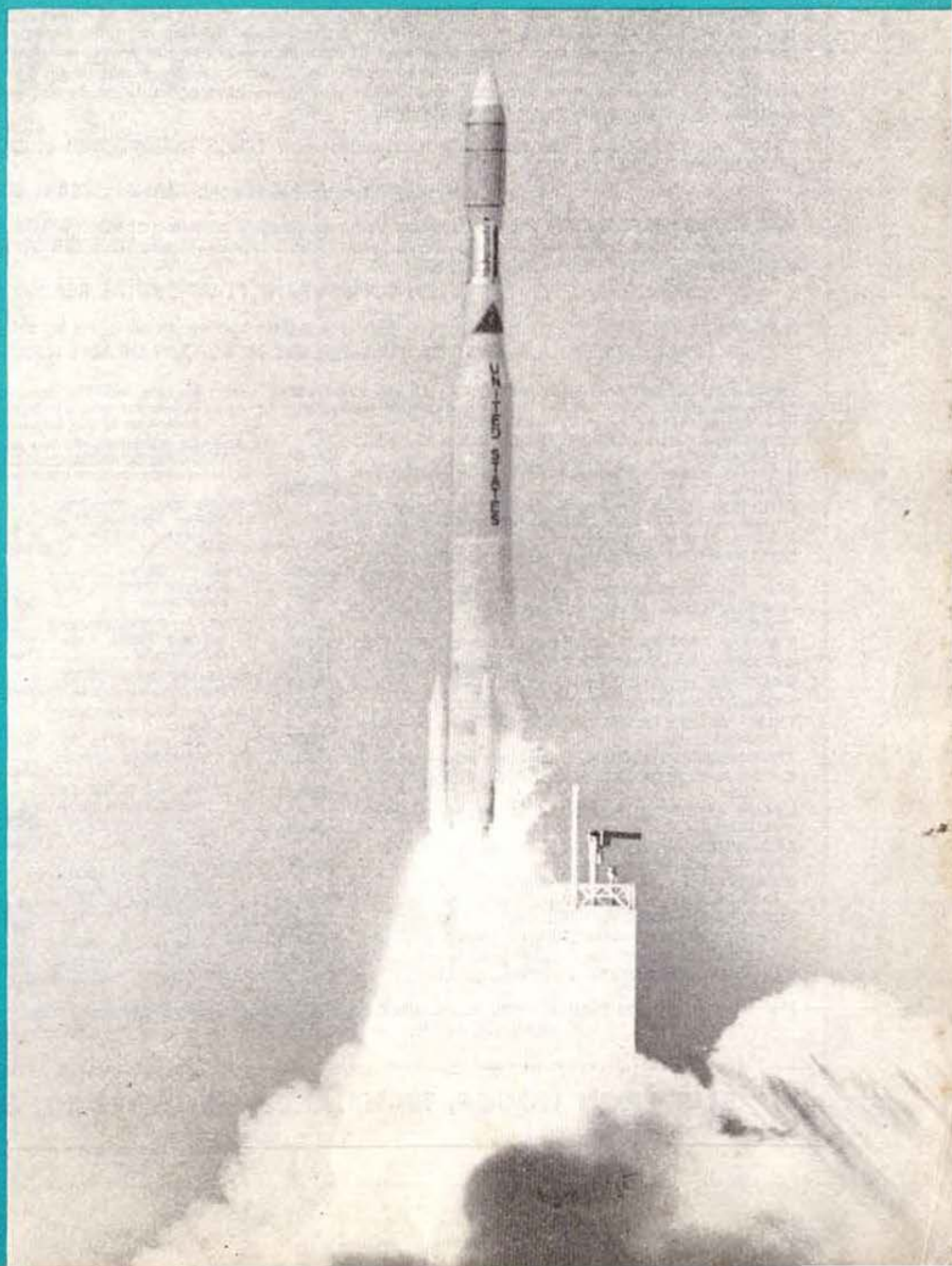
radio communication

December 1972

Journal of the Radio Society of Great Britain



December 1972

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Volume 48 No 12 Price 30p

FRONT COVER

The Thor-Delta rocket taking Oscar 6 into orbit.

CONTENTS

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**

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ABC
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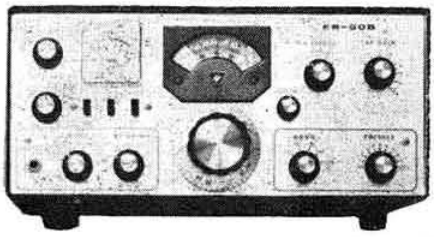
ELECTRONICS (UK) LTD

YAESU RECEIVERS

FR-50B



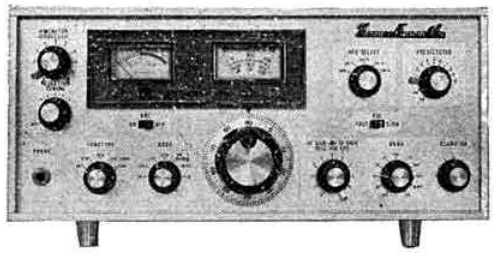
This **AM/CW/SSB double conversion receiver** offers first class value for money. This comes complete with built-in speaker, crystal calibrator and WWV band at £63.
(Less Cal/WWV at £59).

SPECIFICATION

Sensitivity; 0.5V 10dB S + N/N ratio.
Selectivity: 3·6kHz 6dB.; 10 kHz 50dB.
Frequency Coverage: 3·5-3·8MHz, 7-7·5, 14-14·5, 21-21·5, 28-29·2MHz.
Dial Calibration: 1kHz divisions.
Image rejection: Better than −50dB.

FR400SDX

★ **NEW FR400SDX fitted 4m +160—2m! (Ex stock)**



The **FR400SDX** is made especially for use with 2m, 4m, as well as 10-160m. It has:

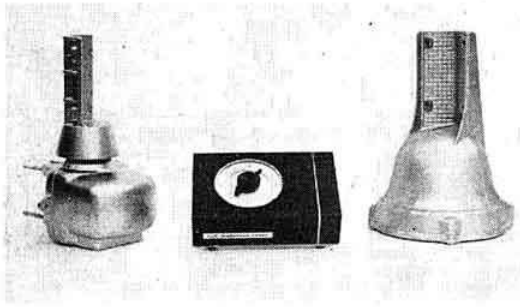
* 4 Mechanical filters; CW 600Hz, SSB 2·3kHz, AM 5Hz, FM 24kHz.
* Rejections tuning.
* Facilities for Sidetone monitoring.
* TRANSCEIVES WITH FL400.

A fully versatile instrument for the discerning amateur.

NEW/USED EQUIPMENT

YAESU FT-101, mint **£199.**
YAESU FT-400 + cwf, mint **£150.**
SOMMERKAMP FT-500 mint **£150.**
SOMMERKAMP FT-500 + cwf, excellent **£155.**
SOMMERKAMP FT-250, excellent, **£135.**
COLLINS 75SI, excellent **£175.**
DRAKE R4B, new **£210**
DIGITAL 500, demo model **£225.**
HALLICRAFTERS SX117, v. good **£80.**
HAMMARLUND HQ170/VHF, v. good **£80.**
HEATH SB303 + CWF NEW **£238.**
HEATHKIT GR78, mint, **£55.**
KW77, v. good **£59.**
KW2000, superb + AC/DC **£150.**
KW2000A, excellent **£150.**
KW1000, mint **£85.**
TRIO JR599, mint **£145.**
TRIO 9R59DS NEW **£49.50.**
TRIO TS510, mint **£125.**
TRISTAO 105' TOWER, £225.

ROTATORS CDE AND HY-GAIN



AR20 **AR22**

ANTENNAS. In stock Hy-gain Mosley Asahi Bantex J-beam.

Catalogue "Towers-antennas" (10p) gives details on all these.

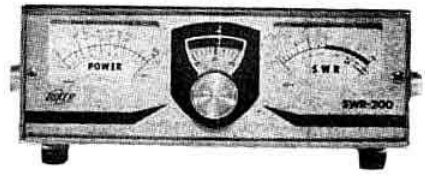
PART EXCHANGE? Certainly. EXPORT? a pleasure!!

ALL ROTATORS EX-STOCK 24/48 HR SECURICOR DELIVERY £1

We stock the best range of rotators, CDE and HY-GAIN and spares. Our stocks are good so you'll get fast delivery plus the after-sales service which counts.

AR20 This model replaces the old AR10 and is ideal for VHF beams, **£20** (40p).
AR22R This model will turn HF antennas of TA33 Jnr. size and can be mounted on the top of masts up to $2\frac{1}{16}$" diameter or onto a flat plate. It can carry a deadweight of 150 lbs. Requires a 4-wire cable, **£25** (65p).
TR44 This model is also for HF beams as the AR22R but carries a 500 lbs. load and has better braking. The control unit requires a 7-wire cable, **£45** (75p).
HAM-M The best of the CDE range. Carries 1,000 lbs. deadweight for large HF beams and employs a solenoid operated brake. Requires an 8-way cable, **£70** (80p).
HY-GAIN 400. It's a brute but takes masts up to 3" dia. and automatically rotates to the desired direction by setting the compass control knob pointer as required. Mounts to standard tower plate on Versatower. **£115 (£1).**
Note—All above rotators are ex-stock and orders are despatched the same day as received.

OSKER POWER METER



Features: Switchable for 52 or 75 ohm systems. Each instrument is individually calibrated. Four ranges: 0–2, 0–20, 0–200 and 0–2kW, 3–200 MHz. Excellent styling.

£18.50 ex stock

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Hours: Tuesday to Saturday 9–5.30 (closed for lunch 1–2 and all day Monday).
Service and Sales: A good range of our equipment is available (evenings and weekends only) at the following: John G3JYG, 16 Harvard Road, Ringmer, Lewes, Sussex. Tel: Ringmer 812071. Sim GM3SAN, 19 Ellismuir Road, Baillieston, Nr. Glasgow. Tel: 041–771 0364. Alan GW3YSA, 35 Pen y Waun, Efail Isaf, Nr. Pontypridd, Glam. Tel: Newton Llantwit 3809. Peter Ward G3XWX, 47 Radstock Avenue, Ward End, Birmingham, B36 8HD.
Service only (evenings and weekends): Dave Dryden G3BKQ, 205 Main Street, Thornton, Leics.

MAIN DISTRIBUTORS FOR YAESU MUSEN EQUIPMENT

The new Yaesu FT–75 meets the need for a very small mobile rig with fixed station potential. It is beautifully made and the performance is everything one has come to expect from Yaesu. It is crystal controlled on all bands with VXO, it is all transistor except 12BY7A driver and 12DQ6B P.A., the filter is top-notch and all in all it is yet another Yaesu winner.

Bands: 80, 40, 20, 15 and 10m. The following frequencies are fitted as standard, but others (up to a total of 3 per band) may be ordered: 3750, 7085, 14200, 21400, 28550.

VXO range: 80 and 20m. 3kHz, 40m. 6kHz, 15m. 20kHz, 10m. 12kHz.

Power: The transformers in both A.C. and D.C. p.s.u's. are tapped and on the highest A.C. p.s.u. tapping we obtained a measured output of at least 30W on all bands (35W on 10!). This corresponds to an approximate input of 60W or more which is very comfortably within the capabilities of the 12DQ6B.

The receiver has a sensitivity of ½ microvolt for 10 dB S/N and the crystal filter (5173·9kHz) has a nose bandwidth of 2·3kHz and 6:60 dB shape factor better than 2-1. All this in a compact 8" × 3" × 12" deep.
Quite clearly a great deal of thought has gone into the design of the FT–75 and there are several very nice touches which appeal to us. The Rx not only has its own r.f. coils, but its own mixer coils as well. The dual gate F.E.T. r.f. amp. has excellent signal handling with amplified a.g.c. applied to one of the gates. Separate receiver and transmitter. I.F. strips, a ring diode detector, etc. allied to a low price and small size make this rig very attractive to anyone owning a car.
As an optional extra there is the FV50C Remote VFO at **£27.50**. Note though, that there is no r.f. peaking control on the FT–75 and that the P.A. tune is pre-set, so the frequency excursion is rather limited by r.f. bandwidth from 75kHz or so on 80 up to about 450kHz on 10m. before acceptable performance is lost, In spite of this, it is a little cracker and for mobile I'm not so sure that xtal control isn't a bad idea.

New Yaesu Equipment:

FT–101 (New Model), **£255**
SP–101 Matching speaker, **£10**
FV–101 Remote VFO, **£38**
FT–101 Mobile Mount, **£5**
FL2100 Linear, **£148**
FRdx400 Super de Luxe Receiver **£160**
FLdx400 Transmitter, **£146**
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FT–2FB (New model), **£89**
FR–50B Receiver, **£59**
FT–2 Auto, **£146**
FT–200 Transceiver, **£134**
FP–200 A.C. p.s.u./speaker, **£38**
FV–200 Remote VFO, **£38**
DC–200 Mobile p.s.u., **£46.50**
FTdx401 Transceiver **£230**
FV–401 Remote VFO, **£38**
SP–401 Speaker **£10**
YC–305 Counter (New Model). **£111**
FT–75 Transceiver, **£99**
FP–75 A.C. p.s.u., **£22.50**
DC–75 D.C. mobile p.s.u., **£22.50**

The above equipment is ex stock and apart from sundry spares which go first class mail, we send all equipment by Securicor, who almost invariably deliver within 24 hours and more important, treat the gear gently. There is no extra charge for this service, nor for the fact that all equipment is thoroughly checked before despatch. Plus of course our unbeatable 12 month guarantee and our money-back guarantee.

While the Yaesu Musen FRdx400 receiver is just about the best you can get in the Amateur Band line, the price of **£160** is beyond a lot of pockets, so to cater for the lower-priced field, we very proudly introduce the Yaesu Musen FR-50B at a very incredible **£59.** In spite of this rock-bottom price, the FR-50B is a very good Amateur Band receiver indeed and provides a high degree of sensitivity and stability.

Basically, it is a double conversion receiver covering 80 to 10m with a VFO for the first oscillator and a crystal controlled second oscillator. Being double conversion (5173·9kHz and 455kHz) explains the incredibly good image rejection figure of better than 50 dB.

When it comes to sensitivity, the 6BZ6 r.f. amplifier ensures 0·5 microvolt for 10 dB S/N ratio.

Selectivity is achieved by two ceramic transducer filter elements which give a nose bandwidth of 3·6kHz at 6 dB and a skir bandwidth of 10kHz at 50 dB. These figures are extremely good for equipment in this price class (even for equipment costing much more!). A high order of stability is achieved by a stabilized transistor VFO and VFO buffer amplifier. Other niceties of design are:

1. 100kHz calibrator circuitry built in and only needs 100kHz crystal plugging in.
2. Built-in speaker.
3. Tuneable BFO.
4. I.F. trap in r.f. circuit.
5. Nice geared drive to the VFO—50kHz per turn of the tuning knob, readout to better than 1kHz. This is the same drive as on the well known earlier (and much more expensive) FR-100B.
6. Triode first mixer for low noise.
7. "S" meter fitted.
8. Noise limiter fitted.
9. Gold bonded IS1007 for AM detection.
10. Product detector (6BE6) for SSB/CW.
11. Built-in muting and monitor circuit for use with companion FL-50B transmitter.

Frequency range:	80m	3·5—3·8MHz	20m	14·0—14·5MHz	10m	28·0—29·2MHz
	40m	7·0—7·5	15m	21·0—21·5	WWV	10·0—10·5

Sensitivity: Better than ½ microvolt for 10 dB S/N ratio in the SSB mode. Selectivity: 3·6kHz—6 dB, 10kHz—50 dB. Image rejection: 50 dB or more. Audio: 1·5W 4/600 ohm output. Built-in speaker. Power: 240v. A.C. Size: 13" wide, 6" high, 10½" deep. Weight: 17½ lb.

Controls: BFO, monitor agc slow/fast/off, noise limited on/off, calibrator on/off, mode switch, AF gain, RF gain band switch tuning, preselector, zero set (for calibration). "S" meter zero (on rear panel).

Valves:	12AT7	Crystal calibrator	6CB6	1st IF amp./2nd mixer	6BE6	Product detector
	6BZ6	r.f. amp.	2SC372	2nd oscillator	IS1941	Noise limiter
	12AT7	first mixer	6BA6	2nd IF amp.	6BA6	BFO
	2SC373	VFO	6BA6	3rd IF amp.	6BM8	Audio
	2SC372	VFO buffer	IS1007	Am detector		

FT101

We have factory modification kits available for up-dating earlier models. Please note that this work should be done at Matlock rather than attempting to do it yourself. If any of our Customers are interested, we would be happy to arrange a date when we can do the work.

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At last, a Transceiver at a down to earth price, for the CW enthusiast

Kit K/HW-7 **£35** **Carr. 40p**
(less batteries)

Kit K/HWA-7-1 12V dc power supply for AC main Op. **£7.50** **Carr. 25p**

HW-7 SPECIFICATIONS—TRANSMITTER: RF Power Input: 3 watts on 40 metres. 2·5 watts on 20 metres. 2 watts on 15 metres. **Frequency Control:** 40 metre crystal, or built-in VFO on 40 metres. 20 metre crystal or built-in VFO on 20 metres. 15 metre crystal, or built-in VFO on 15 metres. **Output impedance:** 50Ω unbalanced. **Sidetone:** Built-in. **Spurious and Harmonic Levels:** At least 25dB down. **RECEIVER: Sensitivity:** Less than 1 microvolt provides a readable signal. **Selectivity:** 2kHz at 6dB down. **Types of Reception:** CW or SSB. **Audio Output Impedance:** 1,000Ω nominal. Receiver frequency response is +3dB at 200Hz to 2500Hz. **GENERAL: Frequency Coverage:** 40 metres, 7·0 to 7·2 MHz, 20 metres, 14·0 to 14·2MHz. 15 metres, 21·0 to 21·3MHz. **Frequency Stability:** Less than 100Hz drift after 10 minutes warm-up. **Power Required:** 13 volts DC, 25mA receive and 450 mA transmit. **Dimensions:** 4¼" H × 9¼" W × 8½" D, including knobs and feet.

The latest QSL count is 27 countries, 40 states, all continents! That's what the Amateurs at Heath have scored field testing the new HW-7 CW QRP Transceiver. And the new contacts are coming in every day. The HW-7 is flea-power operation at its finest. With three-band CW coverage, running a tidy 3 watts on 40, 2·5 watts on 20 and 2 watts on 15 metres. That's a bare minimum, but the HW-7 gives you more than a sporting chance. It has both built-in VFO and crystal transmit capability. Sensitive Synchrodyne Detector receiver circuitry for a readable signal with a 1 μV input or less.

Operation is nice and neat too. Band selection is at the push of a button, and the 6-1 vernier drive gives you "backlashless" VFO tuning. The pushbutton crystal transmit provision makes the HW-7 perfect gear for novice or QRP roundtable use. Built-in sidetone and relative power meter are other top quality features.

You can carry your HW-7 anywhere. As you see it at left it's ready to run on any 12V dc supply. For a fixed flea-power station there is an optional low voltage power supply that plugs into your 120/240V ac line.

You can build this rugged little transceiver in an easy two evenings—building-in the pound savings as you go. One-circuit-board design and the check-by-step assembly manual help you get it together without a hitch.

The Heathkit HW-7—for novice or veteran QRP amateurs operating in the field or fixed. Its the ultimate Mini-Rig. From the folks who brought you the Maxi.

Kit HW-7 £35.00 carr. 40p.

Kit HWA-7-1, 12V dc power supply, for ac mains op. **£7.50 carr. 25p.**

8-Digit 120 MHz Counter

Measures 1Hz-120MHz with 8-digit readout plus overrange gate and two range indicators. 1 M ohm FET input. Sensitivity 50mV or less to 100MHz, 125mV to 120MHz.

Kit K/1B 1102 **£164** **Carr. 50p**

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UHF RX with 2 3 section trough lines 4⅜" long, double superhet 54 and 6·9MHz, B7G, B9A valves, 20 way HC/6U xtal holder size 8 ×5 × 17" **£10**

70MHz AUTO ALARM RECEIVERS, flashing light and audio tone outputs, 3 tone filters in some for selective calling. Several types available from **£3**

MORE HC/6U CRYSTALS £1 ea. 22 22·5 23 23·5 26·5 27·5 28 28·5 23·22 23·32 23·42 23·52 23·62 23·72 23·82 23·92 24·42 24·52 24·62 24·72 24·82 24·92 25·12MHz. 11·25 to 15·5 in 250kHz steps. 5000 5012 5025 3625 3675kHz.

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1820 1930 3766 3795 4002 6001 6009 6016 6024 6046 6054 6076 7002 7005 7010 7017 7032 7047 7054 7077 7092 7099 7129 8081 (WAB) 11750 12000 14000 14250 31200 31225 31250 31275 31300 31325 31350 31375 31400 31425 31450 31475 31500 31525 31550 31575 31600 31625 31650 31675 kHz. **£1** each. 25% qty discount.

RX RF UNITS 2-24, MHz 4 BANDS. 6AK5 RF 6BE6 MIX 6AU6 xtal osc. 1·82MHz IF out also includes TX drive balanced modulator (2)6AU6 & oscl. 82MHz 6AU6. 6AU6 & 6AQ5 drivers. All inductive tuning with 5 tuned circuits at signal frequency. **With circuit** **£8**

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MARCONI 1616 RECEIVERS 2-18·5MHz, single superhet, crystal controlled, fine tuning + or —9kHz, 2 RF, 21F, BFO, CW filter, 2μV for 10db S/N, 8 × 8 × 13 with **MAKER'S MANUAL** control unit and fine tuner **£20**

MARCONI TX UNIT 100 watt output, 2-24MHz. 6AQ5 driver, 829B buffer, 2 × 829 BPA, tuning 23 turn 2 inch dia. roller coil, 2 gang capacitor coil and capacitor turret. Size 8 × 10 × 16. weight 26lb. **WITH CIRCUIT** **£8**

MARCONI ATU UNITS. Roller coils 30 turns, 3 inch dia. 20 turns, 1½ inch dia., capacitor turret, RF voltage and current sensing elements, Size 6½ × 11 × 16, weight 27 lb. **WITH CIRCUIT** **£6**

MARCONI MODULATORS. 90 watt output, transformer to match 2,000 ohms and screen winding speech clipper audio AGC, switched metering for : PA grid, Buffer grid, PA anode, Mod anodes and screens, 500 and 1,000 volts HT. Valves 12AX7, 12AT7, 6AL5, 6AU6, 12AX7, push pull pair 829Bs, 6AQ5, 6AU6. OA2 etc. HT required, 600 volts, 275 volts DC, 250 volts AC, room for PSU inside case. Size 8 × 12 × 16. **WITH CIRCUIT.** Weight 32lbs. **£10**

MARCONI 7092 RX 150kHz-2MHz in 4 bands, 5-1·5kHz. 400Hz selectivity, 10 μV sensitivity, 450mW output, RF stage, 2 IF 110kHz, crystal filter, needs 250V HT, 24 Volt, BFO, IF & AF gain control, DF provision (not supplied) size 8 × 5 × 12, circuit **£10**

SALE SALE SALE SALE SALE SALE SALE SALE

Reduced prices to clear stock of the following units which may have parts missing or be in poor condition.

PYE RANGER 15 2202 VHF TX/RX AM. 15 watts output, RX double superhet, 2 grounded grid RF stages, 12 volt + or — earth power supply, **WITH CIRCUITS,** 68-174MHz, will convert to 2 or 4m **£10**

COSSOR 103BE VHF TX/RX FM. 15 watts output, RX double Superhet, 6AK5 RF 12 volt + or — earth power supply, with conversion data for 2m. **£8**

COSSOR 144AE VHF TX/RX AM. 15 watts output, RX double superhet, cascode RF, 12 volt + earth power supply, **WITH CIRCUIT,** will trim to 4m. **£7**

PLESSEY PTR61E VHF TX/RX AM. 1½ watts output, RX superhet with 2MHz IF. 12 volt —earth power supply. **WITH CIRCUIT.** 116-132MHz air band & **GLIDERS,** will convert to 2m **£8**

R1155 RX, spares breakdown condition, 75-1500kHz, 1·5-18·5MHz superhet. **£4**

T1154 TX, spares breakdown condition, 200-500kHz, 2·35-16·7MHz 50 watts. **£4**

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A Seasonal Message From The President

"WE feel we are out on a limb, and the RSGB doesn't understand our problems". This had been said to me on many occasions, and I was determined to make personal contact during 1972 with as many members as possible.

At mobile rallies at Longleat, Polegate, Woburn and Kenilworth; at club meetings and festive occasions, I was never alone for a moment. Perhaps the feeling of isolation has been particularly noticeable among our members north of the border, and for this reason I was delighted to receive invitations to visit RSGB groups and affiliated societies in north-east Scotland—at Dundee, Aberdeen, Llanbryde, Inverness and Thurso; I hope and believe that our discussions helped to clarify mutual problems. Again, at the Scottish VHF Convention, Zone G Meetings and Region 14 ORM, we had the opportunity of talking and airing views.

