuit was suggested to G4CGQ, who has built the generator, by V. R. Vesma, G8GYB.

The timer is an SN74121 monostable device which is triggered when the outputs A, B and C of IC4 goes to logical "1"; this occurring at the last line scan. The Q output lifts the enable line to IC2 and IC4, stopping both from

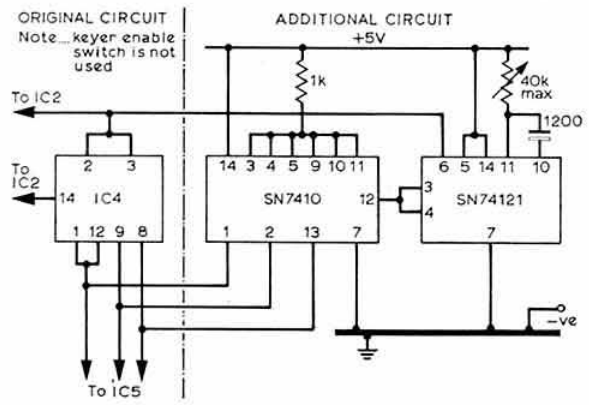

Fig 4. A timer for a digital morse code generator

counting for up to 60s, depending on the value of C and R. After this time the enable line returns to logical "0" and the scan restarts.

The 1kΩ resistor associated with pins 3, 4, 5, 9, 10 and 11 on the SN7410 is a pull-up resistor for the unused gates.

Down converter adds hf to vhf transmitters

The increasing use of packaged 144MHz ssb transceivers, particularly by Class B operators not having any initial interest in hf operation, has produced a requirement which is the exact reverse of the traditional approach of using hf ssb transmitters to provide an exciter for vhf. What happens when the Class A permit is received and you want to give hf a whirl? Or even when you want to use 432MHz with a transverter that needs to be driven at 28MHz? Is there any alternative to discarding the vhf ssb transmitter?

The answer to all these questions is provided by the current availability of a reasonably-priced wide-band double-balanced packaged mixer (type MD108) or by using home-produced mixers of this general type.

A letter from Chris Towns, GM8BKE, reports that this technique for transverting to the hf bands from a vhf transceiver has recently been tried by Stan Floyd, GM3KXQ, using the MD108 double-balanced diode ring mixer with a suitable local oscillator to down-convert to the required hf band, in this case 3·5MHz: see Fig 5(a).

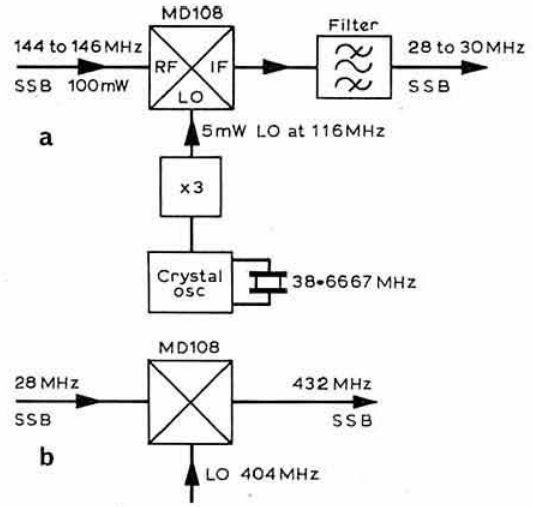

Fig 5. Using the MD108 double-balanced mixer. (a) As a down-converter to provide 28–30MHz output from a 144-146MHz ssb transceiver, for use with a 28/432MHz transverter or for hf operation. (b) To provide up-conversion to 432MHz from 144MHz transmitter (GM8BKE)

GM8BKE points out that many G8-plus-three licensees who possess no 28–30MHz equipment are unable to take advantage of the many designs of vhf/uhf transverters (particularly for 432MHz) which require an input at these frequencies. This has led to a useful modification of GM3KXQ's approach to down-conversion which should be of interest to many vhf/uhf operators: see Fig 5(b).

By using a 116MHz local oscillator frequency, a 28MHz ssb signal can be produced at low level from any 144MHz ssb transceiver. This signal can then be used in the normal way to drive either a commercial or home-brew 28/432MHz

transverter. GM8BKE has found that this gives very acceptable results in the transmit mode, and might be extended to cover reception. The signal from the converter is clean with at least 30dB attenuation of the input and oscillator frequencies in the mixer, and this can be suitably enhanced by means of the bandpass filter. He points out that suppression of the input signal is particularly important when transverting to 432MHz as the 144MHz might otherwise easily be tripled in the transverting process, and GM8BKE believes that converting first to 28MHz produces a much cleaner method of producing 432MHz ssb than the more direct 144 to 432MHz conversion.

He suggests that the method should be of particular interest to owners of such equipments as the Liner 2, FT220, FDK etc, wishing to operate on 432MHz ssb without having first to obtain a 28MHz drive source. The whole unit is very easy to produce, occupying a 4 by 2in pcb. He also believes that the MD108 unit could also be used in a 28 to 432MHz transverter as the rf ports are good to 500MHz and will provide good suppression of a 404MHz local oscillator signal.

The MD108 double-balanced mixer is made by Anzac Electronics (39 Green Street, Waltham, Mass. 92154, USA). Price in small quantities is $7 plus postage.

Solid-state triband transceiver ideas

Although the all-solid-state transmitter is by now well-established on vhf it is still relatively rare on hf. A variety of reasons could be put forward to explain this, but perhaps the most convincing is that, at the power levels used on hf, it is not easy to band-switch a transistorized power amplifier, and the alternative broad-band linear technique is not something to be undertaken lightly; particularly with rf power transistors which are ungenerous towards mistakes and thus may have an operational lifetime measured in microseconds. Then again most solid-state transmitters, with limited gain per stage, always seem to require a very large number of stages when compared with valved transmitters.

One result of this "hands-off" and rather cagey attitude by amateurs is that most of those solid-state designs that have appeared tend to follow closely the accepted "professional" thinking as reflected in the maker's application notes on which they are often based. The *amateur* contribution to solid-state transmitter design has not been over-evident—yet surely that is what we claim the hobby is all about. One notable exception, of course, was the discovery by Tich Ryan, G3VJN, that the CA3028A ic, although developed and marketed as an audio device, is capable of providing over 1W output throughout the hf spectrum when used as a linear amplifier (*ART*).

Similarly, some new-to-me ideas were noticed recently in an article "Solid-state circuits for ssb" by J. W. Herbert, ZL2BDB (*Break-in* November 1975) which described an all-solid-state "front-end" for a 3·5/7/14MHz 20W p.e.p. ssb transceiver to update an earlier design; it features a modest number of stages and simple band-switching: see Fig 6. Most of the ideas could be used in any equipment based on a 9MHz ssb filter.

Among the more unusual features are the use of two small-signal dual-gate MOSFETS in parallel to form a linear driver stage, and the use of a very-high-power vhf transistor at hf. The BLY89 used in this manner provides a high stage gain, a modest 20W p.e.p. output but, according to ZL2BDB, is

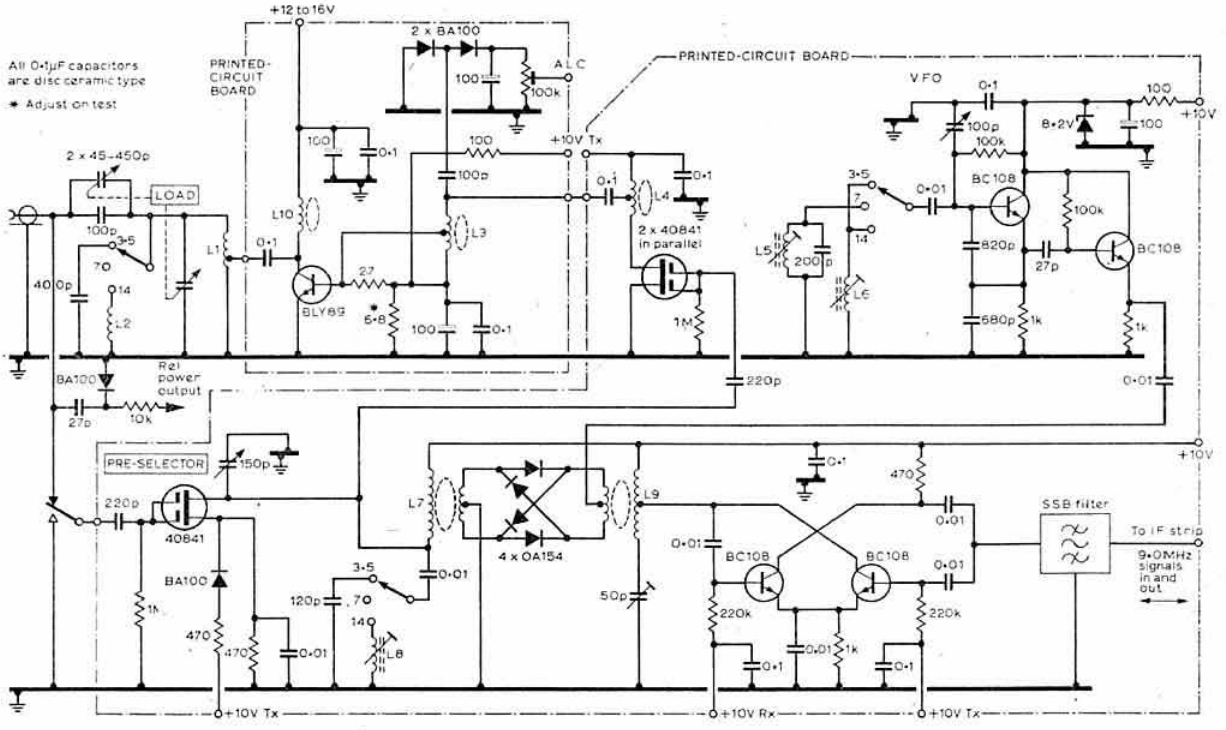

Fig 6. The all-solid-state "front-end" used by ZL2BDB in a new version of an earlier hybrid triband ssb/cw transceiver providing about 20W p.e.p. ssb output on 3·5, 7 and 14MHz and the associated receiver front-end

"virtually indestructible within the operating conditions". The BLY89 has a maximum collector current rating of 10A when used at vhf but in this circuit is operated under derated conditions in order to take advantage of the 6dB/octave gain increase with decreasing frequency. It is possible using transistors with an F_T of about 800MHz to obtain power gains of up to 30dB (1,000 times) in the lower part of the hf spectrum, which is as good as, or better than, what is normally achieved with valves; but of course in such conditions the transistor is very vulnerable to destructive parasitic oscillation (particularly vhf parasitics) unless it is run at much lower power than would be feasible at vhf.

Since the mosfet driver has a stage gain of rather more than 25dB, an overall power gain of some 50dB is achieved in two stages. The driver is fed from a double-balanced diode ring mixer providing only about 100μW p.e.p. but the high mosfet input impedance means that some 3 to 5V peak-to-peak drive is supplied by the resonant circuit of the pre-selector.

In his article ZL2BDB provides full design notes on both these high-gain linear amplifier stages. He shows that a single type 40841 dual-gate mosfet can provide about 62·5mW output or some 125mW with two devices. He gives the following summary of the two stages: overall gain 49dB; input 3V pp high-impedance; output 20W p.e.p. in 50Ω; dc input 34W (13·5V at 2·5A); efficiency 57 per cent. It should be mentioned that the 40481 MOSFETS are preferably selected from a number of devices, on the basis of using those with the highest values of drain current with zero bias (ie high I_{dss}). The step-down matching network between the MOSFETS and the BLY89 (9:1 and then 4:1) first drops the impedance to about 46Ω and then to about 11·5Ω with the base "seeing" about 5Ω because of the effect of the 27Ω resistor. The very low output impedance of the BLY89 (about 3·6Ω) is impedance transformed in the output network to about 360Ω (1:100) and then matched to 50Ω. A bilateral stage, using two BC108, is interposed between the 9MHz ssb filter and the ring mixer. The vfo tunes 5·0 to 5·5MHz for 3·5 and 14MHz and 1·8 to 2·0MHz for 7MHz. The rf mosfet amplifier on receive is run with fixed gain and biased for minimum cross-modulation, this stage being muted by applying a positive potential to the source on transmit. Altogether this "front-end" seems to exploit semiconductor techniques in a very logical way; for full constructional information it is necessary to refer to the original article but it is hoped that these notes will draw attention to some of the design ideas. The same issue of *Break-in* includes a linear amplifier, based on two or more 6146 valves, intended for use with this solid-state transceiver.

Coil data: L1 2μH (10t, 337 mm dia, 250 mm long, tap 1t, 12swg silvered); L2 0·7μH (10t, 125mm dia, 168mm long, 22swg enam); L3 Philips 14 by 9 by 5mm (violet) toroid 8 plus 8t, bifilar wound; L4 core as L3, 5 plus 5 plus 5t, trifilar wound; L5 10μH, 100t, 6mm slug former with two slugs; L6 2μH, 10t, 6mm, slug; L7 and L9 toroid (as L4) 15t, 3 plus 3t bifilar; L8 4μH, 14t, 6mm slug; L10 15t Philips 23 by 14 by 7mm toroid (violet). L3 to L9 30swg enam wire.

Simple high-pass tvi filter

Some time ago we drew attention to the value of even a simple series-tuned trap connected across the tv feeder cable in reducing 144MHz signals reaching the front-end of a tv receiver (*ART*). A slightly more sophisticated version of this arrangement, including low-value capacitors to provide a high-pass characteristic is reported by Barry Priestley, G3JGO, to have proved useful in curing tvi to a transistorized uhf tv set with an aerial only 3ft from a 144MHz aerial: see Fig 7. With this filter no additional braid-breaker type filter was found necessary.

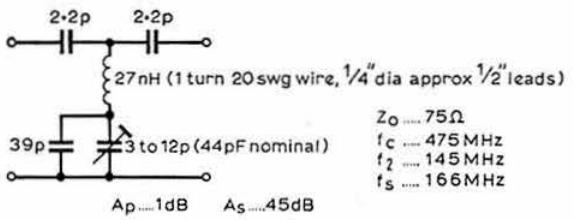

Fig 7. Simple tvi filter used by G3JGO to prevent overloading tv receiver in the locality of a 145MHz transmitter

The main attenuation "notch" provided by the series tuned trap is placed in the 144MHz band, resulting in a stop-band attenuation of some 45dB of the fundamental transmitter signal. He mentions that it is advisable to keep the 2·2pF capacitors pressed near the case to reduce inductance which can cause loss of the incoming uhf tv signals. Alignment consists simply of tweaking the coil until the null is near the 144MHz band and then peaking it more accurately by means of the trimmer capacitor.

The Goral oscillator

For many years, reaching back I suppose to the original Franklin circuit, hf/vhf oscillators have been developed which use two active devices rather than one in order to minimize the effects of changes in the frequency determining components, whether crystal or LC, or a vxo combination of the two.

Yet another addition to this long line has been developed by Pierre Goral of SGC Inc and described by Donald L. Stoner, W6TNS, (*Ham Radio* October 1974, p36–39). More recently a practical application of this arrangement has been put forward by John M. Henry, VE2DNM, in *The Canadian Amateur* in the form of a 12MHz vxo intended for use with such equipments as the Trio/Kenwood TR7200G to provide an output at 145·9MHz for working through the Oscar satellites.

The basic Goral arrangement is, in effect, a Colpitts oscillator in which a junction-fet and bipolar transistor are used; output from the fet is taken from the source and drives a bipolar transistor as an emitter follower so that this provides power gain for the positive feedback energy without changing the phase angle of the signal. The extra gain means that the values of the capacitive-divider in the Colpitts oscillator can be increased with beneficial effects on stability and reduces susceptibility to temperature changes, as well as helping to overcome the sluggishness of a conventional Colpitts fet oscillator.

W6TNS lists the following features of this arrangement:
(1) Ability to correlate at virtually any crystal shunt capacitance between 5 and 50pF with the crystal oscillating very close to series-resonance.
(2) Ability to use crystals which have rather high equivalent series resistance or unplated crystals.
(3) A temperature stability nearly independent of the active devices as a result of the increased shunt capacitances.
(4) Well suited to "pulling" of the crystal using variable capacitance diodes.

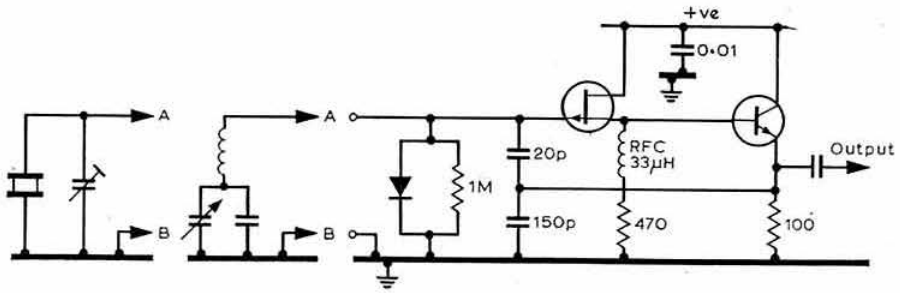

Fig 8. Basic Goral oscillator using an fet/bipolar combination: (a) as crystal oscillator; and (b) as LC vfo

Fig 8 is a composite diagram, derived from the W6TNS article, showing how the arrangement can be used as (a) crystal oscillator and (b) LC vfo. It is also possible to use a variable capacitance diode for trimming the oscillator frequency, for nbfm or for a crystal plus coil vxo. See also "Oscar vxo" opposite.

9MHz crystal nbfm discriminator

In *TT* (March 1973) some details were given of an nbfm discriminator based on a quartz crystal, as described in the Australian journal *Tuned Lines*, and representing one of the most successful ways of obtaining good af output from nbfm directly at a high intermediate frequency, without further conversion to 455kHz. Later some further crystal discriminator arrangements were described and reproduced in *ART5*.

Recently the original arrangement has turned up again, this time in *Ham Radio* (October 1975) and using low-cost citizen's band crystals, though of course other 9MHz crystals could be used. Kent Shubert, WA0JYK, also suggests the use of an MC1355P ic in front of the discriminator to provide the necessary amplitude limiting plus up to 60dB gain: Fig 9.

WA0JYK suggests that C3 should be adjusted for zero voltage output with an unmodulated carrier at the centre frequency of the unit, although he notes that this setting may not hold for all crystals and that it is possible to obtain good performance with crystals that will not tune for a zero centre. C1 and C2 are most easily adjusted with af sine wave applied to an fm signal generator or transmitter, using an oscilloscope to check distortion of the audio output signal. With 1V p-p 9MHz signal and 5kHz deviation it should be possible to obtain about 1V p-p audio output at low af, rolling off at higher frequencies.

Since this type of discriminator is sensitive to amplitude variations it needs a really good limiter and an MC1355P device provides a useful means of doing this, although careful layout, bypassing and shielding is needed in view of the high maximum gain.

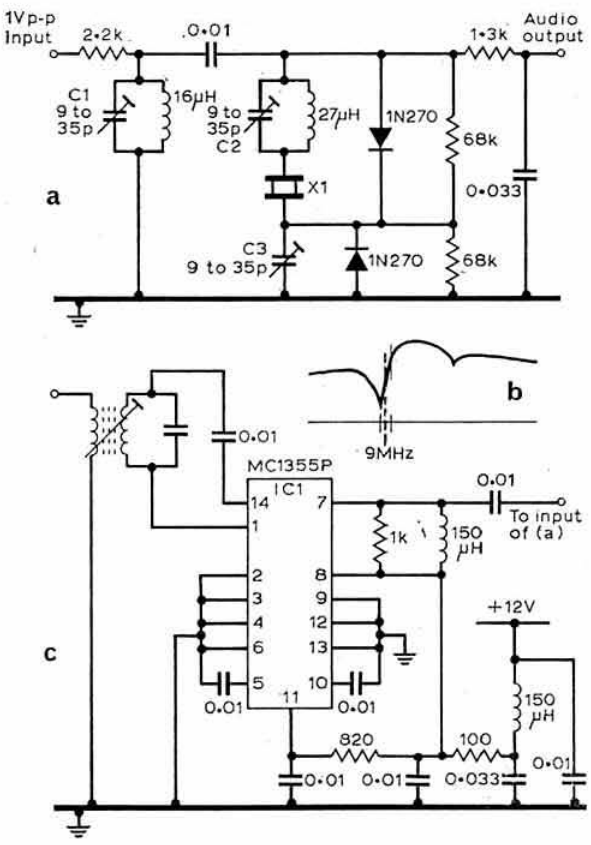

Fig 9. 9MHz nbfm crystal discriminator: (a) basic design, (b) typical responses curve, (c) use of MC1355P as i.f. amplifier/limiter in front of the crystal discriminator (WA0JYK in *Ham Radio*). Note that the linear portion of the response curve just above resonance is used

Simplified transmatch

R. H. N. Johnston, G2ZP, mentions that in the course of correspondence with Lewis McCoy, W1ICP, of ARRL, on the well-known "transmatch" system for matching the 50Ω output of most transmitters to a variety of aerials, he has learned that it is by no means essential to use the split-stator or differential capacitor usually specified. In the simplified arrangement, Fig 10, two separate single capacitors are used and normally will have little effect on the performance since a good deal of capacitance is provided to earth in the transmitter output network. It should, however, be noted that this general form of matching network does not contribute much

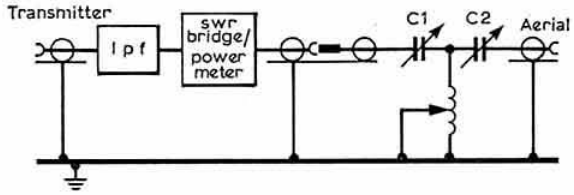

Fig 10. A modified form of "transmatch" aerial matching network that does not require split-stator or differential capacitor. But note that such a network does not provide much harmonic attenuation

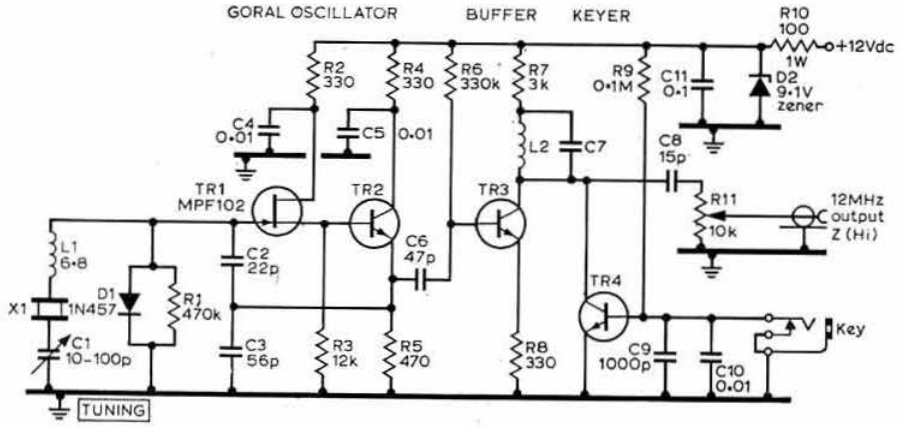

Fig 11. The VE2DNM 12MHz vxo for Oscar cw operation based on the Goral oscillator and arranged to provide tunable facilities for equipments such as the TR7200G. At 144MHz it provides a tuning range of the order of 100kHz although the exact range will depend on crystal characteristics. TR1 MPF102 etc; TR2-4 any general purpose npn transistors with an F_T greater than about 200MHz

to harmonic attenuation since it is virtually a high-pass filter; this means that the low-pass filter is normally an essential requirement. In view of the difficulty in finding suitable high-voltage split-stator or differential capacitors these days, this dodge may prove useful.

Oscar vxo

John Henry, VE2DNM, likes the Goral arrangement because of the low driving of the crystal. His 12MHz unit is shown in Fig 11 and apart from the basic oscillator includes a tuned buffer stage and a transistor keying stage. He claims that with a moulded 6·8μH inductor, L1, and a 12·16MHz crystal, the unit in conjunction with the TR7200G tunes approximately from 145·870 to 145·966MHz (useful cw frequencies for Oscar 6 and 7); other comparable ranges could be covered with suitable crystals. Similarly the unit could be readily adapted for vhf equipment that requires different fundamental frequencies such as 8, 9 or 18MHz. He stresses, however, that the tuning capacitor C1 should be of the log-tuning type. If a linear-tuning capacitor is used (ie capacitor with shaft in centre of the capacitor plates) it will be found that the frequency shift is largely compressed into one end of the scale. Once a suitable value of L1 has been found the inductor should be sealed. With 12W output from the TR7200 and a 16-element aerial, VE2DNM puts a clean signal through Oscar. The unit could also be used for other applications requiring a modest tuning range on 144MHz.

Stable Pierce oscillator as ttl clock

The requirement for stable oscillators able to work from a few volts and suitable for interfacing with ttl devices arises more and more frequently. An arrangement (Fig 12) that allows the supply voltage to vary all the way from 3 to 9V without the output from a 1MHz crystal changing by more than about 0·1Hz was described by Terence King in *Electronics* (21 June 1973, p112). This has a modified mosfet Pierce oscillator followed by another mosfet as a source-follower isolating stage. The extremely low susceptibility to voltage and temperature changes stems from the use of high-value source resistors in both stages and large-value fixed capacitors in the gate and drain loops of the oscillator stage. It is claimed that the overall performance of such an oscillator depends almost entirely on the crystal; if this has temperature stabilization about one part in 10^8 is achievable.

A good interface with ttl is provided by a type-7413 Schmitt trigger ic and the output from this is rich in harmonics, allowing the oscillator to be accurately adjusted to zero beat against MSF/WWV etc. Capacitor C1 governs the calibration range of the trimmer capacitor and may require selecting to suit the crystal. □

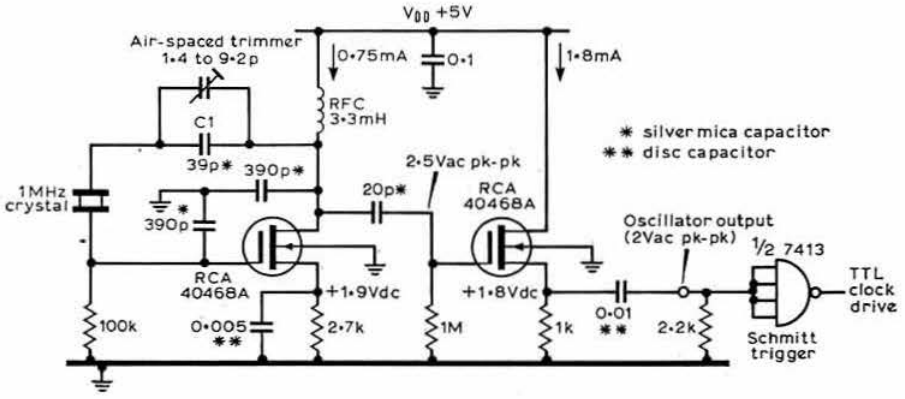

Fig 12. Stable Pierce oscillator as ttl clock drive which is virtually unaffected by voltage and component variations (*Electronics*)

swl news

Bob Treacher, BRS32525 *

80m dx scores

Response to the suggestion of running a table showing 80m all-time scores has not proved too enthusiastic. However, the scores received are shown below. See how your score compares and send it in to be published next time.

Listener	No	Mode	Listener	No	Mode
BRS32525	219	ssb	BRS35943	195	ssb
BRS17567	200	ssb	A8312	156	ssb

The 1976 all-band table

Scores provided to date show that it is a much tighter contest so far this year. With only 200 separating 1st from 8th, and the majority of 1976 to come, competition should be very keen. There is still room for other entries—simply follow the rules in the March issue.

Another interesting mail

Neville Spry, BRS17567, comments on the aurora which affected the hf bands the day before the CQ WPX Contest. Some astonishing signals were heard on 10m on 26 March and there was very pronounced "arctic flutter" on UK signals. Conditions during the contest were generally poor, with very spasmodic conditions "across the pond". Neville has recently received confirmation from VY0A, ZL3NR/C and JA8IEV/JD1 all for 80m reports. New ones heard on 80m included Lloyd and Iris Colvin (W6KG and W6DOD) from 3D2, while on 14MHz he heard their expedition signing from C21NI.

A very long letter from Keith Kerr is remarkable for one thing. He has actually heard three countries on 160m ssb after two years of threatening! An interesting story goes with it—to quote "In February 1975 I bought an FR100B, 80 to 10m. On looking inside I noted two further crystals in the plug-in crystal panel. One was WWV, the other (he worked out) was 6·9–7·5MHz. Recently while looking at the crystals again with the modification details in front of me, I calculated that a 7,450·00kHz crystal was required." Unfortunately for Keith it just happened to be a 6·9–7·5MHz crystal which was fitted, so he had been able to use 160m for the best part of one year! Keith's three countries, however, are only G, GW and GD but he is threatening to hear more during the remainder of 1976. Only time will tell, but he thinks that the noise encountered on 160m makes 80 and 40m sound like 10m! Keith also comments on lower frequency activity; KC4AAC, VP2KF and TR8SS being the pick on 40m, while ZK1DX, YN1R, HH2V and VK2AVA are the best from 80m. Also heard on 3·791MHz at 0642 on 19 March was YJ8DE, who was 44 working DJ8SW. Only a QSL card will prove if he is ok or not.

Tim Chapman, A8890, remarks that he has heard HK0-BKX, KV4FZ, KP4AN and PYs on 160m this season on his homebrew receiver based on the CR100. Tim was the 1st G swl in the Swedish SSA contest last year and his friend Robert Nicholls, A8531, was placed 2nd.

1976 HF COUNTRIES TABLE

Station	10	15	20	40	80	160	Total	Mode
BRS35608	12	110	151	136	95	29	533	cw
BRS17567	18	107	180	44	121	10	480	ssb
BRS35943	3	101	166	81	125	3	479	ssb
A8890	11	82	128	69	79	22	391	ssb/cw
BRS35454	8	72	149	58	76	7	370	ssb
A8849	9	60	139	52	81	12	353	ssb/cw
A8883	21	83	119	44	78	3	348	ssb
A8312	4	67	100	60	82	22	335	ssb/cw
BRS32286	10	49	118	32	77	0	286	ssb/cw
A8808	0	57	70	17	46	3	193	ssb
BRS36208	0	8	75	21	25	1	130	ssb
BRS36554	1	10	25	5	21	1	63	ssb

A bout of flu has meant more time by his receiver for Andrew Glanville, A8849. It has certainly paid dividends judging by 9N1, XT2, KG6, 3D6, 9M6, ZD8 and 5T5, all heard on 20m ssb. 40m cw has produced 4S7WP and A9XU. An equally impressive list is submitted by Keith Morrison, A8883, his 20m dx includes HS, HM, VK9, KG4, ZD7, ST and FR7. Both these SWLs seem to be enjoying 20m conditions and are surely going to have large scores for the table by the end of the year.

Our 160m whizz kid, Dave Sharred, A8312, is getting worried. He thinks Noel Phelps is after his unofficial 160m crown. Looking at the scores so far, his worrying is justified. Dave's latest 1976 additions are KZ5, PJ2, HC and JA. JA is especially difficult on 160m and is a good "scalp" to get. On 8 February Dave heard both VK5KO and VK3CZ. During the ARRL DX SSB Contest he went to bed at 0130 and then heard that C6ABC and HK0BKX had been heard by others. So during ARRL DX CW he stayed up until 0245 and only heard KV4FZ and W2DEO. There is no justice, claims Dave. However 160m was kind to him after this, providing ZB2CJ for country No 42 all-time.

Crosbie Rodgers, BRS32286, reports there are five amateurs in Dumfries and a few more SWLs, and he is hopeful about forming a club in the near future.

Huddersfield is the QTH of a new reporter, Paul, A8808. His first table entry shows 193, all on ssb, which includes VS9MB, 5V7 and VP8 on 15m. Paul uses a Codar receiver into a 100ft long wire.

BRS36208 is one of the latest SWLs to join the RSGB. Ian's father aroused his interest in amateur radio, as he held a 5A Libyan licence 20 years ago. Ian uses an FRDX400 and a long wire, and his favourite band is also 20m.

An even newer member is BRS36554, Peter Cain of Newcastle. Peter has just received his QSL cards from the printer and is now anxious to send interesting reports to the many dx stations he has heard recently.

Another lengthy letter is that from Ken Steele, A8553. Ken seems to be a very enthusiastic listener who has been interested in the hobby for about four years. Using an FR50B and the Barlow-Wadley receiver, Ken listens to the amateur bands as often as possible. He is at present studying cw and hopes to take the RAE soon, and he has recently received a trophy for being the most successful swl in his local club.

Good luck!

Your scribe would like to take this opportunity of wishing all those entering the May RAE the very best of luck.

(Continued on p 363)

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

microwaves

Dain Evans, G3RPE*

The fifth microwave round table

About 70 people turned up at Winchester on 15 February to take part in a fairly informal exchange of ideas, problems and junk, and also to check their equipment. The main business was to review the "in-between" bands at 2·3, 3·4 and 5·7GHz. Both the level of interest in these bands and the amount of information available on equipment came as something of a surprise to most people.

G3RPE, in opening the morning session, suggested that, taking advantage of our hard-won experience on the 1·3 and 10GHz bands, there seemed little point in compromising with respect to the size of equipment: either one produced relatively simple low-power equipment generating tens or hundreds of milliwatts which was capable of working long distances only over optical paths and within ducts or, alternatively, large equipment capable of taking advantage of the reliability of propagation by tropospheric scatter. The approximate size of equipment required to work FMD Microwave Award distances or greater by this latter mode is given below. The figures assume a scatter loss above that for free space of 80dB, aerials having a gain equivalent to a dish 6ft in diameter, a 2kHz bandwidth and a signal/noise ratio of 0dB.