At Scheveningen, where I led the RSGB delegation to the International Amateur Radio Union conference, I soon discovered the esteem with which our Society is held by foreign organizations. The contribution which the RSGB makes, and its significance in world amateur radio circles, must never be underestimated.

With my Presidential year approaching its end, I am conscious of the tasks which remain unfinished, of the problems still unsolved, and of the places I was unable to go to; shortage of time has been the perennial difficulty.

But I am left with a real confidence in the future of our Society, with a greater knowledge of all that the RSGB does for amateurs (members and non-members alike), and above all with the memories of friendship and a shared interest in our hobby. To you all, and to your families, I send greetings and best wishes for Christmas and 1973.

Tim Hughes, G3GVV

QTC AMATEUR RADIO NEWS

RSGB-IEE joint lecture

This took place on Friday 3 November in the main lecture theatre of the Institution of Electrical Engineers at Savoy Place, London. The joint chairmen of the meeting were Dr J. A. Saxton, representing the IEE, and Mr R. J. Hughes, G3GVV, RSGB President. An audience of some 200 persons heard an absorbing lecture by Mr G. R. M. Garratt, MA, CEng, FIEE, FRAeS, G5CS, recounting events between the time Marconi arrived in England in 1896 and the reception of the first transatlantic morse signals in December 1901.

The lecture was illustrated by many slides and a number of items of radio equipment of the period were on view. A demonstration was given of the transmission and reception of signals from a spark transmitter of a type similar to that used by Marconi.

Mr Garratt answered many questions from the audience, which showed at the same time the great interest in the lecture and the amount of research that had been done in preparation for the occasion.

A vote of thanks was proposed by a member of the IEE, Mr McKechnie Jarvis, to which there was an enthusiastic response.

Society trophies

In addition to those notified under "Council Proceedings" in the November issue of *Radio Communication*, the following trophies have also been awarded:

Norman Keith Adams Prize—to Rev. P. W. Sollom, OSB, BSc, PhD, G3BGL, for his article "Just look at the weather?" published in the November and December 1971 issues.

Bevan Swift Memorial Prize—to Mr E. L. Gardiner, BSc, G6GR, for his article "The practical design of mobile aerials" published in the July 1971 issue.

Courteney-Price Trophy—to the late Mr W. H. Allen, MBE, G2UJ, for his article "Some thoughts on mixer-type VFOs for the 2m band" published in the February 1972 issue.

Wortley-Talbot Trophy—to Mr D. A. Tong, BSc, PhD, G8ENN, for his article "Electronic switching in amateur radio equipment" published in the May, June and July 1972 issues.

Ostermeyer Trophy—to Messrs I. D. Brown, BEng, AMIEE, G3TVU, and S. L. Norman, BTech, AMIEE, G8BDO, for their article "A 20MHz digital frequency meter using ttl integrated circuits" published in the July and August 1971 issues.

Operation in Liechtenstein

UK amateurs who obtain Swiss reciprocal licences and intend to operate in Liechtenstein should note that it is necessary to give the PTT in Berne five days' notice of the intended operation. Alternatively this can be done when making the licence application. Acknowledgement is due to Edgar Wagner, G3BID, for this information.

Details of reciprocal licence arrangements can be obtained either from the general manager of RSGB, or from G2BVN, the secretary of IARU Region 1, who have available a booklet giving basic details of arrangements now existing.

UK FM Group (Southern)

The newly-formed UK FM Group (Southern) held their first AGM in Alton on 4 October. Amateurs from Southampton, Basingstoke, Reading, Farnham and even the IOW are now active members, as well as one or two from the London Group. Anyone interested in fm operation or repeaters and living in the southern area will be made most welcome at forthcoming meetings which will take place monthly. Further details are available from the secretary, Dick Ferryman, G4BBH, The Haven, Windsor Road, Four Marks, Nr Alton, Hants. He and other members can be found on most evenings on 144·48MHz.

Radio Amateurs Examination

There were 1,563 entrants for the Radio Amateur Examination held in May. Of these, 954 passed the examination, a percentage of 61·04 compared with 54·22 in 1971.

The next RAE will be held on Thursday 10 May 1973 and applications to sit this examination should be made to the candidate's local examination centre.

The RSGB will provide an examination centre at University College, London WC1. Application forms to sit the examination at this centre are available from RSGB HQ. The fee is £2.10 for RSGB members and £2.60 for non-members. Completed application forms along with the appropriate payment must reach the Society before Wednesday 28 February.

RAE courses

We have only recently been advised that the following RAE courses are being held:

Doncaster. Doncaster College of Technology, Thursday evenings. Particulars from the lecturer, H. Jones, G3SFO QTHR.

Glenrothes. Glenrothes Technical College on Monday and Thursday evenings. Kirkcaldy. Kirkcaldy Technical College on Thursday evenings.

9G1HE

This is the call of the recently formed club at the Tarkwa School of Mines in Ghana. The licensee, George Collins, ex 9J2PV, VP1PV, 7Q7PV and A2CAZ, will be pleased to receive any small circuit boards, electronic components or used books for the use of the club. Any small parcels addressed to Mr Collins and marked *educational aids* should escape customs duty. The address of the club is Box 237, Tarkwa, Ghana.

A wide range digitally-controlled local oscillator

by P. H. McPHERSON, G3TEL*

SOME years ago, the author first became interested in constructing a transistor receiver covering as much of the high frequency spectrum as possible. At that time, there were several possibilities for the type of front-end to be employed, among which were: (i) a free-running first local oscillator with a fixed i.f.; (ii) a multi-crystal converter followed by a tunable i.f.; (iii) a drift-cancelling system such as the Wadley loop used by Racal.

Due to the many advantages of an electronically band-switched up-converter, an attempt was made to build a transistor equivalent of the Wadley loop, but although it worked after a fashion, it was never good enough to be used in a receiver. The project was then shelved until recently, when the introduction of certain integrated circuits to the consumer market made an entirely different approach possible. This article describes a prototype up-conversion local oscillator with digital control of the stability and frequency which provides the equivalent of three hundred crystal-controlled converters, and suggests an alternative to the conventional tunable i.f. which would normally follow such a system.

Phase-locking by numbers

Almost everyone must, by now, have seen examples of phase-locking, either in operation or in print and Fig 1(*a*) shows a block diagram of the most basic loop, where the oscillator frequency, f_{osc}, is locked to and is the same frequency as some reference frequency, f_r. Although it is possible to lock the oscillator to multiples and sub-multiples of the reference, the basic loop is rather inflexible as a generator of frequencies. The introduction of a frequency divider into the loop (Fig 1(*b*)) immediately allows a range of spot frequencies to be generated. Every time the integer, N, by which the oscillator frequency is divided, is changed, the loop adjusts f_{osc} until $\frac{f_{osc}}{N} = f_r$. Complete ic systems of this sort are available from manufacturers such as Motorola and Signetics, but suffer from the disadvantages of square wave output and frequency ranges which are not well placed for this particular application.

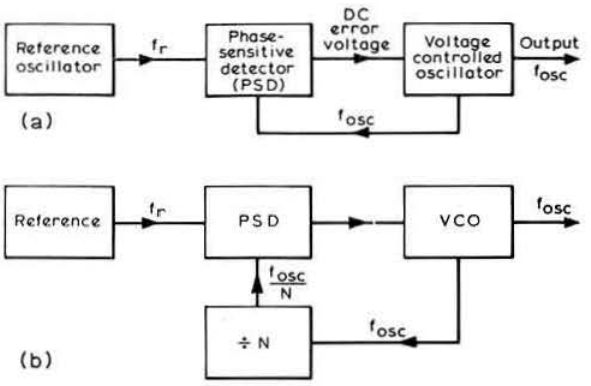

Fig 1. (a) Basic phase-locked loop, (b) programmable loop

The basic system

A mixture of analogue and digital circuitry can be used to produce a programmable loop similar to that in Fig 1(*b*). It was decided that the receiver should have nearly three hundred consecutive 100kHz bands from 0·1MHz to 30·0MHz, with a first i.f. of approximately 41MHz. This means that the local oscillator must lock every 100kHz from 41·1MHz to 71·0MHz.

The reasons for choosing this operating range are as follows:

(i) A lower range, eg 9–39MHz, would mean large changes in oscillator amplitude and/or one or more band changes. The output of a 41–71MHz oscillator can be made reasonably constant in amplitude.

(ii) It is intended that the first mixer in the receiver will be a Plessey type SL640 with a quoted upper frequency limit of 75MHz. An i.f. of 41MHz is therefore a compromise between the limits imposed by specification and components.

A block diagram of the basic system is shown in Fig 2. The oscillator frequency is first divided by 10, as the divide-by-N circuit has a maximum operating frequency of approximately 10MHz. To lock the oscillator every 100kHz requires the divide-by-N circuit to produce a 10kHz output while the loop is locked. The value of N must therefore be any

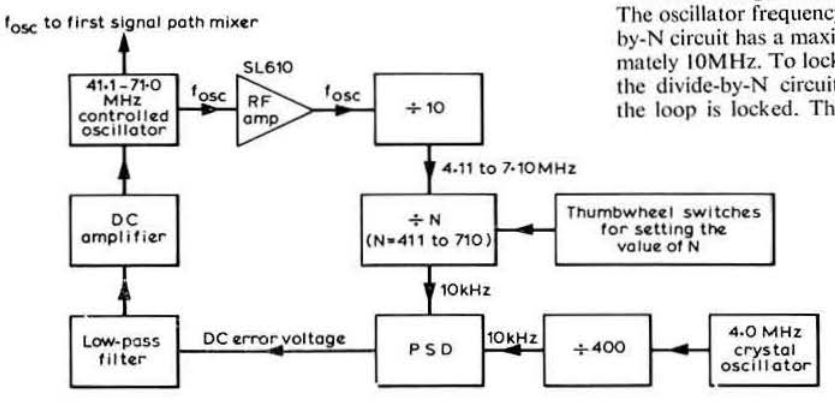

Fig 2. Basic locked oscillator circuit with 100kHz channel spacing

* 17 Christchurch Road, Malvern, Worcs

whole number between 411 and 710. The diagram also shows the crystal standard to be 4MHz. This is not essential as long as the standard used can be divided down to 10kHz (f_r) for comparison in the phase-sensitive detector. It is of course possible to have a different spacing between the oscillator spot frequencies, eg for 200kHz spacing the standard frequency would be divided down to 20kHz and N would run from 205 to 355. For 1MHz spacing, f_r would be 100kHz and N would run from 1 to 29, etc.

Further additions

There are many alternative ways of obtaining the final i.f. when employing a first local oscillator which has a fixed frequency. Normally, this entails a tunable i.f. somewhere in the signal path. A method which is perhaps not so obvious is to make the 41–71MHz local oscillator interpolate between (or even beyond) two of its consecutive spot frequencies. This is shown in Fig 3, and for reasons given later is the method of interpolation which has been chosen for the prototype circuit.

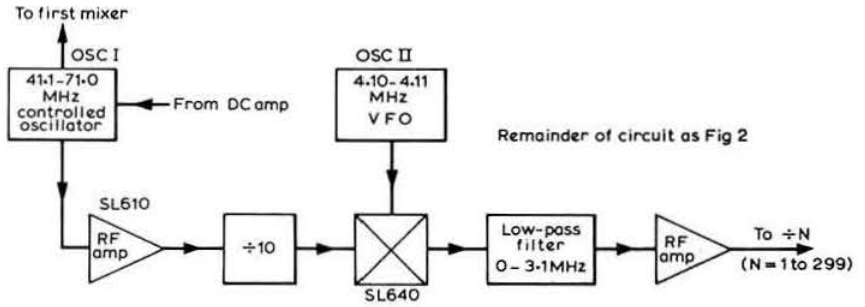

Fig 3. Suggested method of obtaining interpolation

A double-balanced modulator, in this case a Plessey type SL640, is inserted into the loop after the divide-by-ten, and a vfo tuning 4·10–4·11MHz is mixed with the 4·11–7·10MHz output. The 0·01–2·99MHz thus obtained is fed through a low-pass filter and amplifier to the rest of the original circuit. As far as the loop is concerned, it only has control over Osc I (Fig 3) and if Osc II is tuned, the loop will adjust the frequency of Osc I to maintain a constant frequency to the phase-sensitive detector. Thus Osc I is made to track Osc II, but note that due to the divide-by-ten circuit, every 1Hz change in Osc II will cause a 10Hz change in Osc I, calling for a high degree of stability in Osc II. This, in fact, determines the overall frequency stability of the whole system, assuming that the reference oscillator is accurate. There is an obvious application here for a good vxo and a tuning range of 10kHz (or 12kHz for some band edge overlap) should just about be possible at 4MHz.

Several advantages are gained by using this method of interpolation:

(i) It is intended to use a digital display on the front panel of the receiver, and if the counter is attached to the output of the divide-by-ten circuit and is offset by 4·1MHz it will always read the frequency to which the front-end is tuned. If interpolation is accomplished with a variable second or third local oscillator, a counter which displays the complete frequency to which the receiver is tuned has to obtain its information from two oscillators and then combine this in a single display. Perhaps more important is the problem of overlapping the band edges. The method chosen ensures that the hundreds-of-kilohertz digit changes automatically when overlapping either end of the band in use. Any method using variable second or third local oscillators must either do without this facility or must include extra logic circuitry to do the job.

(ii) The frequency of Osc II has been chosen so that the integer N as set up always indicates the lower edge of the band in use in hundreds of kilohertz, eg 141 for the 14·1–14·2MHz band. This avoids the need for mental gymnastics when setting up N for a particular band.

(iii) The second local oscillator frequency may now be generated as a spot frequency and this is conveniently done by multiplying the 4MHz standard by eight to 32MHz, which produces a second i.f. on 9MHz, ideal for a good quality crystal filter.

(iv) The fact that the interpolation is performed in a part of the circuit well away (electronically) from the signal path means that there is less chance of generating spurious responses as might be the case with other methods.

(v) The bandwidth can be made as narrow as required immediately after the first mixer. Unfortunately, with conventional tuned circuits this may not be less than about 100kHz in bandwidth, although it is possible that a crystal filter could be used.

It is not necessary to adhere strictly to the frequency range quoted for Osc I of approximately 41–71MHz. The choice of the lower limit of this range virtually determines what the first i.f. frequency will be, but what must be borne in mind is that the 3·1MHz low-pass filter in front of the divide-by-N circuit can become less effective in rejecting this (divided by 10) lower limit which will inevitably leak through the double-balanced mixer in the interpolation section. For example, if Osc I should have a chosen range of 33–63MHz, the 3·3MHz output of the divide-by-ten (possibly as high as 3·6MHz) may pass through the 3·1MHz lpf, with sufficient amplitude to cause trouble with the waveform to the divide-by-N circuit. Any reduction in the bandwidth of the 3·1MHz lpf to counteract this will, of course, reduce the range over which Osc I can operate. Let us say, then, that the lower limit of Osc I, and hence the first i.f., should not be below approximately 37MHz due to the low-pass filter restriction. What then of the upper i.f. limit? Let us suppose that a range is chosen for Osc I of 50–80MHz. This gives a first i.f. around 50MHz and a range of 5–8MHz to the interpolation circuit mixer. Now in order to maintain our range of N of 1–299 for ease of bandsetting, the frequency of Osc II must be increased to the region of 5MHz, which, bearing in

mind the stringent stability requirement mentioned before for this oscillator, would seem to be a retrograde step. However, a vxo becomes even more possible as one raises this frequency because the percentage change required is reduced. Remember that the suitability of the first mixer in the receiver for use with frequencies above 70MHz is in doubt if the best possible performance is required, and something other than the Plessey SL640 or SL641 may be advised. Assuming, though, that the first mixer has adequate bandwidth, the range of Osc I could be raised until the limit of operation of the divide-by-ten was reached (about 125MHz is quoted as the maximum clock input frequency for the SN74S112).

Thus we have a range of possible first i.f.s from 37MHz upwards and it should therefore be possible to "fit" the first i.f. to any good selectivity filter that may be available. The author believes that such filters are in fact manufactured or can be built with crystals, but regrettably has no information or experience of such, and would welcome any comments from readers on the subject.

Circuit details

Fig 4 shows the circuitry from the reference oscillator through the phase-sensitive detector (psd) to the dc amplifier. Wherever possible, integrated circuits have been used and the reference oscillator is basically two of the NAND gates in a Texas SN7400 ic, with the other two gates used as buffers. The crystal employed in this circuit (which must have a low series resistance at its resonant frequency) is enclosed in an evacuated glass envelope and provides excellent frequency stability. Fine adjustment of the frequency can be obtained using the 3–30pF beehive trimmer in series with the crystal. The 4MHz output is fed to an SN7473 dual J-K flip-flop connected as a divide-by-four, and the 1MHz obtained is then divided down to 10kHz using two SN7490 decade counters to divide by 100. This 10kHz is the reference frequency for the psd. The 10kHz may, of course, be divided further to provide gating waveforms for a display counter or clock.

The psd is one gate of an SN7402 quad NOR gate ic. If two square waves of nearly equal frequency are fed to the two inputs, the output from the gate is a pulse-width modulated waveform with the modulation frequency equal to the difference of the two inputs. Passing this output through a low-pass filter produces the mean value of the pwm waveform which is a triangular wave varying between approximately 0V and half the pwm waveform amplitude (for square wave inputs). As the input frequencies get closer and closer, the triangular waveform frequency decreases accordingly until, when the inputs are exactly the same, (eg when the phase-locked loop is operating) the output from the low-pass filter is a dc level representing the phase difference between the two inputs. There are thus two linear characteristics of different senses available for the loop to choose from (each side of the "triangle") and the loop chooses automatically because only one characteristic has the correct slope to give a stable, locked system.

The low-pass filter on the output of the psd is a very important part of the loop, and under certain conditions of loop operation must be designed with care. In this application, however, there is a certain amount of leeway. The primary requirement of the filter is to remove as much as possible of the psd input components, ie 10kHz, which would otherwise frequency modulate Osc I. Obviously the lower the cut-off frequency of the filter, the more effective it becomes

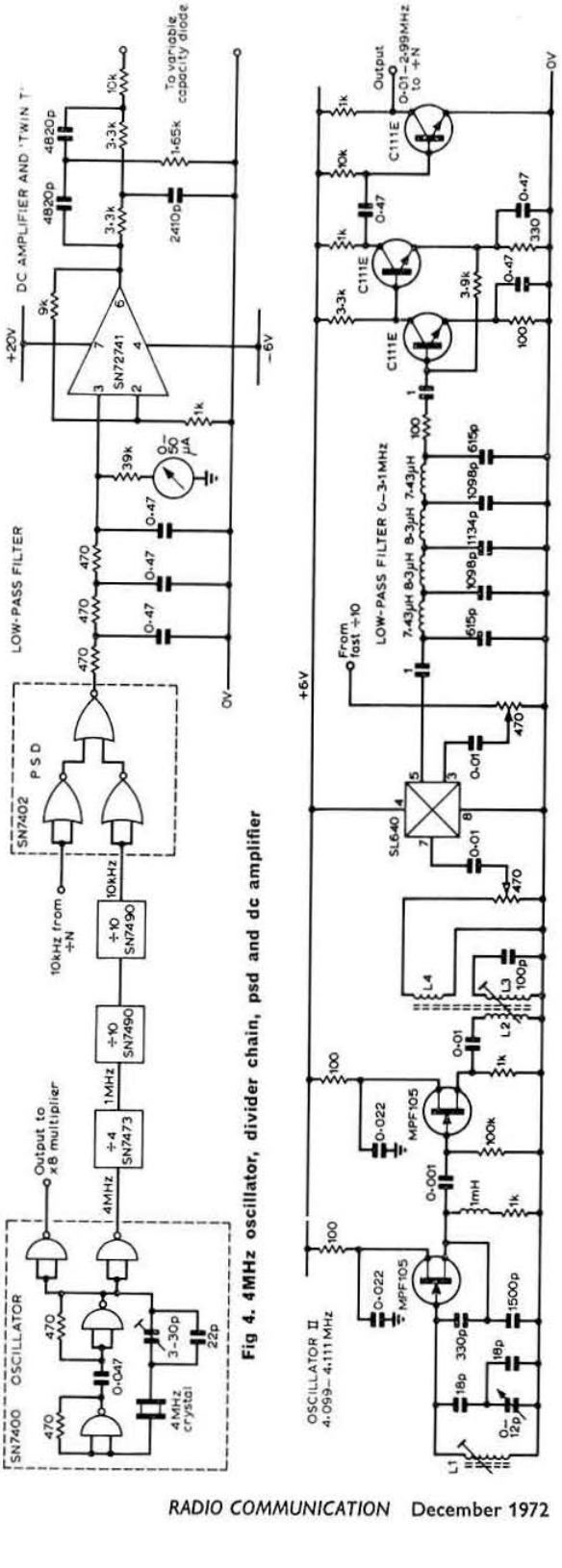

Fig 4. 4MHz oscillator, divider chain, psd and dc amplifier

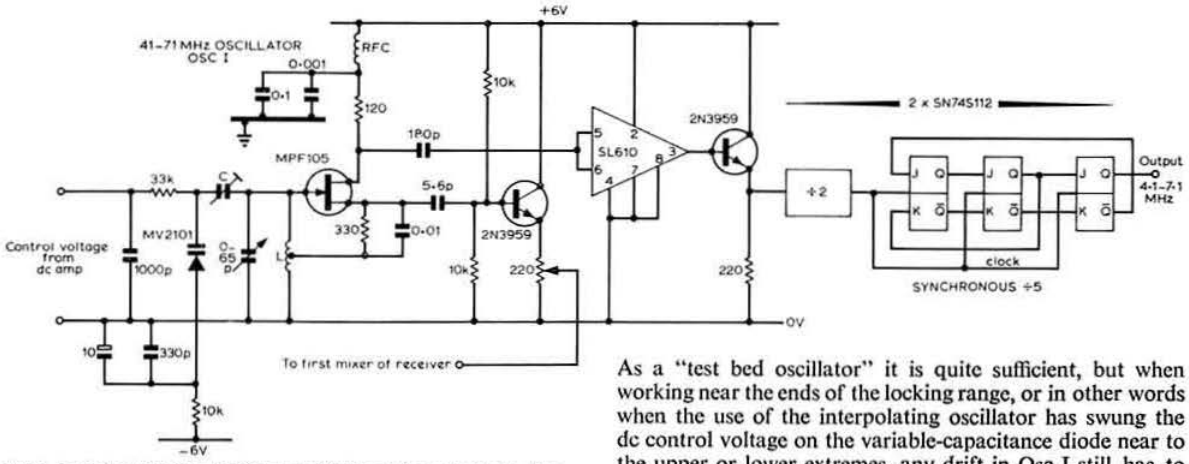

Fig 5. Local oscillator, buffer amplifier and fast divide-by-ten. See text for C. L is four turns 18swg wound on ¼in drill and spaced ¼in long

in this respect, but there is a practical limit to this for the following reasons:

(i) The filter determines the "loop bandwidth" and hence the ease with which the voltage-controlled oscillator may be re-locked when changing bands. Too low a filter cut-off may even make re-locking impossible.

(ii) A filter with a low cut-off is slow to respond to change. Thus there comes a point where the tuning rate of the interpolation is too fast for the loop to follow, resulting in the loop unlocking.

(iii) Too narrow a loop bandwidth means that the loop may not be able to respond to, and therefore control, microphony and noise sidebands from the oscillator itself.

Ideally, then, the filter must have a wide enough response to avoid the above snags while still maintaining a good attenuation of the psd input frequencies. One way of alleviating the problem is to raise the input frequencies, for example to 50kHz, which of course means that Osc I runs in 500kHz bands instead of 100kHz, and this necessitates other changes to the system. Another method is to follow the low-pass filter with a notch filter tuned specifically to 10kHz (see below) which helps to remove 10kHz ripple without substantially reducing the filter bandwidth. The slightest amount of 10kHz (or 50Hz) ripple on the dc control voltage to Osc I causes frequency modulation of the oscillator output to occur and it is worth taking extra care over the low-pass filter and subsequent dc path, to reduce this as much as possible.

The output from the low-pass filter has a range of 0·1–2V, approximately, and to improve the control which the loop has over Osc I, this is amplified to a range of 1–20V using an operational amplifier, which in this case is a Texas type SN72741L. This amplifier is immediately followed by a twin-T notch filter tuned to 10kHz to reduce further any residual 10kHz ripple from the psd. The output from the twin-T then goes to the variable capacitance diode in Osc I.

Fig 5 shows Osc I, the buffer amplifier and the divide-by-ten circuit. The oscillator is a straight-forward Hartley type which was chosen for simplicity more than anything else. As a "test bed oscillator" it is quite sufficient, but when working near the ends of the locking range, or in other words when the use of the interpolating oscillator has swung the dc control voltage on the variable-capacitance diode near to the upper or lower extremes, any drift in Osc I still has to be compensated for by the loop. Thus, if the correction is in the wrong direction, it may be sufficient to push the dc beyond the end of the characteristic, thereby unlocking the loop. So it is therefore worthwhile spending a little time with Osc I in the free running state, reducing the drift rate as much as possible. In fact, anything to improve the quality of the oscillator before introduction to the loop is worthwhile, and there is no reason to ignore the usual rules of oscillator construction.

The variable-capacitance diode is a Motorola MV2101 which has a nominal capacitance of 6·8pF at a reverse voltage of 4V. The diode in the circuit has a permanent reverse bias of 6V plus whatever the dc control voltage happens to be. This is well within the maximum rated reverse voltage of the diode, with a bit to spare for the added rf. The diode is joined to the oscillator tuned circuit by means of a uhf ceramic trimming capacitor (C in Fig 5) of approximately 0–5pF (type number not known). Adjustment of this trimmer allows the amount by which the oscillator frequency is pulled by a given dc control voltage change to be set as desired.

No mention has been made yet of what happens to the loop, and in particular to Osc I, when N is changed from the band number in use. The answer is that the loop unlocks, and Osc I becomes free-running. It must then be re-locked by adjusting the tuning capacitor of Osc I. It is hoped that sometime in the future an electronic means can be developed for this coarse tuning, but unless it can be done in a fairly simple fashion it may not be worthwhile.

The buffer amplifier is a wide-band Plessey type SL610 with a voltage gain of 10, which was included to ensure that the divide-by-ten circuit always has sufficient drive over the entire frequency range and to isolate the oscillator from any possible transients which the divide-by-ten may produce. The divide-by-ten itself consists of a pair of dual J-K flip-flops of the Schottky clamped ttl variety (Texas SN74-S112). The first flip-flop acts as a divide-by-two followed by the other three in a synchronous divide-by-five configuration.

When the circuit is used to generate spot frequencies (ie without the interpolation facility) the output from the divide-by-ten is fed straight into the divide-by-N without interfacing. Fig 6 shows the circuitry involved in the divide-by-N, which consists of three SN74192 up/down counters in series. Each counter is associated with a thumbwheel switch

◀ ***Left*—Fig 7. Interpolation circuit. L1 is 20 turns 28swg on Aladdin F804 former. L2, L3 and L4 are respectively eight, 13 and 10 turns of 28swg close-wound on Aladdin former**

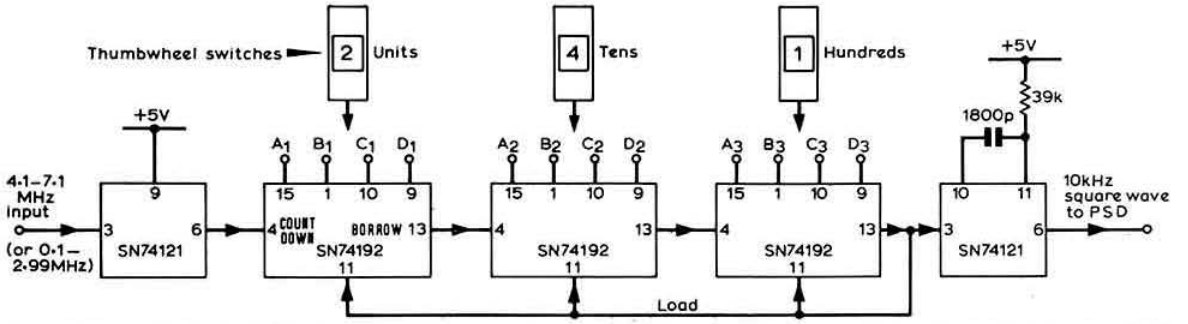

Fig 6. Divide-by-N circuit divides by any whole number from 1 to 999 at speeds of up to 10MHz with SN74121 input or 8MHz without

on the front panel—one for units, one for tens and one for hundreds. N is set up on these switches and on the command of a load pulse, N in binary coded decimal is loaded into the counters. For every input pulse arriving from the divide-by ten, this loaded number is reduced by one. When all three counters have reached zero (ie after N input pulses) a load pulse is generated and the sequence starts again. As one load pulse is produced for every N input pulses, the load pulse may also be used as the output. Fig 6 shows that as well as the three counters, there are also two SN74121 pulse generators. The one on the input to the divide-by-N merely helps to extend the frequency range of the counter, while the one on the output stretches the narrow load pulse to a width of 0·05mS, producing a square wave at 10kHz as required by the psd.

Finally, the circuitry for interpolating is shown in Fig 7. This consists of the interpolation oscillator, a double-balanced mixer and low-pass filter. The oscillator tunes nominally from 4·10–4·11MHz, which, as explained before, produces a 100kHz change in Osc I. In fact the range is 4·099–4·111MHz, giving a 10kHz overlap at the band edges. The capacitor C in Osc I is adjusted so that tuning Osc II over its full range causes the dc control voltage to move approximately from two to 18V at 41MHz (this voltage swing will decrease as the frequency of Osc I increases). It was found that unless one of the input waveforms to the double balanced mixer was extremely pure, mixing of harmonics caused intolerable modulation of the output waveform, as did overdriving the mixer. This is the reason for the tuned circuit on the oscillator output. It is also the most convenient place, as the fixed tuned circuit has the necessary bandwidth at this point whereas a tunable filter would probably be required on the divide-by-ten output. The Tchebychev low-pass filter cuts off at 3·1MHz and further attenuates any of the original frequencies which get through the double-balanced mixer. A wide-band feedback-pair amplifier and emitter follower bring the required mixed product up to a suitable level to drive the divide-by-N.

Construction

Ideally, all the ttl ICs should be on printed circuits, but failing this, Veroboard is a good compromise having been used successfully for some of the prototype circuits. All the circuits have been built onto the *lids* of die-cast boxes. This means that the box can be permanently screwed down while allowing the lid, circuits and all connections to be lifted clear. Inter-box connections are by BNC type plugs and 50Ω coaxial cable. All the supplies in use are electronically regulated in an attempt to get rid of hum problems before they occur. It goes without saying that mechanical rigidity and the best screening possible are necessary, especially in and around Osc I. Another important region is the dc control path. A change of 1mV will move the frequency of Osc I by about 10Hz at 40MHz (and correspondingly more at 70MHz) so it requires very little pickup on this line to produce unwanted frequency modulation of Osc I.

Conclusion

The local oscillator described here is intended for use with an ssb receiver, built with the Plessey SL600 series of amplifiers and balanced modulators. Considering the ease with which one may construct the signal path using the SL600 modules, it is fair to ask why there is a need for a local oscillator of such complexity. One answer is that a good quality, accurate, general coverage receiver can be used for other things beside listening to amateur signals. For example, it can be used as a frequency meter or spectrum analyzer of sorts, and of course any tunable i.f. is available for converters etc. Nevertheless, it is a major project and the integrated circuits alone cost over £20 at present. Anyone who contemplates constructing such a system will find of great value a valve voltmeter with vhf probe, an oscilloscope with at least 3MHz bandwidth, and a digital frequency meter or some other accurate frequency measuring device.

Component supplies

All the digital integrated circuits described in the article are obtainable from Quarndon Electronics Ltd, Slack Lane, Derby, together with data sheets. Alternatively, information on all Texas ICs (digital) is contained in *Texas Instrument Semiconductor Component Data Book Two*. This includes pin connections, circuit descriptions and all necessary design information and is available from Texas Instruments, Manton Lane, Bedford, (for a fee).

The Plessey range of SL600 ICs is obtainable from SDS Ltd, Hilsea Industrial Estate, Portsmouth, Hants, together with data sheets.

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[1] Bryant, J. M., "Using SL610, SL611, SL612 rf amplifiers", *Radio Communication*, Feb 1971.

[2] Bryant, J. M. "Using the SL640 and SL641 double-balanced modulators", *Radio Communication*, Nov 1971.

Assessment of hf aerials using vhf aerials

by P. G. DODD, G3LDO*

THE method normally used to assess the performance of a beam aerial at hf frequencies (14, 21 and 28MHz amateur bands) is to check on its front-to-back ratio (this is usually achieved by monitoring a transmission on the S-meter of a receiver while rotating the aerial), and a statistical check of two-way contacts, relying on experience with a previous aerial as a standard of comparison. If this experience is lacking, more reliance has to be placed on aerial performance figures given in aerial constructional articles in magazines and books.

Aerial performance figures are usually quoted as gain over a reference dipole, and some gain figures often quoted in books for various aerials are:

3-el beam	ZL special	2-el quad	G4ZU birdcage
7-8·3dB	6-7dB	5·6-9dB	10dB

With the exception of the three-element beam, angles of radiation of these aerials at different heights above ground are rarely quoted.

The author decided to make comparative tests on small rotatable beam aerials, capable of being accommodated in a small garden, for the 14, 21 and 28MHz bands, because the comparative aerial performance information available was inconsistent. The requirement was to record the horizontal and vertical polar diagrams and compare the forward gain figures. To achieve this, even at the highest frequency in the 28MHz band, would require a large range with a high tower at one end. As this was out of the question, the tests were carried out at 145MHz in the vhf band, so that the aerial models and the test range could be scaled down to a manageable size.

Initially the test range was 6m long with a tower at one end 6m high (see Fig 1). Consideration was given to conducting these tests at a much higher frequency (435MHz) but this was not done in case the behaviour of these very small aerials was different from that of the aerials with which they were being compared; considerations such as rf "skin effect" and length-to-diameter factor (K factor) could cause complications.

Test range

Fig 1 shows the general layout of the test range. The transmitter was connected to the aerial under test and the signal strength measured on a diode field-strength meter. The tests were conducted over a rather wet lawn. The effect of the reflection coefficient of earth between, say, 14 and 145MHz was not known, so the vertical polar diagram of a horizontal

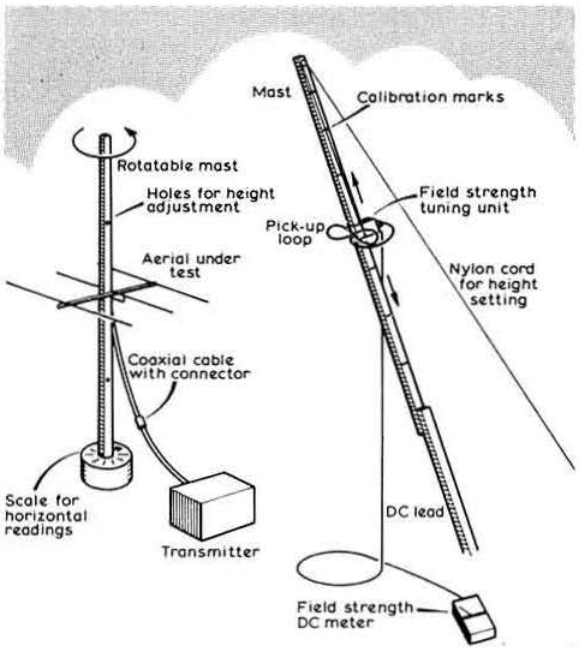

Fig 1. The test range

dipole was measured at a quarter, half, three-quarter and one wavelength above ground (Fig 4). The half, three-quarter and one wavelength patterns were very close to the expected theoretical patterns; the effect of reflection coefficient between 14 and 145MHz was not regarded as significant enough to invalidate these tests.

Diode field-strength meter

The diode field-strength meter circuit diagram is shown in Fig 2. Special care was taken to filter the dc output leads because they were 9m (30ft) long. Because the overall test results are affected by the field-strength meter linearity an attempt was made to calibrate the linearity characteristics. The diode field-strength meter was not sensitive enough to be calibrated on a vhf signal generator [1], so in a further attempt to find the linearity characteristics, the diode field-strength meter was connected to a vertically-polarized dipole.

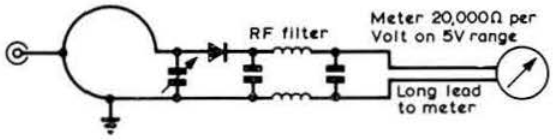

Fig 2. Field-strength meter

A further dipole, energized by a transmitter, was placed at various distances from the meter and the graph in Fig 3 was produced. This test was repeated several times and the results, each time, were roughly the same; at about 9m between the two dipoles the graph departed from the normal downward trend. This might have been caused by ground reflections or a change in characteristics of the field-strength meter diode

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at the lower rf field strengths. Consequently the readings taken during all the tests were kept between 0·5 and 5V whenever possible.

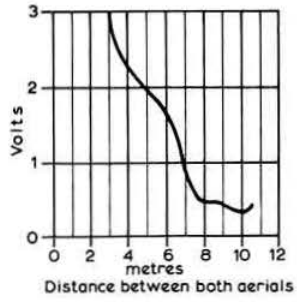


Fig 3. Field-strength meter linearity

Horizontal polar diagram measurements

The horizontal polar diagram was measured by energizing the aerial under test and rotating it through 360°, all the time taking measurements at the field-strength meter. The field-strength dipole was tried at various angles but the horizontal pattern varied very little. The measurements were taken at the vertical angle of maximum radiation.

The dipole test gives a polar diagram similar to the theroretical pattern, see Fig 8. Comparative gains of the different aerials were not performed at this stage. Before commencing a test pattern on an aerial the field-strength meter was adjusted so that the maximum voltage was between 4 and 5V. This was to ensure that field-strength meter was operating over the linear section of its characteristic.

Vertical polar diagram measurements

The vertical polar diagram was measured by energizing the aerial under test and plotting the field strength at various angles relative to the horizontal. This was carried out with a dipole and field-strength meter on a wooden mast situated at the opposite end of the test range to the aerial under test. The field-strength meter and dipole were attached to the mast in such a manner as to allow them to be moved up and down (see Fig 1) against calibration marks on the mast.

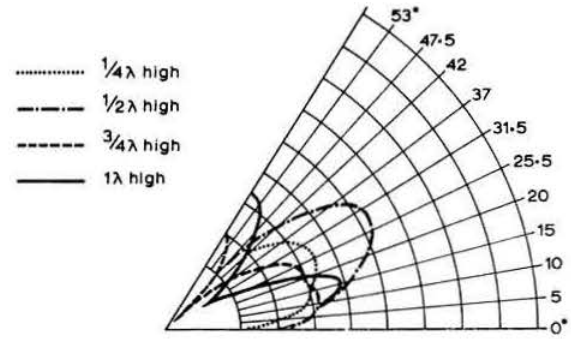


Fig 4. Vertical patterns for the dipole

The mast was 6m high, though only calibrated along 5m of its length. The lower half of the mast was adjustable so that the lowest calibration point was at the same height as the aerial under test when tested at various sub-multiples of a wavelength above ground. The mast was sloped at an angle of 59° (measured from the horizontal) towards the aerial under test. This was done to give the nearest approximation to a section of a circle required for the vertical polar diagram measurements, without making the test tower unduly complicated. Some disturbance of the vertical polar diagram was accepted, but the general effect of earth with the angles of propagation was clearly shown.

The first measurements were made using a dipole as a test aerial. This was tried at one quarter, one half, three quarter and one wavelength above ground. The results were close enough to the theoretical patterns to be encouraging, see Fig 4.

Aerial models

The aerials tested were small practical beam types that could normally be accommodated in an average garden. The test aerials were cut for 144·95MHz and made of 11swg plain copper and 28swg tinned-copper wire. The aerials were constructed by stapling the elements to wooden battens.

3-element beam

This was to be the standard of comparison for the other aerials because more information existed for this type of beam than any other. It was constructed to design graphs in the ARRL handbook.

The aerial was easy to set up and adjustment of the gamma match for a low swr was straightforward. The vertical and horizontal polar diagrams showed expected results.

Quad

This aerial was built to the conventional design using crossed wooden battens held to the boom by a spider. The driver element was fed direct with coaxial cable and the reflector tuned with a stub. The driven element length and reflection stub were adjusted for a compromise setting of swr, front-to-back ratio and forward gain. The vertical pattern showed a lower angle of radiation for a given height above ground and the horizontal pattern showed a broader pattern than the three-element beam. These results were as expected.

Birdcage

This aerial was tried with the parasitic element, first as a reflector then as a director. A higher forward gain resulted with the parasitic element tuned as a director. The driven element was gamma matched and parasitic element length adjustments were carried out by making the elements larger than required and then pruning and re-soldering the wires. The excess wire was left on until after the correct length was found, then cut off. This was a mistake—the excess length had a loading effect and when cut off left the parasitic element too short. Wires were then soldered to the vertical sections of the director parasitic element and pruned for a compromise of front-to-back ratio and forward gain. The swr was taken care of by the gamma match. No amount of adjustment would reduce the two lobes radiated from the back, the horizontal polar diagram shows the best results that could be attained.

ZL Special

The ZL Special was constructed of wire stretched out on an H-frame. The design was conventional and it was fed directly with 75Ω coaxial cable. On initial tests the swr was found to exceed 3:1; no amount of tuning or changing of length of the phasing lines made much difference although the horizontal

pattern was good. It was suspected that the feed impedance was greater than 150Ω, in which case a coaxial balun should make some improvement. This was not done because most constructional articles state that the ZL Special can be connected directly to 75Ω coaxial cable.

All-metal quad

While working in Sierra Leone the author had to build an all-metal version of the cubical quad because materials to make a conventional quad were not available. A 14MHz aerial was constructed out of metal tubing which looked like two 28MHz two-element beams stacked at a half wavelength, with tips of the upper and lower bays joined together with copper wire. The resonant frequency of this aerial was found to be far too high, so, because it was impractical to increase the length of the horizontal tubular elements, the distance between the bays had to be increased. This distance was increased to 20ft before the beam became resonant within the 14MHz band.

An article by G. D. Weson, G3NUF/CX9AAN, [3], and another in *SWM* April 1968, make interesting reading and confirm the author's findings.

An aerial using the same construction technique was made for the test frequency, the ratio of dimensions being the same. The reflector was made larger by increasing the length of the horizontal tube elements because it was impractical to make the vertical wires longer. The driven element was fed directly with 75Ω coaxial cable. This aerial was easy to adjust and produced an excellent horizontal pattern.

Results

Vertical patterns (Fig 5)

The aerials were measured at various heights above ground, the results showing that the gain of the dipole, element beam and ZL Special was greater at a half-wavelength high than at one wavelength. It was thought that this might be due to the test aerial and receiver aerial being too close together.

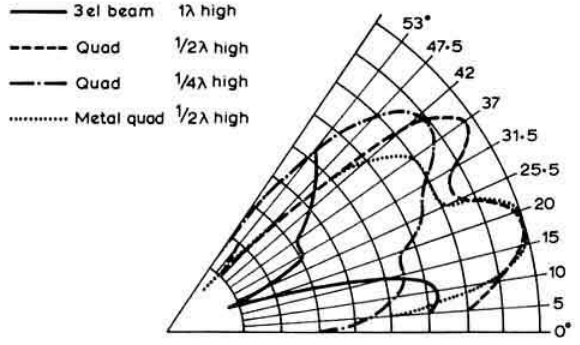


Fig 5. Vertical pattern—3-element beam compared with quad

The test was repeated at twice the distance, which showed the half and full-wave height patterns more equal (Fig 6), though the receiver mast was not high enough to look at the half-wave pattern properly. The angles of radiation seemed fairly close to the theoretical values available [4]. The kinks in the patterns cannot be explained, especially on the top lobe of the three-element beam full-wave pattern. It is possible that, though the aerial height is one wavelength, the electrical height is more, and a third lobe is emerging. The effect was more pronounced on the 12m range test where the lawn was known not to be as damp.

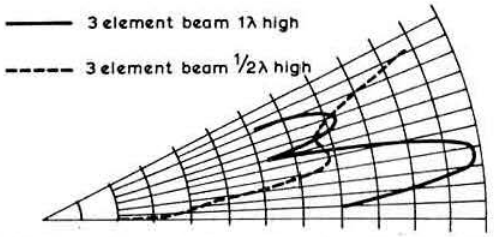


Fig 6. Vertical pattern—3-element beam tested at 12m distance

Horizontal patterns (Figs 7 and 8)

The dipole and three-element beam horizontal patterns were measured and compared against known patterns to check out the measurement technique, then the other patterns were completed.

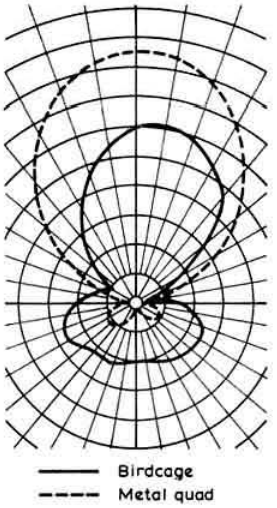


Fig 7. Horizontal patterns

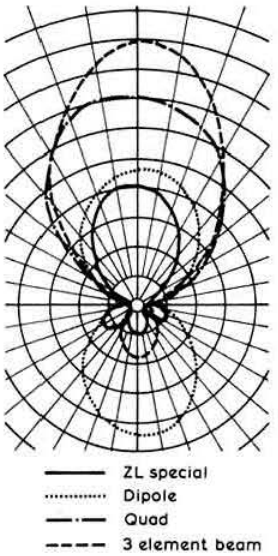


Fig 8. Horizontal patterns

Relative gain measurements

To obtain a gain comparison each aerial was connected to the transmitter in turn and the transmitter tuning and loading adjusted for the same rf output. It was important to maintain a constant transmitter output while comparing the gain of the different aerials. This was done by measuring the pa mode current and the rf current in the aerial lead (with an swr bridge) simultaneously. SWR readings on all aerials, with the exception of the ZL special, were less than 1·6:1.

A series of comparative readings was repeated at various distances and aerial heights and the average figures used to produce a factor. The aerial pattern figures were divided by the factor to produce the comparison polar diagrams. Gain figures have not been allotted to them as the characteristics of the field-strength meter were not known with sufficient precision.

The ZL Special proved to be a real problem. More time was spent trying to get it to perform properly than on all the other aerials put together. The transmitter could be loaded without difficulty but the swr was very high (3:1). This probably resulted in the poor comparative performance of this aerial.

Conclusions

The polar diagrams in Figs 5, 7 and 8 indicate that a three-element beam, one wavelength high, gives the best performance. This means that a tri-band Yagi, 70ft high, would be the best all round hf aerial for amateur purposes. However, such an aerial is out of the question for most amateurs.

The quad works very well provided that the lower elements are a half-wavelength or more high (35ft on 14MHz). Although the all-metal quad gives the best performance, the conventional quad is more practical for three-band construction.

Bibliography

[1] "Taming the diode field-strength meter", *CQ magazine*, February 1963.

[2] "Fold-over mast for beam support", *Short Wave Magazine*, August 1966.

[3] "Story of a cubical quad", *Short Wave Magazine*, June 1969.

[4] "Antennas and radio propagation", *US Army Manual.*

[5] "Ten-metre cubical quad", *Short Wave Magazine*, April 1968.

[6] *ARRL Handbook*, thirty seventh edition, pages 372 and 373.

Oscar 6 progress report

by JACK HUM, G5UM

ON Sunday 15 October at 1719gmt the sixth Orbital Satellite Carrying Amateur Radio was lifted off the ground at the USA Western Test Range. Weighing 35lb, and part of the payload of a Thor-Delta rocket, Oscar 6 carried beacons on 29·45 and 435·1MHz radiating the basic callsign identification HI as earlier Oscars have done, but also intended to provide morse code information extracted from 24 internal telemetry channels describing the general electrical condition of the equipment.

Orbiting the earth at 910 miles (it can "see" out to a radius of 2,500 miles), Oscar 6 offers a further facility: the opportunity to make world-wide contacts through the on-board translator. Signals received between 145·9 and 146·0MHz are re-radiated between 29·45 and 29·55MHz so that 10m tunes exactly like 2m. A signal actuating the translator on 2m may be monitored by listening to it on 10m.

Control of Oscar 6 in space is exercised from AMSAT, the Radio Amateur Satellite Corporation founded in 1969 specifically to co-ordinate the world-wide amateur radio satellite effort (PO Box 27, Washington DC, 20044, membership $10 a year brings copies of *AMSAT Newsletter*, essential reading for Oscar followers). Commands transmitted from ground control in the USA and Australia to the satellite switch various services in or out as required. Additionally, the command facility permits data information such as orbit predictions to be sent up to Oscar 6 for loading into a device known as Codestore, which uses complementary mos logic to store several words for continuous retransmission in morse or rtty. Its capacity is 768 information bits.

After the launch

As soon as the news of Oscar's launch broke via the hf band network, many European operators awaited its appearance over the horizon. Right on orbit 1, G3COJ heard five European countries translated out on 10m from 2m and a couple more on orbit 2. His first contact (150W, 8-over-8) came on 17 October from orbit 27 with many others following until he worked K2RTH the next day (orbit 39) and a rare one in FP8AA on 23 October.