Estimated power required for troposcatter propagation

Frequency (GHz)	Rx noise factor (dB)	Distance (km)	Tx power (W)
1·3	4	600	40
2·3	6	500	30
3·4	7	400	3
5·7	10	300	2
10·0	7	450	1

While constructing equipment of this size will be a challenge, it certainly is feasible for many amateurs. On 1·3GHz, the equipment is already in use; on 2·3GHz, we know how to produce the equipment; on 5·7GHz, at least one station is at this level, and on 10GHz several are within striking distance. Clearly we are in for a most interesting time on these bands.

In the afternoon session introduced by G3HWR, G3WDG, in looking at 2·3GHz equipment, referred to recent designs in the February and December 1975 issues of *Ham Radio* for a power amplifier and a doubler using 2C39 valves. With 1W of drive at 1,152MHz, the doubler produces 5W at 2,304MHz, which is more than sufficient to drive the amplifier to 20-40W output. He also considered ssb operation on this band using the high level mixer/amplifier approach as used on 1·3GHz, with mixer inputs of 144+2,160MHz or 1,296+1,008MHz. On the receiver side, there is no shortage of converter designs —the writer has references to nine. One of the more interesting ones is that based on an interdigital filter described in *QST* in January 1974. Aerials seem less of a problem than at 1·3GHz: there is the scaled version of the G3JVL loop-Yagi given in *Microwaves* in January 1975 (and also available commercially), but even the "standard" 4ft dish is beginning to work properly at these frequencies and should have a gain of 26-27dB.

G8AGN reviewed the rather smaller amount of information on 3·4GHz equipment. He showed his simple polaplexer transceiver based on the 726 klystron which has an output of about 100mW, and also referred to the ZL2HI coaxial transceiver which also uses this klystron: the writer has details. G8AGN noted the growing interest in narrow-band operation on this band also, and showed his version of the modification of the G3LQR 1,152/2,304MHz varactor multiplier into a tripler. He also gave details of an interdigital filter for this frequency.

G3WJG, in talking about the 5·7GHz band, reported that he had little success with a Gunn oscillator, possibly because diodes for this frequency are at a relatively early stage in their development. One of the few klystrons available which can be tuned to the amateur band—the KS7/85—will only operate with a low reflector voltage, about 50V, and under these conditions only generates a few milliwatts. More recently, therefore, he had concentrated on varactor multiplication from lower frequencies, and he showed his 384/5,760MHz multiplier using a BXY40D device. This is a scaled version in WG14 of the G8DEK 10GHz design described in the March *Microwaves*. From about 500mW drive at 384MHz, an output of 3-5mW is obtained which is sufficient as a local oscillator and more than enough drive for his TWT amplifier—to 20W output. He has also experimented with a scaled version of his 10GHz multiplier described in *Radio Communication* in August 1975, p 614. For an input at 1,920MHz of 2W, an output of 200mW at 5,760MHz is obtained.

The continuing interest in 10GHz was still evident despite the main business of the meeting being other bands. More than half of those present had equipment for 10GHz, and one of the suggestions made for the next round table was a construction day during which, starting from scratch, as many as possible complete equipments would be built: an intriguing possibility.

From "Ham Radio"

The October 1975 issue of *Ham Radio* gives details of WA6UAM's microstrip 1·3GHz preamplifier which uses the relatively cheap Motorola MFR901 transistor. The overall noise factor when working into a high-quality mixer is about 2·8dB. A stripline mixer for 2·3GHz which uses HP 5082-2535 or -2565 diodes due to WA2ZZF is also described. This has a noise factor of about 7dB. A rather unusual feature is the use of dc biasing of the diodes which reduces the local oscillator drive required.

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SWL news

(Continued from p 362)

Deadline

Remember that this is your column and all your letters are appreciated, as it takes a vast amount of comment to extract the best to use in this column. Comments, table scores, including your 80m all-time scores, should reach your scribe by 1 June 1976.

4-2-70

Martin Dann, G3NHE*

REMEMBER THE INTERNATIONAL VHF CONVENTION AT BRUNEL UNIVERSITY ON 8-9 MAY.

DX news

A quite extraordinary level of solar activity was responsible for the series of auroral openings at the end of March and beginning of April. On 23 March Ron Ham reported a big burst of solar noise from an area of the sun not considered likely to cause an aurora, and it was agreed to review the situation on the 26th. However, just before this could happen the big 26 March opening started, lasting as far as we were concerned from roughly 1400 to 1930gmt. This opening was followed by two other much less intense events on 1 and 3 April, both in the afternoon and early evening. Apart from being somewhat caught out by the start of the first opening, the warning scheme appears to have worked reasonably well this time.

Insufficient reports have yet been received to build up a complete picture, but the most startling contact heard of so far was between DL7QY (Berlin) and I4XCC in GDO3d at 1522 on 26 March. This is a long way south for an auroral contact, and is believed to be a "first" for this mode of propagation. DL7QY also worked SK6AB and SM6CKU on 432MHz during the same opening, and only just failed to work UP2BBC on this band.

G4CDF (Scunthorpe) took full advantage of the opening, and between his first QSO at 1415gmt, and his last with GM4CXP at 1912, Mike worked 48 stations, all but one on cw. G4CDF's best dx was UP2BBC in LPO7j, worked at 1453gmt. Other dx included OK1FRA, OK1BMW, several SPs, LA, SM, DM and F, plus the usual nearer countries. Beam headings varied between 0° and 45°, with the more distant stations, such as UP, OK and SP, peaking around 45°, and G, GM, PA0 and LA peaking at 10°: DL and SM were anywhere between these two headings. The last station heard in Scunthorpe was GM3JFG at 1930gmt.

The writer arrived home at 1645gmt to find a message via the RSGB warning scheme waiting for him, and was able to join in the proceedings almost immediately. Despite makeshift 144MHz aerial arrangements consisting of a 4-el beam barely clearing the house roof, signal levels were good, and the first contact, with SP5JC in KM56f, proved to be the best dx of the evening. The last signal heard by G3NHE was an OZ at 1915gmt.

After a slow start, activity on 70MHz eventually built up to a moderately good level with S9 auroral signals from GM in the north to G3AUS (Devon) in the south. G3RJX first noticed a rustiness about the GB3SU signal at 1600gmt, and began calling towards the north on cw and ssb. Just as he was beginning to think that he had been mistaken, G3AUS replied, but nothing else was heard until GM4AOR appeared at 1730gmt. Several other stations were then worked before the band went dead for G3RJX at 1850gmt.

* 49 Windermere Court, North Anston, Sheffield S31 7GJ.

G3BW (Cumbria) was lucky (or unlucky) enough to be recovering from a bout of flu, which had kept him at home, so he caught the start of the aurora, working UP2BBC and just missing a UR2. Bill spent the last hour of the opening on 70MHz where he found some very strong tone A signals, notably G3AUS at 59A. Like the writer, G3BW checked 432MHz for signs of auroral propagation without success.

G4CDF was lucky enough to catch both of the subsequent openings, but found them far less interesting than the 26 March event. Best dx for Mike on 1 April was LA and SM5, and the opening lasted from 1325 to 1810gmt, while on 3 April signals were even weaker. This event appears to have lasted from about 1510 to 1840gmt, although for the last hour or so the writer was only able to detect a very weak GM3JFG. Further reports on these openings would be welcome, and all information will be forwarded to the RSGB Propagation Studies Committee.

Two metres

G2HLL of Leeds would like it to be known that he is now active on 144MHz cw and looking for contacts. He is very much a newcomer to the band and confesses that he is a little disappointed by the lack of activity. Perhaps Frank Pickard will find the Monday night cw activity period useful, but in any case he intends to persevere with the mode, being much in favour of building his own gear and reluctant to invest in commercial ssb equipment. Although currently only running 10W of crystal-controlled cw to a dipole, Frank hopes soon to add a vxo and a 4-el beam, which should increase his range considerably.

Four metres

Further to the reports of increased 70MHz activity in Scotland, Drew Givens, GM3YOR, tells us that, in an attempt to attract the attention of those south of the border, several GMs are making a point of beaming south at midday on Sundays, calling on all modes. In particular, GM3IVZ is on 70·29MHz a.m., GM3YOR uses a.m., cw and ssb around 70·26MHz, as does GM4AOR. All these stations would welcome skeds with stations to the south.

G3BW continues to make progress on this band, and recently added GI to his list of countries when GI3CDF and GI3TLT were persuaded to QSY from 144MHz. Bill has also set up a sked with G3AUS at noon every Sunday on 70·15MHz, hoping to repeat the success of his 432MHz skeds with the Devon station. Whenever possible, G3BW intends to be active during the evenings at 8pm, ssb or cw, on 70·15MHz: he will tune the band for calls, answering on the caller's frequency.

Further south, G6GR/M is active on 70·26MHz every morning between 8.30 and 9am from Wolverhampton, another target for the growing activity on 70MHz in the Midlands.

FM channel

Nearly 50 amateurs turned up in Leicester when a meeting was held to consider forming a repeater group, and the result was the formation of an 11-man committee to press ahead with the establishment of a 432MHz repeater, GB3LE. The committee consists of representatives of local clubs in Nottinghamshire, Derbyshire and Leicestershire: photo p 367.

Persistence by RSGB and a willingness to compromise has resulted in Home Office approval of the Kent repeater,

GB3KR. The proposed power of this repeater has been reduced to 5W erp, and a revised map showing the coverage with this low power (taking high ground into account) seems to have done the trick.

The Kent Repeater Group continues to make progress with its planned 432MHz repeater, having reached provisional agreement with Thanet County Council for the siting of the device on top of a tower block in Margate. GB3EK will run about 5W output to a 4-el vertical aerial beaming WSW towards Canterbury, and the frequency will be channel RU2 (434·64MHz in, 433·05MHz out). As little congestion is expected, the repeater will be kept very simple, being carrier operated after the initial tone-burst access, with no time-out. The repeater will stay open until it has not been used for 20s, when it will close down and await another tone-burst. The tone filter will be quite wide to make "whistling-up" possible in the absence of a proper 1,750kHz tone-burst. In the event of the lack of restrictions being abused, the group will install the same rigid controls as used on GB3KR, but it is hoped that this will never be necessary.

The operators of PI8ALK, on channel R8, at Alkmaar in Holland, are considering putting a 432MHz fm repeater on channel RU8. The idea of using the same channel number for co-sited vhf and uhf repeaters follows a plan the Danes are implementing in Esbjerg using R2 and RU2.

Beacons

By way of compensation for the silence from GB3GEC on 432·1MHz, the Emley Moor beacon, GB3EM, is currently putting an immense signal into the writer's receiver on 432·91MHz. Despite the high signal level, no spurii or untoward effects have been noticed, so the device appears to be healthy and clean. It will be interesting to see how GB3EM is copied further afield.

Much further afield, LA1UHF has changed frequency and is now to be found on 432·86MHz, while SK6UHF has moved to 432·925MHz and should now be active again. We are indebted to SM4ETO/6 (operator of SK6AB) for this information, and for the news that SK6AB hopes shortly to have a new 432MHz pre-amplifier working, with a noise figure of 1·1dB!

Contest comment

The 8 February 432MHz Open Contest was not favoured by the best of conditions, and for the first half of the event the going was very difficult. The latter half found slightly improved conditions, coinciding at the writer's location with a marked improvement in the weather. Several serial numbers over the 50 mark were noted towards the end of the contest, so perhaps the entry will be good enough to restore the VHF Contests Committee's flagging faith in the band after that disastrous cumulative contest entry reported this month.

The new chairman of the VHF Contests Committee, Ian White, G3SEK, makes the point that contest results like that cumulative might be construed by some as documentary evidence that amateurs do not use the 432MHz band, which will not help at WARC in 1979. The committee can organize contests to help create activity, but cannot create entries!

A slight adjustment was made last month to "Contests Calendar", with the 144MHz Portable Contest being brought forward one week to 22–23 May, to avoid the Bank Holiday weekend. Also, just to show that the VHF Contests Committee is alive to the members' views, rules for an additional cw contest to run concurrently with the portable event were published under "Contest News".

It remains to be seen how popular the combined dx/local 144MHz contest (6–7 March) was, but activity sounded rather thin for an event on this band. We may be proved wrong but it seemed that while the idea of a dx contest met with favour, the combination with a separate local contest created several problems, not the least of which was the appearance of numerous a.m./fm signals in the sideband section of the band.

Monday night cw

The success of the Monday night cw activity period seems to be gaining momentum, and there are frequently more telegraphists between 144 and 144·15MHz than there are ssb stations further up the band. Recently G5UM counted 22 different cw stations between 8 and 10pm on a Monday evening, and there were probably more not audible to Jack.

Newcomers to the mode should not be afraid to call in to more seasoned operators, who will rarely be reluctant to respond to a request to "QRS" should it be necessary. It is, in any case, plain bad manners to reply at a faster speed than the station one is working, unless one is quite sure of the other's receiving ability: this is one reason why less practised cw users should be sure never to send faster than they can receive.

While on the subject of manners, there seems to be an increasing lack of this commodity among some a.m./fm and ssb users who all too frequently appear on these modes in the 144–144·15MHz cw segment of the band. In some parts of the country, groups are holding regular nets below 144·15MHz, and another dubious practice is that of sidebanders calling dx cw stations on their own frequency at the bottom end of the band in an attempt to persuade them to change to ssb.

Feedback

A standard form for the reporting back of anomalous propagation, such as auroras and sporadic-E, has now been produced by the RSGB Propagation Studies Committee, and supplies will be available at the International VHF Convention in May: the forms can also be obtained from G3NHE by sending an sae. The format is fairly similar to the old auroral report form, but now covers all types of propagation, with space on the back of the sheet for any additional comment.

It is hoped that those who regularly, or even occasionally, take part during unusual conditions will take advantage of this attempt to make the reporting of their results more easy. By asking for the forms to be returned to the writer of *4-2-70* before being forwarded to the Propagation Studies Committee, more immediate publicity can be given to the serious scientific work being carried out by the amateur movement, never a bad thing with WARC 1979 drawing ever closer.

Is your repeater really necessary?

If any reader thinks the above headline provocative, he would be right: it is prompted by the thought expressed by many that some of the 50 or so repeater applications which have been made to the RSGB will not stand the test of time. In fact, only time will show how many of them prove to be viable devices in the cause of the amateur service.

Fortunately the hard-working Repeater Working Group has already acquired considerable expertise in assessing which

repeater applications are likely to be adequately backed technically and financially to become viable, and which are based on the philosophy that "a repeater would be a nice thing to have", unsupported by anything else. Possibly this inconsequential attitude, plus poor operating through existing repeaters, is the cause of the growth of anti-repeater feeling.

It is a pity that any radio amateur should be forced for these reasons to consider himself anti-repeater, for there is, after all, no compulsion to use repeaters, any more than there is to operate through Oscar, or to use cw. There is, as we have often remarked, ample room for vhf and uhf to do whatever we wish, without interfering with others.

Awards

An interesting application in the shape of five simultaneous claims for FMD Awards was received from John Quarmby, G3XDY. He receives 70MHz Transmitting No 121 and 144MHz Senior No 87 for operation from Grimsby; 144MHz Senior No 88 for G/GM portable work; 432MHz Transmitting No 114 for /P operation, mainly from his well-known Claxby site; and 432MHz Transmitting No 115 for fixed station work from Grimsby. John has now moved to Ipswich and can start chasing counties all over again.

Other awards this month are:

70MHz Transmitting: No 122 to G3YQW.

144MHz Transmitting: No 482 to G3ZYS/P; 483 to G8IZK; 484 to G3CO at his new QTH in Essex (he held No 8 at his old QTH in Kent as long ago as 1961); 485 to G4AEZ; 486 to G4CMT at his new QTH near Hull; 487 to G8KQB in Oxfordshire who gained the necessary 5 plus 30 between 26 August and 23 December last year, and, more remarkably, gathered in the necessary QSLs by mid-February.

144MHz Senior Transmitting: No 89 to G4CIK, who as part of the GM6UW/P team last year gave new counties to many others, and now expresses his gratitude to those expedition stations who similarly helped him gain his award; No 90 goes to G4CMT, a simultaneous application with his standard 144MHz award.

The vhf awards manager wishes to remind members who are nearing an FMD claim that they should save a current *Radio Communication* wrapper: one must be sent with each application as proof of RSGB membership. If a club applies it should send the wrapper from its latest *Radio Communication* or some other proof to show that it is RSGB affiliated. Because the FMD Award is an RSGB award, it cannot be issued to non-affiliated clubs.

G2AYQ is the awards manager for the Cornish RAC, and he reminds us of the existence of the Cornish VHF/UHF Award. This is divided into three classes, requiring a score of nine, six and three points for Classes 1, 2 and 3 respectively, one point being scored for each Cornish station worked on each band. QSL cards need not be sent, but the claim (to G2AYQ, QTHR) should be certified by two licensed amateurs, and a remittance of 25p included (free to the disabled). Two recent issues of this award went to DB3PU and GM3XNE—nice dx for the Cornish stations they worked.

QSL—or waste paper?

When the vhf awards manager receives a bundle of QSL cards for an FMD claim, they are often accompanied by remarks about the difficulty experienced in collecting the necessary cards. While it is easy to criticize a station for not replying to one's QSL, especially when the station concerned is the only one worked, or even active, in a particular county, it should be remembered that there are many operators to whom the whole process of exchanging QSL cards holds no interest whatever. There are even those who find that their enjoyment of operating is impaired by the knowledge that they are likely to be inundated by QSL requests. Such stations are most unlikely to maintain a stock of envelopes with the QSL Bureau, so will not receive cards sent in this manner; however, many award hunters, who feel that the receipt of a card from a particular station is essential, are now catching on to the idea of making things as easy as possible for the reluctant QSLer. They not only send their own card direct, enclosing an sae, but they also include a "pro-forma" reply coupon, or card, to be filled in by the recipient in lieu of a QSL card. By these means a very high return rate can be achieved.

At one time the exchange of QSL cards was considered the ultimate courtesy after working each new station. In these days of high-cost postage, expensive printing costs and the ever-present need for economy, this can no longer be true, and it is worth reflecting whether each card one sends out is really necessary. Perhaps it would be better to restrict the sending of cards to the reciprocation of QSLs received, the response to a direct request, and to occasions where a reply is required for award or other special purposes. One suspects that if we all knew just how many of the cards we send out via the bureau lie taking up space and gathering dust, before eventually being destroyed, we would all be a little more frugal with our QSLing.

Expeditions

This year's Cambridge University Wireless Society's expedition to Scotland will take place between 11 and 20 June inclusive. Callsigns will be: GM6UW/P on 144·275MHz between 1900 and 2300gmt; GM4CIK/P on 70·17MHz from 1900 to 2000gmt and 2200 to 2300gmt, and G(M)8IBO/M will be used on ssb during the journey. The main activity will be on cw and ssb, and requests for skeds should be made to Nigel Hoult, G4CIK, 40 Lower Park Street, Cambridge, enclosing an sae.

Miscellany

GM4CXP wishes to point out that despite the change to regions in Scotland for administrative purposes (and FMD Awards), individual addresses remain on the old county basis.

Although it has been said before, it would seem timely to suggest once more that if a newly licensed vhf man is not in the current *RSGB Amateur Radio Call Book* he should state his location when calling CQ. The ultimate fatuity is, "G4---beaming south and calling CQ": yes, but from where? Apart from new licensees, it is always good sense to give one's location on vhf, if only to save the listener the task of either hunting through the *Call Book*, or swinging the beam back and forth to find the correct direction.

Reference recently to G8ITS being the only active vhf amateur in the City of London has drawn a response from G8FWJ, who, after double checking with the planning officer, weighs in with the claim that he too operates from within the square mile of the City. G8FWJ runs 1W of 145MHz fm to a 5/8λ indoor vertical some 16ft agl, and with this has had some 1,500 contacts since October 1972.

Finally, copy for the June issue should reach G3NHE by 5 May, and for the July issue by 7 June.

Special solar report

by RON HAM, BRS15744

Apart from one tiny burst of radio noise at 1140gmt on 8 February, no solar noise was recorded by the author on 95 or 136MHz for almost eight weeks to 16 March, which is not unusual during sunspot minima. This silence was broken on 17 March when a few small bursts of radio noise on 136MHz indicated the start of two distinct periods of solar activity—17-22 March, 23 March-1 April. By 18 March a sunspot around CMP was emitting strong radio noise on 136MHz and continued to do so until it was in the region of the west-limb on the 22nd. Similar noise was recorded on 95MHz on the 20th and 21st.

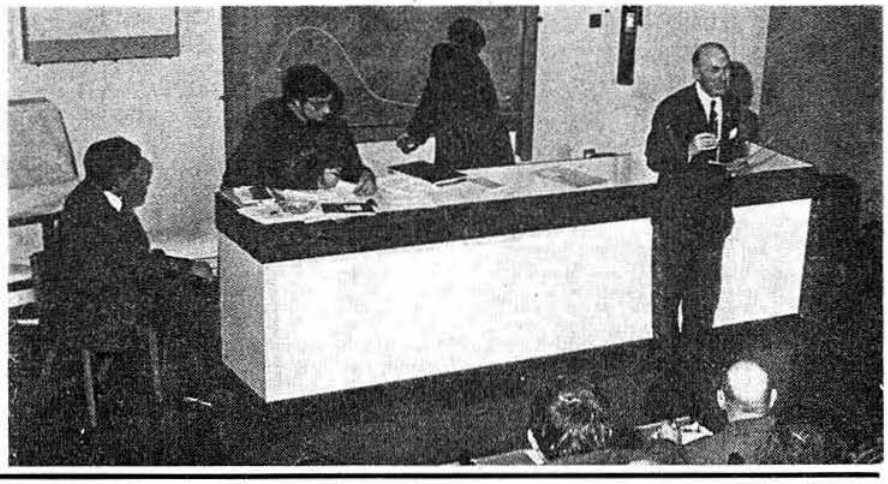
Spectacular solar burst

Early on 23 March, a spectacular burst of radio noise lasting several minutes covered the radio frequency spectrum from 27 to 136MHz (also recorded on 185MHz by E. Doylerush in Wales) and heralded the beginning of the second period of solar activity. The author's equipment was monitoring 49·75MHz (dipole feeding Eddystone 770R) and 28·180MHz (long wire feeding Hammarlund HQ180), when at 0841gmt this large burst suddenly occurred. From a quick flip of the dials on both receivers it was obvious that this solar noise was covering a very wide bandwidth. An immediate phone call to Cmdr Henry Hatfield (secretary of the British Astronomical Association) at his home in Sevenoaks, revealed that his radio/flare warning device operating at 136MHz was also receiving this very strong radio noise.

Soon afterwards Cmdr Hatfield studied the sun with his spectrohelioscope (see *Amateur Photographer* 24 March 1976) and noted that an arched prominence had manifested on the east-limb and one of its legs was very bright—indicating the presence of a new sunspot. The following diary of events will show the progress of the radio noise as this new spot travelled towards CMP:

Date March	95MHz	136MHz
24	bursts	noise storm
25	noise storm	noise storm
26	bursts	noise storm
27	noise storm	noise storm
28	noise storm	noise storm
	(At 1340 a 1min burst above the very strong radio noise was recorded on 95 and 136MHz, and it triggered the squelch, on a 70MHz band monitor).	
29	noise storm	noise storm
	(At 1045gmt a 3min burst of noise recorded on both 95 and 136MHz coincided with a solar event seen by Henry Hatfield with his spectrohelioscope).	
30	bursts	noise storm
31	noise storm	noise storm
	(Both recording pens were driven to fsd as the sun reached the centre of the author's aerial beams. Periodically during this observation, strong bursts of solar radio noise were heard (on the Hammarlund) in the 28MHz band.	
1 April		noise storm

An aurora borealis manifested during the afternoons of 26 March and 1 April and were detected by radio amateurs because of the strange effect an aurora has upon VHF radio signals. □



Almost 50 East Midlands vhf/uhf operators were present at the inaugural meeting of the Leicestershire Repeater Group. Jack Hum, G5UM, who was elected chairman of the group, is shown here outlining the frequencies in the 70cm band to be used for repeater work, while G8GVA (elected treassurer) sketches a picture of uhf coverage on the blackboard. At left: G4CUK, the group's procurement officer; taking notes is G8CAC, who was appointed secretary. There is an 11-man committee, including members from Nottingham and Derby, who would be affected by a repeater established in Leicestershire. (*Photo: G3XKX*).

BOOK REVIEWS

110 cosmos digital ic projects for the home constructor 115 pages, limp bound in laminated covers, 133mm by 215mm. Published by the Butterworth Group (88 Kingsway, London, WC2B 6AB); cover price £2.75.

This is the latest in the series by R. M. Marston describing a range of circuits using modern devices. It is stated that the designs have all been built and evaluated but only basic circuitry and operating notes are given. Following an introduction to cosmos, chapters are devoted to the following types of circuit: inverter, gate and logic; multivibrator; lamp-control; relay-switching; sound generator and alarm and counting/dividing. An appendix shows pin designations.

The preface states that the projects are designed around inexpensive and readily available semiconductor devices of American manufacture. A check of products available from UK retail sources shows that these devices appear to be widely advertised.

Dictionary of Radio and Television Terms. 200 pages, 128 by 198mm, published by Heyden & Son.

Originally produced in 1972 to meet the needs of the broadcasting industry, this new edition has been enlarged by the addition of terms used in electronic communications technology in order to provide a wider field of application. The dictionary comprises some 12,000 German-English and some 17,000 English-German entries, and official bodies in both Germany and the UK have assisted in the compilation.

There are hard-cover and soft-cover versions, and the latter, while durable, allows the dictionary to open flat. Prices of the two types are £7.50 (hard cover) and £5.60, and copies may be obtained from Heyden & Son Ltd, Spectrum House, Alderton Crescent, London NW4 3XX (tel 01-202 5333).

the month on the air

John Allaway, G3FKM*

INTERFERENCE to primary users of any band on which the amateur service is only a secondary user is perhaps one of the quickest ways in which we can lose friends. When this is allowed to happen on top band it could also cause us to be blamed for losing lives if vital ship to shore messages were interrupted. During the coming three years we need every friend that we can find, and your scribe would beg all users of that band to avoid causing any interference whatsoever, and particularly to keep clear of the following frequencies: 1,827, 1,834, 1,841, 1,848, 1,855, 1,883, 1,869 and 1,925kHz. In all instances a frequency should be carefully checked before transmitting, and requests to move immediately obeyed.

News from overseas

Martin MacGregor, VE7CGM, formerly BRS32595, has been living in northern British Columbia for five years. He operates mainly on 3·5, 14 and 144MHz, but temperatures reach −50°F during the winter and the TA33 beam does not rotate easily. Contacts with the UK are sought. Martin, due in the UK on leave this summer, is looking forward to meeting some of those he has talked to from VE7 with his new G5 call.

Al Wilson, ZL1BD, reports that there are currently about 15 members of the Ex-G Radio Club in New Zealand. He would like to remind fellow expatriates that the club meets for its world-wide net at 1900 on Sundays on 14,347kHz, and for its Pacific net on Saturdays at 0500 on the same frequency. Potential new members are cordially invited to join in.

DX news

JD1YAH will be on the air from Oki-no Torishima during the first week in May. He will be with the Kanagawa Sea Expedition team and will have an FT101 and a 14AVQ aerial. Oki-no Torishima was formerly also known as Parece Vela, and it is understood that commencing with a special JARL expedition to the island which will take place in June or July it will be counted as a new country. This expedition is in connection with JARL's 50th anniversary celebrations.

It seems that there is a return to the air by Thai amateurs. HS0HS was due to be active during the second weekend in April, and was to have been operated by the Radio Society of Thailand.

The Seychelle Is become independent this summer and the new administration will include Aldabra, Desroches and Farquhar Is. This will probably result in their deletion from the DXCC Countries List.

ZL4NH is no longer acting as QSL manager for VR4AA, VR4BS or ZL3KK/C, but still does so for YJ8DS. VR4BS cards should now be sent to the address given in "QTH Corner".

*10 Knightlow Road, Birmingham B17 8QB.

Martin MacGregor, VE7CGM, operates this fine array of equipment from northern Canada

WB6OOL, who was one of the operators who visited Kingman Reef last year, is now 5W1AZ and active on 7, 14 and 21MHz cw and ssb. He hopes to visit other rare Pacific areas in the near future.

As mentioned in April *MOTA*, Bill Rindone (WB7ABK, ex-WA6SBO) is making a trip around the Pacific area and into Asia. His first operation was from A35NN and it is believed that he was to join Gus Browning, W4BPD, in Bhutan.

9Q5DM has been active on 14MHz ssb—often around 14,220kHz between 1700 and 1900. The callsign was previously held by ZS1LK and seems to have been re-issued. The new operator is called Dave and is using an FPM 300 and two-element quad.

TR8JCV has been heard on 14MHz. TR8DG (who was also formerly TN8AA and TL8AD) has returned to France and has the callsign F0BYR.

ZL1GP/K is now on the air from Raoul Is in the Kermadec Is group. He has been reported on 14MHz ssb. According to the *West Coast DX Bulletin* this island is under separate administration from the rest of the Kermadec Is. There are currently three stations active from Chatham Is—ZL3NR/C, ZL3LN/C and ZL4AU/C, and all are to be found on the lower frequency bands.

It seems that one of the USA embassy staff in Burundi has some equipment and is trying to obtain a 9U5 licence. The same situation obtains in Conakry where no 3X licences for operation from Guinea are at present being issued.

Al Wilson, ZL1BD, of Hamilton, New Zealand

The special one-day station A9XCON organized by the Amateur Radio Association Bahrain to commemorate the first flight of Concorde to Bahrain. Some 600 contacts in 62 countries were made, despite poor conditions, with the FT200 + FL2500 + KW107 + TA33Jr owned by A9XBD. Left to right: Geoff Smith, A9XBD; Sheriden Street, A9XBE; Owen Jackson, A9XU, and Chris Maier, A9XS.

GM4DLG reports that he is still QSL manager for A4XVI and that anyone needing a QSL for a contact with that station, or with Bob at his old A4XVB location, should apply to the address in "QTH Corner". A4XVB was active from January to August 1975, and A4XVI from July to December 1975.

LZ0P/MM will be the callsign of the Bulgarian sea expedition Plankton IV. This will consist of a sailing boat without a keel *Dju V* which will attempt to cross from Peru to Fiji. There is a 30W cw/ssb transceiver aboard which will be used to keep in contact with Bulgaria on 14,073 and 14,273kHz daily between 1800 and 1830. Potential callers should desist unless the operator makes it clear that they are welcome, as this is primarily a communication net.

Stations in Austria will be using the prefix OE50 to celebrate the 50th anniversary of the Austrian national society OeVSV between 1 April and 30 June.

Gus, W4BPD, and his wife expect to reach Bhutan early in May and remain there about one month. Further activities are not yet known. Frequencies to watch will be 3,500, 7,000, 14,000, 21,000 and 28,000kHz (cw), and 3,773, 7,100, 14,100-14,110, 21,090 and 28,490kHz (ssb). There will be no transceive operation, and listening frequencies will be announced as necessary.

March *QST* listed those currently in the DXCC Honor Roll. In the mixed modes category UK stations (with number of countries confirmed) were as follows: G3FXB, GW3AHN, G3FKM (319), G2BOZ, G3HCT, G5VT (317), G6TA, GI3IVJ (316), G2BVN, G8KS (315), G3AAE, G4MJ, GI3JIM (314), GI3OQR (311), G2FYT, G3IOR, G3JEC (310). In the telephony listing, G3FKM (319), G5VT (317), G6TA (316), G8KS (314) and G3JEC (310) appeared.

VP8s OO, OP, OQ and OR were due to leave Port Stanley in April and return to the UK. VP8NO has left Antarctica and returned to his home G3VUI call. VP8OB is no longer on the S Orkney Is but is now on Adelaide Is, his place had been taken by VP8OT. VP8NP also returned to the UK in April. VP8ON works on an outlying sheep farm and asks for QSLs via RSGB or via WA4NRE (see "QTH Corner").

ZD8MH was due to leave Ascension Is after Easter and return to his UK call G4DDH. QSL cards have been despatched to all those who wanted confirmation, but he still has a few cards left for ZD8 and anyone requiring confirmation of a QSO who has not yet received a card should contact him at the address in "QTH Corner".

Citizen's band (USA)

The following appeared in a recent edition of the *West Coast DX Bulletin:* "Central California had a bit of a confrontation recently when Stump Jumper, Wild Weed and Bulldozer almost replayed the OK Corral routine in a parking lot. Some hot words over the channels led to a rush to the field of honour where Wild Weed showed with a jack handle. Stump Jumper showed up with a shotgun and Bulldozer was there to see how things went. Stump Jumper pointed a loaded shotgun at some of the spectators and was arrested for exhibiting a deadly weapon. Wild Weed was held for disturbing the peace. Bulldozer was held briefly and released . . ."

"QSL Managers Directory"

This lists the QSL managers of over 5,000 dx stations and gives their full addresses. The price is £3.05, $6, or the equivalent in any currency, or 32 IRCs from Geoff Watts, *DX News Sheet*, 62 Belmore Rd, Norwich, NR7 0PU. The book is mailed direct from the USA and the price includes the supply of free supplements.

Contests

Bermuda Contest (cw section)
8-9 May (see page 216, March *Radio Communication*).

The CQ M Contest
2100 22 May to 2100 23 May.
CW and ssb. 3·5 to 28MHz. Cross-mode contacts not allowed. Single-operator single- or multi-band, and multi-operator multi-band categories. Listeners may also enter. Stations may be worked once per band irrespective of mode. Exchanges consist of RS/T plus serial number (from 001), Russian stations give RS/T and oblast number. Contacts between stations in the same continent count two points, in different continents five. Multiplier is total number of countries/territories worked per band added together. The rules do not state what countries list is to be used, but it is believed that the "R-150-S" list may apply. This may be found in *Amateur Radio Awards* and differs very substantially from other country lists. Listeners gain a point for logging the number from a station, and they earn three if they log both exchanges. Special certificates and badges will be given to all who contact 50 or more Soviet stations. Post logs by 1 July to: CQ-M Contest Committee, PO Box 88, Moscow, USSR. Entrants who have made enough contacts to qualify for the "R-150-S", "R-100-0", "W-100-U", "R-15-R", "R-10-R" or "R-6-K" awards may do so without sending QSLs if they are requested with the log.

Yugoslavia YZ-30 Contest
May 9 to November 29.
SRJ has organized this contest in celebration of the 30th anniversary of the foundation of the present Yugoslav state. All YU stations will use the YZ prefix during the period, and a special YZ-30 certificate will be awarded to all who submit log details of contact with at least 30 YZ stations, together with three IRCs to: SRJ YZ-30 Contest, PO Box 48, 11001 Belgrade, Yugoslavia.

WAB Contests
0900 to 2100 6 June (lf cw).
7, 3·5, and 1·8MHz. Single-operator single- or multi-band, multi-operator single- or multi-band, and listener sections. Stations may be worked on each band and each contact counts five points. Multiplier is total number of DXCC countries and WAB areas worked (each counts once only). Exchange RST, number (from 001), WAB area, county, and WAB book number (if any). Logs must reach G4BFY, 10 Toll Bar Avenue, Bottesford, Nottingham NG13 0BB within 50 days of the contest.

World Telecom Day Contest
0000 to 2400 15 May (phone).
0000 to 2400 22 May (cw).
1·8 to 28MHz. Single-operator multi-band only. Exchanges consist of RS/T plus ITU zone (UK is in 27). Contacts with stations in own country count no points, in another ITU zone on same continent two points on 28, 21 and 14MHz, three on 7MHz, and four on 3·5 and 1·8MHz. With other ITU zones on other continents three, five and six points respectively. Score is total QSO points times number of ITU zones worked (each counts once only). Logs should indicate time, station worked, number sent/number received, band, continent, zone, points claimed. Post before 30 June to: Ministerio das Comunicacoes—NENTEL—Brasilia, D.F. —Brazil.

Scandinavian Field Day
1200 12 June to 1500 13 June.
CW only. This has been deliberately designed to coincide with RSGB NFD, and RSGB NFD stations are specially asked to send in check logs of SCAG stations contacted. Exchanges consist of RST and serial number. SCAG consists of some 200 cw enthusiasts, mostly in Scandinavia, but with associate members elsewhere. It is run by a committee —SM5WI, SM5TK and SM7JP—who are directors of SSA. LA4BQ, OH2BN and OZ2NU are section managers. Please send check logs to: SCAG, Box 13, S-150 13, Trosa, Sweden, before 5 July.

Results of the **1975 Scandinavian Activity Contest** have been received and UK entrants listed are as follows: (CW section) **G3ESF** (2,520), G3SXW (2,378), G3TXF (666), **GW3INW** (640), GW4DOO (444), G3JUL (136), G6GH (114) and G3MSE (44). In the listener section **BRS15822** scored 1,874 points. (Phone section) **G3NFV** (648), GW4CYD (555), G3TXF (348), G3UAS (264), G4CYB (88), G3JUL (78). In the listener section were **A8890** (828), A8531 (308), A8591 (104) and A9016 (77). G3ESF was world fifth in the non-Swedish competitors part of the cw section.

Awards

The Helvetia XXII Award
For confirmed contacts/reports with a station in each of the 22 Swiss cantons since April 1948. A list showing the calls, cantons, signal reports and modes should be certified by the awards manager of a national society (G5GH in the case of the UK). All cw, all phone, or mixed modes endorsements are available. Send applications to: Walter Blattner, HB9ALF, Postbox 450, CH 6601 Locarno, Switzerland. There is no charge, but it is suggested that a few IRCs are enclosed to defray expenses. This is a beautiful award—considered by the writer to be well worth the effort involved in applying.

QTH Corner

A4XVB	Ft Lt R. Bower, 1 Cramond Place, Cramond, Edinburgh.
C21NI	YASME, Box 2025, Castro Valley, Calif, 94546, USA.
C21NN	WB7ABK, 3049 Doris Ct, Lake Oswego, Oregon, 97034, USA.
G4DDH	ex-ZD8MH, 11 Inlands Rise, Daventry, Northants NN11 4DQ.
HK0COP	J. Lung, Box 622, San Andres Is, Colombia.
TR8DG	now F0BYR.
TR8JCV	BP 4410, Libreville, Gabon.
VK2FT/LH **VK200/LH**	VK200, 80 Bridge Av, Oak Flats, 2527, NSW, Australia.
VP5DF	(ex-VP7DF) via K4VMA, 1408 Harvard Drive, Cocoa, Fla, 32922, USA.
VP8ON	via WA4NRE, PO Box 1895, Knoxville, Tenn, 37901, USA.
VR4BS	via ZL3AAK, S. R. Wathne, 117 Oakhampton St, Christchurch 4, New Zealand.
VR8D	via Tack Kumagai, Box 22, Mitaka, Tokyo 181, Japan.
ZK2AQ	WB7ABK (see C21NN).
ZL3LN/C	via ZL4BA, R. W. Anderson, 60 Wellington St, Invercargill, New Zealand.
9M6MA	PO Box 113, Kota, Kinabalu, Sabah.
9Q5DM	Songa Hospital, Kamaina, Rep of Zaire.
9Q5EP	BP 1459, Kinshasa, Rep of Zaire.

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

WAMRAC Award
The World Association of Methodist Radio Amateurs issues an award for hearing or contacting 10 members. Full details are available from: Mr R. Carter, 16 Chapel St, Riston, nr Blackburn.

Band reports

Very poor conditions for dx on the higher frequencies were made even worse by the disturbances around 26 March, and some correspondents mention that even Radio Tirana has not been up to its usual strength!

Many thanks to all correspondents, and also to the following for submitting logs from which this section has been compiled: Gs 2HKU, 5JL, 3KSH, 3NKQ, 3UOL, BRSs 17567 and 36713, and As 8312, 8428, 8946, 8961 and G15049.

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

1·8MHz. 0000 *KV4FZ, PJ9JT, VE1MX, W2, W3, W8, W9.* **0100** W3AU, W4BRB, W4BVV. **0200** *W2DEO, W4SSM, W4AH.* **0600** *W2RAA.* **2200** EA8CR. **2300** *ZB2CJ, 9H1CG.*

3·5MHz. 0000 FM7WE, F6BJY/KP4, PZ, VP2, ZS1GT, 6Y5, 8P6. **0100** FG7XE, HI8RD, *W1-W4, 9H1CH.* **0600** *9Y4AC* (QSL to VE7BZC). **1800** YB0ABV (QSL to WA7OBV). **1900** JA1ELY, JY9CR (QSL to W4YEB). **2000** JA1JRK, JH0BQU, ZC4. **2200** HZ1AB, VP2KF. **2300** VU2GDG, *ZB2CJ,* 5T5ZR.

7MHz. 0000 *JY4JW,* 3W8FP, *8P6GN, ZS1.* **0100** HC0HM, HK, 9Y4. **0200** *C6ABA,* PY. **0300** *ZS2.* **0500** *ZL1.* **0600** *KH6AT, VK, ZL, 9G1GE.* **0700** *VK, ZL, ZL3LN/C.* **2100** *CN8CF, VK3MR, ZS1, ZS6.* **2300** *CX,* EA9FC, *FG0BKZ,* HP1JI, *PY,* SV0WZ (QSL to OE5NH), VP2, *ZD8TM 9H1EH.*

14MHz. 0800 A35AK, AP2AC, JA, VK, YB, ZL. **0900** AL7CYH, *UK1PAA, VR8D, ZK2AQ,* 9M2CP. **1000** CR9AJ, VR8D. **1100** C21NI, VP2KJ(WB2TSL on St. Nevis). **1200** *BV2A,* C21NI, JT1AK, KG6JBX (QSL to KH6ILD). **1300** KH6ZZ. **1400** HS5AKW. **1500** VE1APY/SU, VS9MB, YB0ABO. **1600** *KL7PI,* OE6DK/YK, 9X5PT. **1900** TR8RS, ZL1AH, 9X5AN. **2000** A6XP, KC4AAC. **2100** VP2G. **2200** JA, VP1PTL.

21MHz. 0800 *JA, KV4CI/MM/KG6, UA0,* VU. **0900** *A2, JA, ZS, 9G.* **1100** ZD7, *5B4, 5Z4, 9H, 9J.* **1200** *FP8, FR7, VU.* **1300** *A2CNN, A9XBC,* CE, FY0, VP2MDC, *VU2BK, W1-W4.* **1400** D2ASW, HS1AKT. **1500** A4X, *W1-W5,* 3D6, 7P8, 9K2EH (OZ8EH). **1600** CE, HS1AKT, TJ, TR, *ZF.* **1700** OA, PY, VP8NK. **1800** D4CBC, VQ9HCS.

28MHz. 1400 UA, ZE. **1600** PY1ZAE. **1700** EA8, 9H1. **1800** EA8, PY, K5MRU. 1400 to 1800 on 26 March, following the aurora, many Europeans with "polar" flutter.

Grateful thanks to the editors of the following for information extracted: the **29 DX Club Newsletter** (*VK6RV*), **Long Skip** (*VE1AL/3*), the **West Coast DX Bulletin** (*WA6AUD*), **DX'press** (*PA0TO*), **CQ Magazine** (*W1WY*), the **Ex-G Radio Club Bulletin** (*W3HQO*), and **DX News Sheet** (*Geoff Watts*).

Please send all items for the **June** issue **to reach G3FKM** no later than **5 May**, and for **July** issue by **9 June.** □

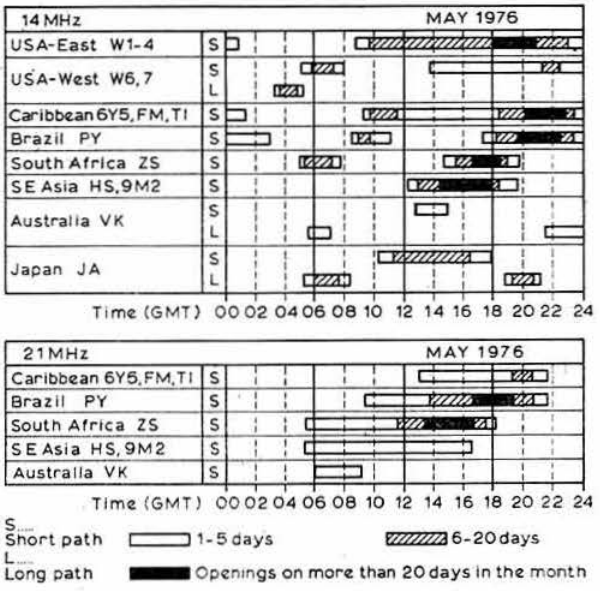
Propagation predictions

In the present period of low sunspot activity, there is no sign of any noticeable increase. Summer conditions in the ionosphere become more and more dominant during May, and as a result of short nights the F2 night frequencies are much higher compared with those of the winter months and the periods around the equinoxes. This will lead to an improvement in dx conditions on 14MHz during night-time.

Because of low sun-spot activity, **28MHz** has no practical importance now for dx, but both 28MHz and **21 MHz** may liven up for short periods during the month with sporadic short-skip conditions over distances of about 700-1,800km. Traffic with North America and Japan will not be possible on 21MHz. Perhaps North America may be heard in conditions influenced by sporadic-E layer transmissions; the most favourable time for this should be around 1700-2000gmt.

Conditions for dx will improve markedly on **14MHz**, especially during late evening and at night. The summertime Es short-skip conditions, which may improve 28 and 21MHz will lead to some QRM on 14MHz, mainly in the afternoon and early evening. As 14MHz lies much lower than 28 and 21MHz there will be no interruption by the dead zone. So many more European stations will be heard on 14MHz than on 28 and 21MHz. Summer conditions will mean extra dx chances via the indirect path, especially with western North America and Japan. Traffic with western North America during the morning will only be possible after the middle of May, but should continue with a few interruptions until August.

The rise of summer time QRM will lead to a worsening of dx conditions on **7MHz**, the most favourable time being the latter half of the night and early morning, provided the greater length of the path lies in darkness. Conditions on **3·5MHz** will remain as they were in April, and the band will only seldom be interrupted by the dead zone.



HF propagation study

Predicted hpfs (MHz ×10) for May 1976

GMT =	00	02	04	06	08	10	12	14	16	18	20	22	24
Aden	140	131	154	225	232	235	253	280	299	234	188	150	140
Ascension	145	114	124	105	227	233	238	272	317	327	270	190	145
Bahrain	136	130	168	223	229	233	246	260	271	247	191	150	136
Bangkok	131	129	176	208	218	221	213	219	190	185	166	140	131
Barbados	167	121	105	115	115	211	223	215	221	244	258	230	167
Bermuda	164	112	87	93	133	197	204	202	209	209	220	216	164
Bogota	169	119	106	114	128	196	218	209	215	228	248	229	169
Buenos Aires	154	128	121	133	125	216	230	241	272	277	301	221	154
Cape Town	143	141	110	227	232	237	248	295	337	224	187	126	143
Colombo	134	129	182	221	227	233	238	247	260	186	161	138	134
Cyprus	129	122	135	210	215	219	227	234	251	255	216	158	129
Dakar	112	139	124	159	227	233	238	272	317	327	270	168	112
Denver	148	121	88	97	103	110	148	167	180	180	186	186	148
Fairbanks	149	124	130	149	154	155	148	149	149	149	155	155	149
Falklands	144	120	119	125	149	197	232	246	282	293	276	141	144
Gibraltar	100	89	77	120	153	155	157	159	171	186	178	141	100
Hongkong	129	129	167	196	199	197	199	197	194	172	152	155	129
Honolulu	149	124	124	149	167	159	139	120	158	173	173	168	149
Iceland	96	70	72	110	135	140	144	141	140	143	147	131	96
Jamaica	166	114	87	103	121	171	208	205	208	213	223	220	166
Lagos	138	140	116	220	229	234	242	293	327	329	243	111	138
Las Palmas	139	119	110	152	202	210	211	228	244	252	249	197	139
Lima	164	122	114	115	125	131	224	218	234	249	275	232	164
Los Angeles	149	122	96	108	89	89	129	159	180	185	186	173	149
Malta	110	106	94	164	181	183	186	197	202	219	196	152	110
Mauritius	141	129	141	225	232	237	256	296	274	204	168	140	141
Mexico	159	114	68	108	119	106	185	197	197	197	210	197	159
Moscow	102	100	125	164	177	169	180	176	187	200	186	143	102
Nairobi	141	135	124	227	232	237	253	296	322	299	197	138	141
New Delhi	133	128	181	214	223	225	221	224	246	191	173	144	133
New York	159	114	68	81	121	173	183	188	196	192	202	197	159
Osaka	131	134	153	174	186	185	185	185	167	144	145	159	131
Perth	134	129	182	221	227	232	162	126	130	121	121	112	134
Rio de Janeiro	152	131	122	126	130	228	232	239	281	290	301	220	152
Salisbury	140	138	117	227	232	238	255	299	327	312	211	124	140
Seychelles	143	116	155	224	232	239	256	286	298	261	223	144	143
Singapore	133	128	181	214	223	225	221	225	214	162	134	116	133
Suva (s)	149	150	149	161	173	180	172	166	144	152	173	168	149
Suva (l)	147	141	121	157	128	115	112	106	108	94	239	167	147
Sydney (s)	129	129	167	196	199	163	129	144	130	121	121	155	129
Sydney (l)	161	124	116	116	115	91	81	75	70	69	125	190	161
Teheran	134	129	182	221	227	233	239	247	260	257	196	152	134
Vancouver	143	124	124	134	129	129	135	149	154	154	159	167	143
Wellington (s)	135	135	154	173	158	134	131	120	121	122	186	161	135
Wellington (l)	148	135	121	126	89	86	88	96	97	94	145	181	148

Special event stations

GB3BEL, 1-31 May
Operational during the entire month of May, in connection with the Belfast Festival. Special QSL cards. Details from GI8FOK, QTHR.

GB3BP/G2FJA/P, 29-30 May
25th anniversary of Kent Scout County camp site, Buckmore Park, taking the form of an open week from 29 May to 6 June. The Medway ARTS is operating exhibition stations on 2m and the hf bands during the 2m contest. The venue is just off the M2 at the top of Bluebell Hill on the Chatham/Maidstone road.

GB2BWS, 3-6 June
Operational at the Bath & West Show from the showground, by G4DCH and G3TWO. All bands 80-10 and 2m, 0800 to 1900. Special QSLs. Help appreciated—G4DCH, QTHR.

GB3SF, 12 June
This station will be operated by the Stoke-on-Trent ARS during the Stone Festival, from 10am to 8pm. Operation will be on 160, 80, 20, 15 and 10m (ssb and cw). Westbridge Park, Stone, Staffordshire.

GB3USA, 26 June to 4 July
This station will be operated from the village of Warton, Carnforth, N Lancs, to celebrate the American bicentenary—George Washington's ancestors were born and lived there. Operation will be on 10-40m ssb to contact American stations and on 80m and 2m ssb to contact UK stations. SS1 V may be available and a special QSL card will be issued. There will be a number of other special activities including a week-long exhibition on the history of Warton, choral and dramatic performances, a flower festival and sports. Details from G4CZP, QTHR.

G3ZQN, 10-11 July
Operational during the Festival of Sport and Recreation held by the Metropolitan Borough of North Tyneside. The callsign is that of the Tyneside ARS. The station will be on the air from approximately 10am on Saturday 10 July to 6pm on Sunday 11 July, and will probably operate on all bands from top band to 10 and 2m. There will be special QSL cards, and special certificates to be signed by the borough mayor will be sent to the farthest contact on each band. The Pavilion, Churchill Playing Fields, Monkseaton, Whitley Bay, Tyne and Wear. Further details from hon sec F. Addison, 3 Wilton Close, Whitley Bay, Tyne and Wear.

GB3IWA, 6-8 August
Operational during Inland Waterways Association National Rally of Boats on the river embankment, Peterborough. Details from G3EEL.

The work of the CCIR Study Group 8, and of BSI Sub-committee TLE/25/6

by D. A. S. DRYBROUGH, CEng, BSc, MIEE, G8HEV

CCIR UK Study Group 8—Mobile services including satellite applications

The international Study Group 8, one of the 12 technical study groups established by the International Telecommunication Union, has the following terms of reference:

To study the technical and operating aspects of the aeronautical mobile, maritime mobile and land mobile and radiodetermination services, including the use of satellites.

The agreed programme within these terms of reference consists of questions and study programmes, together with the maintenance or up-dating of opinions, resolutions, reports and recommendations which have resulted from earlier work.

Interested countries prepare papers on the various items in the programme and these are circulated to all participating countries prior to their discussion at an international meeting, either plenary or interim (such as has just taken place in Geneva). If sufficient information is available on a particular question or study programme and if a draft answer, usually prepared in sub-committee, is adequately supported, a formal report or recommendation is agreed and finally published in the proceedings of that meeting. Similarly, opinions and resolutions or new questions and study programmes can be agreed and promulgated. Recommendations are internationally-recognized technical reference standards and may be cited in tenders for equipment as ruling specifications for the relevant aspects of performance.

The national delegations at each meeting and in each national study group are mainly representatives of the national regulating body, together with other engineers representing public communication corporations, operating companies, trade associations and other competent bodies as well as co-opted technical experts concerned with individual aspects of study.

These activities may appear to have little relevance to the amateur radio operator but it should be remembered that each country is bound by international regulations, issued by the ITU as Radio Regulations and acted on by national regulating and licensing bodies, which are based on the CCIR recommendations. While many such regulations are waived for the amateur service at present, pressures on the available radio frequency spectrum are growing rapidly, leading to the necessity of using that limited spectrum to the best advantage and with minimum interference between services. The tendency in future must therefore be to tighten up on all aspects of technical and operating performance which have a bearing on these aims and may well be governed by CCIR recommendations.

There is also a reciprocal side to this work. In the UK there is virtually no commercial hf mobile or point-to-point working except by amateurs and so their experience in these fields is of considerable value to the regulating body, at present the Home Office, and can contribute materially to international discussions on such problems as the relative effectiveness of a.m., fm and ssb in mobile communication or the practical possibilities of various bands, hf and vhf, for emergency communication. Advanced techniques used by amateurs, such as the application of ssb to vhf and uhf communication, satellite work etc, have been noted with interest, and occasionally surprise, by Study Group 8 and serve to keep the amateur contribution well to the fore at a time when frequency allocations are having to be justified in the face of considerable conflicting claims.

BSI Sub-Committee TLE/25/6—Mobile radio services

The British Standards Institution is the body in the UK concerned with the work of the IEC on methods of measurement and safety standards. Sub-committees, set up in parallel with international committees, deal with the various facets of IEC work. That numbered TLE/25/6 deals with mobile radio equipment and systems while others in the same group, TLE/25/1, /3 and /4, deal respectively with receivers, transmitters and aerials, mainly in the domestic and broadcasting fields.

Proposals are prepared by the international secretariat in Geneva, or possibly by international working groups, and are submitted to national sub-committees for discussion. National sub-committees are made up of engineers nominated by such interested bodies as the regulating and licensing body, broadcasting and tv authorities, trade associations, government establishments and scientific groups, with occasional co-opted experts. Comment is also solicited from trade association and other committees and incorporated in the national reply to Geneva. If there are only minor or editorial differences in the collected national comments, each proposal is re-circulated as a central office document for final approval and subsequent publication as part of an IEC standard. National standards are then based as closely as possible on that standard and become mandatory when issued, for example as BS standards.

Agreement on methods of measurement is essential before international agreement can be arrived at on performance parameters for communication equipment and systems and these methods can apply equally to commercial and amateur equipment. Safety standards are also equally relevant to commercial, professional and amateur equipment.

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obituaries

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

Mr L. Clarke, G3DWA
Les Clarke, who died on 7 March, had been interested in radio since the early 'twenties. A licensed amateur since 1947, he was particularly interested in cw working.

Mr N. Jacobs, G3OGB
Norman Jacobs died on 24 March aged 53. He was active on 2m fm and the hf bands until suffering a stroke last year.

Mr L. S. King, G4IB
Laurie King died on 4 March aged 56. A keen constructor and experimenter, he was active on all the hf and vhf bands, using all modes, and was always ready to help anyone with problems connected with the hobby. He was an RSGB member for many years and a founder member of the West Kent ARS, of which he was president.

Mr L. J. J. Marshall, GW8ESE
Laurie Marshall, who died on 14 March aged 70, became interested in amateur radio after his retirement. Active on 2m from his QTH in Abergele, he was secretary of the Conway Valley ARS for a number of years.

Mr J. J. Smyth, MBE, MA, GI3AOB
Jack Smyth, who died on 10 March, was a well-known amateur both in Northern Ireland and Scotland. He was past-president of Ballymena RC and regional Raynet controller for mid-Ulster, and was active on all bands top to 2m until the day of his death.

The Society has also been informed of the deaths of:
Mr A. W. Milne, GM4CRD
Mr G. E. E. Warder, CEng, FIMechE, FIMarE, G3UZR.

Membership of RSGB committees, 1976

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

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

Educational Visits Scheme: W. A. Scarr, G2WS (chairman); D. Byrne, G3KPO*; T. Darn, G3FGY; G. C. Oxley, G8MW; R. Wallwork, G3JNK; F. C. Ward, G2CVV.

Finance & Staff: C. H. Parsons, GW8NP (chairman); D. J. Andrews, G3MXJ; J. Bazley, G3HCT; J. O. Brown, G3DVV; G. R. Jessop, G6JP; L. E. Newnham, G6NZ; B. O'Brien, G2AMV*; R. F. Stevens, G2BVN.

HF Contests: J. Bazley, G3HCT (chairman); D. J. Andrews, G3MXJ; D. S. Booty, G3KKQ; R. L. Glaisher, G6LX; M. Harrington, BRS20249; G. T. Peck, BRS15402*; A. M. Smith, G3IAS; D. Thom, G3NKS.

IARU Working Group: R. J. Hughes, G3GVV (chairman); D. J. Andrews, G3MXJ; R. J. Baker, G3USB; J. Bazley, G3HCT; A. M. Smith, G3IAS; C. Squires, G3XCS*; R. F. Stevens, G2BVN; D. Thom, G3NKS.

Interference: J. W. Swinnerton, G2YS (chairman); S. R. Allen, G4CYR; D. J. Andrews, G3MXJ; L. I. Carpenter, G4CNH; P. F. Jobson, G3HLF; G. Slaughter, G3PAO; J. E. Swayne, G3BLE*.

Membership & Representation: W. A. Scarr, G2WS (chairman); D. J. Andrews, G3MXJ; R. W. Fisher, G3PWJ; G. R. Jessop, G6JP; W. F. McGonigle, GI3GXP; J. R. Petty, G4JW; A. W. Smith, GM3AEL; D. M. Thomas, GW3RWX; C. H. Parsons, GW8NP.

Mobile & Exhibition: N. O. Miller, G3MVV (chairman); P. Balestrini, G3BPT; G. W. Black, G8HPD; J. S. K. Hitchins, G8GBN; W. J. McClintock, G3VPK; G. W. Norris, G3ICI; C. J. Thomas, G3PSM; P. A. Thorogood, G4KD; M. G. Wallace, G8AXA.

Propagation Studies: R. J. Hughes, G3GVV (chairman); B. Chambers, G8AGN; D. S. Evans, G3RPE; R. G. Flavell, G3LTP; R. A. Ham, BRS15744; M. Harrison, G3USF*; C. E. Newton, G2FKZ; A. J. Oliphant, GM3SEM*; T. Damboldt, DJ5DT*; J. Spurling, G4AQI; A. J. Taylor, G3DME; R. C. Whelan, G3PJT*; A. M. Pomfret, G3LZZ/9G1LZ*.

Raynet: P. Balestrini, G3BPT (chairman); Mrs J. Balestrini; M. Barker, G8CAC; E. R. L. Bassett, BRS16075; A. C. Gee, G2UK; S. Law, G3PAZ; T. I. Lundegarde, G3GJW; S. J. Scarborough, G3MBQ; E. W. Yeomanson, G3IIR.

Technical & Publications: R. F. Stevens, G2BVN (chairman); D. S. Evans, G3RPE; T. D. Giles, G4CDY; J. P. Hawker, G3VA; R. S. Hewes, G3TDR; P. J. Horwood, G3FRB; A. W. Hutchinson; G. R. Jessop, G6JP; M. H. McFadden, GI3VCI*; J. W. Mathews, G6LL*; R. O. Philips, G8CXJ; H. W. Rees, G3HWR; D. M. Thomas, GW3RWX*.

Telecommunications Liaison: R. F. Stevens, G2BVN (chairman); 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; C. J. Thomas, G3PSM; F. C. Ward, G2CVV.

VHF: R. J. Baker, G3USB (chairman); A. H. Bower, G3COJ; M. Dann, G3NHE; A. H. Dormer, G3DAH; D. A. Evans, G3OUF; D. S. Evans, G3RPE; P. Gowen, GI3IOR*; D. T. Hayter, G3JHM; J. H. Hum, G5UM*; J. P. Martinez, G3PLX; C. J. Morcom, IG3VEH; A. L. Mynett, G3HBW*; M. J. Sparrow, G6KQJ/T; G. M. C. Stone, G3FZL; M. G. Wallace, G8AXA.

VHF Contests: I. F. White, G3SEK (chairman); M. T. Deacon, G3XHU; L. Hawkyard, G5HD; F. Mathews, G8ACJ; W. J. McClintock, G3VPK; C. Sharpe, G2HIF; L. V. G. Turner, G4CUT; P. W. Willcocks, G4BWY.

* *Corresponding member.*

cross-talk

G. Slaughter, G3PAO*

Sending for the man

There must come a moment when coping with rfi problems that a decision has to be made whether to continue alone or to spread the load, and it has been most heartening to observe when analysing the 1975 Interference Survey returns how much progress has been achieved by the individual in eliminating difficulties. However it is not proposed to anticipate here any statistics which are now in course of preparation, but to consider possible attitudes to interference problems when encountered by an operator. For example, some of the afflicted might well consider retreat at the first sign of trouble or more trouble, while others might just as readily proceed to tackle the situation with a very high degree of individual resolution; between these extremes there must be many shades of approach.

Factors conditioning any particular person's reaction might perhaps be unneighbourliness, little true interest in the hobby, a feeling that any technicalities involved may be too complicated or difficult to overcome, or even, for some reason known only to himself, unwillingness to seek assistance. Never be afraid to seek help, no request to the Interference Committee, via the RSGB general manager, will remain unanswered.

Having said this, what kind of help might be expected? First, if this has not already been done, it will be necessary to complete a questionnaire and, if it is felt that it would be helpful to do so, to provide as much extra information as might be considered of value to the committee. In due course a reply with recommendations will be received; and here is the rub, the sufferer generally finds that he is expected to do something for himself—making a simple filter and attaching it externally to an offended apparatus is one possibility.

Is the recipient of the letter disappointed; does he think he has "sent for the man" and the man has not materialized? It is not that members of the committee are unsympathetic, indeed if that were the case there could be no committee. The truth is that simple measures can often lead to success. The devices recommended are generally easy to construct and easy to apply, but in no case should one interfere internally with any apparatus other than that owned by oneself, and then not in any manner likely to invalidate a manufacturer's guarantee or warranty, or make any alteration which may render the apparatus unsafe, and above all to take every precaution to avoid personal harm when so doing. Apparatus needing internal modification should be referred to the manufacturer or to a dealer. This last admonition is a clear case for "sending for the man".

Compared with the cost of an amateur rig, the price of a home-brew braid filter or a few ferrite rings is very small, and even if an operator can claim the working of all bands, at all times and all permitted power, it is still good practice to make up a few filter devices and *learn how to use them.* Competence effectively to apply simple anti-breakthrough devices as appropriate should rank equally with the ability to manipulate a transmitter.

There is nothing wrong in emulating a well-known and long-established organization, by being prepared. In addition, the knowledge gained through making and testing these devices will instil confidence in the user whenever the need arises. Why not subject one's domestic tv or hi-fi to a relatively strong field of rf from one's transmitter and try out a few simple filters to gain experience and assess the effectiveness of such measures? It could be the basis of a very useful and convincing demonstration when trying to explain the cause of breakthrough or in pacifying an irate neighbour.

In this article, "Sending for the man" is not to be construed as referring to cases where action by the Post Office or Home Office may be concerned, as these cases are usually fairly clear cut, but to draw attention to and express the hope that the amateur in difficulty, or potentially so, does not immediately resort to a "passed-to-you" retreat, but at least is ready and able to meet the first encounter with a measure of preparedness. Finally, it has been said that a Post Office form on hand can be useful, when aggression is encountered, for official professional third-party representation obviously can do much to ameliorate difficult situations, but it should be remembered that the Post Office engineers have a full work schedule and that initially a soft answer to a complaint can sometimes turn away wrath. Having succeeded in this, further progress is always a possibility. □

* 6 Leggatts Wood Avenue, Watford, Herts WD2 5RR.

contest news

Affiliated Societies Contest 1976 results

How can the success of a new contest be measured? Perhaps by the intensity of the QRM, by the amount of postage due on the logs received or by the fulsome tributes, "Brilliantly conceived changes" or "Please give a medal to whoever thought of this style of contest". Maybe the best test, and possibly the only one that matters in an event of this nature, is whether the participants found the contest an enjoyable way of spending a winter Sunday afternoon—and the overwhelming majority said they did. Activity was at such a level that no one worked even half the entry. Every kilohertz from 3,510 to 3,590 contained three or more signals, and those operators without cw filters had a problem in sorting the wanted signal from 10 others. At QRM corner, which for the writer was in South Croydon, but could have been anywhere from Maidstone to Manchester, intermodulation products appeared in receivers previously thought to be free of such difficulties. The change of rules seems to have transformed a leisurely, slightly tedious event into a frantic, though stimulating, struggle.

The leaders

Emerging from the fray as victors and this year's winners of the Edgware Trophy come the Verulam ARC, whose team comprised G3TMA, G3NOH, G4DJX, G4BOU, G3JKB and G2QB—a blend of experience and new blood which will make this group hard to beat. Maidstone YMCA ARS could provide the challenge next time if they can overcome some mutual interference problems. Out of the 15 stations contributing to the scores of the top three clubs only one has a single-figure placing in the individual table, the high club position being achieved because their third, fourth and fifth members made respectable but moderate scores of the order of 700 points.