First across the Atlantic via Oscar 6 seems to have been F9FT who worked K2RTH on orbit 4 at 559 both ways. On 17 October PA0JMV reached out to VE2BYG and K9HMB near Chicago (orbit 23), and in less than a fortnight after launch had worked 34 stations in 17 countries, 2m to 10m.

Also on 17 October GW3FSP began a remarkable series of transatlantic contacts by working K2RTH, W1FOP and K8UQA, followed on 21 October by K1MDJ and VE1AGR, and on 22 October by VE2BYG, not counting a clutch of Europeans, all on cw with 150W and a 10-el.

Switched off

As the weeks passed and more dx came with experience, it was noted that not every supposedly favourable pass produced results from the satellite. On occasion the translator refused 2m signals offered to it: at any rate none came out on 10m. Or the beacons might be missing. (Of the two, that on 435·1 is reported as the more reliable, and morse code telemetry about internal power states has been received consistently. The Codestore experiment, however, initially provided only garbled text).

System "outage" caused by random switching disappointed many operators seeking to QSO through Oscar 6 in its early days. There was no need for anxiety, for the translator is expected to be in service for a year and (subject to the vagaries of all electronic equipment) to remain operational until its even more comprehensive successor comes forward from AMSAT. So there is plenty of time in the months ahead to make good use of it.

Power

Silence by the on-board beacons and translator was initiated by ground command in the interests of battery conservation. Powered by solar panels, the nickel-cadmium cells' charging rate, and the state of the translator agc, suggested that too much rf was being offered by ground stations to trigger the translator 2m receiver unit. High power, by thumping Oscar's agc, denied its use by lower powered stations.

In the above-reported transatlantics by PA0JMV, maximum output never exceeded 100W of rf; in one of several QSOs with K2RTH output was 20W and for many European contacts only 10W (aerial 16-el at 50ft).

A leading Home Counties operator questions whether "please reduce power" exhortations have any purpose. "The amount of power European stations are able to direct at Oscar is small compared with what the USA can pump out, and this must have been taken into account in the

design, anyway". Some evidence does exist that USA-type power levels were in use in Europe, ie 3kW to a 96-element beam.

A West Midlands group reporting "instability noise" from the 29·45–29·55MHz translation band attributed it to incipient instability induced by excessive power. One of their members decoded the telemetry on 435·1 to say that the agc, saturated by incoming big signals, virtually turned off the 10m retransmit downlink.

Whatever the merits of the argument, it seems clear, as many members have asserted, that "just enough power to make your own 2m signal audible on 10m will do. If *you* can hear it, others will." The maximum required is 80 to 100W of erp.

Aerials

Particularly when Oscar is at high elevations, low-angle aerials are less than effective. But G3COJ, after a few trials with a dipole, stuck to the 8-over-8 and many excellent low-angle contacts. At Dun Laoghaire, EI6AS put up crossed dipoles for both 2m and 10m that paid off. And at PA0JMV the dx was worked with a 10m ground plane *indoors*, complementing the 14-el outside.

Sheffield's G3NHE, noting the 10-el to be less effective at QRBs below 1,500 miles, found a hand-held 3-el an improvement. For overhead orbits G3COJ subsequently put up a 4-el firing vertically. Success came to G6AG with a 10m dipole fixed N-S at 40ft (five Ws worked in the first three weeks), to G3NEO with a rotary dipole at 35ft, which got him W1GOP on Orbit 16, 16 October, at exactly the moment G3MOT was working VE.

Oscar miscellany

G3WPO, G3RKL and others make the point that operators should not neglect the more distant passes, for Oscar 6 can "see" the UK on most orbits. The distant ones offer excellent low-angle shots.

Generously, G3WPO offers orbital predictions, professionally produced, for a month ahead, giving tables for calculating AOS and LOS times, beam headings and maximum elevation. Large sae to Tony Bailey, 5 Erin Way, Burgess Hill, Sussex RH15 9PN.

Use the 435·1MHz telemetry morse to establish if Oscar is using 10m, advises G3COJ. It comes out as three-figure groups four at a time. Look for the *second* number in the row of four. When it begins with "5" (eg 504) it indicates pa emitter current. Look for the *first* number in a row of four. When it begins with "6" it indicates translator rf power. If the numbers are 500 or 501, or 600 or 601, the translator is off. At Cambridge G3SXK copies the 70cm telemetry so consistently that colleague G3USB has written a computer program which calculates and prints out the telemetry figures.

Numerous callsigns appear consistently in reports, eg much admiring comment at the immaculate ease with which G3LTF operates through Oscar and the S9-ness of EA4AO. But others are rarer, eg K1ARD and W4AHJ reported only by G6NB, and W0EPZ and W9YYF, both worked on Orbit 141, 27 October, by GW3FSP, to bring his transatlantic Oscar total to 19 in less than a month. Not many Russians: a few have worked UW6MA. Only in the log of G3USB does UA2BJO appear, heard on A3J on 29 October. Another rarity for 'USB was I2SRR of Milan, sidebanded on 1 November, at low signal level. Most of the G3USB entries in his log for AMSAT say, unusually, "A3J", for a majority of operators have concentrated on A1 even when ssb was in-house, and not too QRQ at that: "Under the fluttery conditions of translated signals a steady fist is more readable than a fast one"—G3NHE.

Although A1 and A3J, which are both on-off cw systems, rarely tangle, it would help through-Oscar readability if they could be kept apart. Suggestion from GW3FSP: telegraphy in the bottom 50kHz and speech in the upper 50kHz of the 2m uplink.

Flutter-QSB on the 10m down channel is common. Has anybody noted Tone-A? On 18 October G3USB records that an auroral sound was present on all signals, suggesting the intriguing possibility of "57A" via Oscar. And another propagation poser: on 7 November at 0740gmt the 10m translated signal from G3COJ was reported by ZE7JX of Salisbury. Ionospheric? Or direct ray at a QRB of 5,300 miles? Again, which of these modes helped G3LDI hear K7BBO at 4,740 miles working VE2?

Prediction bothers? None with G3NHE after he had built the G2AOX chart and cursor device (see April *Radio Communication*). "It became an invaluable aid once I had figured out how to make it."

Report forms

Oscar 6 offers a unique opportunity to amass valuable propagation data. For this purpose a simple combined report form and log sheet has been prepared by AMSAT and is available either from RSGB headquarters or from G2BVN, IARU Region 1 secretary, (Roy Stevens, 51 Pettits Lane, Romford, RM1 4HJ Essex). These when full should be returned either to G2BVN or to headquarters, when they will be photo-copied and then forwarded to AMSAT.

Finally, re-read the authoritative articles on satellite tracking by Bill Browning, G2AOX, which appeared in this journal in April 1972 and in 1966 and 1968*. Above all, monitor the GB2RS news bulletins every Sunday for the latest orbital predictions. From these you can work out Oscar's appearances for the rest of the week by adding 28·77° to each track and 115min to the time, for each orbit, which will be near enough to determine beam headings to use for Oscar until the next GB2RS information is broadcast.

*** Also reprinted in a booklet obtainable from the Editor at RSGB Headquarters, price 10p.**

Oscar History

Oscar 1 12 December 1961. Life: 20 days. Simple HI-beacon 144·98MHz 100mW.

Oscar 2 2 June 1962. Life: 18 days. Simple HI-beacon 144·99MHz 140mW.

Oscar 3 9 March 1965. Life: 15 days. First free access active communications satellite. Received on 144·1, retransmitted on 145·9 and beacon on 145·85MHz at 50mW.

Oscar 4 21 December 1965. Life: three months. Received on 144·1 and retransmitted on 431·938MHz with 3W. Beacon on 431·928.

Oscar 5 23 January 1970. Life: two months. Australis-Oscar first to be ground controlled. Beacons on 144·05 and 29·45MHz at 50mW and 180mW.

TECHNICAL TOPICS

by PAT HAWKER, G3VA

THIS month the usual mixture of what we hope are practical hints that can be used immediately and with reasonable expectation of achieving satisfactory results (though as some journals put it—we guarantee nothing) plus a selection of ideas and techniques that still need working on. All who select material for amateur publications are up against a long-standing problem: a lot of readers are highly-experienced and are looking for new ideas, having already absorbed the mass of established techniques; but many, many others are relative newcomers seeking guidance on how to build or get the best out of conventional equipment, with no immediate wish to blaze a trail. By its nature, *TT* is basically for the experimenter and for those who wish to keep up-to-date on new developments; but at the same time we feel it is equally important to provide hints and tips and information that will be found useful by the newest of newcomers. It is salutary to remember that about one-half of all current British amateur licences have been issued within the last five or six years; and that many readers are trying hard to absorb enough technical information to pass the examinations. As one of those pre-war fortunates who never even had to face an RAE, far be it from me to try and blind readers with science, or come the old-timer! But the fact remains that for tutorial explanations of standard circuits and practice, the place to look should usually be a book rather than a periodical.

Sweep tubes and the Skinnier Linear

Virtually all the Japanese and many of the American transceivers have their linear amplifiers based on television "sweep tubes" (a more evocative description than the British term "line output pentodes"). The more common types include: 6JS6A, 6JM6, 6KD6, 6LQ6, 6HF5, etc. The PL505 and the later PL509 are perhaps the nearest European equivalent but with 40V, 0·3A heaters. The recently published Mazda Data Booklet (1972-73) lists the PL509 as having a rated anode dissipation of 30W with peak cathode current of 500mA. Until fairly recently, the 6KD6, with 33W anode dissipation, was probably the most potent of these amplifiers. But the current contender for the "most beefy" title is probably the Amperex 6LF6 with its maximum anode dissipation of 40W and a temporary overload rating of 200W. A single 6LF6 is stated to provide up to 175W cw output or about 175W p.e.p. in ssb service. The 6LF6 features a thicker than usual glass envelope to combat "suck in" or cracking; Amperex claim the glass is of a special heat-resistant material; heater ratings 6·3V at 2A. The 12-pin base connections are the same as for the 6KD6.

A self-contained "Skinnier Linear" for 3·5-21MHz, using a single 6LF6, has been described by Doug De Maw, W1CER, in *QST* and recently republished in *Old Man*, October 1972, from where these notes stem. The circuit diagram is shown in Fig 1. 28MHz was not included because of the 18·5pF output capacitance, though techniques for overcoming this

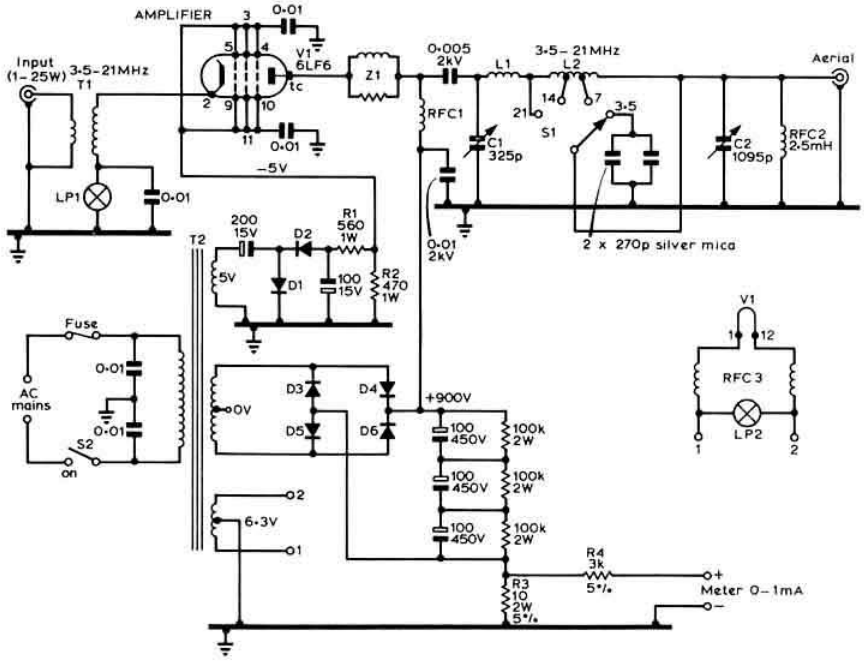


Fig 1. The 6LF6 "Skinnier Linear" amplifier with self-contained power supply. Component notes: C2 formed from three-gang broadcast-type variable; D1, D2-50piv 1A; D3-D6-1,000piv 1A; L1-5½ turns, No 12, 1in dia, 1¼in long; L2-26 turns on T200 toroid, taps from C2 end, 7MHz 13, 14MHz 22; RFC3 - bifilar - wound filament choke, 50 turns No 20 enam on 4in length of ¼in ferrite rod (or 75 turns No 20 on ¾in dia wooden dowel); T1 primary-17 turns No 26 enam to cover two T-68-2 Amidon cores, secondary-35 turns, No 24 enam wound over primary winding; T2-800V centre tapped, 200mA; 6·3V at 5A and 5V at 3A; Z1-parasitic suppressor 6 turns No 20 in parallel with 56Ω 2W carbon resistor; fuse-1·5A for 240V supplies, 3A for 117V supplies

problem have been noted in *TT* (October & December 1971). Apart from the problem of locating a source for the 6LF6, an exact duplication also requires the use of Amidon toroid cores (Amidon Assoc, 12033 Otsego Street, North Hollywood, Calif 91607) but nevertheless it is felt that basic details of this design will be of interest.

The output tank circuit has a design Q of 10 at 250W peak input. To minimize losses, the 21MHz section of the inductor is air wound, the remaining bands on a T200 Amidon core, using No 12 wire. Care should be taken not to overstress the core while winding, but if it should break it can be repaired with epoxy cement, without affecting performance. The input transformer uses two small T-68-2 Amidon cores, stacked. The No 44 pilot bulb (6-8V, 0·25A) acts as a fuse to protect the 6LF6 and also provides a visual tuning indicator. Maximum safe drive for the full output of 175W p.e.p. is 25W, but it is claimed that even a 1·5W QRP exciter will provide enough drive to give a useful increase to about 22W. At full output, third and fifth order distortion products are about 25dB below p.e.p.; at 120W p.e.p. about 27dB.

Solid-state voltage regulation

The use of an fet as a constant-current diode was noted in *TT*, January 1968 and subsequently expanded by G3KOX (*TT*, April 1968). This use of an fet is a feature of a voltage-regulating circuit described by Paul Smay, W9TZN, in Hints and Kinks (*QST*, February 1972); see Fig 2. This approach is most suited for those applications where one wants to run a voltage-sensitive but fairly constant load from a variable voltage source; for example an oscillator run from batteries. It would probably be less suited to those cases where the load itself varies. W9TZN claims that an improvement of about 10 : 1 in regulation can be achieved by using an fet rather than the usual resistor: it is important of course that the maximum current drawn does not exceed the rated current of the fet. The idea seems well worth remembering when it is a matter of running a semiconductor vfo from car or other batteries.

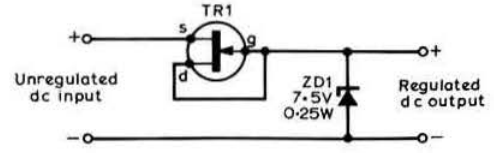


Fig 2. Use of fet to improve voltage-regulation. TR1-MPF102 or any similar type of fet

Some time ago (*TT*, April 1970 and *ART3/4*) we presented a circuit, stemming from ZL2BDB, using transistors and zener diodes to provide a 250V regulated supply. A more recent arrangement, showing how relatively low-voltage transistors can be used for this type of application, stems from Mahendra Shah, *Electronics*, 24 April 1972.

It is pointed out that by absorbing the bulk of the output voltage with a 200V zener, the other devices can have quite low voltage ratings; see Fig 3. The circuit shown is intended to provide 250V with a regulation from 0 to 25mA load better than 0·04 per cent, but it is suggested that similar techniques can be applied up to the kilovolt region. TR1 operates as a shunt regulator, with ZD1 absorbing a good deal of the output voltage so that TR1 need be only about 90V rating.

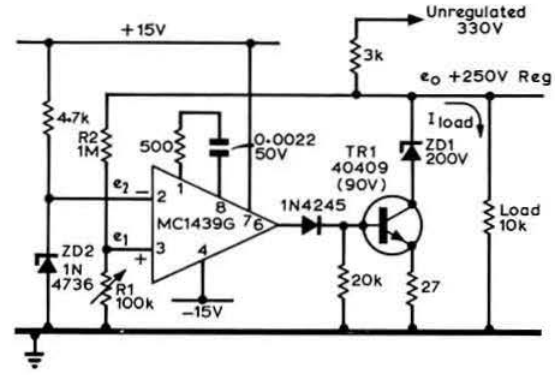


Fig 3. The 250V zener diode takes most of the strain—allowing a 90V transistor to be used to regulate a high-voltage supply. TR1 acts as conventional shunt regulator. Regulated output supply is e2 (1 + R2/R1). The technique could be applied to other regulator circuits not necessarily using an op-amp comparator system

DSBDM—a mode worth watching

Just over two years ago (*TT*, July 1970) we reported on some of the work being carried out at the University of Wales, Swansea, on behalf of the Home Office to investigate the use of double-sideband suppressed-carrier modulation systems for vhf mobile applications. This study has been aimed primarily at checking whether the use of suppressed-carrier techniques would facilitate area coverage in which more than one base transmitter is involved but without the frequency separation that in the past has been used to overcome the problem of beat notes between the different carriers. Clearly the Home Office is anxious to find new techniques to allow the integration of mobile and hand-portable radiotelephones in large area coverage schemes for police, fire or ambulance services.

But this work has also highlighted the attraction of a suppressed-carrier system for applications, such as hand-portables, where the primary source of power is limited and one wants to get the best possible range from battery-operated equipment. These considerations apply equally to amateur operation, although in this case the ability of a network to operate with a number of base transmitters running simultaneously is not particularly sought after.

One of the prime requirements for the successful use of double-sideband suppressed-carrier systems is an effective synchronous detector using phase-lock-loop or related techniques; and it is the coming of the pll-type of integrated circuit that brings this well into the realm of practical possibilities.

At the time the 1970 *TT* notes were written, the work at Swansea was still confined to laboratory tests. Since then, however, fairly extensive field trials have been carried out using up to three base transmitters and adapted mobile two-way radios. The results of these experiments and a detailed assessment of the advantages of the system were presented at the IEE and I have been reading through the papers in *IEE Colloquium Digest* 1972/16.

All the people who have been carrying out the tests seem completely convinced that the system would offer significant advantages over a.m. or nbfm and that, at least for the present, ssb is just not on for this application. These conclusions do not necessarily apply to amateur working, of course, but they seem well worth considering.

The original idea of dsbsc with a more or less fully suppressed carrier has been abandoned, and replaced by dsbdm (double-sideband diminished-carrier). Sufficient carrier is left to simplify the acquisition of phase lock in the receiver and also to improve agc performance, while retaining most of the power-saving advantages of dsbsc. An incidental advantage is that dsbdm can be resolved on an envelope detector so that it would be much easier to introduce gradually. Envelope detection results in a good deal of distortion: it sounds like an over-modulated a.m. signal but because of the use of the balanced modulator in the transmitter this does not mean that the signal is spreading or causing the sort of interference problems associated with over-modulation.

The trial receivers were in fact conventional a.m. receivers of the 25kHz channelling type, but converted to 12·5kHz. Two types of synchronous detector were tried: the 2F system (see *TT*, July 1970) and direct phase-lock using an available ic device. Both were satisfactory but the 2F system deteriorated in the presence of more than one carrier, and was thus not as suitable for the required application of area coverage with multiple transmitters.

In the transmitters, the mobile units were adjusted to have a carrier output of 0·5 to 1W and gave a maximum output of 13W when modulated by a single tone. The sideband power was thus the equivalent of an a.m. transmitter of 37W output, yet the quiescent load on the battery would be that of a 1W transmitter. It can thus be seen that almost all the power-saving associated with dsbsc or ssb transmissions is achieved, yet the residual carrier greatly simplifies phase-locking and agc. And from an amateur viewpoint, it simply means that the balanced modulator does not have to be so accurately balanced!

To quote Professor Gosling: "The results presented demonstrate conclusively the marked advantages which may be obtained with dsbdc in mobile radio applications. This system is preferred relative to nbfm because (*a*) it can give greater range for comparable primary power consumption; (*b*) nbfm would suffer catastrophic worsening of performance in any future reduction below 12·5kHz channelling; (*c*) nbfm is poorly suited to synchronous or quasi-synchronous area coverage . . . a.m. yields poorer range capabilities for the same input power . . . ssb is superficially attractive but suffers from certain serious problems at present, and major technological advances will be required before it is suitable for this field of application. By adopting dsbdc, problems of agc, which arise when the carrier is fully suppressed, are entirely overcome, and receiver phase-locking is greatly simplified. Receivers for dsbdc will operate satisfactorily on a.m. (with slight adjustment of audio gain) and thus problems of changeover to dsbdc from a.m. would be greatly eased."

To modify the a.m. receiver for dsbdc, alterations were made to the i.f., agc and detector circuits, but no alterations were made to the rf and audio sections. The modifications included the fitting of a 12·5kHz channelling filter; gain of i.f. increased to compensate for removal of second 450kHz i.f. amplifier; envelope detector replaced by Signetics NE651B integrated phase-lock-loop circuit. The NE561B's internal oscillator (normally voltage controlled) was held at 10·7MHz by a quartz crystal; while the first local oscillator was converted to voltage-controlled form and controlled by the dc output from the ic. Although coherent agc should provide better results, during the field trials only incoherent agc was provided. The receiver, as modified, locks on to a signal of less than 0·5μV over a range of 1·4kHz (the stability of the receiver can thus be far more tolerant than for ssb).

For valve transmitters, the output stage can be a balanced modulator; for semiconductors the technique outlined in *TT*, July 1970 was used at about 100MHz. Peak clipping was used to increase average power of speech.

Whether or not dsbdm is ever widely adopted for area-coverage mobile applications (the Home Office is carrying out a further 18-month field trial) the work at the University of Wales, Swansea, underlines a number of advantages that would accrue from its adoption by amateurs. Over many years, *TT* has pointed out that dsbsc plus synchronous detection is potentially an extremely attractive system, fully comparable in communications efficiency with ssb plus some other advantages; the extra bandwidth cannot be considered a major disadvantage at vhf. The availability of integrated circuit phase-lock-loop demodulators means that adapting a receiver for dsbdm need be little more difficult than, say, installing a good nbfm discriminator in an hf communications receiver.

Admittedly there is a danger that with so many different modulation techniques now around (a.m., nbfm, ssb, infinitely-clipped plssb, etc) the amateur may feel that the choice is becoming altogether too complicated!

IC generator and counter ideas

The 1MHz square-wave ic signal generator used by Bill Burton, G4ANQ, (*TT*, October 1971 or *ART4*) continues to attract interest, and some further notes have come in recently from Geoff Southern, G3RWW. He has recently built six oscillators of this type, using standard off-the-shelf 1MHz HC6/U crystals from Senator. When he came to measure accurately the frequency of the prototype unit he found it 30Hz high, even with the series trimmer at maximum capacitance, and the other five oscillators showed similar errors. However, he points out that these errors can be readily overcome by using an inductor instead of a capacitor for crystal trimming: see Fig 4. The value of the inductance was calculated to be 150μH, or roughly 110 turns

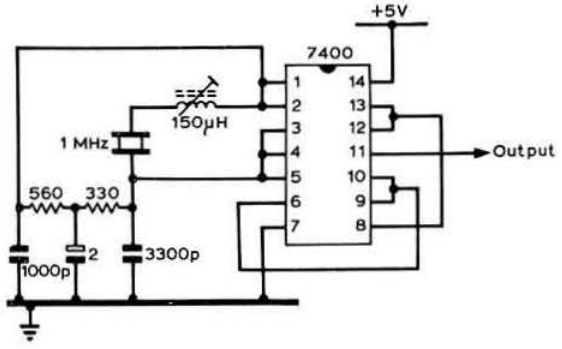


Fig 4. Modified G4ANQ 1MHz oscillator using series inductor to trim crystal to exact frequency

of 36swg copper wire scramble wound on a standard ⅜in former fitted with a dust core. If the crystal is used in an 80°C oven, then the standard G4ANQ circuit with capacitance trimmer should be satisfactory.

G3RWW has also included tube storage in his frequency counter. This utilizes a type 7475 bistable latch between the 7490 decade and the 7441 Nixie driver. The necessary reset and latch pulses are derived from the oscillator divider chain by logic circuitry. The relevant details of these ideas can be gleaned from Figs 5 and 6.