Equipment

Equipment mostly consisted of the usual transceivers or transmitter/receiver combinations, with a sprinkling of home-brew rigs and gear of a previous generation like "Command transmitters". A high aerial seemed to be a mixed blessing, as many of those with wires at over 50ft spent too long working 5-point Continentals instead of staying with the plentiful 10-point UK stations.

The logs

The standard of logs ranged from excellent to awful. Those who are surprised at the difference between their claimed and checked score should not blame the rule only allowing AFS points for contacts with entering stations. This rule accounts, on average, for the deduction of 22 points from the scores of leading stations, and in some logs this number is dwarfed by deductions for incorrect callsigns, non-checking contacts, exchange errors, bad addition and unmarked duplicates. General Rule 12(c) applies to the last mentioned error and 30 points were deducted for each unmarked duplicate contact found. Certain stations claimed points for four duplicates and are thus 160 points down on this count alone. Some of the other errors were undoubtedly due to the heavy QRM and the inexperience of some operators. Please use RSGB log sheets, the supply should be adequate next time, and single-spaced typing on rice-paper or two contacts per line do not make for easy checking.

CLUB TOTALS

Posn	Club	Total	Stations contributing to score					No of entries
1	Verulam ARC	4,191	G3TMA	G3NOH	G4DJX	G4BOU	G3JKB	6
2	Maidstone YMCA ARS	4,084	G3ORH	G3VTT	G3ORP	G3ZSU	G3ZWH	5
3	Crawley ARC	4,043	G3JKF	G3TR	G3MSK	G3GRO	G3YVR	8
4	Bracknell ARC	3,611	G3YMC	G4BRK	G5BOL	G4AUC/P	G4BRA	6
5	Bury RS	3,570	G3KAF	G4AOS	G3RSM	G2AYG	G3GYU	5
6	Hereford ARS	3,555	G3YDD/A	G3WRA	G3HVX	G3WRQ	G3ESY	5
7	Cray Valley RS	3,473	G3XFG	G3RZP	G2MI	G4BXT	G3XRX	11
8	White Rose RS	3,467	G3WPF/A	G3PSM	G3VTY/A	G3FCW	G4CUY	7
9	Surrey Radio CC	3,454	G3IAS	G3BFP	G6LX	G3EUE	G8TB	7
10	Sutton & Cheam RS	3,432	G3LCH	G4CWH	G3DCZ	G2DMR	G3CWL	8
11	Glenrothes & DARC	3,336	GM3OLK	GM3YOR	GM4ALK	GM3PFQ	GM3ZSP	6
12	Echelford ARS	3,334	G3KKQ	G3HZL/A	G3SKC	G4CVL	G3YCQ	15
13	Govt Commns ARC	3,316	G3SSO	G2HDU	G3SNN	G3AUU	G4BEZ	5
14	Addiscombe ARC	3,297	G3SJX	G4CDY	G4ALE	G3XJO	G4CZB	5
15	Edgware & DRS	3,044	G3SJE	G3VW	G3GC	G4AEM		4
16	Leyland Hundred G	2,970	G3XII	G3SHF	G3WYY	G3HKU	G4BEE	5
17	Wirral ARS	2,954	G3OKA	G3CSG	G2AMV	G2FOS		4
18	Swansea ARS	2,931	GW3OAY	GW3INW	GW3GLY	GW4CWQ	GW4BIQ	5
19	Reigate ATS	2,874	G3NKS	G3PWW	G3ZRF	G4DMO	G3RAE	6
20	Leicester Poly ARS	2,853	G3ORY	G3RIR	G4ABX/A	G4BCA/A	G4BUD/A	5
21	West Kent ARS	2,786	G4DIX	G4CCQ	G4BIA	G3AIO	G3ZZD	6
22	ARC of Nottingham	2,675	G3SJJ	G4ANS	G4AFJ	G3WFV	G2FUB	5
23	Thames Valley ARTS	2,577	G3JEQ	G2KI	G6NK	G3JNB	G8SM	6
24	RNARS-HMS *Mercury*	2,558	G3BZU	G3LIK	G4DIU	G3JZV		4
25	Clifton RS	2,039	G3RQZ	G3JKY	G4DBW	G3FVG		4
26	Shefford & DARS	2,009	G3FJE/A	G4DRS	G3DOT	G4DNI	G3EUS	5
27	Southdown ARS	1,966	G3KLX	G3WQK	G3YYF	G3SJV	G4EKX	5
28	Coulsdon ATS	1,940	G3XMW	G3TWJ	G3FTQ	G4DID	G4DRO	6
29	Dunstable Downs RC	1,859	G3ZMD	G3USE	G3HAL	G3HJF		4
30	Grimsby ARS	1,856	G3RSD	G4BNT/A	G3HTI	G3IYT	G4EBK	5
31	Bangor & DARS	1,829	GI2FHN	GI3JEX	GI3SXG	GI3OLJ	GI3TLT	5
32	Hull ARS	1,824	G3AMW	G4EBN/A	G4BHF	G3AGX		4
33	Stockport RS	1,756	G3NOM	G3RUG	G3WEC	G3PEK	G3FYE	5
34	Winchester ARC	1,669	G3OGY	G3YSK	G4DBL	G4AXO		4
35	Crystal Palace DRC	1,535	G4BWG	G3IIR	G2HMV			3
36	Kingston & DARS	1,322	G3HFO	G3GHH	G3ZQF			3
37	Conway Valley ARS	1,302	GW3CW	GW3JI	GW3MDK			3
38	Torbay ARS	1,127	G3LHJ	G3SNU	G4ELZ	G3GDW	G3MVS	5
39	Stourbridge & DARS	1,118	G4IP	G3JEI	G4CLX/M	G3KZG		4
40	Stevenage & DARS	934	G4DDX	G3OVT				2
41	Maidenhead & DARC	908	G4ALG	G3VCT				2
42	Midland ARS	900	G5PP					1
43	Bromsgrove & DARC	887	G4AAL	G3NOY	G2CLN			3
44	Horsham ARC	875	G3TNO					1
45	Hoover-Merthyr ARC	722	GW3MPB					1
46	Chippenham & DARC	631	G3UFW					1
47	Mansfield ARS	614	G3GQC/A					1
48	Cheshunt & DARC	567	G4ECT					1
49	Lincoln SW Club	527	G3ZDW					1
50	Cambridge Univ WS	384	G6UW					1
51	Gtr Peterboro ARC	310	G4BBA					1

Check logs acknowledged with thanks from: G8FC, G4CPY, G4CXT, G3GNS, G2BOF, G4CWY, G4CWD, G4DVW, G3PBC, G3YRM and G4ERH.

INDIVIDUAL SCORES

Posn	Callsign	Score	Club
1	G3WPF/A	1,155	White Rose RS
2	G3SJJ	1,151	ARC of Nottingham
3	G3IAS	1,129	Surrey Radio CC
4	G3ORH	1,119	Maldstone YMCA ARS
5	G3YMC	1,103	Bracknell ARC
6	G3SJX	1,088	Addiscombe ARC
7	GM3OLK	1,073	Glenrothes & DARC
8	G3NKS	1,066	Reigate ATS
9	G3SSO	1,063	Govt Commns ARC
10	G3TMA	1,060	Verulam ARC
11	G3OKA	1,059	Wirral ARS
12	GW3OAY	1,049	Swansea ARS
13	G4BRK	1,040	Bracknell ARC
14	G3JEQ	1,025	Thames Valley ARTS
	G3NOH	1,025	Verulam ARC
16	G3SJE	1,017	Edgware & DRS
17	G3FJE/A	987	Shefford & DARS
18	G3JKF	983	Crawley ARC
19	G3KAF	969	Bury RS
20	G3YDD/A	946	Hereford ARS
21	G4AOS	913	Bury RS
22	G3KKQ	907	Echelford ARS
23	G5PP	900	Midland ARS
24	G3ORY	882	Leicester Poly ARS
	G4BWG	882	Crystal Palace DRC
26	G3RQZ	877	Clifton RS
27	G3TNO	875	Horsham ARC
28	G4CDY	867	Addiscombe ARC
29	G4ALG	855	Maidenhead & DARC
	G3BZU	855	RNARS-HMS *Mercury*
	G4DIX	855	West Kent ARS
32	G3TR	848	Crawley ARC
33	G3CSG	840	Wirral ARS
34	G3XII	838	Leyland Hundred G
35	G3WRA	828	Hereford ARS
36	G3HZL/A	825	Echelford ARS
37	G3BFP	824	Surrey Radio CC
38	G3RIR	802	Leicester Poly ARS
39	G3LCH	798	Sutton & Cheam RS
	G3VTT	798	Maldstone YMCA ARS
41	G4ANS	792	ARC of Nottingham
42	G4CCQ	790	West Kent ARS
43	G6LX	780	Surrey Radio CC
44	G4AAL	777	Bromsgrove & DARC
45	G3OGY	775	Winchester ARC
46	G3MSK	774	Crawley ARC
47	G3ORP	773	Maldstone YMCA ARS
48	GW3CW	770	Conway Valley ARS
49	G3LIK	769	RNARS-HMS *Mercury*
50	G3VW	765	Edgware & DRS
51	G3SHF	764	Leyland Hundred G
52	G3JKY	762	Clifton RS
53	G4CWH	760	Sutton & Cheam RS
54	G3XFG	756	Cray Valley RS
55	G4DJX	753	Verulam ARC
56	G3RZP	747	Cray Valley RS
57	G3GRO	746	Crawley ARC
58	G3PSM	737	White Rose RS
59	G3DCZ	735	Sutton & Cheam RS
60	G3AMW	730	Hull ARS
61	G3HVX	726	Hereford ARS
62	G3GC	725	Edgware & DRS
63	GW3MPB	722	Hoover-Merthyr ARC
64	G3SKC	720	Echelford ARS
65	G3ZSU	715	Maldstone YMCA ARS
66	G2MI	709	Cray Valley RS
67	GW3INW	705	Swansea ARS
68	G2HDU	694	Govt Commns ARC
	G4BOU	694	Verulam ARC
70	G3YVR	692	Crawley ARC
71	G3XMW	688	Coulsdon ATS
72	G3ZWH	679	Maldstone YMCA ARS
73	G4BXT	677	Cray Valley RS
74	G3NOM	667	Stockport RS
75	G3RSM	660	Bury RS
76	GW3GLY	659	Swansea ARS
	G3JKB	659	Verulam ARC
78	G2QB	653	Verulam ARC
79	G3HFO	640	Kingston & DARS
80	GM3YOR	639	Glenrothes & DARC
81	G4DIU	635	RNARS-HMS *Mercury*
82	G3UFW	631	Chippenham & DARC
83	G3WRQ	629	Hereford ARS
84	G6RC/A	625	Crawley ARC
85	GM4ALK	620	Glenrothes & DARC
86	G3GQC/A	614	Mansfield ARS
87	G3SNN	608	Govt Commns ARC
88	G3ZMD	607	Dunstable Downs RC
89	G3USE	605	Dunstable Downs RC
90	G2DMR	604	Sutton & Cheam RS
91	G2AMV	603	Wirral ARS
92	G3VTY/A	587	White Rose RS
93	G3XRX	584	Cray Valley RS
94	G3WYY	582	Leyland Hundred G
95	G3LHJ	570	Torbay ARS
	G3AUU	570	Govt Commns ARC
97	G4BIA	569	West Kent ARS
98	G4ECT	567	Cheshunt & DARC
99	G4ALE	565	Addiscombe ARC
100	G4DDX	555	Stevenage & DARS
	G3HKU	555	Leyland Hundred G
102	G3PWW	554	Reigate ATS
103	G3KLX	550	Southdown ARS
104	G2AYG	540	Bury RS
105	G4AEM	537	Edgware & DRS
106	GM3PFQ	536	Glenrothes & DARC
107	G3CWL	535	Sutton & Cheam RS
108	G4DRS	534	Shefford & DARS
109	G2KI	530	Thames Valley ARTS
110	G4ABX/A	529	Leicester Poly ARS
111	G3ZDW	527	LincolnSW Club
112	G3TWJ	525	Coulsdon ATS
113	G3RCV/A	517	Cray Valley RS
114	G4AFJ	510	ARC of Nottingham
	G4BCA/A	510	Leicester Poly ARS
	G3FCW	510	White Rose RS
117	G5BOL	507	Bracknell ARC
118	G3ZRF	503	Reigate ATS
119	GI2FHN	502	Bangor & DARS
120	G3TIR	495	Crawley ARC
121	G4AUC/P	491	Bracknell ARC
122	GI3JEX	490	Bangor & DARS
123	G3GYU	488	Bury RS
124	G6HD	485	Cray Valley RS
125	G4CUY	478	White Rose RS
126	G3IIR	477	Crystal Palace DRC
127	G3RUG	472	Stockport RS
128	G4BRA	470	Bracknell ARC
129	GM3ZSP	468	Glenrothes & DARC
130	G3XJO	467	Addiscombe ARC
	G3WQK	467	Southdown ARS
132	G4CVL	455	Echelford ARS
133	G4IP	455	Stourbridge & DARS
134	G2FOS	452	Wirral ARS
135	G3RSD	450	Grimsby ARS
136	G3JEI	444	Stourbridge & DARS
137	G3YSK	442	Winchester ARC
138	G4DMO	432	Reigate ATS
139	G3ESY	426	Hereford ARS
140	G3GHH	417	Kingston & D ARS
	G3YCQ	417	Echelford ARS
	G3HAL	417	Dunstable Downs RC
	G6NK	417	Thames Valley ARTS
144	GW4CWQ	411	Swansea ARS
145	G4BNT/A	409	Grimsby ARS
146	G3HTI	407	Grimsby ARS
147	G3IYT	405	Grimsby ARS
148	G4EBN/A	402	Hull ARS
	G4DBL	402	Winchester ARC
150	G3YYF	389	Southdown ARS
151	G4BHF	382	Hull ARS
	G3EUE	382	Surrey Radio CC
	GW3JI	382	Conway Valley ARS
154	G4BEZ	381	Govt Commns ARC
155	G3OVT	379	Stevenage & DARS
156	G3SJV	377	Southdown ARS
157	G6UW	364	Cambridge Univ WS
158	G3WEC	362	Stockport RS
159	G3UES/A	359	Echelford ARS
160	G3GDU	354	Crawley ARC
161	GI3SXG	350	Bangor & DARS
162	G3FTQ	340	Coulsdon ATS
163	G8TB	339	Surrey Radio CC
164	G3AIO	332	West Kent ARS
165	GI3OLJ	327	Bangor & DARS
166	G4ADM	320	Sutton & Cheam RS
167	G3RAE	319	Reigate ATS
168	G3JNB	316	Thames Valley ARTS
169	G4BBA	310	Gtr Peterboro ARC
	G3AGX	310	Hull ARS
	G4CZB	310	Addiscombe ARC
172	G3JZV	299	RNARS-HMS *Mercury*
173	G8SM	289	Thames Valley ARTS
174	G4DID	285	Coulsdon ATS
175	G3ZQF	265	Kingston & DARS
176	G3DOT	257	Shefford & DARS
177	G3RJW	250	Surrey Radio CC
178	GM4DFF	249	Glenrothes & DARC
179	G3PEK	245	Stockport RS
180	G3ZZD	240	West Kent ARS
181	G3ZBA	233	White Rose RS
182	G4BEE	231	Leyland Hundred G
183	G3HJF	230	Dunstable Downs RC
184	G3SNU	215	Torbay ARS
185	G4DZI	210	White Rose RS
186	G4DRB	209	West Kent ARS
187	G4DBW	200	Clifton RS
	G3FVG	200	Clifton RS
189	G4EBK	185	Grimsby ARS
190	G4CQK	184	Thames Valley ARTS
191	G4EKX	183	Southdown ARS
192	G4ELZ	182	Torbay ARS
193	G2HMV	176	Crystal Palace DRC
194	GI3TLT	160	Bangor & DARS
195	GW3MDK	150	Conway Valley ARS
196	G4DNI	147	Shefford & DARS
197	G3JJC	140	Cray Valley RS
198	G4BUD/A	130	Leicester Poly ARS
199	G3WFV	127	ARC of Nottingham
200	G4CLX/M	122	Stourbridge & DARS
201	G3ANK	120	Cray Valley RS
202	GW4BIQ	107	Swansea ARS
203	G6IC	105	Sutton & Cheam RS
204	G4DRO	102	Coulsdon ATS
205	G3KZG	97	Stourbridge & DARS
206	G2FUB	95	ARC of Nottingham
207	G3NOY	90	Bromsgrove & DARC
208	G3GDW	85	Torbay ARS
209	G3EUS	84	Shefford & DARS
210	G3RIN	77	Reigate ATS
	G3ZMF	77	Coulsdon ATS
212	G3MVS	75	Torbay ARS
213	G3XAF	60	Bracknell ARC
214	G2XP	55	Sutton & Cheam RS
215	G3VCT	53	Maidenhead & DARC
216	G4AXO	50	Winchester ARC
	G3JUL	50	Echelford ARS
218	G3DOR	40	Echelford ARS
	G3KQC	40	Echelford ARS
220	G4DPP	30	Echelford ARS
	G3WVP	30	Cray Valley RS
	G4CQO	30	Echelford ARS
	G3TMF	20	Echelford ARS
	G4DUO	20	Echelford ARS
223	G3WVJ	20	Echelford ARS
	G2CLN	20	Bromgrove & DARC
	G3YJI	20	Echelford ARS
	G3FWR	20	Surrey Radio CC
229	G3FYE	10	Stockport RS
	G3VLX	10	Cray Valley RS

The rules

Comments like "Rules perfect to the letter", "You have hit the nail on the head" and other noises of general approval seem to indicate the rules should be maintained much as they are. Some groups felt they were penalized by the 25-mile rule, but the HF Contests Committee believes this is a reasonable compromise between the club having members all over the country and the club so closely grouped that mutual interference is a real problem. There seems to be a good case for advancing the event by one hour to 1300–1700 to avoid the worst of the Continental QRM, and it is proposed to introduce rules which (i) should prevent stations entering who have only worked their fellow club members and (ii) will disqualify stations who only send "AFS" to their friends. Abuses of this kind which did occur made little difference to scores this time.

More comments

"Preferred 1·8MHz event with old rules, now a bad-mannered rat-race." "Very good contest, better than old AFS"; "This is no longer an Affiliated Societies contest"; "It gave many more members the chance to become involved than did the old-style contest"; "We have two stations across the road from one another—two others next door but one"; "25-mile rule unfair"; "We found five

operators but one had to drop out, another retired due to bad tone and a third ran out of battery power while operating mobile static—very enjoyable contest"; "This contest brought out calls I've missed for a long time—except for the G4s, rather like hearing a tape of a top band contest of 15 years ago."

Particular thanks go to those who troubled to comment on the event, and if their resolutions to get organized and to do better next year are anything to go by the 1977 contest should be faster and more furious than ever.

21/28MHz Telephony Contest 1975 results

The reduction in length of this contest was generally welcomed, and despite poor conditions there was a considerable increase in UK entries over recent years. There was a small drop in the number received from overseas.

The bulk of dx traffic was with Africa on both 21 and 28MHz. There was a reasonable level of short skip on both bands. The final two hours produced some business with South America, and the appearance of a few USA signals had most beams spinning to find the appropriate direction (not north-west!).

In the UK transmitting section there was a considerable margin between the top two and the third, the club station of Aerial Radio Group, G3AYC, which was operated by K. Pritchard, GW3WVG. The overseas transmitting section produced a similar gap; first place being taken by R. Macfarlane, 7Q7RM, with Brian Otter, 9J2BO, in second place. Special mention should be made of past winner EP2TW who had to wait until 2½ hours into the contest before any band opened to the UK and he only found paths open for five hours.

Both receiving sections attracted substantially increased numbers of entries this year. First place in the UK section was taken by Bob Treacher, BRS32525, and the overseas receiving section was led by F. Fanari, IS0-57850, who is RSGB member A8938.

Check logs from the following are acknowledged with thanks: G3DYY, G5GH, GI3TTJ, PY3BNJ, UA9ADF, VP8ON, YC2CR, DFH7032003, I1-60076, J. Hinton and W. Koom.

D. J. A.

VITAL STATISTICS

	21MHz		28MHz				
	QSOs	Mult	QSOs	Mult	RX	TX	Aerial
G3OZF	114	55	46	29	Trio 520	Trio 520 + lin	3-el Trib
G3MXJ	111	58	34	25	SB301	SB401 KW1000	TH6
G3AYC	86	46	24	18	FT200	FT200 FL2100	Mustang
7Q7RM	227	15	95	9	AR88	Viceroy KW500	Mustang
9J2BO	220	12	62	9	TR3	TR3 SB200	TH4
9G1LZ	267	14	33	4	FR400	FL400	TH3

RSGB 21/28MHz Telephony Contest 1976 rules

Radio amateurs and SWLs throughout the world are invited to take part in this contest for single-operator stations. Suitable contest log and cover sheets may be obtained from: The General Manager, RSGB, 35 Doughty Street, London WC1N 2AE.

Please note that this contest, as in 1975, has been reduced in length to 12 hours and that the scoring system is now based on a system of multipliers.

GENERAL

A station, whether fixed, portable, mobile or alternative address may be logged only once on each band for the purpose of scoring.

TRANSMITTING SECTION

1. The general rules for RSGB hf contests, published in the January 1976 issue of *Radio Communication*, will apply.

2. When. 0700 to 1900gmt on Sunday 10 October 1976.

3. Eligible entrants. Single-operator stations only.

(a) Home section: RSGB members resident in the British Isles.

(b) Overseas section: Licensed amateurs in all parts of the world except the British Isles.

4. Contacts may be made using any telephony system for which the entrant is licensed on the 21 and 28MHz amateur bands. Stations may be contacted once on each band.

5. Scoring. British Isles stations may not work each other for points. Overseas stations may only claim points for contacts with stations in the British Isles.

(a) **British Isles stations.** Each completed contact will score three points. The final score is the number of countries worked on 21MHz added to those on 28MHz and multiplied by the total number of points. A country worked on both bands therefore scores two multipliers. For the purposes of scoring, the RSGB countries list will apply, with the exception that VE, VK, W/K, ZL and ZS call areas will each count as a separate country.

(b) **Overseas stations.** Each completed contact with a British Isles station will score three points. The final score is the number of British Isles prefixes worked on 21MHz added to those on 28MHz and multiplied by the total number of points. A prefix worked on both bands therefore scores two multipliers. The British Isles prefixes are : **G** 2, 3, 4, 5, 6, 8; **GC** 2, 3, 4, 5, 6, 8; **GD** 2, 3, 4, 5, 6, 8; **GI** 2, 3, 4, 5, 6, 8; **GM** 2, 3, 4, 5, 6, 8; **GW** 2, 3, 4, 5, 6, 8. Contacts with GB stations do not score for points or multipliers.

UK TRANSMITTING

Posn	Callsign	Points	Posn	Callsign	Points	Posn	Callsign	Points	Posn	Callsign	Points	Posn	Callsign	Points
1	G3OZF	39,564	11	G2QT	12,054	21	G6XN	6,840	30	G3WQK	4,836	39	G3HCU	2,484
2	G3MXJ	36,105	12	G8MY	11,730	22	G4COA	6,732	31	G3YBH	4,140	40	GW3SLA	2,142
3	G3AYC	21,120	13	G3ZQW	10,350	23	G4DJF	6,612	32	GC3YIZ	3,627	41	GM3SSB	1,653
4	G4AQG	20,988	14	G4CNY	10,191	24	G3KSH	6,120	33	G3DME	3,120	42	G4CHZ	897
5	G4BUE	18,444	15	G3IAS	9,855	25	G3XBN	6,018	34	G8KU	2,952	43	G3XFW	882
6	GW3NNF	15,989	16	G3UFY	8,184	26	G2FNK	5,994	35	G3TXF	2,808	44	G3JKY	855
7	G3NAS	15,847	17	G3YJI	7,728	27	G4CLN	5,916	36	GM3PIF	2,709	45	G2AJB	684
8	G3TOE	14,161	18	G3NOF	7,182	28	G4BYY	5,355	37	G3MSB	2,640	46	G3JFY	612
9	G4APL	13,515	19	G5BGM	7,104	29	G3WHK	5,280	38	G3VPS	2,508	47	GM3YOR	504
10	GW4CYD	12,972	20	G3SWX	6,882									

OVERSEAS TRANSMITTING

Posn	Callsign	Points	Posn	Callsign	Points	Posn	Callsign	Points	Posn	Callsign	Points	Posn	Callsign	Points
1	7Q7RM	23,016	10	UK5MAZ	4,368	19	DL7QG	1,551	28	UI8AAY	462	36	UW9SG	84
2	9J2BO	17,472	11	7P8AC	3,586	20	EP2TW	1,485	29	OK2BLG	459		OK2SPS	84
3	9G1LZ	16,184	12	C9MIZ	3,570	21	UA4CAQ	1,392	30	I2PHN	450		UA3TN	84
4	5B4DA	7,686	13	PY4KL	2,579	22	DJ7KT	1,216	31	YO6AWR	315	39	OZ3KE	63
5	UA6DL	7,425	14	HA9KOV	2,475	23	OK1MSP	1,197	32	OK2PEQ	234		SP3CDQ	63
6	OK1AGN	5,715	15	UG6GAF	2,220	24	ZC4RH	1,176	33	HB9BCK	204	41	OK1KZ	27
7	SV0WJJ	4,896	16	SP5BAK	1,860	25	UW9WB	1,104	34	OK2KR	128	42	OZ8T	24
8	SP9AI	4,578	17	UL7LEZ	1,728	26	OK3CMW	840	35	OK1PCL	85	43	YZ1GMN	3
9	UA6BV	4,536	18	OK1MPP/P	1,716	27	I3BBZ	707						

UK RECEIVING

Posn	Station	Points	Posn	Station	Points
1	BRS32525	43,605	9	A8088	4,608
2	BRS26431	22,680	10	BRS35890	4,244
3	A8312	11,280	11	BRS26407	3,075
4	BRS15822	10,368	12	BRS32610	2,925
5	BRS33823	10,293	13	BRS29641	2,652
6	BRS28198	10,206	14	BRS20249	1,980
7	BRS27330	8,448	15	BRS18461	1,440
8	BRS35669	7,866	16	BRS35943	672

OVERSEAS RECEIVING

Posn	Station	Points	Posn	Station	Points
1	IS0-57850	4,896	9	I6-61596	420
2	OK1-15835	3,645	10	OK3-26743	342
3	I5-50661	2,301	11	UA3-142-112	330
4	I4-14707	2,093	12	UB5-065-549	270
5	EA8-3455	1,650	13	OK1-15689	189
6	IS0-58191	1,599	14	UA9-165-622	9
7	UP2-038-453	480	15	I5-57718	3
8	UA9-154-940	450			

6. Entries should be sent to M. Harrington, BRS20249, 123 Clensham Lane, Sutton, Surrey SM1 2ND, England. Overseas entries should be posted to arrive not later than Monday 6 December 1976.
7. Awards. The Whitworth Trophy will be awarded to the leading Home Section entrant.

RECEIVING SECTION
1. The general rules for RSGB hf receiving contests, published in the January 1976 issue of *Radio Communication*, will apply.
2. When. As rule 2 of the transmitting section.
3. Eligible entrants. The contest is open to all short-wave listeners throughout the world. All entrants agree to be bound by these rules.
4. Scoring. British Isles entrants may only log overseas stations working British Isles stations in the contest. Overseas entrants may only log British Isles stations in contact with overseas stations in the contest.
(a) **British Isles entrants.** Each complete log entry will score three points. The final score is the number of countries heard on 21MHz added to those on 28MHz and multiplied by the total number of points. For the purposes of scoring, the RSGB countries list will apply, with the exception that VE, VK, W/K, ZL and ZS call areas will count as separate countries.
(b) **Overseas entrants.** Each complete log entry will score three points. The final score is the total number of points multiplied by the total number of British Isles prefixes (as shown in rule 5 of the transmitting section) heard on each band.
5. Entries. As rule 6 of the transmitting section.
6. Awards. The Metcalfe Trophy will be awarded to the leading British Isles entrant.

SSB Field Day 1976 rules

Entrants should note that the scoring system has been amended.
1. The general rules for RSGB hf contests, published in the January 1976 issue of *Radio Communication*, will apply.
2. When. From 1500gmt Saturday 4 September to 1500gmt Sunday 5 September 1976.
3. Eligible entrants. Any group of RSGB members resident in the prefix zones G, GC, 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 will score five points. The total score on each band is to be multiplied by the number of different countries worked on that band to give the band score. The final score is to be the sum of all the band scores.
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 D. Thom, G3NKS, 20 Bramble Close, Copthorne, Crawley, West Sussex RH10 3QB.
9. Awards. Certificates will be awarded to the three highest scoring groups, and also to the leading check log from each continent.

RSGB UHF Open Contest rules

The RSGB October UHF Contest is open to both fixed and portable stations, and takes place at the same time as the IARU Region 1 contest. Since the rules are compatible, all entries for the RSGB event will be passed on to Region 1 for inclusion in the international listings.

The following general rules, published in the January issue of *Radio Communication* will apply unless superseded below:
1. Date: 2-3 October. **Time:** 1600-1600gmt.
2. All entries and check logs to:
VHF Contests Committee, c/o L. Hawkyard, G5HD, 100 Shirley High Street, Southampton, Hants.

After adjudication all entries will be passed on to IARU Region 1 as entries for the International UHF Contest.
3, 4a, 5b, 6a. Unchanged.
7. (i) Scoring will be at one point/km.
(ii) Separate logs and cover sheets must be made out for each band. Claimed scores should be multiplied by the following factors: 432MHz × 5; 1,296MHz × 25.
(iii) After multiplication, the scores should be tabulated, *together with the callsign and name of group if applicable*, on a vhf/uhf multiband contest summary sheet (obtainable from any adjudicator on receipt of an sae).
8. An award will be made to the overall winner and the band leaders.
9a, 10a, 11-22. Unchanged.

432MHz Autumn Cumulative Contest results

This must rate as the most disappointing contest ever. On the first session conditions were some of the best ever on the band, with 1,000km plus contacts common, several stations working OK and an HB9/P 5 × 9 plus over most of southern England. Many potential entrants QSYd to 1·3GHz, and as usual the big lift was followed by a nadir of activity. *G5HD*

Posn	Callsign	Points	QRA	Best dx	QSOs
1	G8BCG/P	1,345	ZN61	1,020km/DM2BEN/P	71
2	G3NHE	847	ZN54	952km/DL7QY	91
3	G8DLX	85	ZM54	155km/G8BCL	25
4	G8BXJ	9	YL38	61km/G6XM	7

Check log received from G3TQF with thanks.

February 432MHz Open Contest results

The excellent entry, more than 50 per cent up on last year, helped to restore the adjudicator's and the committee's equilibrium. Conditions were average with some short lifts. G3BW-G3JXN was the best dx, just topping 400km.

GW3UCB/P again led the portable stations, but by a much reduced margin. G4BPO, with a 190ft mast, led the fixed stations. Certificates go to GW3UCB/P, G3JQA/P, G4BPO and G4BEL. *G5HD*

Posn	Callsign	Points	QSOs	QRA	Best dx	KΞ
1	GW3UCB/P	344	58	YM05	G3DAH	341
2	G4BPO	296	50	AM77	DK2UO	390
3	G3JQA/P	271	65	ZN61	G3DAH	290
4	G4BEL	260	54	AM51	PA0JVY	320
5	G8AGU/P	256	32	YL72	G4BPO	365
6	G3NNG	209	47	ZL23	G3HCW	218
7	G4CQR	145	45	ZL49	G3KMS	270
8	G4CWW	136	38	YM40	G3BW	255
9	G3ZYC	125	37	ZN73	G8AGU/P	280
10	G8DKK	123	41	ZL36	GW3UCB/P	211
11	G3JXN	116	42	ZL39	G3BW	400
12	G3ZMD	114	32	ZL08	G8AGU/P	240
13	G3IZD/P	108	32	ZK08	GW3UCB/P	285
	G3NHE	108	26	ZN54	G4CQR	222
15	G8DLX/P	99	29	ZM45	G8AGU/P	230
16	G3UBX	94	32	YM40	G3BW	240
17	G8DLZ	93	27	ZM65	G3BHW	175
18	G8CTT	90	42	AL41	GW3UCB/P	280
19	GW8ADP/P	81	23	YL25	G3IZD/P	195
20	G6XM	76	20	ZL22	G3KMS	230
21	G8AZA	70	12	ZO69	GW3UCB/P	310
22	G5DF	63	21	ZL45	G3NHE	210
	G4CXL	63	37	ZL58	G4BPO	140
24	G4AEZ	62	30	ZL30	G3JQA/P	208
25	G4ASE/P	57	23	ZM24	G3JXN	143
26	G5UM	53	19	ZM35	G3KMS	138
	G8DCA	53	15	ZK10	G3JQA/P	266
28	G4BBR	51	15	YL10	G3KMS	185
29	G3RQZ	50	28	ZL50	G4BEL	112
30	G3OHC	46	18	ZM31	G8AGU/P	212
31	G8FDJ/P	44	32	ZL60	G4BEL	110
32	G3WHL	39	15	ZN35	G3NNG	205
33	G8BQH	35	23	ZL37	G4BPO	155
34	G8IFT	22	12	YM50	GW3UCB/P	95
35	G4DKK	21	11	YM10	G8DLX/P	90
36	G8IMV	18	10	ZL37	G3SAR	71
	G3WFM	18	10	ZL30	G3DAH	105
38	G8BXJ	17	11	YL38	G8AGU/P	100
39	G3VGG/A	11	5	YM60	GW3UCB/P	155
40	G8FDL	9	5	YN38	GW3UCB/P	80
	G8BKR	9	6	YL48	G8AGU/P	95
42	G8KNW	8	8	ZL50	G2HDJ	31

Microwave Contest rules

1600-1600gmt, 19-20 June 1976
All entries and checklogs must be sent to: VHF Contests Committee, c/o Mr P. W. Willcocks, G4BWY, 27 Manor Road, Barnet, Herts EN5 2LE.
1. Scoring contacts may be made on any amateur frequency above 1GHz, but lower frequencies may be used for setting up contacts.
2. Contest exchanges will be as follows:

On the 1·3GHz band; RS or RST report followed by a serial number, QTH Locator and QTH.