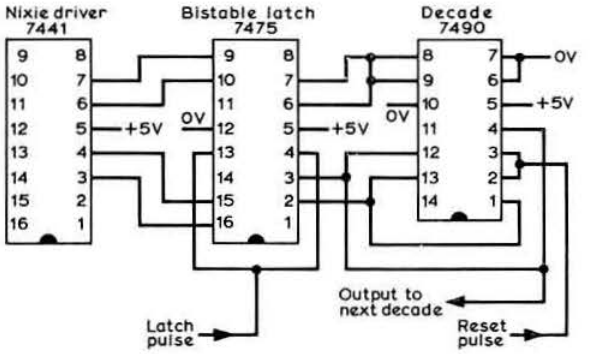


Fig 5. The Nixie decade board used by G3RWW

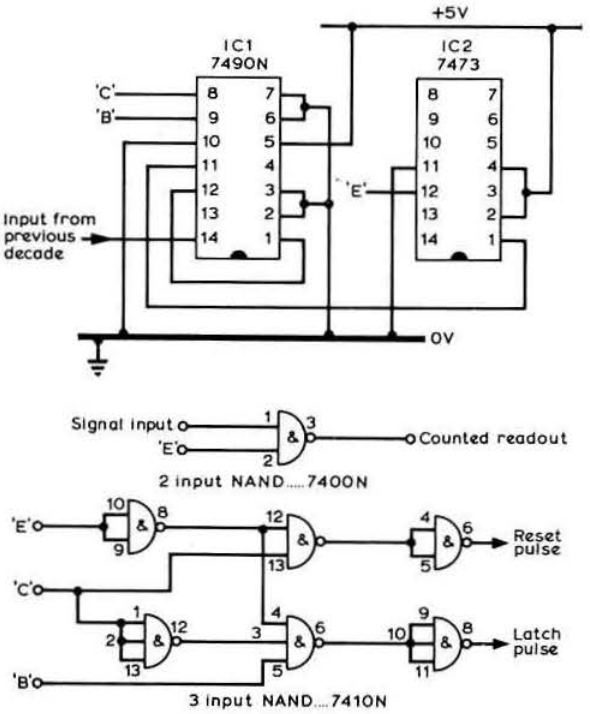


Fig 6. Further details of arrangement used by G3RWW. IC1 represents the last decade divider in the oscillator chain and IC2 is the divide-by-two stage. 7400N two-input NAND, 7410N three-input NAND

More on the new-look receivers

In the notes on better mixers for semiconductor receivers (*TT*, September) we included a short extract from a paper presented by G. J. Lomer of Racal at *Comm 72* on recent advances in hf communications equipment. The conference papers may be a little difficult to come by, so it is worth noting that this particular paper is being reprinted in *Racal Review* (first part in Vol IV, No 4, September 1972). The following are a few more extracts, sidelined by ex-G3DYK and relating to techniques used in such Racal equipments as the RTA1450 and RA1772.

"In the last year or so, some very drastic changes have occurred so that it is now possible to design linear solid-state circuits the performance of which considerably exceeds that of earlier designs using vacuum-tubes . . . receiver performance is principally determined by the performance of the first mixer together with any rf amplification that may be necessary . . . there is a compromise to be reached between the overall noise figure of the receiver and the linearity performance of the mixer expressed in terms of its third order intermodulation products . . . a typical receiver of current design might be expected to have an i.m.p. figure of about 70dB, but receivers that Racal are now offering have a performance in excess of 90dB . . . channel availability with a new receiver *under wideband conditions* considerably exceeds that of a receiver of the previous generation using a tuned preselector . . . in the majority of cases it will be possible to dispense completely with rf tuning in these receivers and this will very much simplify operation under practical conditions."

Unlike the Plessey paper we quoted, G. J. Lomer gives no indication of how the improved mixer performance is being achieved—but we suspect that there may well be some similarity with the techniques outlined in September.

Multi-band verticals

Some 15 years ago, Hans Ruckert, VK2AOU, developed a multi-band aerial technique that had a good deal in common with the multi-resonance tuning circuits that at one time were quite popular for transmitters and aerial tuning units. The VK2AOU approach depends on the fact that a half-wave dipole with two parallel-tuned resonant circuits in series at the centre is resonant at three different frequencies, and no others. He exploited this technique to form tri-band beams, including a tri-band single loop quad element (published originally in *Amateur Radio*, April 1968).

For example, if two equal lengths of wire are strung up horizontally with two parallel resonant circuits inserted near the centre, investigation with a good grid dip meter coupled to either tuned circuit should indicate three resonances, not necessarily harmonically related, and no other pronounced dips: see Fig 7.

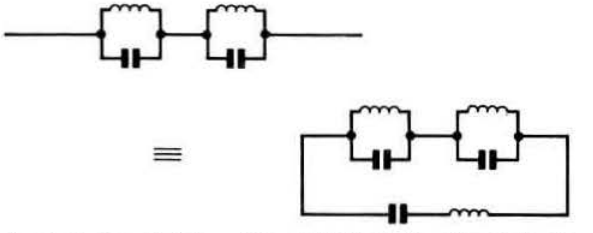


Fig 7. Basic principles of the VK2AOU three-band dipole element

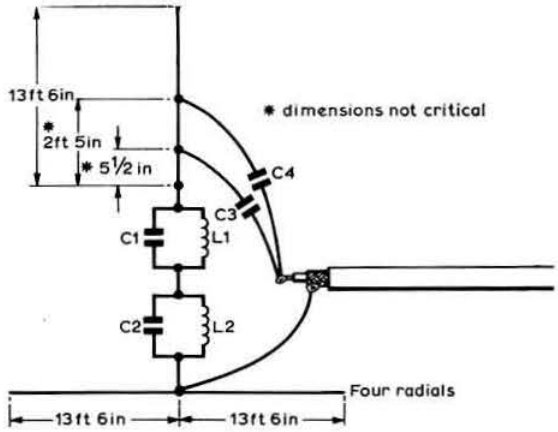


Fig 8. Ground-plane for 14, 21 and 28MHz bands. L1 mainly affects 14MHz, 6½in piece of 14 gauge wire bent into semicircle; L2 mainly affects 21MHz, 2t No 14, 1½in dia, ¼in long, leads 2in and 4in long. C1 mainly affects 21MHz about 160pF; C2 mainly affects 28MHz, 60pF; C3 mainly affects 28MHz, 55pF (adjustment fairly critical); C4 mainly affects 14 and 21MHz, 52pF (adjustment fairly broad). Space gamma section 2in from radiator to 2ft 5in tap, otherwise swr on 28MHz may be seriously affected

Ian Pogson (VK2AZN/T and originator of the home-built Deltahet receivers) has recently described two multi-band verticals based on this three-resonance technique; one covers 14, 21 and 28MHz; the other 3·5 and 7MHz. He provides (*Electronics Australia*, August 1972) a four-page description of the construction and adjustment of this form of aerial, and some of the finer points must inevitably be lost in a brief summary. However, it is felt that at least some readers will be able to work out the essential data from the diagrams, once the basic principle has been grasped. We would not be inclined to recommend the multi-resonance technique to someone who is not armed with a good gdo or not prepared to take time to ensure that the system is really working as it should be. Of course this warning goes for most aerials—since dimensions and adjustments always tend to be affected by the environment, by the screening, and (particularly for verticals) by the ground conductivity and so on.

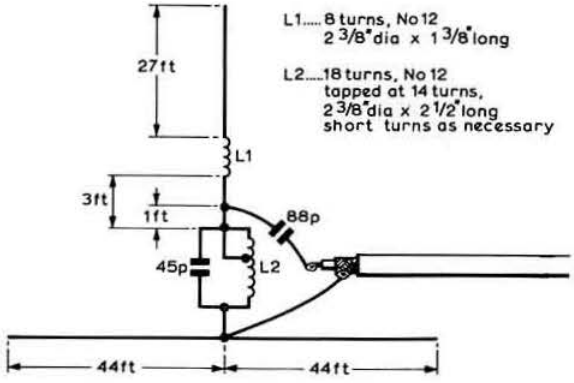


Fig 9. Ground plane system for 3·5 and 7MHz

For the higher bands, the basic element lengths fall between those which would normally be used on 14 and 21MHz: in other words the system is shortened for 14MHz, somewhat lengthened for 21MHz, and lengthened still further for 28MHz. Ian Pogson suggests that the element dimensions given in Fig 8 are about the longest for the frequencies involved, and that it would be possible for rather lower efficiency to reduce the vertical radiator and radials to about 11ft; if this is done it will be necessary to set about finding the necessary values for L and C. The feedline is 75Ω coaxial cable, and it is stated that the whole system can be set up to provide "a low" swr on all bands, though no figures are quoted. All the capacitors were of the miniature variable type, each in a protective plastic container derived from pill boxes and other pharmaceutical products. L1 is just a semi-circle of a 6½in length of wire. C3 and C4 are mounted close to the end of the feedline; the lead from C3 should be a heavy gauge of wire run directly to the tap point 5½in up the vertical element. Greater care is needed with the lead from C4 to the tap 2ft 5in up the element—this must be run parallel with the vertical element starting from an inch or two of the bottom to form a gamma matching arrangement.

Ian Pogson describes a wooden base for mounting the vertical element and the four horizontal radials, all made from 1in od dural tubing, but presumably other forms of construction could be used, or the vertical element fed against a very good earth.

We are by no means certain from the description whether the main application of the original aerial has been as a receiving or transmitting aerial, although both uses are mentioned. So, for someone prepared to experiment, this technique looks interesting.

Unidirectional dipoles?

We have suggested before in *TT* that there is a place for receiving aerials that provide signals which may be weaker than those from a normal dipole but which possess desirable directional characteristics: for example frame aerials, found useful for mf and 1·8MHz dx reception (*TT*, August 1972).

An interesting new concept has been reported recently (with detailed mathematical analysis) by Y. Mikuni and K. Nagai of the Toshiba Research Centre (*Electronics Letters*, Vol 8, No 19, 21 September 1972, p472-3). This consists of a unidirectional dipole aerial intended primarily for vhf television reception but which might well have amateur applications.

The aerial closely resembles a shortened folded dipole, but with the two connecting links at the ends made up of an impedance (capacitor in series with resistor) rather than just a short-circuit. It then acts rather like an extremely close-spaced two-element beam.

Fig 10 suggests that front-to-back ratios of up to 30dB have been achieved experimentally and closely conform to theoretical predictions (though there are still frequency differences between theoretical and experimental performance).

A warning to those who think this means that they can quickly convert a folded dipole into an effective beam aerial: the "gain" is given as about 13dB below a dipole—so it is not going to make an effective transmitting aerial. But it is pointed out that in a high noise-temperature area, such as a city, the signal/noise ratio of a received signal may actually be higher than with a dipole, because of the directivity.

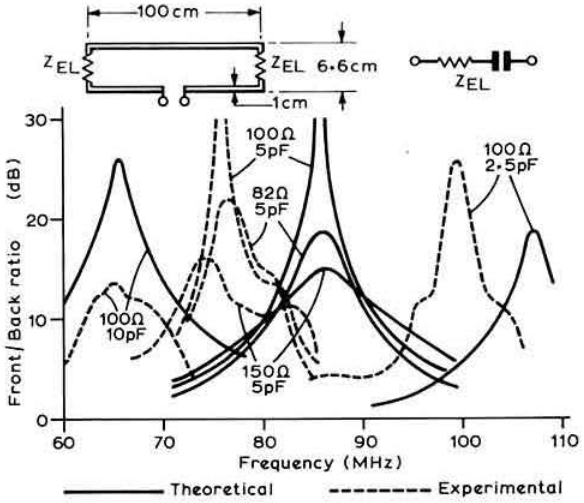


Fig 10. Details of the unidirectional dipole technique showing the front-to-back ratio at various frequencies and with various impedances, theoretical and experimental results

One suspects that for most amateur vhf applications, this arrangement would be less attractive than more conventional arrays: on the other hand the very high back-to-front ratio might make such an aerial a very good receiving system for hf, cutting down signals from the Continent, while open to North and South America.

On the subject of compact directional receiving aerials, we recall seeing in 1968 a demonstration at Hanslope of the EMI-Cossor series of active aperiodic loops (*TT*, July 1968) providing equivalent directivity to a full-scale rhombic. Current advertisements appearing for what looks like the same idea (but marketed by Hermes Electric) say that more than 53 government agencies are now using this form of broadband 2-32MHz receiving aerial; in rosette configuration such active loop systems can provide an omnidirectional "antenna farm" in only one-hundredth of the space needed for an equivalent configuration of rhombics!

Varistors for transient suppression

The need to protect semiconductor devices against voltage spikes or transients is by now well known; such spikes are often induced into power supplies by switch-on surges or in the form of mains-transients which arise from many factors, including lightning strikes near overhead cables. But whatever the cause, voltage transients are a major cause of component failures and equipment malfunction. In recent years a number of protection devices and techniques have been developed including special transient-suppression diodes such as the Mullard BZW96 series (see "Transient voltage suppression using transient suppressor diodes", *Mullard Technical Communications*, No 113, January 1972). Spark-gaps and gas-filled devices have been described in *Radio Communication*: see, for example, "Lightning and your aerial", by G. R. Jessop, G6JP, January 1972.

Another, and very promising, approach for guarding against power-line surges and turn-on transients is a new metal-oxide varistor developed initially in Japan by Mashushita (who call them zinc oxide non-linear resistors or "znrs") and now also being made in the United States as

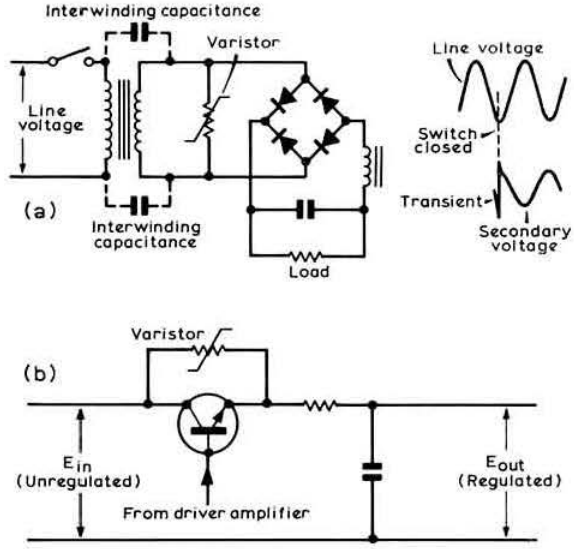


Fig 11. Applications of the metal oxide varistor transient suppressor, (a) elimination of switching transient on power step-down transformer by placing varistor across secondary winding; (b) varistor protecting regulating transistor from turn-on transients. The varistors can also be used to protect audio output stages

the GE-MOV or MOV varistor. These devices, about the size and shape of ceramic disc capacitors, act as very high resistors when normal low voltages are applied across them, but once the voltage exceeds a critical value they become virtually conductors, behaving as back-to-back zener diodes and capable of passing very high currents over short periods.

A full description of these devices appears in *Electronics* (9 October 1972). Among the suggested applications are their use in power supplies by simply connecting a suitable type across the secondary of the power transformer or to protect a series regulator; see Fig 11; another use is to protect transistor output stages in audio output stages.

Soldering semiconductors

Joe Cropper, G3BY, sends along what sounds like a very useful tip when soldering some of the more heat/static sensitive semiconductors such as the igfet/mosfet family. The idea stems from a technique long used by working jewellers to protect vulnerable small parts from heat. It consists of simply wrapping the section concerned in wet cotton wool. When applied to mosfets etc, G3BY inserts a small pellet of wet cotton wool between the leads, pushing it right up the body of the fet before removing the usual metal clip or sleeve normally supplied to protect the devices when out of circuit. With the pellet inserted, the device remains adequately protected from static and quite effectively from reasonable application of heat since the cotton wool can be kept wet; paper handkerchiefs or kitchen "cloths" could no doubt be substituted for cotton wool. Both the water and the material should be clean to avoid the possibility of slight deposits being left which could be corrosive; however, there is no risk of damage from the water itself as the fets are sealed. A similar pellet could be inserted when carrying out any changes to the circuit since, for example, a gate might be damaged when removing a coil.

MICROWAVES—1,000MHz and up

by DAIN EVANS, G3RPE*

Waveguide variable attenuators

A variable attenuator is a particularly valuable piece of test equipment, even if it is not calibrated. In an fm receiver the audio signal/noise ratio varies strongly with the input signal strength only over a narrow range of inputs. In practice one therefore tends to hear signals having a high signal/noise ratio, or nothing at all. It is only by chance that signal strengths are in the narrow range of a few decibels when noisy signals are produced, so that the audio quality may be used as a guide for "tweaking" the equipment for optimum performance.

The effective signal strength can of course be changed by altering the aerial and/or pointing it away from the optimum direction. However, a more satisfactory method is to insert a variable attenuator in the connection to the aerial: this can be adjusted so that tweaking can be done under the most sensitive conditions, and with a more direct measure of improvements in performance.

A widely used method of construction is to mount a sheet resistive element as shown in Fig 1(a) so that it can be moved across the guide. The attenuation is at a maximum when the element is half-way across the guide, and reduces as it approaches a side wall. If the element can be made a close fit against the side wall, then the attenuation becomes insignificant, and the attenuator can be permanently installed. For details of a suitable resistance card, and dimensions of the element, see last month's column. The push rod can be metallic if its diameter is small compared with the height of the guide (say $\frac{1}{8}$in diameter compared with 0·4in for WG16), and if fitted at the centre of the element so that any reflections from it are also attenuated.

Alternative designs are shown in Figs 1(b) and 1(c). In both of these, the resistive element is inserted progressively through a slot in the centre of the broad face of the guide: in Fig 1(b) the element is clamped to an adjustable hinged arm and in Fig 1(c) the element is mounted eccentrically on a rotatable shaft. These types of attenuator are in some ways easier to make, but there is a risk of the slots resonating and producing spurious effects, although these have not been observed by the writer. For maximum attenuation the element should fit from wall to wall. The shaping of the card to fit can be simplified, and the maximum attenuation available can be increased if a second slot is cut in the lower face so that the resistive element can pass completely through the guide. A suitable tool for cutting the slot is a hacksaw blade with the sides of the teeth ground away to a width of about $\frac{1}{32}$in.

If the variable attenuator is calibrated, then it becomes a most useful device indeed. For example, the efficiency of an aerial can be measured by comparison with a horn of calculated gain; the overall performance of a system can be checked against calculations such as described in the July column; the potential range of the system can be estimated. Some sort of scale for indexing the position of the attenuator must, of course, be fitted. For the type shown in Fig 1(a) a small micrometer is frequently used; a knob and a scale is all that is required for that shown in Fig 1(c). Calibration is obviously straightforward if one has access to suitable calibrated attenuators, but difficult if not. One possible method would be to make use of directional couplers: the coupling measured on those the writer has made has usually been within 1 or 2dB of the design value.

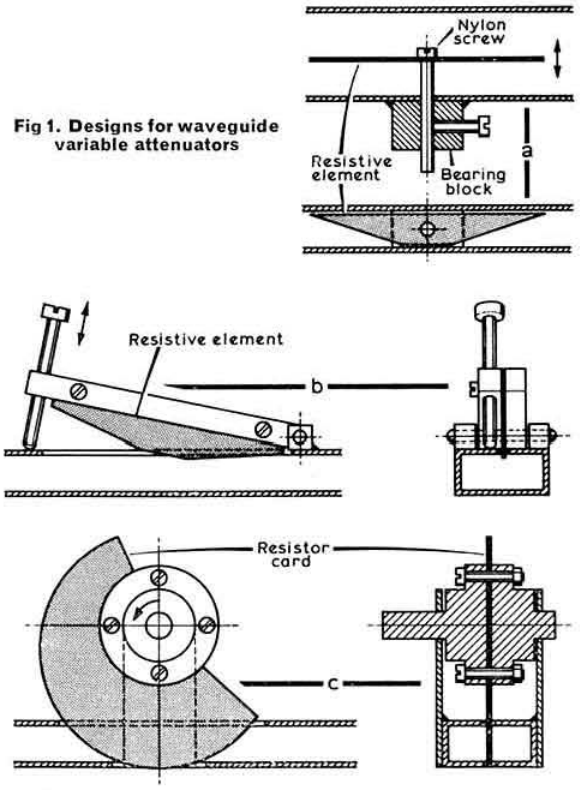


Fig 1. Designs for waveguide variable attenuators

New faces

GW4AMV of Cardiff has written that he and one or two other members of the Barry Club are developing an interest in 3cm with some building of equipment already started. GW4AHV of Pontardawe near Swansea is also interested in this band and would like to contact other locals.

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

FOUR METRES AND DOWN

by JACK HUM, G5UM*

WITH the Oscar 6 news dominating, little space remains for the rest of the month's currencies. A quick round-up, then . . .

New records: On 21GHz a contact was made on 12 November between G3EEZ/P and G3BNL/P, Cleeve Common to Clee Hill, 45 miles, believed first ever with crystal control. "Stability was staggering," says Alan Wakeman: "No retuning necessary in a 5kHz bandwidth throughout a 5min QSO." And on 70cm the distance record was hoisted on 13 October to 856 miles when GD2HDZ on cw worked OE2OML's sideband from Salzburg. The Austrian was worked the same day by G8BCL, Halifax, at 745 miles.

Another record of a kind: A four-call family are W5FAL (father), W5RWX (wife), W5ZYS (daughter) and W5ZYP (son). They have a 400ft mast and intend to put on it a 2m repeater (*a*) to be triggered by local stations and (*b*) to be self-QSY to trigger other repeaters. Thanks, G3RFG, for this extraordinary bit of info.

Super dx by m-s: During the Orionids G3CCH worked I4BER, and G3WZT on 19 October logged his callsign and morse bits from UT5DL on the 144·01 schedule. "Another one-way QSO!" says John Mathews.

—and by balloon: The Anjou 2 transponder balloon launch on 29 October gave G8CFZ beacon signals for nearly two hours and 11 contacts, all with F-men, from his south coast site. Tony Holder's 70cm unit runs 25W to a 6/40A and a 46-el Multibeam. Further to 70cm . . .

UHF linkline: From G3BW in Cumberland comes a suggestion to transfer to 432·15 some of the ssb traffic now on 145·41. He envisages a link between GM3FYB down to G3BW, across to GD2HDZ, south to G3BA and onward where possible. Farther south a 70cm linkline (on a.m.) already operates Friday nights 2130gmt tying in YS-NM-DY-LR. Has *your* local net transferred to 70cm?

Perfect site? It sounds like it on 4m on Sunday mornings when GW3MHW operates from his new-old cottage in Montgomeryshire, 1,200ft asl. The QRP aerial and transmitter initially used are being superseded by bigger and better both.

Old Timers' 4-meeting (see p. 683): Among many who like the idea is G8VN of Derby. Specifically, he will monitor 4m Thursdays 11am and noon and invites schedules with other "retireds".

"Nice picture of the President with the GM boys" many have said after looking at last month's p 752. The photographer was A. M. E. Luciani of Thurso, a good friend of the Caithness Club. More pix like it would be welcome.

Power out or in? Much discussion has followed the G3IZD comment last time that VHF NFD transmitter outputs rather than inputs should be specified. Says G8AFA: "Why not, come to that, specify site height, aerial gain, number of ops and so on?" He recommends the 2C39 not only for 23cm and 70cm but for 144MHz as well. His Yeovil ARC find it cheap, small, very efficient and with excellent modulation characteristics within the 25W NFD limit.

"Civilized 'clear of tv' operating times" is not true of Sunday mornings, when the 4m Cumulatives are on, reminds G2WS, adding that ". . . there is a religious broadcast every Sunday which is keenly appreciated, particularly by those unable through illness or age to attend a place of worship". Bill Scarr feels this should be borne in mind by those who devise contests.

Spin-off from the Scottish VHF Convention and ORM, October: A building project for 2m senders, all fm-ready and all with cw sockets (already four brand-new GM4B—licensees are keyed up, reports GM3UWX). Next, 70cm is a natural choice after the demonstration of simple 432 gear given at the convention by GM3FYB. And . . .

A two to one vote against repeaters was cast by a show of hands by the 190 present at the GM-convention afternoon session.

TV cumulatives start next month

Last September's amateur television contest raised so much interest (21 /T men and 29 sound only entered) that a cumulative series is being organized for seven evenings in January/February, 1930–2230gmt. A copy of the rules appears in this issue.

If you think amateur tv a little too specialized for you, now read an encouraging comment from BATC chairman Malcolm Sparrow, G6KQJ/T: "To receive amateur television is even simpler now that the Mullard varicap diode tuner type ECL1043 is available (price £4.50 plus 25p post from Manor Supplies, 172 West End Lane, London NW6). It covers 70cm with no mods at all. Just apply 12V and 0·4V to the tuner diode, plug the output into the aerial socket of a domestic telly tuned to Channel 1 and there's your amateur TV picture, if any is about locally. No preamps required."

FM from Tyneside

Checking his statistics of stations worked by mode, G3ZXN of Newcastle upon Tyne noted a steady increase in the number of fm contacts, which as 1972 rolled on had reached 36 per cent. Contacts with a.m. stations have been standing at 63 per cent during the year.

The 'ZXN fm transmissions are evidently readily copyable by a.m. receivers, which is more than can be said of certain signals that "sound like a straight line" because their deviation is so wide. Ernie Earnshaw declares: "I believe fm is a far superior mode to ssb. It is easier to generate, all stages operate more efficiently, there are fewer neutralization troubles, a better signal-to-noise ratio, and less impulse interference. Can anyone back up this argument mathematically, I wonder?"