On each of the other bands: RS or RST report followed by a serial number and a code word of the operator's own choosing (eg "Centimetric Overture"). The same code word cannot be used on more than one band. Contestants must record their code word clearly on the 427 Cover Sheet accompanying the entry log for each band. If the station has not already been contacted on the 1,296MHz band, the QTH Locator and QTH may be substituted for the code word. Serial numbers shall begin at 001 for each band, and information should be passed on the band for which points are claimed. All data should be recorded on the log.

3. Each band will be listed separately.
4. Unless superseded by the above, the following general rules will apply: 1, 2, 3, 4b, 5b, 6a, 7b, 8b, 9b, 10a, 11-22.

VHF contest logging

The majority of logs received by VHF contest adjudicators are impeccable, but a few entrants lose points by logging inaccuracies. One group suffered the ultimate disaster in 1975 VHF NFD, by slipping from the position of band leader to runner-up. The table shows (a) the correct entry, (b) an entry with four errors, each costing two points (one radial), and (c) an entry with its callsign incorrect, scoring zero points. Stations consistently transmitting QRA or QTH at variance with their 427 forms are liable to suffer a 20-30 per cent penalty. Defective signal complaints are considered only if the offending station is warned over the air and fails to take action.

(a)	G3SOU/P	56,011	56,011	ZL52C	14km NW of Andover
(b)	G3SOU	56,011	57,011	ZL53C	14km NE of Andover
(c)	G3FOU	56,011	56,011	ZL52C	14km NW of Andover

The VHF Contests Committee looks forward to a bumper entry this year and hopes for conditions similar to those experienced in last July's contest.

G5HD

IARU Region 1 co-ordinated vhf/uhf/shf contest dates and times

In the item under this heading on p290 of the April issue, amend 3-4 October to read 2-3 October, and 1-2 November to read 6-7 November.

Mobile rallies calendar

23 May—Welsh Mobile Rally, Barry Rugby Football Ground, Barry, S Glamorgan. Trade stands, raffles, club bar. Talk-in on 2m-320, via GBSBC on R6 and ssb 144·3MHz.

23 May—Northern Mobile Rally, Victoria Park Hall, Keighley, W Yorkshire. Talk-in on top band 1·910MHz; 2m a.m. 145·000MHz; 2m fm 145·525MHz (S21); 2m ssb 144·250MHz; 70cm fm 433·200MHz; lectures on "Practical vhf aerials" by E. Ashby, G3HCW, and "FM repeaters" by the UK Northern FM Repeater Group. All the usual attractions. Rally opens 1130am. Organized by the Otley RS. Details from G8BZY, QTHR.

30 May—Hull DARS Mobile Rally, College of Agriculture, Bishop Burton, near Beverley. G3AGX has withdrawn from all involvement with this rally. Details of the event are now obtainable from G8IED, QTHR.

13 June—Elvaston Castle Rally, near Derby. Further details from P. Neal, G3WFU.

13 June—Goole & D ARS Rally, High School, Booth Ferry Road, Goole. Trade stands, entertainment.

20 June—HMS *Mercury* Mobile Rally.

20 June—Mobile Rally, Castlewellan Forest Park, Co Down. Details from GI4EMS, 59 Donaghadee Road, Millisle, Co Down.

27 June—Longleat Mobile Rally, Longleat House, Longleat, nr Warminster, Wilts. Talk-in stations operational on 160, 80 and 2m, 1,920, 3,775, and 145·50kHz plus vfo (callsigns to be announced later). Rally opens 10am. Walking df hunt starting at 3pm on 160m, all members of the family can take part. All the usual attractions. No charge for entrance to the rally, but visitors must pay for entrance to Longleat Park. Car parking available. Overnight camping from 6pm, Saturday 26 June. Details from G3ULJ, QTHR.

4 July—Upton Mobile Rally. Exhibition space and further details from G3TQD, QTHR.

18 July—Cornish Radio Amateur Club Rally, Cornwall Technical College, Camborne (venue to be confirmed). Details from G3NKE, QTHR.

18 July—Anglian Mobile Rally, Stanway School, Colchester.

7 August—Air Day at HMS *Daedalus*, Lee-on-the-Solent, Hampshire. Talk-in on 2 and 160. Details from G3JMG, QTHR.

15 August—Derby & D ARS Rally, Rykneld Schools, Derby. Details from G3FGY, QTHR.

22 August—Preston & ARS Mobile Rally, Walton-le-Dale County Secondary School, Preston.

29 August—Torbay ARS Rally. Newton Abbot Rugby Ground. Details from G3GDW, QTHR.

26 Sept—Harlow & D ARS Rally. Venue as last year. Details from G3WUX, G8JXU, G3YDI, QTHR.

RSGB Region 1 VHF Contest rules

0900–1700gmt 20 June 1976

Bands. 4m, 2m and 70cm; plus 23cm separate trial (Section 4).

Section 1. Multi-operator, fixed or /P. Separate callsigns for each band, simultaneous operation.

Section 2. Single-operator, fixed or /P. On any or all bands. /P entrants may go up to 20 miles outside the region, but **ALL** operators must state in QSO that they are in or from Region 1. All transmissions **must** be monitored—**keep them clean!**

Section 3. Outside region: operators in other regions may enter. Send in complete log for the period for checking, but score **only** Region 1 contacts for points.

Section 4. 23cm. Any entrants, separate log and score.

Rules. The following general rules, published in the January 1976 issue of *Radio Communication*, will apply: 2, 3, 5a, 6a, 9a, 10a, 11 to 16, 18, 19, 20a, 20b, 21.

Scoring A Sections 1, 2 and 3 as Rule 7a; section 4 as 7b.
B Multiply 4m score by 1·5, and 70cm score by 4.
C Add 10 points bonus for each contact with a Region 1 station.
D According to aerial height asl. Total after C may be multiplied as below:
000ft by 2, 100ft by 1·8, 200ft by 1·6, 300ft by 1·4, 400ft by 1·2, 500ft by 1·1, 600ft and over by 1.

Logs. Separate sheets from 001 on each band. One Form 427 to include NGR and aerial height asl.

Awards. 1, the G2CIP Shield; 2, the G3SMM Shield; both to be held for a year. Certificates of merit to band leaders in 1 and 2, and to winners in 3 and 4.

Entries to G2CUZ, 34 Sandbrook Road, Ainsdale, Southport PR8 3JE.

Contests calendar

8-9 May	Bermuda CW
16 May	DF Qualifying Event Dartford Heath (Rules in April issue)
22-23 May	144MHz Portable (Rules in April issue)
23 May	144MHz CW Open (Rules in April issue)
6 June	DF Qualifying Event South Manchester (Rules in April issue)
12-13 June	HF NFD (Rules in March issue)
19-20 June	Microwave (Rules in May issue)
20 June	RSGB Region 1 VHF (Rules in May issue)
20 June	DF Qualifying Event Chelmsford
26-27 June	Summer 1·8MHz
3-4 July	VHF NFD & Listeners (Rules in March issue)
11 July	DF Qualifying Event Coventry
18 July	3·5MHz FD
18 July	DF Qualifying Event Oxford
25 July	144MHz QRP
1 August	DF Qualifying Event Salisbury
7-8 August	70MHz Portable & Listeners (Trophy)
22 August	DF Qualifying Event Slade
4-5 September	144MHz Open & Listeners (Trophy)
4-5 September	SSB FD (Rules in May issue)
12 September	DF Final High Wycombe
2-3 October	UHF/SHF (Rules in May issue)
9-10 October	21/28MHz (Rules in May issue)
16-17 October	7MHz CW
24 October	70MHz Fixed
Oct-Nov	432MHz Cumulatives
6-7 November	144MHz CW
6-7 November	7MHz Phone
13-14 November	Second 1·8MHz
5 December	144MHz Fixed

Looking ahead

8-9 May—International VHF Convention, Brunel University, Uxbridge, Middlesex.

15 May—Region 11 ORM and mobile rally, Royal Lido, Prestatyn, Clwyd.

30 July-1 August—RSGB Radio Communication Exhibition, Alexandra Palace, London.

26 September—Welsh Amateur Radio Convention, Oakdale Community College, Blackwood, Gwent.

28-30 October—ARRA Exhibition, Granby Halls, Leicester.

your opinion

The Editor
Radio Communication
Sir—I really must protest at the latest tinkering by the VHF Contests Committee with contest rules, ie penalizing ssb stations for the March 2m Open Contest.

The "no points under 200km for ssb" rule is not only ridiculous in an OPEN contest which includes FIXED and /P stations, but it has certainly driven a number of good operators completely away from this contest. If you want to separate ssb from other modes then split the contest into separate sections, not penalize the more advanced sector of activity. I and a number of my colleagues will not take part in this contest under your rules as presented.

Further to this I strongly object to the moving of VHF NFD to July as it will also lose support because most people with families take their annual holiday at that time. It is also ridiculous to say that weather in July will be better than early September as temperature and rainfall statistics are closely coincident. I, among many others that I have contact with, would prefer that VHF NFD be moved back to September, and also the re-imposition of the maximum power rule as all of us cannot afford the gallons of petrol necessary to run the high power which becomes necessary even to be heard in the general splatter of a great number of maximum power signals.

C. D. Plummer, G8APB

The chairman of the VHF Contests Committee replies:
If Mr Plummer examines the history of vhf contests he will find that the current rules and calendar of events were arrived at by the very "tinkering" to which he objects. Some ideas are successful and survive; the new rules for the March contest did not work out well, so they will not be repeated; the VHF Contests Committee is sorry that the experiment did not work, but is quite unrepentant about having tried something new.

The change of date of VHF NFD will of course have some disadvantages, and the possible clash with family holidays will be one of them. Surely nobody is foolish enough to say what *will* happen to the weather: the expression used in the March issue was "chances of better weather". Do Mr Plummer's temperature and rainfall statistics apply to exposed hilltops; and what about the wind? Chances are that taking *all* factors into account, July will be the better date for VHF NFD.

As for the power level, it is incorrect to assume that high power automatically means a poor signal. Much of the alleged splatter may be generated by receiver overload, and the committee does not intend to make a rule against interference that is not really there! A good receiver will be less troubled by a high-power transmitter run well within its capabilities than by an overdriven 10W rig.

I. F. White, G3SEK

The Editor
Radio Communication
Sir—Until seven or eight years ago, when lack of interest in this district made it impossible to muster a team, I had participated in every NFD that had taken place. Last year an entry was again made from this area and I again took part. Over many years the contest has given me great pleasure.

The formulation of new rules, which make NFD a high-power contest, removes the last trace of identity of the event with its roots, having been conceived in the early 'thirties as an exercise to set up a low-power station as in emergency conditions. One result of the new rules is that I am no longer interested in NFD, although the statement is not in any way intended as criticism either of the organizers or those who remain or become interested.

Some years ago I was concerned in the establishment of LFD (Low-power Field Day, of blessed memory) which event gave much pleasure to myself and others but which was subsequently abandoned for lack of support. In view of the fundamental change in NFD I wonder if the present time would be auspicious to consider the revival of LFD. If there are those who hold this view may I ask them to write to me (QTHR) and say so. I think LFD would fill what has become a gap and, should there be an encouraging response to this enquiry, I intend approaching the HF Contests Committee to see if they would be willing to help.

M. Strickland, G8KB

"I would have preferred a Yagi"

The Editor
Radio Communication
Sir—The HF Contests Committee killed off the Low Power Field Day within one year.

National Field Day proved a stronger adversary, surviving successive uppercuts over recent years; but the latest below-the-belt blow has finally felled this giant among contests.

For 28 years nothing could stop me participating in NFD, but I find no appeal in this new chromium and plastic gift-wrapped QRO event.

J. J. Yeend, G3CGD

The Editor
Radio Communication
Sir—It was with much dismay that members of the Shefford & DRS read of the changes in NFD rules. Some Shefford members have participated in NFD since the 'thirties, and the society has done so since its formation in 1949. The contest has always been a focal point of the society's summer activities, the reason being that, though the co-operation of all was essential, the skill of the operators was the deciding factor.

The increase in power since the war has been shown to have added but little to the competitive aspect of the contest. Perhaps there has been the feeling that some groups never adhered to the power limitations in spite of Council inspections. The new 150W limit gives way to the brute force brigade—that this increase in power will offset the falling number of entries is a suggestion surely without foundation—time will prove that there exists no relation between the two factors.

While it is felt that the RSGB HF Contests Committee is composed of duly elected members whose mandate is to foster the interests of the competition-minded membership, steps should have been taken to establish the wishes of those members most concerned. It would be interesting to learn upon what basis the innovation was made. Was it the comment accompanying past NFD entries or

was there a consistent mail from individuals advocating "the sky is the (Home Office) limit!".

May we recommend that the number of entries for this year is examined and if no worthwhile increase is observed, then in future years NFD should be reinstated as a competition of skill. As an alternative, comments should be invited from participants, affiliated societies in particular, regarding their views.

Failure to implement the above must surely result in a declaration of "No Contest".

G3EUS, G3TVG, G8GAM, G3BWC, G3DOT, G4EIY, G4DRS, G4BWP, G8FCA, G3WKR, G5BON, G8HHO, G3ZZG, G2DPQ, G8CTB, G4DAQ, G3TAZ, G8EKU, G3JKK, BRS35475, BRS26795,

B. Orsel

The Editor
Radio Communication

Sir—On receiving recent issues of *Radio Communication* my first action has been to read the "Your Opinion" column to see who had answered the letter from Mr T. Hall, GM3HBT which appeared in the January issue. On seeing no reference to GM3HBT it occurs to me that perhaps we are all waiting for someone else to write. A sign of the times?

Mr Hall queries the fact that during 160m contests he hears amateur signals "which are at a remarkably higher level than any other amateur signals from equivalent distances at any other (non-contest) times". I suspect that this letter hints at the running of high power on 160m during contests, although Mr Hall lacks the conviction to come straight out with the accusation.

In fact there is another explanation for this phenomenon which can be termed "selective operation". There are many ardent 160m operators (myself included) whose interest is limited to dx working and contests and we rarely use the band for "normal" working with other UK stations. This may appear anti-social, but it is, perhaps, a habit which is easy to understand. In my own case there are two main reasons for this habit—first, having attained WAC on 160m (with 9W dc input), I find working UK stations to be a bit of an anticlimax. This feeling is also prevalent on the hf bands, and there are many operators on these bands who work dx only. Second, my dx operation means that I am frequently in my shack at 1, 2 or 3am and regular operation during the evening would not help to promote harmony in the 'XAP household—I feel that my xyl puts up with enough already.

I can assure Mr Hall that I am able to put a remarkably large signal into his receiver without resorting to high-power operation, but he will have to get up at 2am if he wants to witness this phenomenon! In the meantime he may like to read my article in the December 1973 issue of *Radio Communication*, do a bit of honest spade-work and then sit back and smile when he gets accused of QRO.

Having said all this, dare I draw readers' attention to G3ZXN's advertisement in the "Wanted" column of the February "Members' Ads"? If G3ZXN is a regular QRP operator, I'd hate to receive his electric bill. Let's all hope it's a misprint, Hi!

A. P. Ashton, G3XAP, 1·8MHz WAC

(No misprint—Ed.)

The Editor
Radio Communication

Sir—I wish to put on record the appreciation of all associated with GB3HU for the work put in by the RepeaterWorking Group. Having been on a few committees in my time, I know only too well the large amount of personal effort that is needed from everybody, and also the lack of "thanks" that one gets.

The Repeater Working Group has not had an easy job; however, we know it has done it well, and in record time.

A. J. Oakley, G8IWA
PRO, UK FM Group (Northern)

The Editor
Radio Communication

Sir—The School of Engineering, Hatfield Polytechnic, recently held an open day inviting young people approaching school-leaving age to come along and see for themselves the possibilities of further education in engineering subjects, perhaps to enable them to develop a broader view when deciding for themselves the kind of industry they would like to train for on leaving school. As part of the electrical/electronic engineering area I was asked if I would operate an amateur radio station, and by late afternoon had been highly successful.

We feel that obviously we owe it all to the many contacts we made nationwide, and may we through your columns thank all the contacts we made over the air for the help and patience they gave in putting our message across so successfully that day. As well as our appreciation, our sincere apologies to the GWs who earlier had volunteered to help out on sked but unfortunately we did not get an opportunity to involve them.

A. Geeves, G3SUE

The Editor
Radio Communication

Sir—An article in your March issue discusses the optimum size and curvature for a galvanized dustbin lid which is to be adapted for use as a paraboloid reflector. There will be some puzzled ironmongers watching shoppers measure dustbin lids critically!

It reminds me of the time when I was one of a group engaged in the development of a new microphone. We needed a number of gossamer-thin rubber films lying within a specified thickness tolerance, and someone suggested the local chemist as a source. I bought half a dozen different proprietary articles to see if any of them would do. It was raining, so I went into a corner of the shop out of the way, opened them up and began to measure them for thickness with my micrometer.

I was interested and absorbed in what I was doing, but after a few minutes came sharply back to earth when the voice of the manager whispered in my ear "Bit fussy, aren't you?"

Bob Roberts, G2RO

The Editor
Radio Communication

Sir—I am neither "pro" nor "con" in regard to repeaters. It is my personal belief that both the advantages and the drawbacks are over-stated by both sides but, although I have no use for repeaters myself, I see no reason why others who want them should not have them as they are unlikely to interfere with me. I write as a Norfolk amateur "goaded" (G3IOR's word) into writing to you not by G4BYV's letter in the November issue but by G3IOR's splenetic reply in January.

No reasonable person could take exception to G4BYV's letter, which is probably why G3IOR felt constrained grossly to distort what he said in order to have something to attack. When John wrote that "'many" amateurs were pleased that Bacton had been turned down he was saying no more than the truth. He did not mean "I" and G3IOR's failure to understand this shows clearly how out of touch he is with opinion in the amateur fraternity in the area in which he lives.

The so-called survey proves nothing. I could get whatever result I want by careful selection of the sample and it may not be without significance that few, if any, of the members of the Norfolk club were included in it although they, assuredly, should be regarded as "potential users". Equally valueless is his estimate of the number of amateurs who take holidays in the area of the Norfolk Broads and the coastal resorts. Far from being "hundreds" the number is unlikely to exceed a couple of dozen in a good year bearing in mind, of course, that we have no way of identifying amateurs who do not bring their gear and operate during their holiday.

Possibly the high spot of the letter is G3IOR urging G4BYV to support "research into new techniques in the state of the art"—this from a man who, not so long ago was making himself a nuisance in the local club because they were turning to vhf and uhf from hf. Satan reproving sin, with a vengeance!

It is clear that G3IOR's letter was provoked by the fact that, more than a couple of years ago, G4BYV wrote of Oscar in terms which indicated something less than adoration and he failed to accord to its devotees that reverence which high priests have always considered to be their due. Now these are grievous offences and it may well be that, when the day of judgement comes, G4BYV will not be sent to heaven—especially if G3IOR is on the bench. However, while John is in this life he is entitled to express his opinions in temperate language without being reminded that Kipling wrote of:

"... the truth you've spoken
Twisted by knaves to make a trap for fools"

G. E. R. Eddowes, G8IDP

The Editor
Radio Communication

Sir—What a timely and important warning appeared in the January issue in Mr M. J. Cooper's letter.

After reading the other missives appearing on the letters page an outsider would have been left with a particularly unattractive insight into the activities of the British radio amateur. Are we a rabble bickering about personal and regional interests and publicly displaying our sour grapes to the detriment of our collective image?

Now is the time for awareness of national interests and progress towards an image of a responsible, progressive organization worthy of continued allocation of valuable frequency space in 1979. Bigoted argument and entrenched resistance to change will not help.

M. D. Booth, G3YNO

The sstv scene

by R. F. G. THURLOW, G3WW*

BY mid-March, Neville Jackson, G3IAD, had had a two-way sstv QSO with TA2MM for his 100th country on sstv, and became only the third person in the world to do so, behind W8YEK and W4MS. A DJ is not far behind with 96 countries.

Home-built sstv keyboards are now in use in GM, I0, ON and ZS6, and others are being built, along with DL2RZ and W6MXV designed fast-scan converters. The latter two designs give excellent results with normal tv cameras.

On 3 March 1976 Howard Waton, G3GGJ, claimed another sstv "first", following his sstv keyboard in April 1975, with his version of the slow-to-fast-scan converter by Dr George Steber, WB9LVI, which was the subject of articles in the March and May 1975 issues of *QST*. These articles for use with 526-lines and 60Hz ac mains were certainly not "constructional" ones, as G3GGJ and eight other British amateur constructors know. These include Ron Johnson, G3GRJ, who should have the next operational converter. The basic design has already been much modified and improved, while three more pcb designs are promised shortly.

Interest in the reception of an additional sstv standard of 256-lines 34s frame, even on the normal 5FP7 128-lines tubed but easily modified monitor, has been growing since the appearance last November on the hf bands of 256-lines transmissions through the new Robot 300 storage-tubed slow-to-fast and fast-to-slow scan converter with its four sets of lines capabilities. The apparent ability of a 256-lines sstv transmission to be less affected by QRM than a similar 128-lines transmission prompted the "HF/LF bands active sstv operators group" to again seek the help of the RSGB through its Telecommunications Liaison Officer to obtain Home Office permission to transmit 256-lines sstv signals. The request was agreed to by the Home Office with the welcome stipulation that those amateurs already "permitted" to transmit 128-lines sstv need not apply individually for permission to also transmit 256-lines. Bert Uppington, G2BAR, who had received one of three Robot 300s known to have arrived in the UK, was thus able to have the first known two-way 256-lines sstv QSO emanating from the UK on 80m at 0745gmt on 10 March with the writer, who used a taped 256-lines identity transmission; on reception both transmissions were recorded on audio tape and the contents of each tape transmitted back to the originating station as "proof of the QSO".

On 15 March, the writer, now also equipped with the G3GGJ-built WB9LVI converter, had his first "permitted" 256-lines 20m two-way sstv QSO with K4QPR and saw a "whole" frame of video on either transmission or reception on a 625-lines tv screen, and could "hold or freeze" the frame in his own shack, go out on a shopping expedition and find it still on display until the power was switched off.

By now 9K2DO in Kuwait should also have appeared with the complete Robot 300 installation of converter, two 10in tv sets and an RCA camera to transmit both 128 and 256 lines with his 3kW transmitter.

Further 80m sstv activity to that on Sunday at 0830am around 3,735kHz with the sstv net in operation, can now be found on Wednesdays from 1030am around 3,730kHz for the senior citizens and shift workers.

* 2 Church Street, Wimblington, March, Cambs.

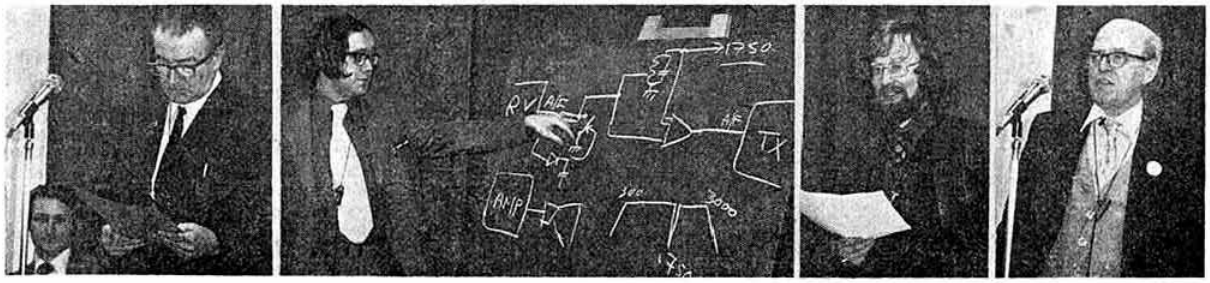
Central Scotland Convention

The Central Scotland Convention took place on 14 March at Wrangholm Hall, Motherwell, the QTH of the Mid-Lanark ARC. Over 300 visitors were in attendance, having been attracted from as far afield as Banff and Buckie in the north and Middlesbrough in the south.

The theme of the convention was the Central Scotland 2m repeater, GB3CS, and a packed lecture—with a cctv link from the main hall to the overflow in another room—heard the principal constructors, GM8FM, GM8BJF, GM3EDL and GM8ARV, detail the part each had played in putting the repeater together. The problems each contributor had encountered and how they had managed to overcome these difficulties were also mentioned.

On view were the electronics of the repeater which, it is hoped, will soon receive the approval of the Home Office, permitting it to be installed at the Black Hill transmitting station of the IBA, where the aerials will be around the 300ft level on the tv mast, giving coverage of the Glasgow-Edinburgh region.

A "homebrew" competition attracted entries ranging from a morse oscillator to some very sophisticated communication equipment. The quality of the entries gave the judges a difficult task, but they were unanimous in awarding first prize to the sstv system constructed by GM3KJF and operated by him for several hours. The club would like to thank South Midland Communications for presenting an swr bridge/power meter as first prize in the competition, and GM3SZP for organizing a demonstration of rtty.



From left to right: Jim Shankland, GM8FM, giving a general description of GB3CS, with N. McDonald, GM4BVU, in the chair; Brian Flynn, GM8BJF, describing the transistor pa; Bill Lamb, GM3EDL, explaining the design of the power supply, and Dave Taylor, GM8ARV, explaining the speech processing circuits. (Photos: GM3SZP.)

club news

RSGB affiliated societies and clubs, and RSGB groups, are invited to submit items for inclusion in "Club News" to their regional representatives (not direct to the editor).

Items of news and dates of forthcoming events should reach RRs by 29 May for the July issue.

REGION 1—RR B. O'Brien, G2AMV, "Tanglewood", Anthony's Way, Heswall, Wirral, Merseyside L60 0BP.

Ainsdale (AARC)—6, 20 May, 3, 17 June. 8.15pm. Ainsdale Scout Headquarters. Further details from G2CUZ.

Blackburn (East Lancs ARC)—6 May (Visit by regional representative G2AMV), 3 June (Beginners' night, an introduction and explanation of amateur radio). Visitors are welcome. 7.30pm. YMCA, Blackburn.

Blackpool (B&DARS)—Mondays, 8pm. Pontins Holiday Camp, Squires Gate. Morse tuition, 7.30pm.

Bolton (B&DARS)—Third Wednesday in each month, 8pm. Clarence Hotel, Bradshawgate. Sec G4AQB.

Bury (BRS)—The new larger edition of *Feedback*, free to members every other month, is certainly doing a great job because of the wealth of information for club members. It means quite a lot of work for the two editors. The G3VVQ trophy was presented at the March meeting by the late G3VVQ's daughter to the member who in the club's estimation has done most for the club in that year (picked by club voting). It was presented to G4BVE, the ever-popular secretary. Well done, John! At the June meeting there will be a 5min lecture competition. Main meeting on second Tuesday in each month, RAE classes and morse instruction every Tuesday as well as an informal meeting of club members. Mosses Community Centre, Cecil Street, Bury. Sec G4BVE, tel 061-764 3466.

Carlisle (C&DARS)—Mondays, 7.30pm. Currock House, Lediard Avenue, Currock, Carlisle. A very full programme of lectures and demonstrations has been arranged for the coming months. Full details from G8DVD.

Chester (C&DARS)—Tuesdays, 8pm, except first Tuesday in month. YMCA, Chester. Full details from GW8DMR.

Douglas IoM (IoM ARS)—Mondays fortnightly, Highlander Inn, Crosby. Visitors welcome. Sec GD2HDZ, tel Laxey 465.

The G3VVQ Trophy being presented to John Clifford, G4BVE, by the late G3VVQ's daughter. It is awarded to the member of the Bury Radio Society who has done most for the society during the past year. In the background is Mike Horrocks, G8GTP, society chairman

The new area representative for the Isle of Man is GD3KGC, Plot 19, Howe Road, Onchan.

Eccles (E&DARC)—Tuesdays, 8pm. Bridgwater School, Worsley, Manchester. Club 2m net, 11am Sundays on 145·66MHz. All visitors and prospective members welcome. Sec G4AEQ.

Lancaster University (UoLARS)—Wednesdays, 7pm. Furness College. RAE and morse classes. The society is active on the hf bands and 2m using G3ZBY and G8DOU. Skeds and visits welcomed; enquiries please to Colin Pegrum, Department of Physics. Local members are asked to look out for the Lancaster net on 3·71MHz at 1900gmt every Friday. Further details may be obtained from G2FAS.

Leyland (LHARG)—Second Monday in each month, 7.30pm. "Rose & Crown", Ulnes Walton, Leyland. Details from G3XII.

Liverpool (L&DARS)—Tuesdays, 8pm. Conservative Association Rooms, Church Road, Wavertree. Sec G3WCS.

Liverpool (North Liverpool RC)—Tuesdays, 8.30pm. Informal meetings. "Nags Head", Thornton, Crosby, Liverpool 23. Visitors welcome. Sec R. B. Porter, 11 Cranmore Avenue, Crosby, Liverpool L23 0QD.

Liverpool University (UoLARS)—Details of meetings from J. M. Pagett, G8IAV, c/o The Students Union.

Manchester (M&DARS)—Wednesdays, 7.30pm. 203 Droylesden Road, Newton Heath, Manchester 10. Sec G8IYX.

Manchester (South Manchester RC)—7 May (Review of club activities), 14 May (AGM), 21 May (Direction finding contest), 28 May (Visit to GMC Fire Service), 4 June ("Repeaters" by G3FMT), 11 June (Trip to ITA tx, Winter Hill—club members only), 18 June (Visit by G2AMV), 25 June ("Industrial hazards" by G3VIW). Fridays, 8pm. Sale Moor Community Centre, Norris Road, Sale, Cheshire. Morse practice precedes the lectures. Visitors are welcome. Sec G8GDM.

Manchester University (MUARS—G3VUM). Interested parties should contact G4AOS, QTHR.

University of Manchester (UoM—IoS&TARS)—G3CXX is active on all hf bands and G8FOT on 2m and perhaps 23cm. Items for club magazine/newsletter, or letters from intending members gratefully received by G8GOS.

North Western Repeater Group—Third Thursday of each month, 8pm. 'Grey Mare", Blackburn. Meetings open to all interested. Full details from G8HQW.

Preston (PARS)—6, 20 May, 3, 17 June. Morse practice 7.30pm, main meeting 8pm. "Windsor Castle", (private room), St Paul's Square, Preston. Please note that new sec is G8KTM, 9 Ratten Lane, Hutton, Preston.

Salford (Dial House RS)—Wednesdays, 5.30–9.30pm. Dial House, W45, 55 Portland Street, Manchester M60 1BA. Net channel 145·25MHz a.m.—most members are now mobile on this channel, and the club station G3WDH now monitors this frequency every club night for calls from any other station. Sec G8JCN.

Stockport (SRS)—Second and fourth Wednesdays in each month, 8pm. Blossoms Hotel, Buxton Road, Stockport. Sec G3FYE.

Thornton Cleveleys (TCARS)—First and third Wednesdays in each month, 8pm, morse practice from 7.30pm. St John Ambulance Hall, Fleetwood Road North (next to "Gardener's Arms"), Thornton. Details from sec G8OY.

UK FM Group (Western)—17 May (Meeting at the Wirral Mercury Motor Inn, Backford Cross, Chester, 7.30pm), 30 May (2m fox hunt). Monday net nights figures 145·600MHz, 9.30pm. Further details from sec G3LEQ, tel Knutsford 4040.

Warrington (W&DARS)—Tuesdays, 7.45pm. Grappenhall Community Centre, Bellhouse Lane, Grappenhall. Sec J. Weaver, c/o Grappenhall Community Centre.

Wigan (W&DARS)—First and third Wednesdays of each month. Poolstock Cricket Club, Keats Avenue, Poolstock. Sec A. Cunliffe, G4EII, 50 Langholm Road, Garswood, Wigan.

Winsford (Mid-Cheshire ARC)—Wednesdays. Technical Activities Centre, rear of Verdin Buildings, Verdin Comprehensive School, Grange Lane, Winsford. RAE class 7pm to 8pm. Morse class every third Wednesday. Net nights 160m Mondays, 8pm, 2m (fm) Tuesdays, 8pm. Sec G8HAV.

Wirral (WARS)—First and third Wednesdays in each month, 7.45pm. Sports and Recreation Centre, Grange Road West, Claughton, Birkenhead. Sec G3DLF.

Merseyside members meet for lunch on the first Monday in every month. Please obtain details and book beforehand with G3VQT or G2AMV.

The Region 1 VH1 contest is being held on Sunday 20 June. Details from G2CUZ or G2AMV.

REGION 2—RR R. C. Andreang, G4CMT, 6 Beech Avenue, Bilton, Hull, North Humberside.