The fm at G3ZXN employs compression to improve slope-detectors' readability. He asks for technical opinion on compression, for in his experience few fm men seem to use it.

* Houghton-on-the-Hill, Leicester LE7 9JJ

Tech corner

From GW3WVT (Mold, Flintshire)
To provide better copy for fm signals, the TAA570 ic circuit (*FMD*, January 1971), has been adapted, after making the following changes to the circuit given:

First, the input transistor of the ic will not function unless a dc connection is made between pins 8 and 9. I have found a 68Ω resistor satisfactory, although the dc connection can be by virtue of the secondary winding of the i.f. transformer (Fig 1).

A less serious omission from the January circuit was the damping resistor necessary to obtain a sufficiently low Q in the ic load tuned circuit. I found 15KΩ about optimum. A further point is that maximum audio output may be obtained by leaving pin 4 open circuit, which not only saves three components but allows the existing volume control to be used, routing the fm audio or a.m. audio via a two-way switch.

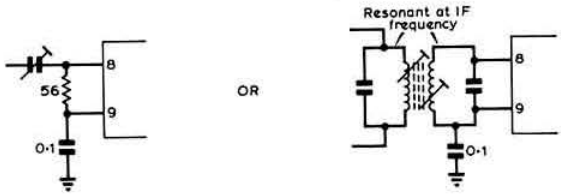


Fig 1. See note by GW3WVT

From ZL2APC (Harry Burton of Wellington)
I was interested to read the comment in *FMD* about tune and lock-on reception for hands-off mobile operating. Members who have the NZART journal *Break In* available to them may like to refer back to the edition of November 1966, where an article, "Seeking receiver", discussed the technical requirements for a scan and lock-on system for both 2m and 6m.

Basically, an increasing positive voltage applied to a varactor reduced its capacitance, causing the frequency of an associated oscillator to increase, and the receiver to tune up the band. An agc circuit or special control circuit is used, and provides a negative going voltage when a signal is encountered, so that the tuning is then held on this signal.

Originally, a 6CW4 and OC201 were used. The semiconductor update is shown in the diagram herewith. The first tune and lock system at ZL2APC was built in 1965, and a digitally-controlled one is on the stocks. Greatest range on the Mark 1 was 400 miles for a lock-on. Mark 2 did once lock-on Australian television sound just below 144MHz. How's that for dx at 1,400 miles?

Operationally, the system can be provided with a three-way switch to give (1) scan and lock, (2) manual tuning, mute disabled, or (3) autoscan, at about 1MHz per second, over 144-145MHz.

From G6OPB/T (M. J. Bues, Epsom Downs)
We in London have found that all the Yaesu FT2F transceivers are set on the high side, and the deviation potentiometer needs setting just off the bottom stop (approx ±4kHz). After reducing the deviation the advantages of using a narrow filter may be obtained. Some information on this point is given in the newsletter for April of the London FM Group.

(**Note.** No doubt G6OPB/T would be willing to supply users of fm transmitters with a copy of the mod-sheet referred to on receipt of an sae. Some commercial fm transmitters have a deviation as wide as 15kHz, and can be modified to 8kHz at the −6dB points, which is still in excess of the IARU recommendation of 3kHz for 2m rigs.—J. H.)

From GW3WVT (Mold, Flintshire)
After several months' tuning high to low the plastic dial of the HW17A drive system became badly worn. Eventually, the whole system seized when the drive shaft became clogged by powdered plastic.

Using the HW17A dial as a template, a disc was cut out of $\frac{1}{32}$in stainless steel. A window was cut in the disc to coincide with the 144–146MHz calibration on the dial and screw holes were drilled, again using the HW17A dial as a template. A $\frac{1}{8}$in strip was trimmed off the circumference of the plastic dial and the dial was replaced, clamping the steel disc over it using the original screws. The annulus of the steel disc was engaged in the tuning drive and a little lubrication applied.

The result of this modification was a vastly improved feel to the tuning and an anticipated longer life.

From G8FMK (Ray Cox of Thame, Oxon)
Experiments with the G8ARV board have been directed towards deriving enough output to drive a valve pa. The circuit shows the use of three devices in parallel (unmarked silicon types similar to the BF180 but cheaper). This pa was driven by the well-known strip starting with a 24MHz crystal, then a tripler followed by a doubler to 145MHz.

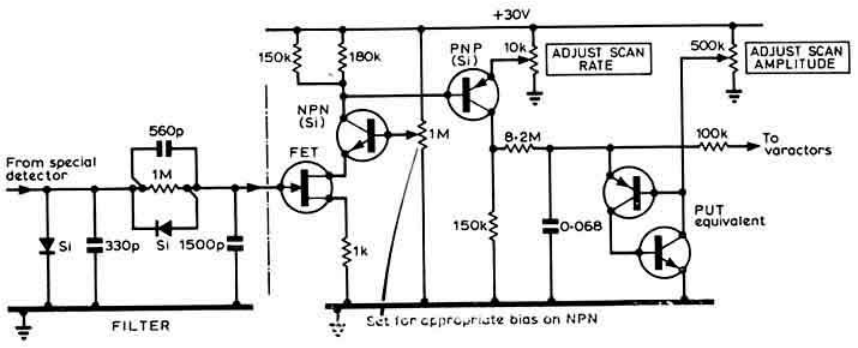
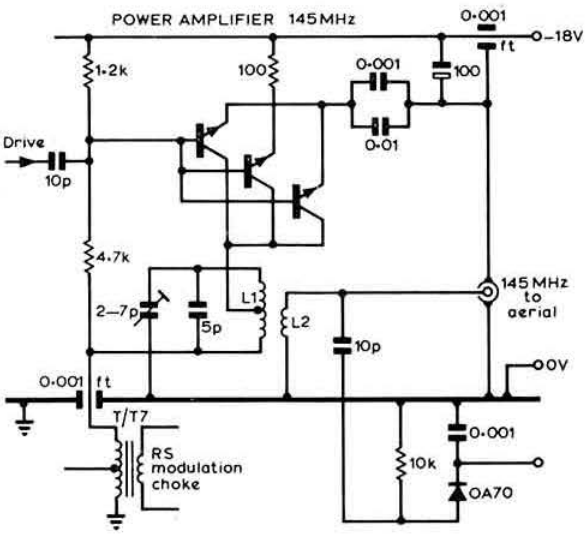


Fig 2. Simplified diagram of search and lock circuitry using semiconductors to replace 6CW4 and OC201 as originally used. See note by ZL2APC. A scan rate of 1MHz/s is achieved over 144-145MHz



Three transistors of the BF180 type are used at the end of a G8ARV board at G8FMK to provide enough drive for an EF183 pa at 145MHz

This three-device pa would drive an EF183 furnished with 6W dc input and a 6½-turn grid input coil tapped at 1½ turns for the 80Ω input from the transistor pa. Choke modulation was from a small four-stage transistor board through a Radiospares transformer with one section only in use.

About 50-100mW of drive were needed from the transistor pa to drive the EF183 to an "upward mod" condition. Later, a 3/10 was added to the EF183 to run at 18W dc input, again using choke modulation, but this time from a single EL84.

What they say

"Most of the 2m ssb merchants can't receive fm and they *never ever* tune the band"—G3ZXN.

"If you're looking for tautologies (use of 'K please' on telephony) how about your use of PA-land? If that's ok surely the amateurs who operate from there should be PA-men or PA-landers?"—G3HAL.

"My only gripe on the vhf bands is the increasing number of new G8G— — licensees who do not give any indication of their QTH when putting out a call. Perhaps they all want to keep it a great big secret!"—G8CDW.

Heard on 2m:
1st amateur: "I didn't catch the handle". *2nd amateur:* "I didn't throw it, but actually it's chromium plated and fixed to the transmitter."

"Playing chess on 2m (G8FDC, *FMD* October). Early in my amateur radio career I did. Then came a visit from 'the man in the trench coat' to tell me the playing of chess over the air was contrary to the self-training clause 1(i) (b) in my yellowing battered licence. Perhaps official policy is more flexible these days . . ."—G3TWZ.

Arthur Russell, G8AWS, in action at a meeting of the Chester & DRS, when he demonstrated his solid-state 70cm sideband transmitter. Delivering 25W out, this rig will be behind GW8AWS/P on the Welsh hills throughout the winter whenever weather permits

"Like G8BQX, I cannot agree with the suggestion to make the last four hours of a 2m contest cw only. But let's have that four hours as a separate cw contest. Even better, why not a cumulative cw contest on several Monday evenings?"—G3NHE.

"A lot of adverse comment about VFOs, ssb etc on 2m surely comes from people who have buried their heads in the sand and are then worried by the success of amateurs who have moved beyond the 'twenties. Abandon the bandplan and let VFOs and ssb thrive. Let's have more mixed mode contacts on 2m"—G3VMB.

"I'll support 5W max input for contests"—G8DLL of Cumberland.

"It took a couple of hours and 20 calls before I could work a Yorkshireman I was after. Then I got RS59 from him. Reason: we GMs are blanketed by the heavy occupancy from the Border southwards. Please lift the QRM between 145·85-145·95 and look for us"—GM3FSD.

"To G2HIF I say 'Hear, hear!' Anyone trying to work G8AFA/P in parallel in a contest will get no QSO. So there! Agreed with Cliff Sharpe: it is bad manners"—G8AFA.

25 YEARS BACK

"The decision to allocate a new band between 144 and 146Mc/s (approximately 2metres) is very desirable, especially in view of the fact that no provisions have been made in the Frequency Allocation Table for European amateurs to operate around 60Mc/s (5metres). The Council is pleased to record that five further vhf bands are to be made available to amateurs . . ."

RSGB Bulletin, December 1947 (the annual report of the Council).

THE MONTH ON THE AIR

by JOHN ALLAWAY, G3FKM*

ALTHOUGH it seems but a short time since December 1971, we have the 1972 festive season almost upon us, and the time is here again for the writer to thank all readers for their support during the past year, and to wish them every success in the next.

MOTA is very fortunate in having a number of sources of information (the publications listed at the end of *Band Reports* each month) without which it would be most difficult to continue, and your scribe is certain that all would wish to join him in extending sincere thanks to the various authors.

The RSGB would also like to express its gratitude to Dr G. Lange-Hesse, DJ2BC, of the Lindau Ionospheric Institute in Germany, for his efforts in supplying the information which is used in compiling *Propagation Predictions*.

DX news

VR1PA, who also operates as WB4LDK/KB6, was formerly in Greenland and licensed as OX5BA. VR1W has been noted having two contacts with each station—once as VR1W and the other as KB6DA—thereby giving DXCC credit for two countries. A truly novel arrangement.

Peculiar prefixes were common around the time of the CQ WW DX contests. Mexican stations XE1AK, XE1IIX, XE1CI, XE1TX, XE1J, XE1IIJ, XE1AZ and XE1FFC were noted using the calls XD1AK, XI1IX, 6D1CI, 6D1TX, 6F1J, 6G1AA, 6I1AZ and 6J1M respectively. HT0A proved to be YN1DS. YO0XPO was operated by YO3RF from the International Fair in Bucharest during the middle of October.

G3WPL, left, recently received a special hand-painted QSL from VS9MZ (G3UKN) who was on leave from Gan. The card, 18in by 14in and painted by a Maldivian, celebrates a twice-weekly link with home which will continue until Colin (VS9-MZ/DL5XS) returns home in mid-1973. Photo: *Lynn News & Advertiser*

The callsign VA6NQ was used to celebrate the 50th anniversary of the Calgary ARC. CT1SH used CT7SH during the CQ contest and asks for QSLs via CT1VE.

There should be another station on the air from Gough Is by now—this will be Pop, ZD9GC, who will be at the weather station. Norman, ZD9GG, is frequently on 28,545 kHz in the afternoons, either on the island or operating /MM.

"DX News Sheet"

A very worthwhile Christmas present for anyone who is interested in hearing or contacting the more unusual stations to be heard on the various bands is the *DX News Sheet*, published by Geoff Watts, 62 Belmore Road, Norwich, NOR 72T, Norfolk. This news sheet costs only a few pence a week and in your scribe's opinion is the dxer's "best buy".

Mellish Reef

Bulletin No. 396 from ARRL states that serious questions have been raised concerning the operations that have taken place from Mellish Reef, and until such time as the validity of the points in question have been ascertained no DXCC credits for Mellish Reef have been, or will be, made.

Dxpeditions

A full-scale repeat of the operation which took place from Mt Athos in mid-October is promised for sometime in December. About 10 Greek operators are expected to go and their callsign may be SY1MA. Mount Athos is an autonomous department of Greece and consists of an area in the Acte peninsular which contains a number of monasteries.

The long awaited expedition to Spratly Is may materialize in early December—a suitable boat is said to be waiting in a Thai port for the monsoon season to finish.

Long Skip quotes YV5ANF as the source of the information that an expedition to Aves Is is likely to be organized between January and April 1973. The callsign will be YVØAA, and the Venezuelan navy will provide transport.

The Japanese expedition to Bhutan was reported to have been delayed as a result of the death of the king of that country. If it was not possible to get there before the end of November it was expected that they would wait until March.

David Woolf, G4BFZ, reports that the callsign of the British Joint Services Expedition to Chagos will be VQ9DW. Operation was due to commence on 10 November and should continue until 15 January. 1800 on 21,300kHz daily from Mondays to Fridays will be a good time and place to look for a contact.

W6GQU will lead an INDXA organized expedition to Fanning Is during the period 8 to 11 December. The callsign will be VR3AC, and frequencies to be used are 14,195, 21,295 and 28,595kHz (ssb), and 25kHz inside band edges for cw. Three transceivers (with external VFOs) and beams and long wire aerials will be available, and some operation on 7 and 3·5MHz is likely. QSLs go via INDXA.

* 10 Knightlow Road, Birmingham B178QB.

HF Beacons

Callsign	Frequency (MHz)	Location	Reports to
DL0IGI	28·195 and 28·200	Mt Predigtstuhl near Salzburg	DJ5DT, Kollwitzweg 1, D 6100 Darmstadt, FR of Germany
	switches to 28·200 MHz between 15-20 and 45-50 min past each hour		
GB3SX	28·185	Crowborough, Sussex	G3DME
3B8MS	28·200 will QSY to 28·190 shortly	Signal Mount, Mauritius	G3DME (Beacon keeper: 3B8DG)

News from overseas

ZD8RW has written from Ascension Is to say that his wife is now licensed and has the callsign ZD8AW. This is believed to be the first time that a lady operator has been on the air from ZD8. QSLs for ZD8RW and ZD8AW should be sent via G8BXU.

VK9RY, who is located in Konedobu, Papua, was previously VK1RJ. He is using an FTDX400 transmitter with which he feeds a six-element wide-spaced Yagi beam on 21MHz, a four-element quad on 28MHz, and a ground plane on 14MHz. He looks for UK contacts between 1000 and 1200 every day Monday to Friday and favours 21,270-21,300kHz and 28,540-28,600kHz. A 100 per cent QSL policy is followed to British stations and one IRC will result in direct card by surface mail. Ron says that there is no VK9 QSL bureau.

Kanu Patel, 9J2KL, is at present studying in London and has been given the call G4BJH. He was the youngest Zambian amateur and will be at London University studying electronics for three years. All his 9J2KL cards will be despatched via the bureaux or may be obtained direct from him: c/o British Council Residence, 35-39 Queens Gardens, Bayswater, London W2 3AB.

The VQ9FOS Festival of Seychelles station which was on the air early in October seems to have been quite successful. It was honoured by a visit from HRH Princess Margaret and Lord Snowdon—which came as a great surprise to VQ9R and VQ9DC who happened to be operating at the time.

VS6AD, ex-G8ATV, is now relicensed as VS6GA. He has been in Hong Kong for four months and is very active. It seems that the callsign VS6AD was issued to him in error, as its owner, although at present in Germany, still holds his licence—a rather unfortunate state of affairs as Ian now has a large batch of useless VS6AD QSL cards.

Hugh Kirk, VE7BYR, and his friends VE7ARY and VE7AGJ, are especially interested in working into the UK on 80m. Hugh suggests 3,795kHz between 0400 and 0500 and asks that those interested write to him at Box 529, Kinnaird, BC, Canada.

G6VX, who was standby newsreader for G8ML for many years, is now living in New Zealand and has the callsign ZL1NW. He may be reached at the address in *QTH Corner*.

Contests

In the **1972 OZ-CCA Contest** only two UK stations—**G3NSY** (32,508 points), and G3TXF (24,024 points) appear among the 230 or so entrants. UA3RH was top scorer with 312,390 points.

In spite of the apparent reluctance of the Radio Society of Bermuda to communicate directly with your scribe, full

Gerry Rigby, G3KTJ, radiates an outstanding signal from Wigan. This neat set-up activates a two-element three-band quad about 100ft above ground

results of the 1972 Bermuda Contest have been supplied by G3KTJ and are as follows:

	Phone		CW	
G3KTJ	**51,243 points**		**G3KMO**	**23,208 points**
G3WJN	33,129	,,	G3FXB	20,412 ,,
G3MVZ	17,493	,,	G3KWK	14,355 ,,
G3TR	13,362	,,	G5RP	13,230 ,,
G3FWA	5,250	,,	G3JVJ	11,628 ,,
G2QT	3,456	,,	G2DC	8,415 ,,
G3JVJ	546	,,	G4AYL/A	7,488 ,,
			G3DLH	3,549 ,,
			G3LHJ	2,466 ,,
			G2QT	1,416 ,,
			GW3MPB	987 ,,

The Wirral DX Association QSO Party

1400 to 1700 31 December. 7MHz only. Any mode. QSOs with non-member UK stations count one point, with member UK stations two points, and with non-UK stations three points. List of five previous contacts may be passed to member stations for one point. Exchange name and QTH with non-members. Entries go to G3OKA, 219 Prenton Dell Road, Birkenhead, Cheshire. The Wirral DX Association Award 1st Class is available to anyone working five members, and 2nd Class to those working three. The award costs 25p.

The ISWL DX Transmitting Contest

0800—2000 10 December.

Object is to contact as many countries as possible on 14 and 21MHz, using any mode. QSOs with ISWL members count 10 points, with others one point, with ISWL HQ station G4BJC 25 points per band. W/VE/VO/VK call areas count as "countries", and an ISWL Countries List may be obtained from the address below for 5p. Participants exchange RS/T plus serial QSO number commencing from 001. Logs should show time, station worked, number out, number in, location of station worked, and separate sheets should be used for each band. A summary sheet should give details of equipment, and entries should reach Mr Clifford Tooke, 6 Chelmer Avenue, Rayleigh, Essex, SS6 7TB, by 19 January.

The Bristol '73 Activity Contest

This special event, which celebrates the 600th anniversary of the granting of a royal charter to the City and County of Bristol, and the Diamond Jubilee of RSGB, will run from 1 January to 31 August 1973. Amateurs all over the world are invited to contact as many stations in Bristol (BS1 to BS20) as possible during this period, and a case of sherry will be presented to (1) top scorer outside the UK call areas, (2) top UK scorer outside Bristol, and (3) the Bristol station making the largest number of contacts with participating stations. Contacts with Bristol special event stations (eg GB2GB—operational in August only) count for double points on each band. Only one contact per band may be counted, but fixed, /M, and /P each count provided they are in the right area. Points per contact made from each area are shown as follows:

Band	G,GW,GC	GD	GI	GM	Overseas	Bristol (Award only)
160	4	4	4	4	5	4
80	2	2	2	2	2	2
40	2	2	2	2	2	2
20	—	4	4	4	2	—
15	—	4	4	4	2	—
10	—	4	4	4	2	—
4	20	20	20	20	20	20
2	5	10	10	10	10	4
70,23,13cm	10	20	30	40	50	10
Microwave and /T—one point per kilometre						25

The Bristol Activity Award will be forwarded to each participating station scoring 100 or more points on payment of 30p, six IRCs, or $1. Log extracts set out under band headings and certified by two licensed amateurs should be sent to J. A. Reynolds, G3PTO, 24 Shaldon Road, Bristol BS7 9NW. Entries must be posted before 30 September 1973.

Tops CW Club Contest 1972

1800 9 December to 1800 10 December.

On 3·5 to 3·6MHz cw only. Call "CQ TAC" or "CQ QMF". Contacts with own country count one point, with other countries in same continent two points, and with other continents three points. Total score is total points multiplied by the number of different prefixes worked. There are single- and multi-operator entries. Logs should be sent to: Peter Lumb, G3IRM, Tops CW Club Contest Manager, 22 Hervey Road, Bury St Edmunds, Suffolk, no later than 16 January.

There were 135 entries in the 1971 event—overall winner being HB0XHW with 104,796 points. UK scores were: **GM3CFS** (33,060), **G3KMA** (20,448), **G3GMK** (8,550), **G3JKY** (2,592) and **G2GM** (2,250).

Arabian Gulf states

The Foreign & Commonwealth Office has confirmed that Bahrein, Oman and Qatar are no longer protected states of the UK nor are they members of the Commonwealth. They ceased to be protected states in December, September and August 1971 respectively. The United Arab Emirates (A6A—A6Z) comprise the former Trucial States, not now protected or in the Commonwealth. Kuwait ceased to be a protected state in June 1961. These territories are no longer on the RSGB list for BERU and contacts made since these changes took place do not count for Commonwealth awards.

Top band news

The latest W1BB *160m DX Bulletin* emphasizes the value of the Beverage aerial for reception of weak dx signals. Stew draws attention to the reduction of noise and static which makes signals much more readable even though their strength may be reduced. The transequatorial tests held in mid-summer seem to have disclosed conditions not quite as good as those of previous years although EI9J is reported to have worked into EL, VP8, ZD9 and ZP, and to have heard CX3BH. Paddy suggests that as signals are sometimes marginal in readability, only the RS of their RST be sent to save time. A note from W4QCW says that there is a possibility that ARRL may establish a special award for 160m work.

Odds and ends

GC2CNC wishes it to be known that his callsign is being used by a pirate on 160m. Ernest says that he has not used the band for years except for a few tests last year.

Malcolm Fretter, GC3ZIP, is leaving Guernsey on 1 December for New Zealand. His new address will be found in *QTH Corner*.

Band reports

Quite exceptionally good conditions have been noted on all bands from time to time during the past four weeks, and the abnormal solar activity which has taken place resulted in great activity on 28MHz. One correspondent reports hearing over 100 countries on that band during the weekend of the CQ WW DX (Phone) Contest.

Many thanks to the following for sending in the logs from which the list below was prepared: G2BJY, G2HKU, G3AAE, G3GVV, G3HB, G3NKQ, G3UKH, GM3UMW, G3UOL, G3YHB, GM4AFF, GW4BLE, G5JL, BRS2098, BRS17567, BRS25429, BRS25901, BRS31301, BRS33823, A7511, A7545, A7768, A7785, and A7850.

Stations listed in italics were on cw, all others on ssb.

1·8MHz. 0200 OH2BO/1, W3ZQW. **0400** *W1BB/1, W1HGT, WA1GXE, K2GNC, W2UEZ, W3HUS.* **0500** *WA8IJI, K8KL.* **2000** HB0XMK. **2300** KV4FZ.

3·5MHz. 0100 CE8AA, LU6FEP, YA1AH, K3WEU/6Y5. **0200** FM7WE, FG0AMF/FS7. 9Y4VU. **0300** *UA0ER*, ZF1GC, 8P6CZ. **0400** *OH0NA*, OX3EN. **0500** VP7BL, W6NJU. **0600** HK0BKX, HT0A, VE6ZZ, VE8RA, W7RM, ZD3X, ZL4s KF, PG. **0700** VP2LX, K6AHV, K6UA, WA6ZZK (S9), ZL2BT, *ZL4IE.* **2100** 7X0GM. **2200** FP8CT, JW9KD, JX6VO, TU2DO, XT2AC, 9G1HE. **2300** UK0SAA/P (Zone 23), 6W8DY, 9C9TW.

7MHz. 0000 OH2MM/6W8. **0100** HT0V, VP2LX, ZD3X, 9C9TW. **0200** 9E3USA, W7RM. **0400** *CM2CL, W7RS.* **0500** FP8AA, OA4OS. **0600** VKs, W6/W7s, ZLs, 3A2EE. **0700** CR4BS. **1800** DU1EJ, ZC4HC. **2100** *CM2AM*, JA1DJL, *HT2DO.* **2200** FL8HM, TU2DO, XV5AC, 4W1AE. **2300** *EA9EU*, XT2AC, VE3MR/4X.