Barnsley (B&DARS)—Fourth Friday in each month, 7.30pm. King George Hotel, Peel Street, Barnsley. Hon sec G3LRP.

Halifax (Northern Heights ARS)—7.45pm. Peat Pitts Inn, Ogden, Halifax (four miles north of Halifax Town Hall). Hon sec G3MDW.

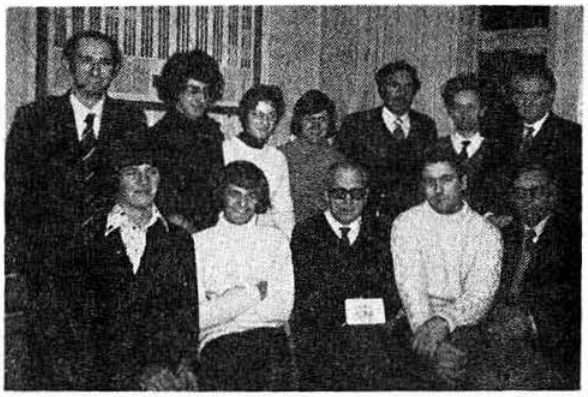
Hull (H & D ARS)—Fridays, 7.30pm. 592 Hessle Road, Hull (nr flyover). Our third mobile rally plans are now being finalized. Same venue—College of Agriculture, Bishop Burton, Beverley. Attractions for the whole family. Organizer, G3AGX.

Leeds (White Rose RS)—Wednesdays, 7.30pm (lectures start 8pm). 83 Town Street, Armley, Leeds. There is a current programme of operating activity sessions. New members and visitors welcome. Hon sec G3VTY.

Scarborough (SARS)—Fridays, 7.30pm. Scarborough Technical College, Corby Road, Scarborough. Local and visiting amateurs most welcome. Holiday visitors write to hon sec Charles Whitaker, 1 Rye Field Close, Eastfield, Scarborough, who will arrange visits to local amateur stations.

Sheffield (SU & PRS)—Thursdays during term time, 5.30pm. "The Phoenix", Charles Street. Details from A. Marvin, G8CZO, 74 Kirkstone Road, Sheffield S6 2PP.

York (YARS)—Fridays, 7.30pm (except for the third Friday in the month). United Services Clubroom, 61 Micklegate. 5 & 12 May (Visits to GPO sorting office), 3 July (Special station GB2JRS operational from Joseph Rowntree School, New Earswick). Hon sec G3WVO.



Members of the Rugby Amateur Transmitting Society which celebrated the 50th year of operation of Rugby Radio, GBR, by running special event station GB3GBR in January. Back row (l to r) G8EYY, G8KQU, Anita, Steve, G4ECO, G8DLX, G3CYH; front row (l to r) G8KUR, Simon, G3GG, G3NDM, G4DDW

REGION 3—RR H. S. Pinchin, G3VPE, 61 Cole Bank Road, Hall Green, Birmingham B28 8EZ.

Birmingham (Midland ARS)—18 May ("The Post Office radiophone system" by Clive Burton, G8ELO), 15 June (Surplus sale). 8pm. The Birmingham and Midland Institute, Margaret Street, Birmingham. G3ZKQ.

Birmingham (Slade R&SS)—14, 28 May, 11, 25 June. 8pm. The Committee Room, Church House, Erdington, Birmingham. G8GRC.

Birmingham (South Birmingham RS)—5 May ("The motorway control centre" by West Midlands Police), 2 June (Surplus sale). 8pm. Hampstead House, Fairfax Road, West Heath, Birmingham B31 3QY. G8GDZ.

Birmingham (Birmingham University RS)—Every Tuesday during term, 7.30pm. Students' Union. G3IUB, QTHR. Sec G4BVF.

Bromsgrove (B&DARC)—14 May ("Dowsing—water/electricity"), 12/13 June (HF NFD at Signet Fields Farm), 11 June ("VHF aerials"). 19 June (Demonstration station at Catshill School), 3 July (GB2BRC at Saunders Park). Meetings 8pm. Avoncroft Art Centre, Bromsgrove. G8JTK.

Coventry (CARS)—Fridays, 8pm. Baden Powell House, St Nicholas Street, Radford, Coventry. G8DMI.

Coventry Technical College (CTCARS)—Mondays, 7pm. Morse classes and rtty included in club activities. Winfray Annexe of the College. G8ISJ.

Dudley (DARC)—Second and fourth Tuesdays in each month. 7.45pm. Central Library, Dudley. G4BFT.

Hereford (HARS)—First and third Fridays in each month. Civil Defence HQ, Gaol Street, Hereford. G4CNY.

Lichfield (LARS)—First Monday and third Tuesday in each month. 8pm. Swan Hotel. Tuesday meetings are natternites. Sunday net 1200 bst, 21·150MHz. G3NLY.

Lichfield (Chad RC)—Meetings fortnightly commencing 6 May at Swan Hotel. G4ESK/G8FBL.

Mid-Warwickshire (MWARS)—First and third Mondays in each month. 8pm. 61 Emscote Road, Warwick. G8CXL.

Redditch (RRC)—Second and fourth Thursday in each month. 8pm. The Old People's Centre, Park Road, Redditch. G3EVT.

Solihull (SARS)—18 May ("Practical demonstrations of eliminating tvi" by Fred Ward, G2CVV), 12/13 June (Club station at Scout Hut, Brackleys Way), 15 June. 7.30pm. The Manor House, High Street, Solihull. G4AXW.

Stoke-on-Trent (S-on-TARS)—Thursdays, 7.30pm. 2A Racecourse Road, Oakhill, Stoke-on-Trent. G4CWN.

Stoke-on-Trent (North Staffs ARS)—Mondays, 7.30pm. Lectures, natter-nites, hf and vhf stations. Harold Clowes Community Centre. Bentilee, Stoke-on-Trent. G8KVM.

Stourbridge (S&DARS)—4 May, 1 June, 6 July (Informals, 9pm, at "Shrubbery Cottage" public house, Heath Lane, Stourbridge), 17 May, 21 June. 7.45pm. Longlands School, Brook Street, Stourbridge. G4CLX.

Sutton Coldfield (SCRS)—10 May (Demonstration—scout communications caravan, by G8ALO), 24 May ("Spectrum analysis" by G3MNV), 14 June ("Construction of radio equipment in prisoner of war camps" by Tom Douglas, G3BA), 28 June (VHF twiddle evening). 7.30pm. Central Youth HQ, Clifton Road, Sutton Coldfield. Sec Norman Sanderson, 130 Willmott Road, Sutton Coldfield B75 5NW.

Telford (T&DARS)—Wednesdays, 7.30pm. Phoenix Centre, Webb Crescent, Dawley. G4AXZ.

Wolverhampton (WARS)—3 May (Home-built equipment competition), 10 May (Natter-nite), 17 May ("SSB for commercial radio telephones" by G6GR), 7 June (Post Office films), 14 June (Natternite), 21 June (Surplus sale), 5 July ("Repeaters" by G3PWJ). 8pm. Neachells Cottage, Danescourt Road, Stockwell End, Tettenhall, Wolverhampton WV9 9PH. G8BSR.

Worcester (W&DARC)—3 May ("Interference and the Post Office" by Mr A. Pidgeon, PO Radio Protection Service), 15 May, 7 June (HF NFD arrangements), 12/13 June (HF NFD), 19 June (Upton radio rally arrangements), 4 July (Upton radio rally), 5 July (Ragchew evening). 8pm. The Old Pheasant, New Street, Worcester. G4BXS.

REGION 4—RR T. Darn, G3FGY, Sandham Lane, Ripley, Derbys.

Derby (D&DARS)—5 May (Surplus sale), 12 May (Open evening), 19 May (Direction finding), 26 May (Technical topics), 2 June (Surplus sale), 5 June (Summer dinner and dance, Regency Rooms, Ilkeston), 9 June (Open evening), 16 June (Direction finding), 23, 30 June (To be arranged). 7.30pm. 119 Green Lane, Derby. RSGB visitors to Derby are welcome at all meetings. G2CVV.

Derby (NHCAARG)—Fridays, 7.45pm. Nunsfield House, Boulton Lane, Alvaston, Derby. G4CTZ.

Leicester (LRS)—Monday evenings. Gilroes Estate Cottage, Groby Road, Leicester. Morse practice 8–8.30pm. G3TQF.

Mansfield (MARS)—First Friday in each month, 7.45pm. The New Inn, Westgate, Mansfield. G3XWZ.

Melton Mowbray (MMARS)—21 May, 18 June (Yet to be finalized, but G3NVK will be pleased to inform you of arrangements). St John Ambulance Hall, Asfordby Hill, Melton Mowbray.

Nottingham (ARCoN)—6 May (Forum), 13 May (Visit by G3RJV, sec of the QRP Club), 20 May (Activity night), 27 May (RSGB tape lecture). 7.30pm. Sherwood Community Centre, Woodthorpe House, Mansfield Road, Nottingham. G4EKW.

Nottingham (UoNRS)—The University of Nottingham RS is active at present with the calls G3UNU and G8FNU. Alternate Thursdays from 6 May onwards. Details from A. M. Jackson, c/o the Union.

REGION 5—RR P. F. Chilcott, G4BBA, 258 Coneygree Road, Peterborough PE2 8LR.

Bedford (B&DARC)—6 May (Texas Insts speaker), 13 May (Tape/slides, "Aerials"), 20 May (70cm mobile), 27 May ("Simple 2m tx" by G3YUQ), 3 June ("Keyboard morse" by G8LHJ), 10 June (VHF

Members of the Stamford & D ARS at their annual dinner on 17 December. With them is their patron, Miss Jennifer Bate, the celebrated organist

NFD plans), 17 June (Tape/slides, "Oscar 7"), 24 June (Final VHF NFD plans). Thursdays, 8pm. United Services Club, The Broadway. Sec G8FMG.

Cambridge (C&DARC)—Fridays, 7.30pm. Corporation Yard, Victoria Road. Sec G3YRZ.

Dunstable (DDRC)—7 May (160m df hunt), 14 May (Eyeball QSOs), 21 May (Junior members' talk), 28 May (Natter-nite), 4 June (Junk sale), 11 June (Members old and new), 18 June (2m ssb df hunt), 25 June (Country pub night). Fridays, 8pm. Chews House, 77 High Street South. Sec G3WXS.

March (M&DRAS)—Tuesdays, 7.30pm. 2 Grays Lane. Sec G8GNE.

Northampton (NRC)—20 May (Contest talk by G8GHZ/G3XTT), 27 May ("SSB generation and power measurement" by G4DAW). Thursdays, 8pm. Spencer Dallington Community Centre. Sec G8GHZ.

Peterborough (GPARC)—27 May (Mags and cats), 24 June (VHF NFD plans). 7.30pm. Southfield Infants' School. Details from G4BBA, tel 65213.

Peterborough (PR&ES)—21 May (DF hunt), 18 June (Club's 30th birthday celebrations, social evening with music and dancing). 7.30pm. Scout Hut, Occupation Road, off Lincoln Road. Sec is now L. Critchley, G3EEL.

Shefford (S&DARS)—Thursdays, 8pm. Church Hall. Sec G3TAZ.

REGION 6—RR D. C. Andrews, G4CWB, 63 Bulmershe Rd, Reading, Berks RG1 5RH.

Banbury (BARS)—Fridays, 7.30pm. 43 North Bar, Banbury. New members and visitors welcome. Details from sec G3LTN, tel Banbury 710623.

Bracknell (BARC)—First and third Mondays in each month (other Mondays morse evenings). Cooper's Hill Centre, near railway station. Sec G3YMC.

Maidenhead (M&DARC)—6 May ("The work of BREMA" by Ray Laxton), 18 May (HF NFD preparation). 7.30pm. The British Red Cross Hall, The Crescent, Maidenhead. Sec G4ALG.

Milton Keynes (MK&DRS)—Second Monday in each month, 8pm. Lovatt Hall, Silver Street, Newport Pagnell. Details from sec G8JYW, YMCA, 4 Cheyne Walk, Northampton.

Newbury (N&DARS)—First Monday in each month, 7.30pm. Newbury College of Further Education, Oxford Road, Newbury. Everyone most welcome. Sec G4EFE, tel 0635 45747.

Reading (RARC)—First and third Tuesdays in each month, 8pm. "White Horse", Emmer Green, Caversham, Reading. Details from sec G4CCC.

REGION 7—RR R. S. Hewes, G3TDR, 24 Brightside Avenue, Laleham, Staines, Middx.

Addiscombe (AARC)—Tuesdays, 9pm. "Spread Eagle", Portland Road, South Norwood. Sec G4CZB.

Ashford, Middlesex (Echelford ARS)—10, 27 May; 14, 24 June. 7.30 for 8pm. St Martin's Court, Kingston Crescent, Ashford. Visitors welcome. Sec G3TDR, tel Staines 56513.

Bexley Heath (North Kent RS)—13 May (AGM), 10 June (To be announced), 27 May, 24 June (Natternites). 8pm. St Mary's Institute, 2 North Cray Road, Bexley. Sec G4ARQ.

Coulsdon (CATS)—First Thursday in each month, 8pm. 10th Purley Scout HQ (opposite Rickman Hill), Chipstead Valley Road, Coulsdon, Surrey. Sec G8KMJ.

Cray Valley (CVRS)—6 May ("Ceefax" by J. P. Chambers of BBC), 20 May (Natternite), 3 June ("Early days" by A. O. Milne, G2MI), 17 June (Natternite). 8pm. Eltham United Reformed Church Hall, 1 Court Road, London SE9. Sec G3YWO.

Croydon (Surrey Radio Contact Club)—Third Tuesday in each month. 7.30 for 8pm. "The Ship Inn", Croydon, Surrey. Sec G3FWR, tel 01-657 3258.

Crystal Palace (CP&DRC)—15 May (To be confirmed), 19 June ("Aurora" by G2FKZ). 8pm. Emmanuel Church Hall, Barry Road, London SE22. Sec G4AVV.

Guildford (G&DRS)—Second and fourth Fridays in each month, 8pm. Model Engineering HQ, Stoke Park, Guildford, Surrey. Sec G3SYM.

Kingston (K&DARS)—12 May (Junk sale), 9 June (To be announced). 8pm. Tolworth Scout Hut, Stirling Walk, Raeburn Avenue, Surbiton, Surrey. PRO G8HVW.

New Cross (Clifton ARS)—Fridays, 8pm. 225 New Cross Road, London SE19. Details from sec R. A. Hinton, 58 Camilla Road, Bermondsey SE16.

Reigate (RATS)—4 May, 1 June (Natternites). 8.30pm. "Marquis of Granby", Hooley Lane, Redhill. 18 May, 22 June. St Mark's Church Hall, Alma Road, Reigate. Sec G3RIN, tel Reigate 47659.

Sutton and Cheam (SCRS)—18 May (HF and VHF NFD discussion), 22 June (To be announced). 7.30pm. Sutton College of Liberal Arts, Cheam Road, Sutton. Sec G4BOX.

Thames Ditton (Thames Valley ARTS)—4 May (Judging of the "Caernarvon Trophy" for home-made gear, monthly morse practice), 1 June (Discussions on HF NFD, monthly morse practice). 8pm. At new venue: The Conference Room, Giggs Hill Green Library, Thames Ditton. Sec G3ZNW.

Wimbledon (W&DRS)—Second and last Fridays in each month, 8pm. St John Ambulance HQ. 124 Kingston Road, Wimbledon SW19. Sec G3XTC, tel 01-664 3698.

REGION 8—RR D. N. T. Williams, G3MDO, "Seletar", New House Lane, Thanington, Canterbury, Kent.

Burgess Hill (Mid-Sussex ARS)—Meetings held at Marle Place, Burgess Hill. Details from G3RXJ.

Canterbury (East Kent RS)—6 May (Visit to North Foreland), 3 June ("SSTV" by G3VID). Details from G8GHH.

Chichester (C&DARC)—First Tuesday and third Thursday in each month. Lancastrian School, Basin Road, Chichester. Details from G8EPJ, tel 0234 88069.

This photograph, taken at the Sutton and Cheam RS 28th annual dinner, shows (r to l) Victor Brand, G3JNB (chairman, Thames Valley ARTS); Jack Korndorffer, G2DMR, (chairman, Sutton & Cheam RS); Allan Keech, G4BOX (hon sec, Sutton & Cheam RS); "Mic" Mitchell, G8DF; Ron McDonald, G3DCZ (vice-chairman, Sutton & Cheam RS); John Allaway, G3FKM (President, RSGB); "Roddy" Clews, G3CDK; Bob Tillin, G3MES (president, Sutton & Cheam RS); Jeff Bowden, G3YVR (chairman, Crawley ARS); Les Seaton, G3HSK; John Graham, G3TR (president, Crawley ARS; and past-president, RSGB); Seated: Alan Meers, G8SM (president, Thames Valley ARTS); Roy Scott, G2CZH

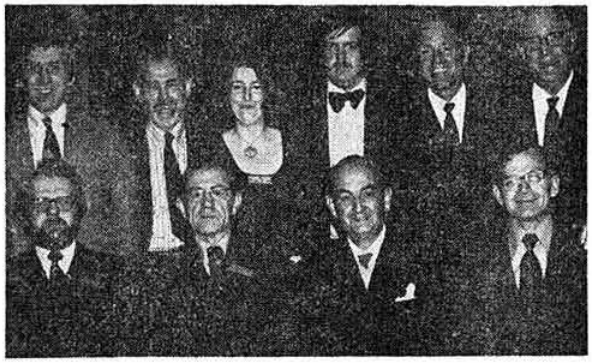
Crawley (CARC)—United Reform Church Hall, Ifield, Crawley. Details from G3MGL.
Dartford (DHDFC)—Details of meeting from G4CVC.
Dover (South-east Kent YMCAARC)—First and third Wednesdays in each month. All meetings in three parts: (1) morse tuition; (2) talk/demo; (3) practical. The shack is open to all members any evening 7-10pm. Details from G8DRS.
Eastbourne (Southdown ARS)—3 May ("IARU/RSGB/YOU/THEM" by D. Andrews, G3MXJ), 7 June ("Bring your thing" construction contest). Victoria Hotel, Latimer Road, Eastbourne. Details from G3LFZ.
Horsham (HARC)—First Wednesday in each month. Civil Defence HQ, Moons Lane, Brighton Road, Horsham. Details from G3NPF.
Maidstone (MYMCAARS)—"Y" Sports Centre, Maidstone. First and third Fridays devoted to the beginner.
Medway (MARTS)—Fridays, 7.30pm. "Aurora Hotel", Gillingham. Details from G3XZS.
Worthing (W&DARC)—22 June (Club mobile evening rally). Adult Education Centre, Union Place, Worthing. Details from G3LQI.

REGION 9—RR H. W. Leonard, G4UZ, 4 Start Bay Park, Strete, Dartmouth TQ6 0RY.

Camborne (Cornish RAC)—First Thursday in each month, 7.30pm. SWEB Clubroom, Pool, Camborne. Cornish net every Sunday, 11am on 3·685MHz. Details from G3NKE, tel Camborne 2419.
Exeter (EARS)—Second Monday in each month, 7.45pm. Coombe House, Coombe Street, Exeter. Details from sec Jack Bawden, 232 Exwick Road, Exeter EX4 2BA.
Newquay (N&DARS)—Alternate Wednesdays, 7.45pm. Treviglas School, Newquay. Details from G8GOR, tel Newquay 4168.
North Devon (NDRC)—Second and fourth Wednesdays in each month. Meetings held alternately at G4CG and G2FKO. Details from G4CG.
Plymouth (PRC)—First and third Tuesdays in each month, 7.30pm. Virginia House, Bretonside, Plymouth. Visitors always welcome. Sec G8JES, 36 Higher Mowles, Higher Compton, Plymouth PL3 6NE.
Saltash (S&DARC)—First and third Fridays in each month, 7.30pm. Burraton Toc-H Hall, Saltash. G4DHA.
Torbay (TARS)—29 May (Final NFD preparations). Tuesdays (RAE night), Fridays (General club night), and special meeting on last Saturday of each month. 7.30pm. Rear of 94 Belgrave Road, Torquay. Visitors always welcome. G3UIQ.

REGION 10—RR R. G. Barrett, GW8HEZ, 23 Carshalton Road, Beddau, Pontypridd, Glam.

Barry (BCoFRS)—Thursdays, 8pm. Barry Rugby Football Club, Reservoir Road, Barry. Details from sec GW3VBP.
Blackwood (BARS)—Fridays, 7pm. Oakdale Community Centre, Oakdale, Nr Blackwood. Details from sec GW3KYA.
Bridgend (Glamorgan VHF/UHF Group)—18 May ("Wales Gas telecomms" by GWFKO), 15 June ("Marine comms" by GW3GDO). 7.30pm. NCB Social Club, Tonddu, nr Bridgend. Details from GW8HEZ, QTHR.
Cardiff (CRSGBG)—10 May ("Homebrew ssb tx" by GW3ATM), 14 June (Surplus sale). 7.30pm. BBC Social Club, Llandaff, Cardiff. Details from sec GW3VOW, QTHR.
Merthyr (Hoover ARS)—Mondays, 7.30pm. Hoover Social Club, Pentrebach, Merthyr. Details from sec GW8HHY, QTHR.
Pembroke (PRSGBG)—28 May ("Computer memories" by GW8GKU), 25 June ("Colour tv" by GW8GKU). Defensible Barracks, Pembroke Dock. Details from GW3XJQ.
Pontypool (PRSGBG)—Tuesdays, 7pm. Educational Settlement, Park Hill Road, Pontypool. Details from GW3JBH.
Port Talbot (British Steel Corporation ARS)—Thursdays, 7.30pm. BSC Sports and Social Club, Margam. Details from GW3ACF.
Rhondda (RARS)—Every other Thursday, 7.20pm. Transport Employee's Club, Porth. Details from GW3PHH.
Sully (S&DSWC)—Tuesdays, 7pm. Sully Bowls & Social Club, 59 South Road, Sully. Details from GW8JHF.
Swansea (SARC)—Tuesdays fortnightly, 7.30pm. The Commercial Inn, Killay. Details from sec GW4AYJ.



The committee of the Torbay ARS at the society's annual dinner. Back row (l to r) R. Snowden, G3JTJ; Bob Barton, G3PQH; Jed Coker, librarian; J. Coker, G8GCS; D. Webber, G3LHJ, contest manager; L. H. Webber, PRO; front row (l to r) M. Yalis, G3UIQ, secretary; F. Bolton, G3VTQ, chairman; L Mays, G2CWR, president; R. Luscombe, treasurer

REGION 12—RR Frank Hall, GM8BZX, 45 Priory Cottages, Lunanhead, Forfar, Angus DD8 3NR.

Aberdeen (ARS)—Friday evenings. Clubrooms, rear of 91 Crown Street, Aberdeen. Closing date for the annual building competition is 7 May. Rules as previous years. First prize £10, second prize £5, third prize £2. Have a go, you have nothing to lose. Sec GM4BKV.

Dundee (Kingsway Technical College ARC)—Wednesdays, 6.30pm. Kingsway Technical College. Sec Robert Officer, 23 Sherbrook Place, Dundee.

Inverness (Queen's Own Cameron Highlanders Memorial Youth Club, Radio Section)—Sec W. M. Begg, 68 Tomnahurich Street, Inverness.

Lerwick (RC)—Wednesday evenings. Annsbrae House, Lerwick. Sec GM3HTH.

The nomination for GM3ZDH as Highlands area representative is now at RSGB HQ. A representative is still required for the Islands area. Any offers, please, to GM8BZX.

Club secretaries please note that information and news is required for this column.

REGION 13—RR Rev S. J. Smith, GM4DNM, St Ninian's, 6 Derran Drive, Cardenden, Fife KY5 0JG.

Berwick (BARS)—Last Sunday in each month, 7pm. Tweed View Hotel. Further details from GM8IIO.

Dunfermline (DARS)—Second Wednesday in each month, 7pm. CCTV Studios, Pittencrieff School, Maitland Street, Dunfermline. Further details from GM8HEY.

Edinburgh (Lothians RS)—13 May (Surplus junk sale), 27 May (Talk by GM3UM), 30 May (DF treasure hunt), 10 June (AGM), 26 June (Review and forward planning). Adult Education Centre, Riddles Court, High Street. Sec GM8BJF.

Edinburgh (Pioneer Club)—Tuesdays, 7.30pm. Church Hall, Ravenscroft Place, Gilmerton. Further details from GM4BWT.

Glenrothes (G&DARC)—6 June (Final NFD and VHF NFD preparations), 12/13 June (NFD), 3/4 July (VHF NFD), 11 July (Film, "Tale of a tower"). 7.30pm. Old Nursery Buildings, Leslie, Fife. Sec GM3YOR.

St Andrews University (UStAARS)—Details from GM4BGA, Dept of Physics, North Haugh, St Andrews.

REGION 14—RR A. J. Mitchell, GM3UDL, 7 Limetree Crescent, Newton Mearns, Glasgow G77 5BJ.

Ardeer (ARCARS)—Thursdays, 7.30pm. Ardeer Recreation Club, Stevenston, Ayrshire. Details from GM8BOM.

Ayr (ARG)—Every second Sunday evening. Community Leisure Centre, 24 Wellington Square, Ayr. Details from GM3THI.

Falkirk (F&DRSGBG)—Temperance Cafe, Lint Riggs, Falkirk. Details from GM3OQI.

Glasgow (West of Scotland ARS)—Fridays, 7.30pm. 22 Robertson Street. Programme and other details from hon sec G. Milne, GM4BLO.

Greenock (G&DARC)—Tuesdays and Fridays, 7.30pm. 22 Inverkip Street, Greenock. Details from GM3LYI.

Motherwell (Mid-Lanark ARS)—Fridays, with alternate meetings informal. Morse classes every other Friday. Wrangholm Hall Community Centre, Jerviston Street. Further details from GM3KMG, tel Hamilton 28759.

REGION 15—RR H. J. Campbell, GI8FOK, 26 Kilcoole Park, Belfast BT14 8LB.

Ballymena (BRC)—Tuesdays, 8pm. 86 Old Cullybackey Road, Ballymena. RAE and morse classes. Fridays, club night; Sundays, special projects, 3pm.

Bangor (B&DARS)—7 May (Film, "Coastguard Service at work"), 20 June (Annual mobile rally, Castlewellan Forest Park). 8pm. Redcliff Hotel, Seacliff Road, Bangor. Visitors welcome. Hon sec D. Steele, GI4EMS, 59 Donaghadee Road, Millisle, Co Down.

Belfast (QUoBRC)—Tuesdays, 8pm. Queen's University Radio Club, 37 Fitzwilliam Street, Belfast. All welcome.

Belfast (CoBYMCARC)—The club celebrates the golden jubilee of its callsign GI6YM during May. The call was issued on 12 May 1926. The club is active on the air from 7.30pm on Tuesdays, from 2.30pm on Saturdays, and all day on 12 May. A special QSL will be issued as well as a commemorative certificate for members and former members of the club.

Belfast (BRSGBG)—Third Wednesday in each month, 8pm. 90 Belmont Road, Belfast. In connection with the Belfast Festival the special callsign GB3BEL will be active throughout the entire month of May. A special QSL will be sent to all stations. It is hoped that RSGB President Dr John Allaway, G3FKM, will visit the region during this time. For further details contact GI8FOK.

Mid-Ulster RSGB Group—First Sunday in each month, 3pm. At QTH of GI4BAC. Full interesting programme arranged. Hon sec M. Anderson, 32 Knockview Drive, Tandragee, Craigavon, Co Armagh.

North Ulster (NURSGBG)—Details from GI8AYZ.

REGION 16—RR R. E. G. Kendall, G8BNE, "Wesley", Ranworth Road, Hemblington Corner, Blofield, Norwich NR13 4PJ.

Chelmsford (CARS)—First Tuesday in each month, 7.30pm. Marconi College, Arbour Lane, Chelmsford. Details from B. G. Tew, G3WFF, 334 Gloucester Avenue, Chelmsford.

Colchester (CRA)—5 May (Club night), 12 May (Visit to Harwich Docks communications centre), 19 May (Club night), 26 May (Visit to Hospital Radio, Colchester), 9 June (NFD last minute preparations), 16 June (Social and barbecue with YLs and XYLs), 23 June (Club night). 7.30pm. Stanway School, Colchester. Sec T. A. Mills, G3YAI, 75 Lymington Avenue, Clacton-on-Sea.

Great Yarmouth (GYRS)—Last Thursday in each month. 67 Southdown Road, Great Yarmouth. Details from G3NHU.

Harlow (H&DRS)—Tuesdays, 8pm. Mark Hall Barn, First Avenue, Harlow, Essex. Details from G3WUX.

Ipswich (IRC)—Details from J. Gee, G4BAV, 35 Neath Drive, Stoke Park, Ipswich.

Loughton (L&DRS)—Second and fourth Fridays in each month, 8pm. Loughton Hall, near Debden Station. Sec G4CMD.

Lowestoft (L&DARC)—Twice weekly, 7.30pm. YMCA, Park Road, Lowestoft. Details from G4AJO.

Martlesham (MRS)—Details from G. Murchie, G8AXU, Post Office Research Centre, Martlesham.

Norwich (Norfolk ARC)—Wednesdays, 7.45pm. Crome Community Centre, Telegraph Lane East, Norwich. Details from G4EOL.

Norwich (U of East Anglia R&EC)—Details from P. Gowen, G3IOR.

Southend (S&DRS)—Alternate Fridays. Technical College, London Road, Southend-on-Sea. Details from G3AXN, 3 Sasson Way, Maldon.

Stowmarket (S&DARS)—Details from sec K. J. Bertrard, 35 Curwen Road, Stowmarket.

Vange (VARS)—Thursdays, 8pm. Youth Hall, Barstable Tenants Community Association, Long Riding, Basildon. Details from Mrs D. Thompson, 10 Feering Row, Basildon SS14 1TE.

REGION 17—RR L. Hawkyard, G5HD, 100 Shirley High Street, Southampton, Hants.

Basingstoke (BARC)—First Saturday and third Wednesday in each month, 7.30pm. Chineham House, Popley, Basingstoke. Sec G3CBU.

Basingstoke (UKFM Group, Southern)—5 May (Evening visit to Douai School, Woolhampton, Berks), 2 June ("Early days of radio" by Ken Alford, G2DX), 8pm. Chineham House, Popley, Basingstoke. Sec Mrs J. Payne (xyl of G3ZRM), tel Aldershot 26108.

Bournemouth (Wessex ARG)—First Tuesday in each month 7.30pm. Portman Hotel, Ashley Road, Boscombe. Sec G8BBN.

Chippenham (C&DARC)—Tuesdays, 7.30pm. The Boys High School, Hardenhuish Lane, Chippenham. G3UFN.

Fareham (F&DARC)—Wednesdays, 7.30pm. Porchester Community Centre, Room 9. G8FFI.

Farnborough (F&DRS)—Second and fourth Wednesdays in each month, 7.30pm. Railway Enthusiasts' Club, Access Road, off Hawley Lane, Farnborough. Sec G8KUY.

Guernsey (GRES)—Tuesdays, 8pm. The Lodge, La Corbinerie Oberlands, St Martin's, Guernsey.

Horndean (H&DARC)—Second Thursday in each month, 7.30pm. Merchiston Hall, Horndean. Net Sundays 6.30pm. 21·40MHz. Sec G4CHO.

Jersey (JARS)—Sundays, 1030am, and Fridays, 8pm. Le Hocq Tower, St Clement, Jersey. Sec Mary McTaggart, 19 Parade Road, St Helier.

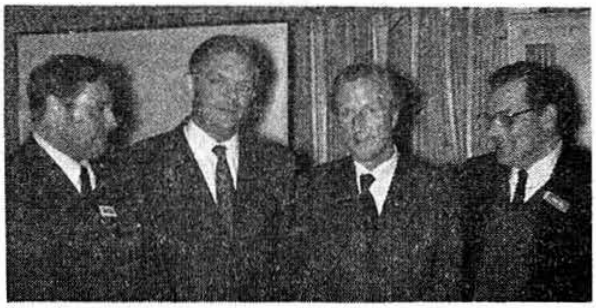
Portsmouth (P&DRC)—Wednesdays, 7.30pm. Portsmouth Community Centre, Malins Road, Buckland, Portsmouth. G3CNO.

Salisbury (SR&ES)—Tuesdays, 7.30pm. Salisbury Activity Centre, Wilton Road. Sec G2FIX.

Southampton University (SUARC)—Tuesday evenings, also informal meetings every lunchtime in the clubroom, Old Union Building. The club celebrates its 21st birthday in September and a reunion is planned. Ex-members are asked to contact sec T. Williams, G3YOZ.
Southampton (SRSGBG)—Second Saturday in each month, Lanchester Building, Southampton University; Wednesdays, the clubroom, Kent Road; both at 7.30pm. AR G4COM.
South Dorset (SDRS)—First Tuesday in each month, 7.30pm. Lecture Hall, S Dorset Technical College, Newstead Road, Weymouth. G3WAO.
Swindon (SD&ARC)—5, 19 May and alternate Wednesdays, 7.45pm. Clubroom above Coldharbour Public House, Blunsdon, just north of Swindon. Sec G8KWC.
West Dorset (WDARG)—First Friday in each month, 8pm. British Legion Club Hall, Dorchester. Sec G8GHU.
Winchester (WARC)—First and third Fridays in each month, 7.30pm. Antrim House, St Cross Road, Winchester. G4BKE.