14MHz. 0300 W6/VE7. **0700** FK8BQ, FO8DF, HK0BKX (Op. K6JAN—QSL to WA6AHP), KJ6CF, KL7s, VK9s GA, OM, ZK2BD, 5T5BH. **0800** *A35FX, SM2AGD/CE0,* KC4USM, KL7s, KC6SK, KS6s CC, ER, VK0RC, *VP7BI* (QSL to G3AMR), VR1PA, YJ8s EE, XX, 3D2EQ/M. **1100** FP8DH, SY1MA. **1400** CR3AD, KA1DX. **1500** JT0AE, KG6SH, VK9XX, YA1DX. **1600** C21TL, KG6JAR, VK9DH, VQ9R/D, XV5AC, ZS2MI, *3B8DX*, 3X1P. **1700** FB8ZZ, JY3BZ, KC6SK, K5QFH/VQ9, *3B8DA*, 3V8BD, 9G1BF (QSL to W3HQO). **1800** HS4AGZ, TA5YSF, *YO0EXP*, ZS2MI. **1900** FB8XX, FY7AE, HH9DL, UA1KAE/6 (Antarctica), VP1BH, *VP2MAH*,

QTH Corner

CT2BH	via K8NGR, Ruth Burt, 3160 Warren Drive, Drayton Plains, Mich. 48020. USA.
CT2BJ	via WA3GCS,W. Snyder, 120 Miffin St, Bristol, Pa, 19007, USA.
FG0AFC/FS7	via W3HNK, Box 14, Norwood, Pa, 19074, USA.
FG0AMF/FS7	via K2KGB, L. R. Cohen, Box 73, Coram, NY, 11727, USA.
ex-GC3ZIP	M. E. Fretter, c/o 7A Stark St, Wanganui, New Zealand.
HH9DL	(Nov 3-10 only) W3HIZ, RFD-1, Box 20-37, Glen Arm, Md, 21057, USA.
HT0A	via DL3OH, Pforzheimerstr 9, 7136 Oetisheim-Corres, Germany.
KJ6DG	Box 1037, 2194th Comm Sqdn, APO, San Francisco, Cal, 96305, USA.
SM0KV/0	Olle Ekblom, PO Box 40, Sigtuna, Sweden.
SY0MA	via WA1HAA, W. B. DeLage, 238 Slater St, Attleboro, Mass, 02703, USA.
TZ2MM	via OH2NB, Armas Valsta, Lansipellantie 12, SF-00390, Helsinki 39, Finland.
VK9RY	F. R. Ryan, POB 2073, Konedobu, Papua.
VP2VV/FS7	via F6AEV, P. Luizard, Hotel Digue, 50 Mont St-Michel, France.
VQ9R/D	Box 193, Mahe, Seychelles.
VQ9DC	D. Cardell, POB 188, Mahe, Seychelles.
VQ9MI	John Cardell, POB 188, Mahe, Seychelles.
VS5RL	Rick Lawrence, POB 337, Kuala Belait, Brunei.
VS6GA	A. I. R. Dredge, Senior Rates Mess, HMS Tamar, BFPO 1.
XT2AC	DJ6QT, Klostermauer 3, 6471 Hirzenhain, Germany.
XW8EU	c/o British Embassy, Vientiane, Laos.
ex-ZC4CB	C. R. Burchell, 12 Ravenspurn Rd, Patrington, Hull, Yorks.
ZD3X	via OH2NB (see TZ2MM).
ZF1EP	Dr. L. E. Parsons, POB 1647, Ft. Myers, Fla, 33902, USA.
ex-ZK2AF	W. Christie, 328 Mt Albert Rd, Auckland 3, New Zealand.
ZL1NW	M. D. Mason, OBE, Wallace Rd, Te Puna West RD2, Tauranga, New Zealand.
3B8DX	via WB9BPG, 4606 Thornleigh Drive, Indianapolis, Ind, 46226, USA.
4W1BC	G4ATQ, G. R. Hawkins, 13 Sandfield Cresc, Saul, Glos.
5T5BH	via OH2NB (see TZ2MM).
OH2BCP/6W8	via OH2NB (see TZ2MM).

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

ZD7SD. **2000** TZ2AC, XT2AC, 9C9WB. **2100** CE8CP, TR8VE, VP8s HZ, ME, MS, ZS1ANT. **2200** SU1MA, TL8LI, XT2AG, ZD7BB, 9Y4s. **2300** TY3ABF.

21MHz. 0800 *FL8DS*, JAs, TU2DQ (QSL to WB4SPG), XW8EU, *3D2EK*. **0900** JAs, PYs, ZLs, XV5AC, 5B4AC. **1000** WA6OVU/KG6, VK9RY, YA1GTZ (QSL to K2GTZ), *9G1GC*. **1100** DU2EL, K8CRM/KG6, SY1MA, VP1BH (QSL to VE2AKZ), VU25ARS/YL, 5T5BH. **1200** CR8AK, FR7ZW, FG0AFC/FS7, G3ZXH/MA (nr 3B8), VK9GA, XV5AC, 9Y4CR. **1300** FP8AA, VP2MAH, YB1ZZ, ZD3Y, 9K2BQ (QSL to JA1ZZ). **1500** 3V8BD, 9M2DQ. **1600** HH9DL, VQ9R/D, VS9MB. **1700** FG0AMC/FS7, KC4USP, W6/W7s, *5R8AP*. **1800** KH6IJ, KL7HGT, VE6/VE7s. **1900** KH6GMP, VP1BH, ZD3X, 5Z5NSA.

28MHz. 0700 A2CCY, 3B8CZ. **0800** IG9BAF (Zone 33), JAs, XV5AC, *VK6SA*, YA1DX, 9M2DQ. **0900** KA6RS, KG6SL, KG6JBA, YB0AB, ZD3X, 9CT9W. **1000** KH6RS, MP4TEE (rapid QSL via G3LQP), TT8AC, YA1OS. **1100** FB8XX, VK6s, UK0SAA/P, VP2MAH, VS6BB, XW8EV, ZD7BB, 5T5BH, 5VZYH, 9G1YA, 9K2AR. **1200** JY8DK, W4GIW/VP7, ZC4BJ. **1300** CE3RC, FP8AA, VK9XW (QSL to VK6RU), 3B8s. **1400** FL8OM, HI8LC, ST2SA, VP7BA, YB0CJ, ZD9BM, 9M2DQ. **1500** JY6HA, 5N5ABG, 8R1N. **1600** HC2YL, VP2LX, XT2AC, ZD3X, ZD9GG, 3B8s CV, CZ. **1700** SM2AGD/CE0, CR4BS, W4GIW/VP7, VU25BAA, ZF1EP, 4M4UA, 6G1AA. **1800** HK0BKX, OX3LP, W6s, W7s, ZC4HJ, *9L1GC*. **1900-2000** Ws.

Many thanks to all correspondents, and especially to the authors of the following news sources for information extracted: **29 DX Club Newsletter** (*VK6JR*), **QUAX** (*G3DME*) the **DX'ers Magazine** (*W4BPD*), **NARS Newsletter** (*5N2-ABG*), **Long Skip** (*Nick Sawchuk*), the **West Coast DX Bulletin** (*WA6AUD*), the **Ex-G Radio Club Bulletin** (*W3HQO*) **DX'press** (*PA0INA/PA0TO*), and **DX News Sheet** (*Geoff Watts*).

Propagation Predictions

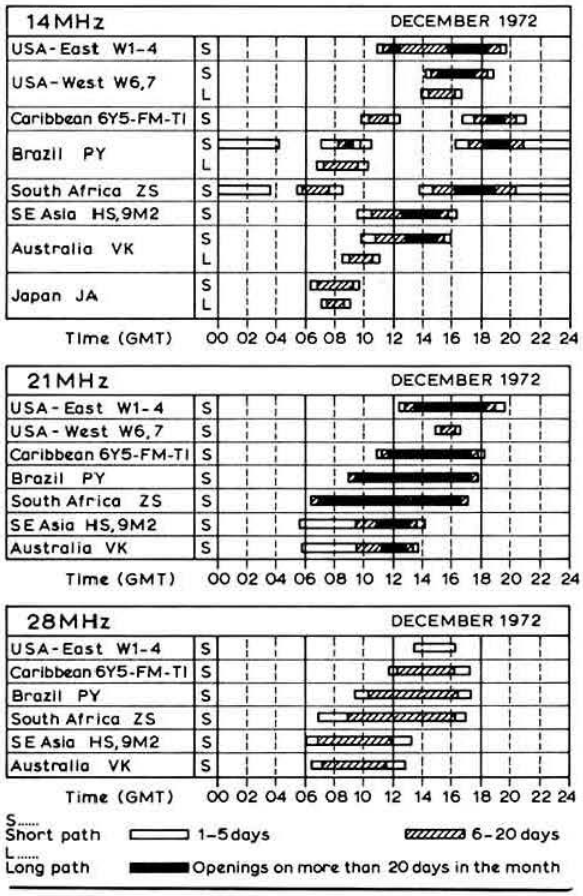
Conditions worsen as usual in December compared to the two previous months. This is caused by two factors: firstly, this month sees the maximum of mid-winter conditions, short days mean shorter hours of communication, particularly on the hf bands; and the F2 MUFs are lower in the northern hemisphere than they were in the previous month.

It will not be possible to work consistent dx on **28MHz**. All continents should be heard with certainty on **21MHz** but the early sunset will mean the closing of dx around 1830gmt. 14MHz should remain open for dx until 2030gmt under normal conditions: the best chance for WAC on this band will be between 0800 and 1300.

Seasonal conditions will make it possible to work dx via the indirect path on **14MHz** so that communication with South America, the Far East and Australia should be possible before noon, and with western North America in the late afternoon. Under exceptional circumstances traffic with Central America, South-East Asia and eastern North America will also be possible around noon.

There will be no changes to conditions on **7** and **3·5MHz** compared to last month, only the maximum distance covered will vary from day to day. This is due to sporadic changes in the ionosphere, which are not related to solar activity.

The provisional sunspot number for October 1972 from the Swiss Federal Observatory was 54·8 with the period of greatest solar activity during the last 10 days of the month. Predicted smoothed sunspot numbers for February, March and April 1973 are 47, 45 and 43 respectively.



Please send all items for **January** issue to reach G3FKM **no later** than **4 December,** and for **February** issue by **8 January.** Note that the **December** date is earlier than that given previously.

RAYNET

by S. W. LAW, G3PAZ*

From our visit to the Midland National Radio and Electronics Exhibition in Leicester in October we came to an astonishing conclusion after chatting to the various Raynet members whom we met as we looked round the welter of goods displayed; the present rise in the cost of second-hand commercial vhf equipment makes it cheaper to install teleprinter links than transmit messages verbally! At least that was the impression we gained when comparing notes after visiting the BARTG stand and seeing what they had to offer in their specialized field. Of course, we may well have the wrong impression but it does seem that the days are past when a few pounds and a few hours adaptation could put one on 2 or 4m for Raynet purposes. Admittedly teletype is out for actual mobile use but how much actual traffic is passed to stations in motion in an exercise or emergency? There may be food for thought here; certainly grounds for heated discussion if we know our members!

A change of mode?

There would appear to be a distinct trend towards fm on the vhf channels these days, probably due to a similar trend in the commercial field. Curiously enough we hear little of ssb among the Raynet groups. Naturally the internal traffic within the area of any given group is a matter for the controller, committee or the combined decision of the members concerned according to the type of administration favoured in the area. Nevertheless, with the wider view now in evidence in our activities it should always be borne in mind that inter-group liaison is more to the fore in these days and some consideration must be given to the possible need for a combined operation of the type we have already seen tried out so successfully in some parts of the country. Certainly it makes sense to agree on one common frequency and mode should the need arise for inter-group operation. After all, there is no restriction on Raynet operation over the whole of our permitted spectrum; most of it has been employed by us at various times in the past, in fact it all started right down in top band in the 'fifties.

Talking of those past beginnings, do you realize that we have a twenty-first birthday coming up in 1974? It is not too early to give some thought to the matter. Send in your ideas to the committee if you consider the occasion worthy of a special effort.

Sobering thoughts

A lecture was given to the Cornish Radio Amateur Club in October on the subject of Raynet and emergency communications and was followed up by an article by G3FWG in the club magazine *The Link*, the November issue of which was thoughtfully sent in by the club PRO, G3NKE. We need not apologize for extracting some of the more cogent points made by G3FWG.

Do you realize that electromagnetic waves travel only at the speed of light? Ergo the age-old bonfire on the hilltop or smoke signals are just as fast as our much vaunted vhf communications. Even the later heliograph or the Aldis lamp are just as slow etherwise!

What does matter is the handling of the message content at each end of the link. There is little point in a 30 second radio message taking 30 minutes to reach its ultimate destination; it could be sent quicker by horseback! So get your ends as good as the middle if you can.

Elevating thoughts

Raynet has grown in 1972; may we continue to expand. Meanwhile please accept the best wishes of your committee and your scribe for a happy Christmas and a New Year celebration uninterrupted by disaster call-out wherever you may be.

Honorary registrations secretary: **Mrs Jane Balestrini, "Merrivale", Willow Walk, Culverstone, Gravesend, Kent.**

* 130 Alexandra Road, Croydon, Surrey CRO 6EW

YOUR OPINION

The Editor
Radio Communication

Sir—Without in any way disputing his statements, may I say how much I deplore G3IJU's enthusiastic haste to compel amateur radio to become an expensive commercialized hobby, and agree so whole heartedly with G2WS's comments.

Yours faithfully,
C. B. Raithby, G8GI

The Editor
Radio Communication

Sir—In the September issue Mrs Kay Priestley, G3XIW, points out that only 2,223 members voted at the election of the Council out of a membership of 16,500 members. This is a common complaint in all societies. It seems to me that members do not know the *policy* of the candidates they are asked to vote for.

Is there any easy way in which a member can see how each individual member of the Council has voted on any particular issue? Especially, of course, this applies to controversial issues. I would point out that Hansard publishes the names of each MP who voted *for* or *against* each motion in Parliament. Such a system applied to societies such as the RSGB would be the best way of encouraging more members to vote, since they would then have some idea of the *policy* which each member adopted on any particular issue in which the member was interested.

I plead guilty to voting only very rarely, since out of the 18 members of the Council, including the President, Treasurer etc, I only know three!

Yours faithfully,
E. M. Wagner G3BID

The Editor
Radio Communication

Sir—Like many *Radio Communication* readers I scan the monthly propagation predictions with interest and a keen awareness that forecasting is by no means an exact science. But I have long felt that there was an uncomfortably wide gap between the 10m forecasts and subsequent propagation conditions. However, only recently has it been possible to check the predictions reasonably systematically against actual experience over one of the specimen circuits regularly covered by the forecasts.

The June 10m forecast was that "on favourable days only South Africa and South America will be heard". July and August forecasts were no more encouraging. In September there would be "no worthwhile improvement before the end of the month".

But what actually happened? Beacon observations have shown that a G-9M2 path was open for part of *at least* 16 days in June, 11 in July, 10 in August and 24 in September. Signals were often very weak, but then they related to a 25W transmitter with a simple aerial. Again, contrast the pessimism of the forecasts with the fact that out of 98 observation days between 6 June and 30 September, the Mauritius beacon was audible on no fewer than 94! Average duration of openings was 7h 20mins (minimum 11min, maximum 13h, 20min).

How are such discrepancies between prediction and performance explained? An uncharacteristic observation period, or failure by the forecasters to compensate for the unexpectedly slow decay of sunspot activity? While only time will tell, since my suspicions of the forecasts are of fairly long standing, I doubt if the explanation lies there. It looks more to me as if either the forecasters are interpreting a basically adequate formula too conservatively, or alternatively the formula or whatever basis is employed for making 10m forecasts is not in fact taking account of all the elements governing propagation at these frequencies. It would be helpful if the forecasters could comment on these problems.

At all events, thanks to the beacons we now have a means of measuring forecasts against experience. One hopes we can use this as a means of improving the actual forecasts and of extending our own understanding of hf propagation—a subject on which we still have much to learn, and the amateur has still a contribution to make.

Yours faithfully,
Martin Harrison, G3USF

The Editor
Radio Communication
Sir—Having awarded Bill Scarr, G2WS, a halo to wear for his letter in the September *Radio Communication* on how the present-day radio amateur should be brought up, I must perforce award John Barker, G3SAZ, at least three halos for his in the November issue!
Now let us hear from the/a young amateur(s).

Yours faithfully,
Richard Thurlow, G3WW

The Editor
Radio Communication
Sir—I was very annoyed to read Mr Hyde's request (page 683) for chess partners over the air. This has been tried before by some misguided individuals, bringing disastrous comments from certain members of the public who just happened to be listening to one parıcular game. The purpose of obtaining a licence is for furthering one's knowledge of radio, not chess.

Yours faithfully,
A. F. Notschild, Tech (CEI), MSERT, G3RSF

SPECIAL EVENT STATION

EI0YSE, 4 to 7 January 1973
The Terenure College Radio Club will provide a working exhibition station at the National Young Scientist of the Year Exhibition which will take place at the showgrounds of the Royal Dublin Society at Ballsbridge, Dublin, from 4 to 7 January.

Operation will be on 80, 10 and 15m ssb, 20m rtty, 40m cw, and 4m (70·25MHz calling frequency); 1300 to 2100gmt on 5 January, 1100 to 2100gmt on 6 January, and 1100 to 2100gmt (20, 40 and 4m), 1100 to 1300 (80m Gaelic language), 1300-2100 (10, 15 and 80m) on 7 January.

Midland National Radio and Electronics Exhibition

This successful exhibition, sponsored by the Amateur Radio Retailers Association, was held in Leicester from 26 to 28 October. Nearly 5,000 people, the majority licensed amateurs, visited the exhibition from all parts of the British Isles.

A stand at which RSGB books were on sale was well patronized, and thanks are due to G5YY and his xyl, and to G2CVV, G3FCY and G3WBB for their efforts in connection with it.

The Leicester ARS operated an hf station and talk-in stations with the call GB3ARE; over 300 dx stations and 500 mobiles were contacted. BARTG put on a teleprinter demonstration which aroused much interest.

Top right
The stall at which RSGB publications were on sale.

Right
General view of the exhibition

Photos by C. R. Cooper

Mobile Rallies Calendar

1 April—White Rose RS, Lawnswood Girls' High School, Ring Road, West Park, Leeds 16.

8 July—Cornish RAC.

Looking ahead

5 January—RSGB Presidential Installation, Connaught Rooms, Great Queen Street, London WC2.

7 April—RSGB VHF/UHF Convention, Winning Post Hotel, Whitton, Middlesex.

INTERFERENCE PROBLEMS

Members accused of causing interference or who suffer interference from external sources are invited to seek the assistance of the Interference Committee in solving their problems.

Enquiries should be addressed to: The Chairman, Interference Committee, RSGB, 35 Doughty Street, London WC1N 2AE.

VHF NFD 1972 Results

Winner Mid-Essex & Mid-Severn VHF/UHF Contest Group
Runner-up Pye Telecommunications Contest Group
Band leaders

70MHz	GW4BBR/P Golden Valley VHF Contest Group
144MHz	GW3BA/P Midland Amateur Radio Society
432MHz	GW3VXK/P North Liverpool Radio Club
1,296MHz	GW3LTF/P Mid-Essex & Mid-Severn VHF/UHF Contest Group

VHF NFD 1972 attracted entries from almost 150 groups throughout the British Isles. Well over 1,200 callsigns shared the operating of at least 330 stations on 4m, 2m, 70cm and 23cm, thus firmly establishing this event as being the most popular and best supported contest in the vhf/uhf calendar. The weather was kind over most of the country, and no station reported experiencing anything worse than an occasional shower, high winds and lower than average temperatures during the hours of darkness. Propagation conditions were far from exceptional, and any "lifts" were confined mainly to the lower frequencies along a north-south path. Comparatively few Continental stations were worked even by groups located in the south-eastern counties, and this caused a significant shift of the geographical bias in the overall results. The prevailing propagation favoured sites to the north and west, and stations in these areas were not slow to turn their advantage to good account.

Among these were the Mid-Essex and Mid-Severn Contest Groups who joined forces in Brecknockshire to score a commanding victory by gaining a 1,400 points lead over their nearest rivals. On this, their fifth successive VHF NFD win overall, the Mid-Essex Group are to be congratulated not only for a most impressive performance, but also for having mastered what appears to be a reliable formula for success: that of being able to forecast conditions accurately, and to site their station accordingly.

The general standard of operating on all bands was high, with quite a noticeable improvement in the attitude of competitors towards what they believed to be defective signals. Stations were more ready to accept the possibility that their own equipment might be at fault, with the result that adverse criticism was made in less ill-mannered tones, and was received with more credulity. The Society's monitoring stations were active throughout the contest, and surprisingly few "black marks" had to be recorded against stations persistently radiating bad signals. In almost every instance noted, the offending station was politely informed of the error of his ways by other competitors, and within minutes had taken steps to remedy his transmission. Written complaints have been few, and in consequence the adjudicators have been spared the unpleasant necessity of having to extract any penalties for blatant disregard of the rules.

Several competitors feel very strongly that the Band Plan should be enforced rigidly, with all stations remaining inside the frequency limits recommended for their zone. While there might be some sympathy for this argument in certain circumstances, it is recognized that some concessions must be made to the current trend towards co-channel working. Nor can an operator, equipped with a vfo, be expected to call fruitlessly at one end of the band while the dx persists in tuning from the remote end after every transmission. The practice of working stations out of zone is objectionable only when the operator fails to return to his own channel after the contact has been completed.

Many groups commented upon the difficulties they are having in finding good sites sufficiently remote from near neighbours; others, like those along the Sussex Downs, are coming to accept the situation very much as a driver looking for a place to park in a crowded city. It was inevitable, therefore, that several minor incidents should have occurred in which inter-club rivalry was not confined solely to the ether. The VHF Code of Practice, published last May, was written especially to overcome problems of this kind, and had the parties most intimately concerned done their homework a little more thoroughly before arriving on site, many hard words might have been avoided. It must be conceded, however, that even close adherence to the code cannot in itself ensure complete freedom from near neighbours, as two groups found to their chagrin on the day. Both had applied for, and received, the permission of local farmers to use their selected sites, but unknown to either, those sites were in adjacent fields.

The Verulam ARC, St Albans, VHF NFD station at Wendover operated by Brian Cockall, G8BJK. *Photo by P. M. Fletcher*

The rules for this year permitted the use of four callsigns in order that the 23cm stations could be operated independently of 70 cm if so desired. The popularity of this rule when it was first published was in some doubt, but an analysis of the information given on the 427s indicates that one group in every five supporting 23cm availed themselves of the additional facility. This is quite encouraging, and the rule will certainly be retained next year.

It would not be VHF NFD without a dozen or so competitors raising the hoary one about "finishing earlier so that the station could be dismantled during daylight hours". The committee have always been aware of this problem, but it was not until a new agreement was reached at the last IARU Region 1 Conference that it became possible to amend the 1800gmt timing. The revised times for all 24-hour contests, including VHF NFDs, come into effect from 1 January 1973, and will be 1600 to 1600gmt. The VHF Contests Committee are now standing by to receive complaints of too early starting times.

It may be argued that the rules for vhf contests are either too many, too complicated, or merely that they are printed in the wrong order, but in every event there are competitors who do not read beyond the first two. VHF NFD 1972 was no exception, with rule 20 coming in for the least share of attention. Fortunately the number of transgressors was few, and all those entries carrying doubtful postmarks, or wrong addresses, have been included if they managed to reach the adjudicators before checking was completed. However, many of the logs which were posted under separate covers, or could not be correlated as a part of a group entry because the summary sheet was omitted, have received less sympathetic treatment. Entries in these categories have not been listed in the overall table, but do appear in the individual band tables under the callsign of the station using the band.

VHF NFD seldom fails to stimulate the majority of competitors into voicing their experiences, criticisms and comments on the reverse side of the 427 cover sheet. It is obviously impossible to answer every one, but they are read and noted by the committee, and subsequently taken into consideration when the next set of rules are formulated.