REGION 18—RR P. J. Fay, G3AKG, 5 Harland Way, The Glebe, Washington, Tyne & Wear NE38 7RB.

Easington (AR&EC)—Tuesdays and Thursdays, 7.30pm. Easington Village Workmen's Club (3 minutes from A19). CW practice, 80 and 160m operation. ATV can be received on 405 lines. RAE instruction if required. Club engaged in Washington Old Hall project at present. Sec G3VSS.
Middlesbrough (PORC)—Sec G8CDP, 200 Marton Road, Middlesbrough.
Morpeth (Northumbria RC)—Thursdays, 7.30pm. Old Wheatsheaf Yard, Morpeth. (Ashington HS lectures have now been discontinued.) Club entertained RSGB President Dr E. J. Allaway, G3FKM, together with John Blazey, G3HCT, at the Marksworth Hotel on 5 March. Particular interest in the 1979 conference was shown by the large crowd of members and non-members present, the implications were well explained by Dr Allaway. After the slide lecture by G3HCT it is felt that local amateurs will be well represented in the Bermuda Contest in future. Please note that G8GVN is the new vice-chairman, and the new secretary is Mr R. J. Thompson, G4AVO.



Dr E. J. Allaway, G3FKM, RSGB President, attended the meeting of the Northumbria Radio Society on 5 March, and is seen here with (l to r) Mr E. F. Shield, G8GVN, vice-chairman of Northumbria RS; Mr J. Bazley, G3HCT, who gave a slide show and talk; and Mr W. Ricalton, G4ADD, chairman of Northumbria RS (r)

Newcastle (Tyne & Wear Repeater Group)—A list of local amateurs who are willing to act as local controllers will be made out as soon as possible and sent to RSGB HQ. Any amateur interested in joining this repeater group should contact the sec John McGee, G8GUP, QTHR, for place and times of meetings.
South Shields (SSD&RS)—Fridays, 7.30pm. Trinity House. Old and new members welcome. Sec G8BQF, 67 Lauderdale Avenue, Kings Estate, Wallsend.
Sunderland (SARS)—First and third Tuesdays in each month. Leisure Centre, Stockton St, Sunderland. Sec G4DQA.

Members in Region 18 wishing to play a part in the proposed exhibition station at Washington Old Hall during the celebrations in June/July please contact G3AKG or G3VSS. Clubs interested in an inter-club net in the region please indicate day and time suitable.

REGION 19—RR D. S. Smith, G4DAX, 151 Hamperhill Lane, Oxhey, Watford, Herts.

Acton, Brentford & Chiswick (ABCRC)—18 May ("*WW* audio speech processor" by G3CCD), 15 June ("My VK visit" by G3OJX). 7.30pm. Chiswick Trade and Social Club, 66 High Road, Chiswick. Sec G3GEH.
Barking (BR&ES)—Mondays (Constructional), Wednesdays (CCTV techniques), Thursdays (Informal). Morse classes Tuesdays, 7.30pm. Westbury Recreation Centre, Westbury School, Ripple Road, Barking, Essex. Sec G8JEG, tel 01-599 1103.
Cheshunt (CDRC)—Wednesdays, 7pm for 8pm. Rosedale Sports Club, Andrews Lane, Cheshunt, Herts.
Chingford (Silverthorn RC)—Fridays, 7.30pm. Friday Hill House, Simmonds Lane, Chingford E4. Visitors very welcome. Sec G4AJA, tel 01-529 2282.
Harrow (RSH)—Fridays, 8pm. Sea Cadets HQ, Woodlands Road, Harrow. Sec G3KDL, tel 01-902 2570.
Havering (H&DARC)—Wednesdays, 8pm. British Legion Club, Western Road, Romford.
Holloway (Grafton RS)—Fridays, 7.30pm. Archway School Annex, Whittington School, Highgate Hill, N19. Details from John Hitchins, 46 Granville Road, Finchley N12. Tel 01-346 2744.
Islington (Sherbourne RC)—Mondays, 7–9pm (RAE and club activities), Thursdays 7–10pm (CW class, building, etc). KW200E available for licensed members. White Lion Youth Centre, White Lion Street, London N1. Sec Freda Young, 5 Old Well House, The Grove, London N6.
Northolt (British Airways European Division ARS)—First Monday in each month. Trident Club, Western Avenue, Northolt, Middlesex. This club is open to non-BA employees by invitation. Contact G3OUF, tel Amersham 21573 for details. Civil Aviation Sunday net at 1100–1200gmt on 3·68MHz, listen for G3NAF or G3BEA.
South Kensington (Baden Powell House Scout ARG)—Third Tuesday in each month, 8pm. Baden Powell House, Queensgate, South Kensington.
Southgate (SRC)—Second Thursday in each month, 8pm. The Green, Winchmore Hill, N21. Sec G4AEZ, tel 01-346 7166.
St Albans (Verulam ARC)—Main meeting on the fourth Thursday of each month, 7.30pm. Market Hall, St Albans. 27 May ("Microwaves—1976" by Dain Evans, G3RPE), 24 June (VHF NFD). Informal meetings during summer months at Salisbury Hall, London Colney, on the second Thursday of each month. Visitors welcome. Sec G4DUS, tel Rickmansworth 77616.
Stevenage (S&DARS)—First and third Thursday in each month, 8pm. Hawker Siddeley Dynamics Ltd, Gunnels Wood Road. Sec Paul Tewkesbury, 267 York Road.
Only two clubs in this region sent contributions for "Club News" in this issue to the Regional Representative.

REGION 20—RR G. Mather, G3GKA, 8 Hills Close, Keynsham, Bristol.

Bath (B&DRG)—Mondays, 8.30pm. Church of the Ascension, Claude Avenue, Oldfield Park, Bath. Further information from John Noden, Flat 4, 30 Paragon, Bath BA1 5LY.
Bristol (BRSGBG)—24 May ("Energy conservation—choice or necessity" by Professor G. F. C. Rogers), 27 June (Longleat mobile rally), 28 June ("Interface quartz devices" by M. Hall, G3USC). 7pm. Becket Hall, St Thomas Street, Bristol 1. Sec G3ULJ.
Bristol (BARC)—Tuesdays, 7.30pm. The University Settlement, Barton Hill, Bristol 5. Sec G8HAZ.
Bristol (Shirehampton ARC)—Fridays, 7.30pm. Twyford House, Shirehampton. New members most welcome. G4BWB.
Bristol (BUARS)—Most Saturdays during term time, 2.30pm. Dept of Physics, Royal Fort, Tyndall Avenue, Bristol 8. Full details from G3WDG.
Cheltenham (CRSGBG)—First Thursday in each month, 8pm. Royal Crescent Hotel, Clarence St, Cheltenham. Sec G3KII.
Gloucester (GARS)—First Thursday in each month, 8pm. Oddfellows Club, Barton St, Gloucester. Remaining Thursdays informal club night. G4AYM, The Chequers Bridge Centre, Painswick Road, Gloucester 8.
Taunton (T&DARS)—Fridays, 7.30pm. Jelalaband Barracks, The Mount, Taunton. Sec G. Swetman, "Little Copse", Monkton Heathfield, Taunton. Tel West Monkton 298.
Weston-super-Mare (WsMRS)—Second Friday in each month, 7.30pm. Room Lewis M2, Worle School, New Bristol Road, Worle. G3PQE.
Yeovil (YARS)—6 May (AGM), 13 May ("Using transistors" by G3XFW), 27 May (Junk sale). 7.30pm. The Youth Centre, 31 The Park, Yeovil. Sec G3NOF.

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

Yaesu YC305 frequency counter, 5Hz–30MHz, 240V ac or 12V dc operation, as new, in manufacturer's carton and comp with manual, an absolute bargain at £59 inc postage. G3VNP, QTHR.

Microwave Modules 2m converter, 4–6MHz i.f., as new, £15. Burgess spray gun VS646, £5. Manual, EMI tv monitor type 1A, £1.50. G8ISI, QTHR. Tel Liphook (0428) 723 168.

Hammarlund Super-Pro, power pack, spkr, good cond, £40. Will exchange for AR88D in similar cond, collect within reasonable distance but would pay for delivery. E. T. John, 5 Kingsland; Harlow, Essex CM18 6XJ.

6in oscilloscope, mint cond, Heathkit 10–18U with manual and oscilloscope handbook, £45 or exchange 2m tx/rx. GW8GNY, QTHR. Tel Glanconwy 584.

Trio TS510 tx/rx, comp with psu and spkr cabinet PS510, vgc, fitted with cw filter, free delivery within mainland, £160. GM3WRN, QTHR.

Liner 2 with R115E psu, fitted internal 40673 preamp, immac cond and comp with spare power lead, mobile mount, handbook, etc, in original packing, £145 ono. G8AXE. Tel 061 442 0696.

Shack clearance: txs, rxs, rtty and aerial gear, components, oddments. SAE for list. G3JWK, 4 Over Hall Drive, Winsford, Cheshire. Tel Winsford 2466.

DSB a.m. cw tx, 160m, solid state, ideal mobile, £15. CSE whip, £3. 30ft lattice tower, £25. G3ZUM, QTHR.

NCX5 tx/rx, digital readout, new pas, external xtal calibrator, mic, £180. G4DLN, QTHR. Tel Leven 42587 (day).

Vanguard 25B tx/rx, needs some attention, £15. Heathkit HA201 2m amp, £12. Heathkit grid dip meter GD-IU, £12. GW8EDE, QTHR.

Toshiba tv camera head with lens, less data, hence £27. G8KUX, 28 Conqueror Road, St Leonards, East Sussex.

KW52Ω low pass filter, £6. Attention mobile operators, Lucas 11 ac alternator, control box, relay, etc, also loom, mounting brackets etc, for Hillman Imp range, £25. 5¾in quartz headlamp units, 2 mainbeam, 2 dip, £25. Poulter, G3WHK, QTHR. Tel 01 337 0117.

RCA ssb L1 radiotelephone, mod for 80/40/20/15, 2 × 6146 o/p, external vfo, £40. Telford TC7 Mk2, £30. Both good cond with manuals. G3JZF, QTHR. Tel 021-350 3553.

HQ1 Minibeam, mast, rotator, £67. 2m tx QQVO6-40, £15. Eddystone EB35 fm/a.m., £50. Cassette recorder, £10. Weyrad sig gen, £5. Pye l/b base station, £10. 4m ground plane, £4. CW tx, £10. Various *Short Wave, Ham Radio* and *RadCom* magazines. G4BTE. Tel Wolverhampton 734729.

TS700, £340. FL2100, £190. FV101, £45. YO100, £83. FT2 auto, fitted S0, S20, S21, S22, S23, S24, R6, ·480, £185. AVO 8 Mk4, £48. All as new. GW3SFC, QTHR. Tel 068-588 4880.

R1155, int psu, spkr, S-meter, a.m./ssb, variable bfo, black aluminium case, seal-grey fascia, recently revalved, vgc, £20. Heathkit Mohican GC1U Mk2 transistor rx, gen cov and ham bands 580kHz-30MHz, manual, vgc, £30. RCA xtal calibrated wavemeter type TE149, dial calibrator direct every 1kHz from 2·5-5·0MHz, vgc, £7.50. Lees, 450 Castle Lane West, Bournemouth. Tel 517200 after 6pm.

KP202, S0, S20, S22, R5, R6, R7, ni-cad batteries, charger, leather case, helical whip, xtal, tone burst, £90. Osker SWR200 with calibration charts, £15. G3NYH, QTHR. Tel Southampton (0703) 551258.

7B teleprinter, synchronous mains motor, ex-newspaper office, therefore well maintained, base and silence cover included, £15. G3XXO, QTHR. Tel Worksop 2316.

Trio TR2200, £60. Heathkit IO12U scope, £20. Jaybeam rotary guy rings, £2.50. Pair 805 valves. *Wanted:* SB10, incomplete OK. G3KJX, QTHR. Tel 0609 2702 after 7pm.

18AVQ, £30. G4ESK/G8FBL, QTHR. Tel Lichfield 23919.

Trio TR7010 2m tx/rx, 144·100–144·320MHz, with extra xtal and preamp, £150. G8ILF, QTHR. Tel Walton-on-Thames 28037.

DL6SW converter, 28–30MHz i.f., £7 ono or exchange 5/8 mobile aerial for 2m. G4CNA, QTHR. Tel Droitwich 2087.

Eddystone 888A rx, one owner, little used, recently realigned, £70. Nearly comp, professionally built G2DAF ssb tx, £25. Pye remote controlled base station tx/rx on 2m, £15. G3ION, QTHR.

FT101B, one year old, little used, hf, £320. Camera 625, interlaced lens, £20. Collins filter F455, Z5 xtal, £12. TIL306 LED displays with logic, £4. CRTs, DY-200GM, two off, £5 each. G3UEQ, QTHR. Tel Chichester 89931 (day).

Yamaha B40R electronic organ, two manual plus rhythm section, for domestic or professional use, £600. Sharma Leslie spkr cabinet, 100W output, 2000E professional model, £300. Delivered reasonable distance. Tel Preston (Dorset) 832760.

Scope C1-5. TV tuning equipment X1-7A. Heathkit electronic switch ID101. Nombrex "40" sig gen. Valve voltmeter AV-3U, plus meters, etc. Deceased friend's gear, £90 the lot. Tarry, 49 Heathrow, Bishop's Stortford, Herts. Tel 56805.

Trio 9R59DS, vgc, inc OA2 spkr, atu, manual, £55. Xtal calibrator, £5. Shure 201 mic, new, £4.50. Headset, £1. A.M./cw tx for junk box, free. SAE for details. G4EOF, 7 Ashfield Road, Market Harborough Leicestershire.

Heathkit SW717, Codar PR40 plus h/b atu, suitable phones, mint cond, property late chartered engineer, £50. Tel Beaconsfield 3253.

HRO B7G rfs, product detector, calibrator, 0·470MHz–30MHz, 7, 14, 21, 28 bandspread, psu, handbook, £35. Ranger, one highband, one lowband, boot mounting with control boxes, £8 each. McKechnie, 12 Grosvenor Road, Dorchester. Tel 0305 4350.

AR88D original S-meter, xtal calibrator, good cond electrically and mechanically, manual, £45. *Wanted:* Collins mechanical filters, type F500B. G3VXZ, QTHR. Tel Maidenhead 27350.

Drake R-4B with nine extra xtals, mint cond, £220. G4EEP, QTHR. Tel Ash Bank 2904 after 7pm.

8/8-el 2m aerial, brand new, £10. Halo, £1. H/B 5A stabilized psu, 6–20V variable, £6. *Wanted:* FT2F or similar 2m mobile rig. G4DIC, QTHR. Tel Hinckley 36811.

Trio 2200G, as new, a few months old, comp with all accessories and ni-cads, fitted channels are S20, S22, 145·0, R7, R6, R5, £110 ono. G8EPE, QTHR. Tel 021 705 7158.

EA12 rx. Mohican rx. 1·8–3·6–7MHz h/b tx/rx. Woden trans 450-0-450, each 220mA, 6·3-0-6·3, each 3A, new. Joystick. LG50 80-10m tx, 50W. *Short Wave* mags and *Bulletins*. Bug key. G3VMI, QTHR.

Liner 2 with fitted preamp, £125. Graham Hallett, G8KLT, QTHR.

BAY96, new, £2·50 each. 10+, £2 each. *Wanted:* Bird MOD43 Thruline wattmeter, elements 250, 500 and/or 1000W 30MHz. Buy or swop various vhf/uhf elements for same. G3JHK, QTHR.

FTDX500 and Europa 2m transverter, comp with all coaxial connections and relay, £200. Buyer collects. Barlow, G3TCJ, QTHR. Tel Liskeard 42073.

Heathkit DX100U tx, £28. AR88 rx with manual, no mods, good cond, £32. Buyer collects. G5KV, 9 Hop Gardens, Henley on Thames RG9 2EH.

Pair heavy-duty 115V selsyns, £8. 2 7360 valves, £2. 2 QQZO4/15 and bases, £1 each. 16 FT241A xtals, 20 to 21·5MHz, £4. 19 FT243, 7,000 to 7,400kHz, £6. 2m a.m. tx chassis, 9 in band, xtals, mic, wkg, £8. Meters, psu optional, £4. Carr extra. SAE others. G2BPC, QTHR.

MSK5 electronic mains operated squeeze key, £20. Spectrum analyser, Heathkit SB620, five months old, £80. G4BNN, QTHR. Tel Thornbury 415832.

14AVQ vertical, will exchange for pre-1914 wall clock, fusee movement, cash adjustment either way. G3PTN, QTHR. Tel Leeds 654644.

G-whip multimobile with 40m and 80m coils, whip section, extendarod, less than half price at £16. G3LBT, QTHR. Tel 0268 (Essex) 412177.

UR57, 64ft, £4.25. 96ft, £6.40. Both, £10. Heath balun B1U, £7.50. Savage chokes 10H 1A, wt 52lb, £5 plus carr. Relays 4p c/o 10A each. Various coils, 24 to 220V, £1.25 post free. Variacs and xformers, list available. *Wanted:* Gears for Creed 75, 45·5 and 75 bands. Polypropelene guy rope. G8LT, QTHR. Tel Blakesley 321.

Photomultiplier tube in brass housing, comp with tfmr for sstv tx, £5. *Wanted:* Heath gdo. G4AKD. Tel Cambridge 46107.

Grundig Stenorette dictation machine, ideal log memo or automatic CQ sender, £12. Buyer collect. G8AKA, QTHR. Tel Reading 332582.

Cambridge/Vanguard rx boards, rf/mixer, wkg 2m, £6. First i.f., £2. Second i.f./detector, £2. Second mixer, £1. 455kHz xtal filter, 25kHz channel spacing, £4. Audio, £1. Squelch, 50p. £15 comp. T. Charles, 40 Gurdon Road, Colchester, Essex. Tel 46966.

Trio TS515 tx/rx, exc cond, fitted new RCA 6146B finals, exc performer, £195. MFJ cw filter, £5. Palomar electronic keyer, fitted Brown Bros twin paddle, £15. Diamond KB105 vertical, 80–10m 1kW rating, four traps. £20. G3JFC, QTHR. Tel Crayford 522489.

H/B 160m tx, requires variable capacitor in vfo series, gate mod, 807 output, inc psu, £35 or will swap for decent 2m gear. Alan. Tel 01-806 7676.

RTTY Creed teleprinter 7B, £10. 6S6M auto tape reader, £6. Two Creed 25 Mk4 tape perforators, £6 each. G8EQD, QTHR. Tel Rotherham 66864.

Trio JR310, immaculate cond, Hamgear top band converter, spkr and Mosley trapped dipole aerial to suit, £55 ono. B. Meekings, 8 Cardinal Way, Haverhill, Suffolk CB9 0DW.

Yaesu FR50B, FI50B, FV50B, SP50, YD844 table mic, Osker SWR200 power meter, KW E-Zee match, vgc, £200. Prefer buyer collects. G4CSG, QTHR.

Yaesu FL50B ssb/cw tx and matching vfo FV50, excl mic but comp with manuals, exc cond, £80. Buyer collects. G4EJT, QTHR. Tel Great Missenden 4694.

Pye U450L 70cm tx, 5W fm, mic, xtals, £20. Matching rx, unmoded, comp with manuals, £15. G8AUN, QTHR. Tel Norwich 42253.

FTDX401 tx/rx plus matching spkr, £275. CW filter used as rx only, Shure 444T mic, new, £16. Datong clipper, new, £35. Eddystone 770R, 19–165MHz, 770U, 150–500MHz, both realigned and revalved, £100 each. James. Tel 0362 2437.

QSY to VE-land means big and heavy items must go. For details write G3MYT, QTHR. Tel 0742 78555 ext 422 during office hours.

Cowlgill motor with selsyns and drive etc in steel box as aerial rotator, base mounting only with compass direction indicator unit and transformer for operating complete unit, £15. Buyer collects if possible. G8LIN. Tel 061 761 6616 evenings.

Hewlett Packard 8·2–12·4GHz sweep generator, type 686C, £100. Marconi Sanders 3·5–12·5GHz sig gen, type 2459, £65. G8BXH/G6AFD/T, QTHR. Tel 01-959 6799.

Klienschimdt TM11 teleprinter with cover, loop supply, 50Hz motor and handbook. ATE TDMS comp with psu, two new 813s, 12V 250W PE generator, overhauled, fitted self-starter. Offers. Buyer collects or carr extra. G3SME, QTHR. Tel Huntingdon 72513.

KW Vanguard, 160–10m, exc cond, £25. Buyer collects. G5SB, QTHR.

Sommerkamp FL200B tx, with fan, £80. Trio JR5005 rx, £30. Or the pair as a wkng combo inc leads etc, £100. KW E-Zee match, as new, £20. Martin Ward, G4DNU, 14 Victoria Avenue, Nottingham. Tel 584364 evenings.

SB303, SB401, standard C140 2mf m tx/rx, cw CV110 vfo. Offers. G4AQK, QTHR. Tel Wroughton 813466.

Exchange Trio JR5005 Hamband rx, mint, for good broadcast band rx, Eddystone AR88, why? Barton, 19 Leigh Place, Welling, Kent. Tel 01-854 4926.

Linear amp, FL2000B, £180. Oscilloscope, Heathkit IO 18U, 5MHz bandwidth, £30. Hamgear preselector, PMIIB, £5. Sentinel 2m preamp, £5. QQVO, 640A, new, £5. G4DAW, 479 Wellingborough Road, Northampton. Tel 714821.

Audio and photographic equipment, BSR MP60 type deck, P&C mag cart, virtually unused, £18. Condenser enlarger, S/L, tank, loader, dishes, etc, £25. *Wanted:* 2m Cambridge or similar with tunable rx. Tel Kings Langley (09277) 62882 after 5pm or weekends.

FT500 tx/rx, similar FT560, good cond, £180. G4DUE, 18A Spencer Close, Potton, Sandy, Beds. Tel Potton (0767) 260552.

Property of late G3RLP. Sommerkamp FTDX505, in mint cond, spkr, KW E-Zee match, Raymart band checker, SWR50, Shure 444 mic, morse key, £280. Mrs Derrington. Tel Scaynes Hill (Sussex) 498.

AT5 with circuit, £10. Heathkit valve stereo amp, electronic banknote counter, Woden trans, 540V, 600mA, 500V, 150mA, heater trans. *Bulletin, Short Wave Mags,* 1960/75, offers. G3KMH, QTHR.

Swan 350 with 230V ac psu, new pa tubes, £150. Used for 5BDXCC of G2TA, QTHR. Tel 01-950 1762.

FT401B, £300. FRDX400, £150. UD844 mic, £12. FF50DX LPF, £15. Eddystone EC10 Mk2, mains/batt, psu, £100. KW109 Supermatch, £80. 240ft 169 wire, £5. 100ft 300Ω, £5. Expo 12V dc drill, £4. All unused cond, due deceased BRS. G2TA, QTHR. Tel 01-950 1762.

Trio TS700, £290. Two 2m aerials, Cushcraft ARX2, Ringo Ranger, three half-waves, £14. Jaybeam double five, £7. Stolle 2010 rotator with 50yd control cable, £32. All items perf and near new. G2KF, QTHR. Tel Par 2337.

Drake R4A rx, mint cond, inc set unused valves and nine xtals, full coverage 160–10, handbook, £140. Glass, 152 Churchway, Plymouth. Tel 35815.

X-band resonator performance tester, tunable 9,160–9,470GHz, possible mod to 10GHz, variable attenuator, detector, waveguides. Offers. G3YSH, QTHR.

RME70 11 tube postwar rx, revamped by G2DAF, good cond, manual, value not known, best offer secures. Buyer collects. SAE details. G2FST, QTHR.

Electronic Developments Magnum 2 transverter, as new, £85 ono. *Wanted:* TX599. G8FXB, QTHR. Tel 0277 840 406.

Linear 20-15-10 with psu, two units, 5×5B254Ms, £15. Deliver by arrangement. SSB filters, lsb 60-108kHz every 4kHz, small size, £2 inc p/p. G4AMK, QTHR. Tel Melton Mowbray 2755 after 6pm.

Trio TS700, late model, perf cond, everything works, deviation and tone-burst spot-on correct, bargain at £325. G8DDQ, QTHR. Tel Bramley 2638.

Yaesu FT220 144–146MHz ssb/fm/cw tx/rx, comp with 145·00, S20 and other xtals, mic, manual, etc, £215. Commercial 2m 40W linear, 12V, £25. T. N. Price, G8FIH, 17 Bremhill, Calne, Wilts SN11 9LD. Tel 0249 812047.

G3TDZ 2m portable tx/rx, rx working, tx and mod untested but assembled metalwork, almost comp, £25. Chorley, 7 Foxfield, Harts Farm Estate, Everton, Lymington, Hants. Tel Milford-on-Sea 5231.

Super 600GTB 200W tx/rx, 80–10m, ssb/cw for FT75 with mains and 12V power packs, or swap for Argonaut QRP tx/rx or why? in QRP ssb/cw tx/rxs. Also plenty of junk, sell above T/R, £150. Prefer anyone interested to call. G3KYR, QTHR.

Trio JR310 rx, fitted with 10AZ mech filter, SO239 aerial connector, mains filter and top band, worked W1, W2, VO1, ssb on top band, inc manual, vgc, £80 ono. G3NGD, QTHR. Tel 061 748 2238.

HRO5T rx, 0·1–30MHz, psu, spkr, manual, good wkg order, £25. G3TDZ 2m tx/rx (Jan '73), fully built, tx needs attention, 2m whip incl, £30. G8IHF, QTHR. Tel Weybridge 43296 after 6pm.

Comdel speech processor, new and unused, £25. G6PD, QTHR.

Telford TC7 Mk2 fitted G8AEV converter, £35. Heathkit valve voltmeter V-7 AU, £15. Tech Tradiper TE15, £12. Emu marker xtal calibrator, 1MHz, 100kHz, 10kHz, £5. FT2F tx/rx xtals 144·30, 144·40, 144·60, 144·80, 145·40, £2 pair. G8ANU, QTHR. Tel Stafford 52693.

Comp ssb station HA350 with Q-mult and 160m h/b tx, 160/10m, 150W p.e.p., 9MHz McCoy xtal filter, see Jan/Feb 1970 *RadCom,* £110 the pair. Demo available. Buyer collect. G3HVA, QTHR. Tel Tadley 4445.

HW7 QRP rig, £25. 14AVQ Hy-gain vertical with mod details for 80m, plus 32ft 52Ω coaxial, rated 2kW, new, £20. 38ft lattice tower in two sections with custom-built grillage, £40. G4CJY, QTHR. Tel 0494 444417.

Liner 2, vgc, preamp, exc rx, mic, power lead, mobile mount, no spurious at all, must be sold soon for £120 only. G8JZD, QTHR. Tel 01-346 1893 evenings only.

US Navy ME-11A/U rf wattmeter, 10–500MHz, 0–15 and 0–60W, mint cased, £35 plus postage. Jaybeam 2m 14-el Parabeam, new, part assembled, with low loss coaxial, £20. Buyer collects. AR88, BC342, HRO spares. SAE list. G3GUU, QTHR.

Liner 2 with preamp, perf, £115. Hudson FM208, wkg on 2m, mobile mount, £16. Large 500-0-500 transformer, at least 1A, £6. Trio 9R59, £35. G4BWG, 8 Cerise Road, Hanover Park, Peckham, London SE15 5HQ. Tel 01-732 0668.

KW2000B, with ac psu and Shure mic, £200. G3ZJF, QTHR. Tel Windsor 68364.

Motorola HT2/SP, 2W o/p pocket portable, hi-band, unmod, £50. Frequency counter board, as July 1971 *Rad Com,* ics, displays, etc, £12. Amplivox Jetlite headset with boom mic, £5. CCSI conduction-cooled 4CX250B, new, £5 each. AVO valve voltmeter CT38, comp. G8BCL, QTHR. Tel 0422 21885.

FTDX401, £225 ono. Europa transverter + new spare pa, £65. KW107 aerial match, £35. Stolle Memomatic rotator, £22. Bantex 2m whip, £3. G3POX, QTHR, tel Huntingdon 810038.

FT200 ac and dc psu, as new, £200. G3MOT, QTHR. Tel Shipton-under-Wychwood 830640.

KW Vanguard with 160m, £20. BC342 rx, £10. Class D wavemeter No 1, £8. G3RPH, QTHR. Tel Stroud 77636.

Lafayette HA600 hf rx, dual xtal filter, £20. HRC TCS13 hf tx, 40W, £10. Kumar Arasu, Jesus College, Cambridge.

Jaybeam 10XY/2m with circular polar harness, almost unused, £15. Also SSM Europa A transverter, fitted c/o relay and all plugs and cables for FT101, £55. G8IRU, QTHR. Tel 044 284 3474 weekends.

2m linear -2X 4CX250B with high power variable psu, offers. 70cm tripler, £10. 70cm converter 28–30MHz, £10. 2m bandpass filter, high power, £5. Helical filter, low power, £2. Sentinel 2m preamp, £5. G4DAW, 479 Wellingborough Road, Northampton. Tel 714821.

AVO electronic multimeter CT38, £12. Metvic ditto, £8. Tech TE15 GDO, £12. USA SigCorp sig gen wavemeter, 8–15MHz, 120–250MHz, £10. Taylor sig gen 65B, £4. 500V 300mill psu, £4. Buyer collects. G8HBO, QTHR. Tel 01 399 8196.

4X250B and uhf PTFE base with incorporated chimney, £5. AM 10B high band Cambridge, £10. UHF reflectometer module with plugs, £3. Papst mains blowers, suit FT101, £6. Ernest Turner 3½in square 100μA meters, £1.50. Also 813s. All carr extra. G8ENI, QTHR. Tel Cheslyn Hay 415374.

2m mosfet preamp, 18dB gain, 3dB noise fig, £5. 2m mosfet conv, 28–30MHz i.f., in case, £14. G4EBI, QTHR.

Swan 350 with psu. Eddystone EA12 rx. Taylor valve tester. Hallicrafter HT18 tx, R1132A rx. 221 frequency meter. Other meters. Boxes of goodies. Send for list, all cheap. G2MF, QTHR. Tel Sheffield 70210.

Good cond 2m equipment, for sale to callers or by Securicor (extra). 3301/2 tx comp with mic, handbook, 240V ac 25W output, £25. AM10D mobile with vfo, £25. 2m rx with psu and spkr, £20. G2PU, QTHR. Tel 0223 870454.

Creed teleprinter 7B, with base and cover, reperforator No 2 and auto tx 2F plus paper. Teleprinter/reperforator tester, £35 the lot. Buyer collects. G4CLC, QTHR. Tel Wigston (05376) 2225.

Swan 500, a good sample with set of valves, £175. FT101, early model but almost unused, mint, £275. BC221 with power supply and spare valves, exc, £18. 1,000kHz xtal for BC221, £3. G3AO, QTHR. Tel Chinley 639.

FT75, comp hf mobile or base station, dc psu, 15ch with vxo or vfo, G-whip, atu inc swr meter, good results, £180. *Wanted:* Liner 2. G4DSO, QTHR. Tel 07357 2119.

Racal RA17 rx. Heathkit RF-1U generator. Heathkit GD-1U grid dip meter. Airmec vvm type 712. Quick sale required due to emigration, only £245 the lot. L. Coussens, 122 Galsworthy Drive, Caversham Park ,Reading, Berks. Tel 0734 477399.

TH3Jr, £65. TA33Jr, £50. Collins linear 30LI, manual, £220. Heath HW32, mic, psu, spkr, £65. CT446 transistor analyser, manual, battery powered, £15. Microwave Modules 2m converter, 28/30, BNC connectors, £12.50. LM14 het frequency meter, charts, psu, £25. G3YMS, QTHR.

Sig gen, type SEI 106, 5·5–55MHz, 1μV to 0·1V, 75Ω attenuated cw/mod, £15. Buyer collects. G3JNM, QTHR. Tel Bolton 0204 43999.

Yaesu FT/FP200, £200. FV200, £40. DC200, £40. SSM Europa, £70. Comdel CSP11 rf processor, £40. All vgc, original boxes, manuals. G3ZYN, QTHR. Tel Lea Valley 712874.

TW 6CW4 Nuvistor preamp, 144MHz, £2. Aveley dc inverter, input 12V, dc output 300V 200mA. Honda E300 petrol generator, output 230V ac, 300W, £68 or exchange 2m fm tx/rx. Pye Continental manual, £2. QSTs 1940–59. Postage extra. G3LHA, QTHR. Tel 414333.

Reflectograph tape recorder. Mullard 510 amp with preamp. Stentorian two-spkr system in reflex cabinet. Collard transcription turntable with stereo cartridge on plinth. All vgc. Offers. G8BUA, QTHR.

Telford TC7 Mk2, as new, comp with G8AEV 2m converter and band searcher unit, £40 ono. Jaybeam 10-el long Yagi comp with long length coaxial, £7 ono. Stolle aerial rotator with 40ft control cable, good cond, £25 ono. G8FID, QTHR. Tel 021-355 5767.

Trio TR2200G. Xtals for S0, S20, S21, S22, R3, R7. Automatic tone-burst, ni-cads, case, mic, charger, as new, in perf order. VB2200 10W amp. £140 or will split. G3XLL, QTHR. Tel Norwich 408685.

Swan 350C 400W tx/rx, vgc, £195. AR40 rotator, comp, £20. Solartron scope D300, £25. G3GBB, QTHR. Tel Bury St Edmunds 66496.

Standard C826 tx/rx with 10 xtal channels, £115. Standard CV100, dual vfo for 826, £16. Yaesu 355 frequency counter, unused, £74. QM70 2FM70, 144–70cm, £38. 8/8 Jaybeam for 70, £7. Redifon tx/rx GR289, Mk3, 12 or 24V operation on 158MHz, £18. G8EWO, QTHR.

KW500 plus KW2000, just overhauled by KW. New 813 and 6146B in finals. Shure 201 mic. Coaxial SO239 aerial c/o relay. KW500 OP, exchange for KW2000B or similar, or offer for KW500. Lack of space. G2ANT, 7 Acorn Gardens, London SE19.

Modern three-bedroom detached bungalow in village two miles from centre of Falmouth, Cornwall. Separate garage, fitted electric central heating, cavity wall and loft insulation, double glazing, £17,000 ono. G3ZNE, QTHR. Tel Penryn 72895.

18AVT, exc cond, £40. Grundig "Yacht boy", one year old, perf, £40. B40 rx, £10. Buyer collects. *SWM* 1955–75 comp, £10. 10 by 5B/254M, £10. Carr at cost or collect. G3KMY, QTHR. Tel Chesterfield (0246) 862099.

Heathkit solid state voltmeter IM16, £12. Advance 7000 DPM 3½ digit, new. £15. Cathodeon ssb xtal filters, 1·4MHz usb, unused, £5. Pye Cambridge xtals 145·35 tx/rx, £2 pair. Others available. Axial blowers, 250V, 119sq by 38mm, ex-equip, £1.25 plus postage. Sealectroboard programming panel, 24 by 32 matrix with 60 diode pins, list £80, brand new, £15. Additional pins 10p each. Rack slides, £1 pair. Equipment castors, support ¼ ton, £1.50 four. Powerful printed circuit motors, suit rotator system, £3.50. G3YLQ, QTHR. Tel Luton 25595.

Advance OS250 scope, 10MHz, dual-beam compact, as new, £85. Geloso 20 rx, 160m mod, needs alignment, £15. 3-speed mono tape recorder, £10. G8AJF, 6 Lechmere Avenue, Chigwell, Essex. Tel 01-500 5594.

RTTY Creed 75 T/P with reperf attachment, 240V ac sync motor, gears 45 and 50 bauds, recent makers overhaul and running perfectly, 6S6 autosender, 240V ac, governed motor with tuning fork, cables, 12 pin connectors, manual, paper, tape, ribbons, £55. Please collect. G2UD, QTHR. Tel Brighton 34924.

Heathkit HW32A 20m tx/rx, comp with handbook, etc, £55 ono. Many ex-WD items of harness equipment, aerials, etc. SAE list. GM8FVC, 47 Lawers Crescent, Polmont, Central Region, Scotland FK2 ORQ. Tel Polmont 712800.

G-whip tribander mobile aerial, comp with two 15/20m extensions, 80 and 40m coils, telescopic whip for lf coils, no base mount, £20 inc postage. Would deliver up to 40 miles. G3ZZR, QTHR. Tel Witney 3792.

Marconi H4000 tx/rx, a.m./ssb, ac 240V, dc 12V, 6ch 1/160m, 2/80m, 2/20m, 1 spare, final 2/6146s, £75. 2m fm Boot Cambridge 6ch Ledex, two xtals, 48ESN, £30. G4AMW, QTHR. Tel Parkstone 746295.

Comp 2m station, comprising Trio JR500 rx, Emsac valve converter, Pye base station (tx section only), working on 145·8MHz a.m., £85 ono. GI8IFP, QTHR.

PI tank switched 3·5–28MHz inc PAR807 ex-Elizabethan copper box, £5. Labgear WB multiplier, £3. Transformers E. G. Woden, 750V 250mA, £4. Thermador 700V 350mA, 1100V 500mA, £3. 510V 275mA, 375V 80mA plus htrs, £4. Cabinets. SAE requirements or full list. G3CBU, QTHR.

Perdio town and country, £7. Unused Elstone xfmr 450-0-450 250mA, £2. *RadCom* vols 36, 37 and 48 to 51, *SWM* vol 15, £2.50. SCR522 xfmrs, mod, and driver, £1. QQVO3-10 (2), E88CC, new, 50p each plus postage. G3KZC. Tel Bristol 673026.

Pye Vanguard PTB25AM highband, £8. Lowband, £6. Dash mount lowband Ranger, 2007V, £3. G3REP, 10 Hill Top Road, Cheltenham.

SPCO relay, 250V ac coil, in cast box, £1.20 each. 16-way 5A terminal block, 30p each. Transformers, 250Vp, 25Vs, 70p each. 0·25A pots, 100Ω and 25Ω ww, 20p each. Capacitors, 33μF 10V, 3p each, £2.50 per 100. 2μF, 250V, 10p each. G3TOI, QTHR.

WANTED

Pye Pocketfones tx/rx, spare ni-cads 9 and 18V, also charger, even not working considered. All answers acknowledged. G4AQP, QTHR.

TS520, FT101 or similar for /M, any cond, not necessarily working. G3MOT, QTHR. Tel Shipton-under-Wychwood 830640.

Replacement valve 6BV8 for Hammarlund HQ-170, TX/rx with psu, 10–80, about £150. GW8JMQ, QTHR.

VHF rx R216 and psu or similar. Radar system engineering by Ridenour MIT series. Sig gen covering 100kHz–10MHz. Eddystone plinth spkr 906. *For sale:* Garrard AP76 transcription chassis, unused. Offers: Cooper, 53 Jepps Avenue, Barton, Preston. Tel 862493.

CRT type DG7-5 and handbook for miniature oscilloscope CT52. Heathkit RF1-U sig gen. *Rad Com* April and September 1974. Patterson, 16 Norton Road, Stourbridge, Worcs. Tel Stourbridge 2689.

SSB rig, KW, Swan, etc, with psu or not, cond immaterial, wanted for rebuild, cheap. GM8GTN, QTHR.

2m converter, valve job, TW, etc. Hutchings, G8FOD, QTHR.

Microcell Electronics psu type 420, serial No 924–wish to buy, borrow, hire circuit for this unit, postage etc refunded. *For sale:* Korting Decca convergator hatch generator, 625 lines uhf. G8JHZ. QTHR. Tel Sandon 312.
Mobile psu, neg earth for KW2000A. G3XXO, QTHR.
Trio TS700 G vhf tx/rx or similar. G3JBU, QTHR.
Eddystone slow-motion dial type 598. Two mod transformers, ex SCR522 equipment, not driver type. Lawler, G4CMD, QTHR. Tel 01-500 5107 after 7pm.
Heathkit xtal filters, 2·1kHz ssb and 400Hz cw for SB102. *For sale:* 3·75kHz, or exchange for either of the above. G3DBZ, QTHR.
Elliott VM1002A tx/rx, manual or circuits, buy or copy. A. Hogg, GM8LKL, 101 Weavers Knowe Crescent, Currie, Midlothian, Scotland. Tel 031-449 2096.
Amateur bands or gen cov rx, must be cheap. Any gen on 4CX250B valve. Ian Wylie, 3 The Elms, Countesthorpe, Leicester. Tel Leicester 7703116 after 7pm.
T-vette Philips portable tv tube A28-W14. Will buy non-working set for good tube. G8JOK, QTHR. Tel Bristol 772804.
Loctal sockets wanted urgently, (not octal), quantities required in new unused cond, ptfe or similar insulation, reasonable price. *For sale:* Wray "Supar" f4·5 enlarger lens, £3.50 posted. Shack clearance bargains, send SAE with your wants. G3ZDO, QTHR.
Eddystone 888A required by Basingstoke AR club. Have Trio JR310, £60, for part exchange or separate sale. Offers c/o hon sec G3CBU, QTHR.
826MB xtals S24. HC6U/10XAJ 8100 (145·8), exchange for 826MB set R3, 10XAJ 8030, HC6Us 8066·66, 8018. G3LMO, QTHR. Tel Selsey 4768.
AT5 LABG 160 or similar. HRO BS20 xtal, mic. 144 converter. G6HQ, QTHR. Tel 051 336 2033.
BTH RK spkr, preferably energized, C2, etc. Early radios and components, valves, books. Philips Pye Cossor. GEC, prior to 1933. Anything considered. C. Sawyer, 210 Gordon Avenue, Camberley, Surrey. Tel 0276 29460.
Pye Bantam, Ultra Cub or similar high band hand portable suitable for conversion to 145MHz. G8LAE, 10 St Andrews Close, Old Windsor, Berks SL4 2QU.

raynet

S.W. Law, G3PAZ *

Frequencies
There seems to be confusion in some areas about the suggested 144MHz frequencies mentioned in this column in March. We can only repeat the relevant sentence from our chairman: "New groups are urged to adopt these channels and existing groups to change as and when possible." This does not imply (as some seem to imagine) that an immediate and wholesale scrapping of crystals is called for by groups already operating successfully on channels other than those quoted. Rather should such groups look to the future when their need for another channel arises or appears desirable for one reason or other. We would also like to endorse the reminder regarding the 70MHz band.

*130 Alexandra Road, Croydon, Surrey CR0 6EW.

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

Raynet net
The change to bst caused some slight confusion on that particular week-end. Other than that there are always some signals to be heard, notably that most consistent transmission from G4CUK (Leicester group). A more numerous turnout on the net would be appreciated, as even a short QSO might convey much of interest and would make things more interesting for the participants. One tip, be on in good time to establish the channel. Sunday is notorious for QRM on 3·5MHz!

Any takers?
Paul Jessop, G8KGV (not QTHR) has for exchange an HC6/U 8·0444MHz crystal for 144·8MHz. Paul would prefer a similar crystal for the S0, S20 or S22 channels. The address is 1157 Warwick Road, Solihull, W Midlands B91 3HQ.

Group news
Manchester has once again come under the control of John Scarborough, G3MBQ; previous controller Ian McArthur having other commitments. G3TIR has relinquished the leadership of N Sussex, the new controller being W. B. Kendall, G3GDU. A new group, Cannock and Walsall, has been formed under controller Colin Edmonds, G4CFR, QTHR. Groups are reminded that if they should have news of immediate and general interest these items may be included in the GB2RS news broadcast at the discretion of the compilers. Any such items should reach RSGB headquarters by first delivery on Thursdays.

Repeaters
At the Raynet Committee meeting on 6 March it was decided that Alan Morris represent Raynet interests on the Repeater Working Group. The Raynet Committee was informed that the RWG had agreed that RB0, 433·000MHz in, 434·600MHz out, was reserved for Raynet use, simplex or repeater. Forward-looking groups may care to note this for future consideration.

Lectures
There is still plenty of scope for members to offer their services for lectures on the subject of Raynet to interested parties. Offers and material should be forwarded to G3BPT. The latest lecture was delivered to the Institute of Civil Defence by G3GJW.

Membership
The registrations secretary has been kept very busy; at the last check there were 37 new registrations and 171 re-registrations, apart from the usual volume of enquiries and other work. □

Members of the Cornwall Raynet Group in Truro after winning the Raynet Trophy. Left to right: G. Cooper, G3VJB; Mrs Cooper, G3UGO; G. Kitts; B. Locke, G3NKE; E. Warne, G3YJX; B. Currell, G4EIK; E. Bowden, G2AYQ; L. Bryant, G3WJO; W. J. Colclough, G3XC; D. Fisher, G8DZE; K. Harding, G3XFL; B. Pearce, G8GOR; A. Wallis, G4DEO; J. Johnson, G3THT; W. Hammill, G2BHW; and Mrs S Locke.

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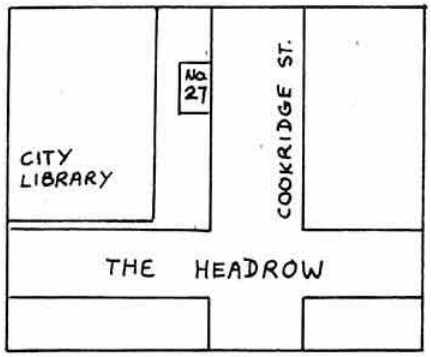
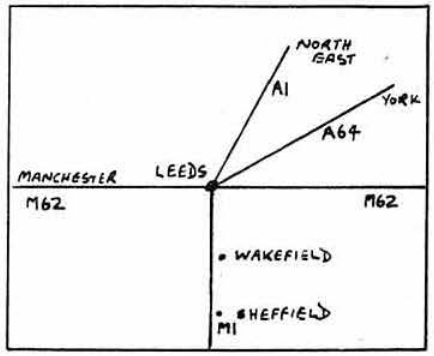


TRIO



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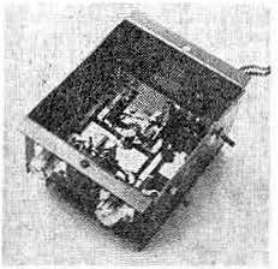

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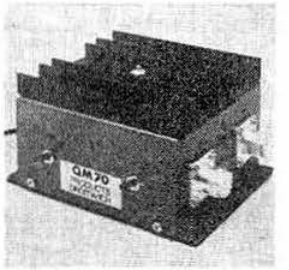

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CRYSTALS 8%—OVERSEAS ORDERS (Inc. Eire and Channel Isles) NO VAT CHARGEABLE.

2M TX & RX CRYSTAL AVAILABILITY & PRICE CHART

CRYSTAL FREQUENCY RANGE USE (TX or RX) and HOLDER / OUTPUT FREQUENCY	4MHz-TX-HC6/U	6MHz-TX-HC25/U	8MHz-TX-HC6/U	10MHz-RX-HC6/U	11MHz-RX-HC6/U	12MHz-TX-HC25/U	14MHz-RX-HC25/U	18MHz-TX-HC25/U	36MHz-TX-HC6 & 25/U	44MHz-RX-HC6/U	44MHz-RX-HC25/U	48MHz-TX-HC6 & 25/U	52MHz-RX-HC25/U	72MHz-TX-HC25/U
144·030 ..	b	b	b	b	b	b	b	b	b	b	b	b	b	c
144·4/433·2 ..	a	b	a	b	b	c	b	c	b	b	b	b	b	c
144·480 ..	b	b	b	b	b	b	b	b	b	b	b	b	b	b
144·600 ..	b	b	b	b	b	b	b	b	b	b	b	b	b	b
144·700 ..	b	b	b	b	b	b	b	b	b	b	b	b	b	b
145·000/SO ..	a	a	a	a	a	a	a	a	a	a	a	a	a	c
145·050/R2T ..	a	a	a	b	b	a	b	a	b	b	b	b	b	b
145·075/R3T ..	a	a	a	b	b	a	b	a	b	b	b	b	b	b
145·100/R4T ..	a	a	a	b	b	a	b	a	b	b	b	b	b	b
145·125/R5T ..	a	a	a	b	b	a	b	a	b	b	b	b	b	b
145·150/R6T ..	a	a	a	b	b	a	b	a	b	b	b	b	b	b
145·175/R7T ..	a	a	a	b	b	a	b	a	b	b	b	b	b	b
145·200/R8T ..	a	a	a	b	b	a	a	a	b	a	a	b	a	b
145·300/S12 ..	b	b	b	b	b	b	b	b	b	b	b	b	b	b
145·350/S14 ..	b	b	c	b	b	b	b	b	b	c	c	b	b	c
145·400/ S16 ..	b	b	b	b	b	b	b	b	b	b	b	b	b	b
145·500/S20 ..	a	a	a	a	a	a	a	a	a	a	a	a	a	c
145·525/S21 ..	a	a	a	a	c	a	a	a	b	a	a	b	a	b
145·550/S22 ..	a	a	a	a	c	a	a	a	b	a	a	b	a	b
145·575/S23 ..	a	a	a	a	c	a	a	a	b	a	a	b	a	b
145·600/S24 ..	a	a	a	a	c	a	a	a	b	a	a	b	a	b
145·650/R2R ..	b	b	b	a	b	b	a	b	b	a	a	b	a	b
145·675/R3R ..	b	b	b	a	b	b	a	b	b	a	a	b	a	b
145·700/R4R ..	b	b	b	a	b	b	a	b	b	a	a	b	a	b
145·725/R5R ..	b	b	b	a	b	b	a	b	b	a	a	b	a	b
145·750/R6R ..	b	b	b	a	b	b	a	b	b	a	a	b	a	b
145·775/R7R ..	b	b	b	a	b	b	a	b	b	a	a	b	a	b
145·800/R8R ..	a	a	a	a	a	a	a	a	b	a	a	b	a	c
145·950 ..	a	b	a	a	b	b	b	b	b	a	b	b	b	b

PRICES: (a) £2.16, (b) and (c) £2.64 + VAT (12½%).
AVAILABILITY: (a) and **(c)** stock items, normally available by return (we have over 3,000 items in stock). **(b)** Four weeks normally but it is quite possible we could be able to supply from stock.
N.B. Frequencies as listed above but in alternative holders and non-stock loads are available as per code (b).
ORDERING. All we require to know is (1) Output frequency, (2) Crystal frequency range, (3) The holder, and (4) Either the load capacitance (pfs) or equipment. The exact crystal frequency is not essential, though it would be of assistance to quote it if known.

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With the ever increasing popularity of Japanese equipments we have further expanded our range of stock crystals. We can now supply for **YAESU** (FT2F, FT2FT, FT2 Auto, FT224), most of the **ICOM** range and the **TRIO-KENWOOD** range. We can also supply from stock crystals for the **HEATHKIT** HW202 and HW17A.

4m CRYSTALS FOR 70·26MHz—HC6/U

TX 8·7825MHz and RX 29·7800MHz .. .. at **£2.16** each + VAT (12½%)
RX 6·7466MHz .. .. at **£2.64** each + VAT (12½%)

IT'S ALL GO ON 70cms

Starting with GB3PY on 1st. June 1976.
By about mid May we will have stocks of the repeater crystals for the new 70cm channels. Get your orders in early, as the heavy demand already indicates the possibility of delay for late comers. Remember GB3PY "goes over" on the 1st. June.
Stock channels—Tx and Rx—RB2, RB4, RB6, RB10, RB14, plus SU8 for use in Pye Pocketfones (PF1), UHF Cambridge (U10B), UHF Westminster (W15U), and Storno CQL/CQM 662—all at **£2.16** + VAT (12½%). For the Pye U450 Base Station we have all the above TX channels plus SU8 RX at **£2.16** + VAT (12½%). The Repeater RXs are available as per 2 metre class (b) items.

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For use in PYE and other equipments with 10·7MHz and 455kHz IFs to get rid of the "birdy" just above 145·0MHz. In HC6/U, HC18/U and HC25/U.
CRYSTAL SOCKETS—HC6/U, HC13/U and HC25/U (Low loss) 16p each + VAT (12½%) + **10p** P. &. P per order (P. & P. free if ordered with crystals).

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All at **£2.80** + VAT. 38·6666MHz (144/28), 42MHz (70/28), 58MHz (144/28), 70MHz (144/4), 71MHz (144/2), 95MHz (342/52), 96MHz (1,296/432/144), 101MHz (432/28), 105·6666MHz (1,296/28) and 116MHz (144/28).

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In either code PE(±0·003% at ambient) or code ID(±0·005% 0 to 60°C) In HC6/U 1·5 to 2·6MHz, **£3.28** + VAT (12½%) and HC6/U 2·6-105MHz and HC18/U and HC25/U 4-105MHz **£2.80** + VAT (12½%). Delivery usually 4-5 weeks. Fundamentals (1·5-21MHz) will be supplied to 30pf circuit conditions, and overtones (21-105MHz) to series resonant conditions unless otherwise specified. For details of closer tolerance crystals please send S.A.E.

TEST EQUIPMENT FREQUENCY STANDARD CRYSTALS—8% VAT

100kHz in HC13/U, 1MHz and 5MHz in HC6/U and 10MHz and 10·7MHz in HC6/U and HC25/U all at **£2.50** each plus 8% VAT.

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HC6/U Tx ranges: 4, 8MHz **Rx** ranges 10, 44/45MHz
Channels: 145·0, S20, S21, S22, R3, R4, R5, R6, R7
40.500D for Cambridge tuneable conversion (*Rad. Comm.* Dec 74)
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Simplex channels: 145·0, 145·2, S20, S21, S22, S23, S24, S25, 145·8
Repeaters: R0, R1, R2, R3, R4, R5, R6, R7, R8
Rx crystals for repeater inputs: R3, R4, R5, R6, R7, R8
Inclusive price **£2.25** each Prompt despatch by First Class post

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70cm: We shall be pleased to quote for your requirements
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RTTY AUDIO FREQUENCY SHIFT CONVERTOR CV—89A/URA—8A. First quantity release of this most sought after Ritty Convertor. Brief description uses 15 BG9 & BG7 Valves, with a 2" C.R. Tuning Tube. Housed in a grey alloy case size 17" × 5" × 15" deep. Input supply fully filtered for interference. Requires 105-125 Volts A.C. A two position Selectivity or Filter Switch that enables to set up for any Narrow Shift from 10-200 cycles or any Wide Shift from 200-1000 Cycles. The Mean or Centre Freq for the Narrow Shift is 1000 Cycles, for the Wide Shift is 2550 Cycles. Normal Audio input from receiver is 600 ohms. The Convertor will operate with an Input of 60 Microwatts to 60 Milliwatts or about −14 to +18 DBM. Has Internal Tone OSC Freq 595-1785 CPS. Mark Space Switch Normal or Reverse. Supplied in good used condition, checked complete, but not tested Electronically. £22.50. Carr. £2.50 onwards.
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All above details and circuits in Teleprinter Handbook (RSGB)
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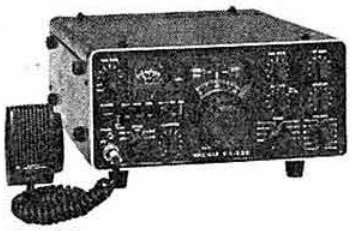

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500kHz-30MHz. FULL COVERAGE

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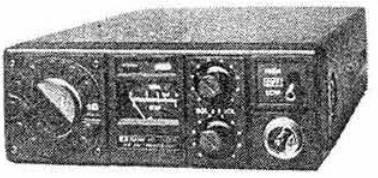

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22-CHANNEL FM CAR TRANS-CEIVER 10 CHANNELS AND TONEBURST FITTED

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MFHT 455kHz mechanical filter with silicon transistor in/out impedances. Available with BW of 4 and 7kHz £1.65
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MC1310P	2.20	NE567V	2.50	8038CC Waveform	
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300pF SWING VARICAPS: MVAM 1.05, MVAMI 2.75.
MVAM2 = 6 matched diodes, MVAM1 = 3 matched diodes.

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2 METRE TRANSCEIVERS

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IC225	80 channel PLL	**£230**
IC21A	22 channel 12/240V the ideal home station rig	**£210**
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70cm mobile and base station transceivers also available.
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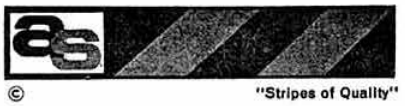
All above VAT extra at 12½%. Carriage free.

NEW. We are now stocking antennas by Antenna Specialists. See page 328 for full details



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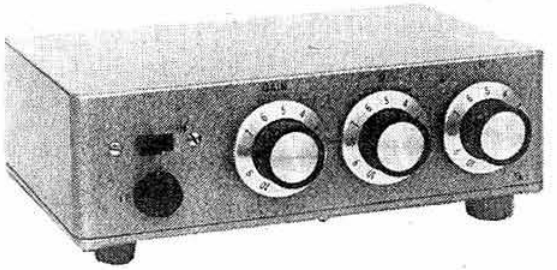
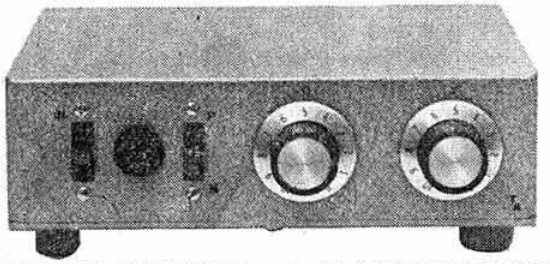
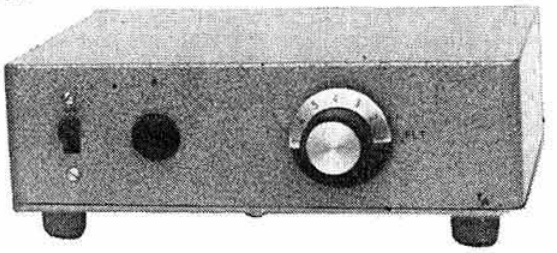


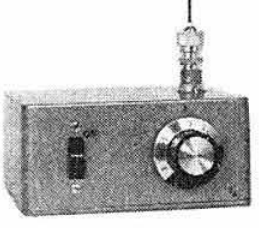
AUDIO COMPRESSOR ★ Suitable for SSB/AM/FM ★ pure compression, no clipping! ★ 24 to 26dBs of compression, with less than 1% distortion ★ fast attack time in the order of 200 microseconds ★ variable decay time, on front panel ★ varialbe noise gate on front panel prevents ambient noise level tripping vox or being tx in pauses in speech ★ all functions routed to output in "off" position ★ goes between mic and tx no mods involved ★ these compressors have been tested alongside commercial rf clippers, the only difference at the receiving end was superior audio quality. **£21.00** + VAT (12½%) + 50p P. & P.



RX PEAK AND NOTCH FILTER ★ no gimmicks ★ all integrated circuits ★ will clear QRM in seconds ★ 1 watt o/p stage ★ headphone socket ★ goes between RX and loudspeaker ★ by-pass switch ★ can be used in series with our famous band-pass filter ★ notch-width control for optimum width of notch ★ tune control allows you to put the notch or peak where you want it ★ runs from internal PP9 battery or any supply from 9V to 15V ★ will also peak up CW signals. **£23.00** + VAT (12½%) + 50p P. & P.



RX BAND PASS FILTER ★ 9 integrated circuits ★ 1 watt O/P stage ★ headphone socket ★ 8 switched positions of filter ★ high pass—2·5kHz-2·00kHz-1·5kHz-200Hz-110Hz-80Hz ★ Bandwidths selected for optimum readability on AM, SSB, FM, CW ★ can be used in series with our peak and notch filter, giving the operator total control over bandwidth and QRM conditions ★ makes the poor RX superb and the superb RX better ★ runs from internal PP9 battery or any supply from 9V to 15V. **£23.00** + VAT (12½%) + 50p P. & P.



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VAT 193-8133-46

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Air spaced UHF trimmers. 1·5 to 6·5pf Oxley type, **20p** each.
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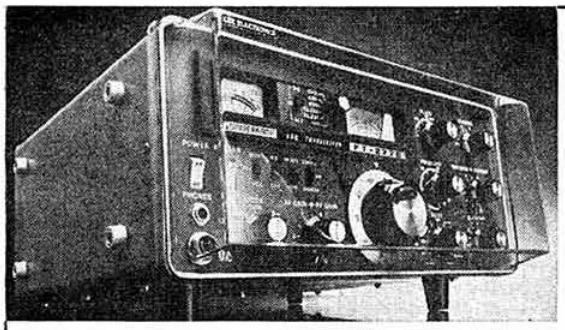

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STANDARD RANGE

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C828 2m 10W Transceiver	£135
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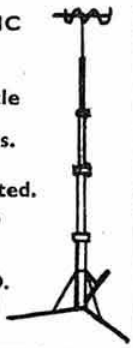

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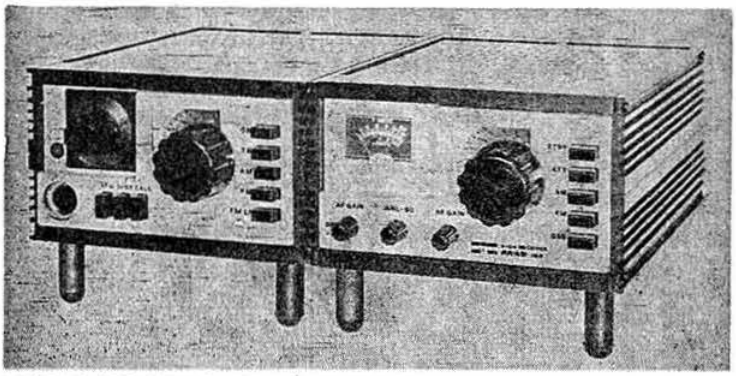

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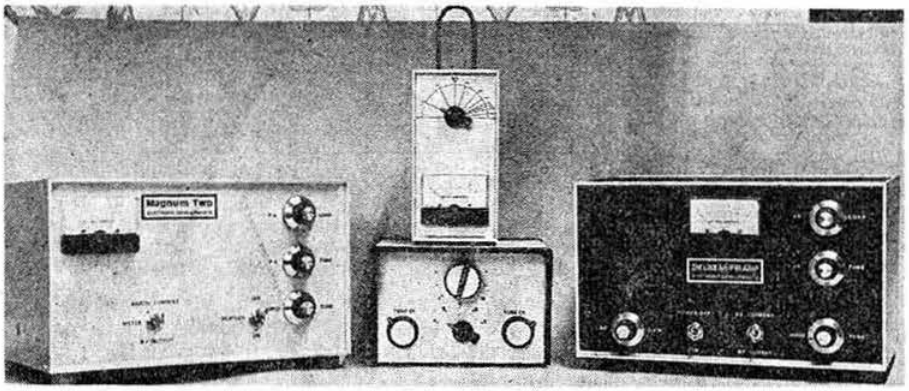

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WAVEMETER £16
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★ 3dB Typical noise figure.
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Not least of these products is our Digital Frequency Meter (MMD050) which, when you consider the competition, is in a supreme class of its own. By utilising the latest CMOS technology we have produced this counter which is invaluable to every active radio enthusiast. Let's face it—where else can you get a 50 MHz frequency counter with better than 50 mV RMS input sensitivity, with an accuracy at 50 MHz of better than 200 Hz. All of this in a compact diecast box for £66 including V.A.T.

The size and price of this unit lends itself to many applications, too numerous to mention, but not least of these must be to comply with GPO licensing regulations which necessitate an effective means of measuring transmitted frequency.

Should you require a 500 MHz capability for VHF and UHF work, then our ÷10 prescaler (MMD500P) must be the answer to your most stringent requirements. This unit is fully TTL compatible and will work not only with our own counter, but with any other unit which requires up to 2·5 volts RMS input voltage.

Don't just take our word for it—ask any of the many satisfied customers who have dealt with us and they will tell you the facts.

SPECIFICATION

	MMD050		MMD500P
Display height	10 mm	Case size	111 × 60 × 27 mm
Display width	45 mm	Frequency range	50-500 MHz
Case size	111 × 60 × 27 mm	Sensitivity	Better than 200 mV RMS over above range
Frequency range	0·45-50 MHz	RF connectors	50 ohm BNC
Sensitivity	Better than 50 mV RMS over above range	Input impedance	50 ohm
Input connector	50 ohm BNC	Power connector	PTFE feed through solder pins
Input impedance	200 ohm	Power requirements	11-15 volts at 100 mA approx.
Power connector	5 Pin 270° locking DIN socket (plug supplied)	Output voltage	2·5 volts peak (TTL compatible)
Power requirements	11-15 volts DC at 200 mA approx.		**PRICE £27.00 inc. VAT**

For further information on our complete product range, please write or phone for data sheets.

NB: BNC plugs for above products available at **70p** including V.A.T.

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SB-200 Heath Linear	**£155.00**
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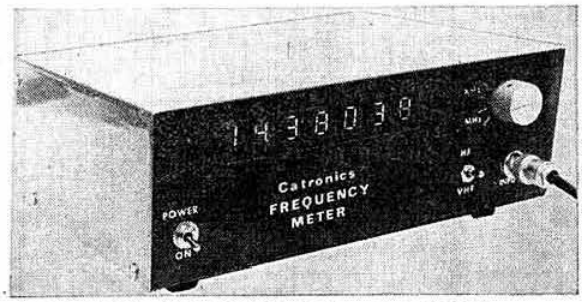
180MHz DFM



VHF DIGITAL FREQUENCY METER—Model DFM 5
The updated version of the Catronics Frequency Meter now with extended frequency range up to 200MHz with a restyled cabinet and front panel. Size: 8½" × 7" × 3" (approx.)

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- ★ I.C. memory giving a "non-blinking" display.
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We would like to apologise to all our customers for any delays in receiving crystals experienced over the last few months. These delays were caused by a multitude of reasons, not the least being your fantastic response to our New Year sale coupled with illness and staff difficulties at two of the factories supplying us with crystals. By the time this advert goes to press we should be back to offering our normal service.

Unfortunately due to the present Sterling crisis and added freight charges we have at last found it necessary to increase our prices. This is the first price increase in almost two years of trading and in fact we are still offering lower prices on all crystals than when we commenced trading in the Summer of 1974.

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We can now offer quality crystals over a complete range from 50kHz to 216MHz with extremely favourable discounts for large quantities of the same frequency/specification. This includes fundamentals up to 25MHz and 3rd overtones from 10MHz. Please enquire for further details. Crystals in HC6/U, HC18/U and HC25/U1·5-21MHz fundamental. 21-105MHz overtone. Delivery approx 4 weeks. Specification: 50ppm 0-60C or 30ppm at ambient. (State required tolerance and I/P capacity on fundamentals.) Prices 1·5-2·6MHz **£3.28**, 2·6-105MHz **£2.75.** 5% discount on five or more crystals. Please note crystals below 4MHz not available in HC18 or 25/U at the above prices.

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