OVERALL RESULTS

Posn	Group	Points	70MHz	144MHz	432MHz	1,296MHz
1	Mid-Essex & Mid-Severn VHF/UHF CG	9,159	GW3VPK	GW3WRA	GW3LTF	GW3LTF
2	Pye Telecommunications CG	7,736	G5PI	G3PYE	G3SXK	G3SXK
3	Midland ARS ..	7,300	GW3MAR	GW3BA	GW3HAZ	GW3KPT

Posn	Group	Points	70MHz	144MHz	432MHz	1,296MHz
4	March & DRAS	7,064	G3VCV	G3PMH	G4BEL	G4BEL
5	North Liverpool RC	6,868	GW3TPF	GW3XMG	GW3VXK	
6	Surrey RCC	6,520	G8TB	G3ODY	G2RD	G2RD
7	Albright & Wilson ARS	6,317	GW3PXZ	GW3OXD	GW3NZS	GW3NZS
8	Wulfrun CG	6,094	G3ONP	G8BHH	G3UBX	
9	Crawley ARC	5,830	G3TR	G3WSC	G3GRO	G3GRO
10	AERE (Harwell) ARC	5,823	G3PIA	G3SLH	G3NNG	G3NNG
11	Dunstable Downs RC	5,420	G3ZFP	G8DDC	G3VZV	G4ARD
12	Verulam ARC	5,304	G4AFS	G3VER	G3YHY	G3YHY
13	Stockport RS	5,230	G3KJW	G6UQ	G8BHQ	G8BHQ
14	Norfolk ARC	5,083	G3ZIG	G4ARN	G3XPT	G3XPT
15	Salop ARS	5,042		G3SRT	G3UQH	G3UQH
16	Mid-Herts ARS	5,010	G3AAZ	G8BUR	G8ACE	G8ACE
17	Pennine VHF Gp	5,006	G3VVT	G3VRW	G3XAC	G3YGE
18	Southampton RSGB Gp	4,973	G3ZKR	G8FAB	G3SOU	G3WDG
19	Soil Hill VHF Gp	4,917	G3TQA	G3UGF	G8BCL	
20	Blackpool & Fylde ARS	4,892	G3NJN	G8BWW	G3VNQ	
21	South Dorset RS	4,864	G3VPF	G3SDS	G3RZG	G3RZG
22	Echelford ARS	4,680	G3TDR	G3UES	G3HZL	G2HDJ
23	RS of Harrow	4,570	G3TUX	G3EFX	G3HBR	G3HBR
24	Bournemouth & Poole VHF Gp	4,390	G3VOB	G3PFM	G3OBD	G3OBD
25	Southgate RC	4,348	G3TDM	G3SFG	G4ASR	G4ASR
26	Golden Valley VHF CG	4,294	GW4BBR	GW3SZS	GW4ABR	
27	Sutton Coldfield RC & VHF Gp	4,133	G3CNV	G3RSC	G8AVH	
28	Yeovil ARC	4,041	G3WIE	G3CMH	G8AFA	G8AFA
29	Reigate ATS	3,998	G3XIG	G3REI	G8AMU	G8AMU
30	Bolton & DARS & Bury & Rosendale RS	3,903	G3BRS	G8WY	G3ZPL	
31	Wessex ARG	3,684	G3ZTZ	G3YUZ	G3NIL	G3NIL
32	South Coast VHF/UHF Gp	3,585	G3ZCI	G3JHM	G3NNW	G3NNW
33	Liverpool & DARS	3,462	GW3XSN	GW3AHD	GW8CFM	
34	Reading ARC	3,429	G3LFM	G3ULT	G8DOR	
35	East Kent RS	3,330	G3XDV	G4ATX	G4AJC	G4AJC
36	Bristol RSGB Gp	3,294	G3ULJ	G6YB	G3TWT	G3TWT
37	Adur Contest Gp	3,190	G3YHM	G4ACG	G8BDJ	
38	Yorvik VHF Gp	3,157	G3JFO	G3OZE		
39	Hull & DARS	3,136	G3PQY	G3AMW	G8GBY	
40	Horsham ARC	3,092	G3NPF	G3TNO	G3WZT	
41	"Me and My Friends"	3,074	G3UHN	G3SHK	G8CLY	
42	Southdown ARS	3,049	G3XUS	G8BQX	G3WQK	G3WQK
43	Newbury & DARS	3,029	G3WOI	G8FNS	G8DGR	
44	Shefford & DARS	2,984	G3XTQ	G3FJE	G8AKT	
45	Addiscombe ARG	2,904	G3SJX	G4ALE	G8AWQ	
46	South of Scotland VHF/UHF CG & Lothians RS	2,860	GM3WOJ	GM3ZSX	GM3HAM	
47	Mexborough & DARS	2,840	G3UJR	G4ANP	G8DXS	
48	Doncaster College of Technology	2,804	G3WHL	G3UER	G3NEO	
49	Cray Valley RS	2,794	G3TAA	G3YGR	G3RCV	
50	East Notts CG	2,752	G3YCT	G3TBK	G3SHY	G3SHY
51	Leicester RS & Leics VHF/UHF Gp	2,695	G5UM	G3LRS	G5UM	G8BMF
52	G3ZKE/G3XBF/G8EAY Gp	2,685	G3ZKE	G3XBF	G8EAY	
	Yorks/Derby Border Gp	2,685		G4AGE	G4AGE	
54	Nunsfield House Community Assn ARG	2,549	G3ZBI	G3EEO	G8BDO	G8BDO
55	Cornish VHF Gp	2,538	G3XFL	G3XC	G2BHW	
	Eccles & DRC	2,538	G3GXI	G4AEQ	G4BBU	
57	Vectis VHF Gp	2,492	G3KSU	G3WXC	G3TGZ	
58	Luton VHF Gp	2,465	G3TDH	G3XXH	G3WOS	G3WOS
59	"Monty Python's Flying Contest Gp"	2,451		GW3ZSS	GW3ZKH	
60	Crystal Palace DRC	2,438	G3OOU	G3FZL	G3VCP	
61	Swindon & DARC CG	2,361	G4BDW	G3FEC	G3ZVC	G3ZVC
62	Oxford & DARS	2,359		G4AZN	G4AOQ	
63	Guildford & DARS	2,352	G3PJX	G3HTP	G3TLM	
64	Preston ARS	2,347	G3KUE	G8EJB		
65	Wakefield & DARS	2,115	G3WWF	G3WRS		
66	S Manchester RC and NW VHF Gp	2,105	G3FVA	G3UHF		
67	TVARTS	2,055	G3JEQ	G3TVS	G8SM	
68	Liverpool University ARC	2,042	G4AXA	G3OUL	G4BBP	
69	Basingstoke ARC	2,026	G3CBU	G3TCR		
70	Pontypool Gp	1,842	GW3VXC	GW8COJ	GW3UUS	
71	Slade R & S S	1,793	G3XRH	G8GLU	G3SRS	
72	Torbay ARC	1,786	G3NJA	G3TLK		
73	Mid-Sussex ARS	1,758	G3JBM	G3ZMS	G3WPO	
74	GM8CHR Gp	1,747		GM8CHR		
75	West Kent ARS	1,734	G3WKS	G4IB	G8EBU	
76	Clifton ARS VHF Gp (London)	1,666	G3GHN	G8GHN	G8DIU	
77	Kidderminster & D VHF/UHF Gp	1,663		G4AFY	G3EMK	
78	Chichester DARC	1,648	G4ACW	G3IZD	G2DSP	
79	Maidenhead & DARC	1,641	G3RQI	G3WKX	G8CUZ	
	Farnborough & DRC	1,641	G3XCH		G8DIZ	G8FCK
81	North Riding ARG	1,580	G3PEJ			
82	Colchester Gp	1,562	G3FIJ	G3PED	G3ZEZ	G3ZEZ
83	Worthing & DARC	1,533	G3WOR	G8GCP		
84	Windscale AR & ES	1,403		G3WIN		
85	Havering & DARC	1,393	G3KFW	G3TPJ	G4ALN	G4ALN
86	Kingston & DARS	1,387	G3ZYS	G3KIN	G4AKA	
87	Marconi Club Gp	1,383	G3ZLQ	G3JTW	G3WYT	
88	491 ATC RC	1,378	G3FIA	G8ELO	G8ELO	
89	Forest Glade DX Club	1,352	GC3WWV			
90	Sheffield VHF Gp	1,318		G8DMW		
91	Mid-Cheshire ARS	1,308	G3JWK	G3ZTT	G8CFY	
92	Purley & DRC	1,292	G3ZRR	G8DTQ	G8DLB	
93	Sutton & Cheam RS	1,256	G4ADM	G3LCH		
94	Tyneside ARS	1,231		G3ZQM		
95	GW3NNF/GW8FOL	1,209		GW3NNF		
96	GI8AYZ	1,208		GI8AYZ	GI8AYZ	
97	Burnham Beeches ARC	1,052		G3WIR		
98	Woodmansterne Gp	1,031	G3KTA	G8CCK		
99	Letchworth, Mid-Wales & D Gp	1,006		GW3UXS	GW3OHW	
100	G8AYY	990			G8AYY	
101	G3YKK	955		G3YKK		
102	Spalding & DARS	878	G3VPR	G3XBS		
103	Southend & DRS	875		G5QK	G8DJE	
104	Cardiff RSGB Gp	835		GW3GHC		
105	Nailsworth & DARC	823		G4AAN	G8BEL	
106	Loughborough Gp	802		G3PXP		
107	G8ADP	765			G8ADP	G8ADP
108	Bedford & DARC	733		G3WTP	G3WTP	
109	Edgware & DRC	705	G3ASR	G8ERS		
110	Winchester ARC	697		G3ZPT		
111	South-East Kent ARC	689		G8DOH		
112	Vange ARS	683		G3YCW	G3YCW	
113	GW3ZEY	662		GW3ZEY		
114	Border ARS	655		GM8BDX	GM8GJH	
115	Roses VHF Gp	653		G3KJY		
116	GW8COP	646		GW8COP		
117	Worcester Cattle Rustlers	630		GW4ADJ		
118	Carlisle & DARS	620		GM8DVD		
119	Medway ARTS	599		G2FJA		
120	Derby & DARS	576		G3ERD		
121	G2WS	530	G2WS	G2WS	G2WS	G2WS
122	Ipswich RC	521		G3TNE	G3YWM	
123	Corby Tech Col	519		G3MQV		
124	Silverthorne RC	518		G8CSA		
125	Chad Radio Club	516		G3YPD		
126	Banbury ARC	511		G3GFI		
127	North Bucks ARS	507		G4AFN		
128	Daniel Stewart's College RC	442		GM8EWQ		
129	Mid-Warwicks ARS	439		G3UDN		
130	G8FPI & G8FQR	419		G8FPI		
131	Dial House RS	309		G3WDH		
132	G3OTK	304		G3OTK		
133	Gravesend RSGB Gp	285		G4ALD		
134	GI2FHN/GI3TLT/GI3USS	231		GI2FHN		
135	ARC of Nottingham	213		G3EKW		
136	G8CID	198		G8CID		
137	G3OLW & G8FOV	141		G3OLW		
138	G8AFN	130		G8AFN		
139	GM8EYW	108		GM8EYW		
140	G3JFY	99		G3JFY		
	Plymouth RC	No score claimed		G3PRC		

70MHz BAND RESULTS

Posn	Callsign (/P)	Points	QSOs	County	Best dx	Km
1	GW4BBR	2,168	133	RN	GM3WML/P	493
2	G3NJN	2,148	108	LE	GC3WWV/P	535
3	GW3VPK	2,054	135	BR	GM3UAG/P	570
4	G5PI	2,048	131	ST	GM3WOJ/P	486
5	GW3TPF	1,980	97	CV	G3XIG/P	405
6	G3VVT	1,978	127	LE	G3XFL/P	475
7	G3JFO	1,946	109	YS	GC3WWV/P	510
8	G3ONP	1,708	112	HD	GM3UAG/P	507
9	G3VJR	1,700	106	YS	G3XFL/P	455
10	GW3XSN	1,684	100	DB	GM3WML/P	430
11	GW3MAR	1,646	107	MG	GM3WML/P	476
12	G3VPF	1,604	104	DT	G3WWF/P	419
13	G3PEJ	1,580	76	YS	G3NJA/P	460
14	G3UHN	1,560	73	HE	G3NJA/P	472
15	G3KUE	1,528	84	LE	G3XFL/P	440
16	G3TR	1,492	128	SX	GM3UAG/P	663
17	G3VCV	1,470	120	CE	GM3UAG/P	530
18	G3MRA	1,430	117	HE	GM3WOJ/P	507
19	GW3PXZ	1,412	102	RN	GM3UAG/P	520
20	G3WWF	1,392	72	YS	G3VPF/P	410
21	GM3WOJ	1,386	82	LK	G3XFL/P	580
22	G3XIG	1,378	107	SX	GM3WOJ/P	584
23	GC3WWV	1,352	63	GC	G3NJN/P	535
24	G3NJA	1,332	66	DN	G3PEJ/P	456
25	G3TUX	1,320	118	SX	GD2HDZ	480
26	G3TAA	1,316	134	KT	G3XFL/P	398
27	G3TDM	1,298	131	BS	GD2HDZ	370
28	G3ZIG	1,262	67	NK	GM3UAG/P	510
29	G3KSU	1,224	106	HE	G3WWF/P	400
30	G3NPF	1,212	120	SX	G3NJN/P	398
31	G4BGG	1,202	101	GR	GM3UAG/P	536
32	G3ZFP	1,196	126	BS	G3XFL/P	370
33	G3ZBI	1,168	83	SD	G3XFL/P	392
34	G8TB	1,166	103	SX	G3NJN/P	417
35	G3SJX	1,160	120	SY	G3NJN/P	375
36	G3BRS	1,158	77	LE	G3XFL/P	415
37	G5UM	1,138	92	LR	GM3UAG/P	696
38	G3PIA	1,136	100	BE	G3WWF/P	320
39	G3XFL	1,128	46	CL	GM3WOJ/P	810
40	G3CBU	1,080	102	HE	G3WWF/P	345
41	G3CNV	1,062	91	WK	G3XFL/P	370
42	G3AAZ	1,056	91	HF	GM3WML/P	560
43	G3JEQ	1,050	119	SY	G3NJW/P	410
44	G3YHM	1,034	101	SX	G3NJN/P	405
45	G3WHL	1,032	68	YS	GM3WML/P	370
46	G3XCH	1,024	96	BE	GM3WOJ/P	446
47	GW3VXC	1,022	75	MH	G3UHN/P	335
48	G3XDV	1,018	76	KT	G3PEJ/P	382
49	G3TDR	1,016	107	HE	G3NJN/P	370
50	G3LFM	1,002	102	HE	GI3HCG/P	468
51	G3KJW	998	76	SD	GM3UAG/P	460
52	G3FVA	990	75	DY	G3WKS/P	320
53	G3WIE	986	89	WE	G3WWF/P	332
54	G4AXA	960	90	DY	G3XIG/P	304
55	G3TQA	946	67	YS	G3NJA/P	370
56	G3ZKE	944	92	EX	G3WWF/P	310
57	G3VQB	936	82	WE	G3WWF/P	388
58	G3FIJ	928	72	EX	G3NJN/P	365
59	G3ZKR	910	84	HE	G3UHN/P	345
60	G3GXI	908	64	YS	G3XFL/P	420
61	G3WOR	874	93	SX	G3NJN/P	410
62	G3XTQ	866	80	BD	GC3WWV/P	332
63	G3PJX	846	91	SY	EI2VKK/P	447
64	G3GHN	844	86	SX	G3NJN/P	410
65	G3XUS	840	84	SX	G3NJN/P	425
66	G4ACW	824	88	SX	G3NJN/P	380
67	G3KTA	812	95	SY	G3NJN/P	380
68	G4AFS	788	88	BS	G3NJN/P	307
69	G3ZCI	778	61	SX	GW4BBR/P	260
70	G3YCT	772	64	SE	GC3WWV/P	360
71	G3WKS	740	87	SX	G3NJN/P	415
72	G3ZYS	690	96	SY	G3NJN/P	380
73	G3RQI	684	82	BS	G3NJN/P	313
74	G3ULJ	682	56	ST	G3UHF/P	340
75	G3ZTZ	680	56	DT	G3NJN/P	362
76	G3OOU	648	84	SY	G3NJN/P	369
77	G4ADM	642	79	SY	G3PEJ/P	350
78	G3WOI	618	69	BE	G3NJN/P	350
79	G3XRH	616	59	WE	G3XFL/P	320
80	G4BDW	588	60	WS	G3WWF/P	325
81	G3JWK	570	53	CH	G3XFL/P	375
82	G3PQY	560	40	YS	GM3WML/P	370
83	G3VPR	510	41	LN	G3VPF/P	266
84	G3ZLQ	482	67	HE	G3NJN/P	394
85	G3KFW	472	76	EX	GW4BBR/P	256
86	G3JMB	470	69	SX	G3VVT/P	390
87	G3ASR	342	46	HF	GC3WWV/P	320
88	G3ZRR	320	54	SX	GW4BBR/P	255
89	G3LMT	314	23	LN	G5PI/P	345
90	G3YRO	312	74	HE	GW3VPK/P	165
91	G3FIA	284	31	NR	G3XFL/P	350
92	G2WS/P	52	10	DN	G3ZBI/P	252

Check log from G3MI

144MHz BAND RESULTS

Posn	Callsign (/P)	Points	QSOs	County	Best dx	Km
1	GW3BA	2,498	341	MG	PA0MOT	520
2	G3SRT	1,950	257	SE	DC8EE/A	875
3	G3ODY	1,923	236	SX	DC1DN/P	579
4	G3UGF	1,829	221	YK	ON3NO	590
5	G8BHH	1,794	250	HD	ON4PB	538
6	G3PMH	1,765	208	CE	OZ5TE	800
7	GM8CHR	1,747	174	—	G3REI/P	550
8	GW3OXD	1,699	240	RN	PA0ZAZ/P	525
9	G6UQ	1,666	263	SD	F5IJ/P	525
10	GW3SZS	1,640	226	RN	PA0ZAZ/P	537
11	G4ATX	1,594	176	KT	GM8FFX/P	690
12	G3VRW	1,572	214	LE	PA0JOU/P	595
13	G3WSC	1,495	212	—	DC6XL/P	635
14	G3PYE	1,488	204	ST	GM8FFX/P	649
15	G8DDC	1,449	213	BS	OZ1OZ/A	806
16	G3XBF	1,447	184	EX	GM8FFX/P	584
17	GW3XMG	1,432	161	CV	G3REI/P	405
18	G3WIN	1,403	168	—	GC8AWE	507
19	G3SHK	1,388	118	—	DL0NI	632
20	G3GEI	1,376	230	WR	ON5EW/A	585
21	GW3WRA	1,371	231	BR	F1UZ	490
22	G4ARN	1,336	161	NK	GI8AYZ/P	500
23	G8DMW	1,318	167	YS	ON5EW/A	587
24	GW3AHD	1,314	188	DB	GM8AZS/P	430
25	G3JHM	1,313	191	SX	PA0JOU/P	525
26	G3EFX	1,298	206	SX	GM8BCP/P	531
27	G3YUZ	1,296	192	DT	GM8AGU/P	482
28	G8BQX	1,280	188	SX	GM8AGU/P	678
29	G3VER	1,263	208	BS	GM8FFX/P	572
	G3UES	1,263	201	HE	GM3ZSX/P	519
31	G3ULT	1,233	202	HE	GM3ZSX/P	475
32	G3ZQM	1,231	143	DM	G3EFX/P	420
33	G5BK	1,229	225	GR	ON4PB/P	470
34	G3OZE	1,211	162	YS	G3PRC/P	415
35	GW3ZSS	1,209	176	DB	PA0ZAZ/P	525
36	GW3NNF	1,205	139	AG	PA0ZAZ/P	611
37	G6YB	1,178	197	ST	F6AGV	415
38	G8FAB	1,143	171	WE	GI8AYZ/P	490
39	GM3ZSX	1,132	138	LK	G3ODY/P	545
40	G3UHF	1,115	161	DY	ON5NO/P	593
41	G8BWW	1,076	115	LE	PA0ZAZ/P	540
42	G3WIP	1,052	203	OX	GI8AYZ/P	495
43	G8BUR	1,035	147	HF	GM8FFX/P	550
44	G3AMW	1,034	152	YS	F9NJ/P	425
45	G3TNO	1,028	174	SX	GM8AGU/P	540
46	G3RSC	1,019	196	—	F1BOR	410
47	G3OUL	962	145	DY	PA0CKV/P	475
48	G3PFM	958	153	WE	GM8AGU/P	492
49	G3SFG	955	188	BS	GM8BCP/P	425
	G3YKK	955	117	YS	G3REI/P	385
51	G3TCR	946	147	—	GM8BCP/P	—
52	G3YGR	920	196	KT	GM8CHR/P	475
53	G3SLH	886	156	BE	GM8EWQ/P	464
54	G3FZL	866	142	SY	GM8AGU/P	525
55	G4ALE	844	166	SY	GM8CHR/P	496
56	GW3GHC	835	144	—	F6AGV	463
57	G3UER	830	165	YS	GM8AZS/P	370
58	G8EJB	819	118	LE	G3DAH	415
59	G4AFY	817	160	SE	—	—
60	G3XXH	808	144	BD	GM8BCP/P	420
61	G3FEC	805	114	WE	ON4PB/P	558
62	G3PXP	802	174	LR	—	—
	G3REI	802	134	SX	GM8CHR/P	547
64	G8WY	783	138	LE	G3PRC/P	350
65	G3LRS	757	146	LR	GM8BCP/P	348
66	G3HOX	732	110	LE	PA0ZAZ/P	—
67	G3SDS	725	116	OT	G3GJY	410
68	G3WRS	723	101	YS	G3WXC/P	405
69	G3ZPT	697	137	HE	PA0ZAZ/P	445
70	G8DOH	689	91	KT	F1RM	469
71	G8EIA	685	100	YS	G8BQX/P	408
72	GW3ZEY	662	115	RN	GM8BDX/P	460
73	G4ANP	660	122	YS	—	—
	G3RAF	660	119	ST	GM3ZSX	440
75	G8GCP	659	135	SX	G3YKK/P	370
76	G8FNS	653	110	BE	G3WIN/P	298
	G3KJY	653	105	YS	G3REI/P	375
78	G3ZMS	652	116	SX	GM8AGU/P	557
79	G3TBK	650	120	SE	GM8BDX/P	360
80	G3EEO	649	143	SD	G3PRC/P	303
81	GW8COP	646	99	DB	G3DAH	370
82	GW4ADJ	630	100	DB	G2UJ	330
83	GI3IZD	626	128	SX	GM8AGU/P	554
84	GM8DYD	620	82	DF	G3TCR/P	442
85	G3LCH	614	153	SY	G3WIN/P	387
86	G8GHN	612	79	SX	DC8EEA	510
87	G4AEQ	610	102	YS	G3PRC/P	360
88	G2FJA	599	111	KT	G3ZQM/P	400
89	GI8AYZ	596	63	AM	G4ARN/P	511
90	G3WTP	590	111	BD	GM8CHR/P	420
91	GM8BDX	589	91	BW	G3PMH/P	425
92	G3ERD	576	110	—	G3TLK/P	310
93	G8EQL	573	106	ST	—	—

Posn	Callsign(/P)	Points	QSOs	County	Best dx	Km
94	G4AZN	571	131	OX	G3XC/P	317
95	G3FJE	564	110	BD	GM8BCP/P	415
	G8DTQ	564	117	SX	GM8CHR/P	490
97	G3XC	552	62	CL	G3AHM/P	402
98	G3MQV	519	111	NR	GM8BCP/P	360
99	G8CSA	518	100	HF	GM8BCP/P	440
100	G3YPD	516	116	SD	GM3ZSX/P	340
	G3ZTT	516	102	CH	G3REI/P	345
102	G3GFI	511	119	—	G3WIN/P	287
103	G4AFN	507	114	BS	GM8BCP/P	405
104	G3TNE	503	83	SK	—	—
105	G3CMH	500	97	WE	PA0ZAZ/P	458
106	G3TVS	489	123	SY	GM8CHR/P	—
107	G8ELO	476	102	NR	GM8CHR/P	360
108	GW8COJ	460	100	MH	G3OZE/P	306
109	G4IB	454	113	SX	G3UGF/P	327
	G3TLK	454	73	DN	G3WIN/P	407
111	GM8EWQ	442	72	PB	G8FAB/P	483
112	G3UDN	439	106	WK	GM3ZSX/P	385
113	G3WXC	434	70	HE	G3WRS/P	400
114	G4ACG	428	111	SX	G2CUZ	345
115	G3HTP	420	102	SY	G3ZQM/P	410
116	G8FPI	419	77	SY	G3ZQM/P	405
117	G3YCW	413	124	EX	F6BRZ	352
	G5QK	413	96	EX	G3ZQM/P	320
119	G3PED	394	80	EX	G3PYE/P	295
120	G3WKX	387	115	BS	G3TLK/P	244
121	G4AAN	373	85	GR	G8BWW/P	300
122	G3XBS	368	76	LN	GM8CHR/P	315
123	G8ERS	363	118	—	G3ZQM/P	375
124	GW3UXS	340	58	CD	GM8AGU/P	325
125	G3IDV	324	66	DM	G3ODY/P	375
126	G3WDH	309	47	LE	G3YUZ/P	387
127	G3JTW	307	70	HE	G3YKK/P	350
128	G3OTK	304	55	ST	G3WIN/P	387
129	G8GLU	301	89	—	G3XC/P	320
	G3KIN	301	98	SY	GW3XMG/P	340
131	G4ALD	285	83	—	G8WY/P	320
132	GI3XRQ	241	40	—	—	—
133	G8CCK	219	71	SY	G3ZQM/P	420
134	G3EKW	213	67	NG	G8BQX/P	234
	G4AGE	213	33	DY	F6AGV	350
136	G8CID	198	50	YS	GM8EYW/P	348
137	G3OLW	141	27	—	—	—
138	G8AFN	130	54	EX	G3ZQM/P	398
139	G3TPJ	116	53	EX	G3YUZ/P	190
140	GM8EYW	108	16	AB	G8DMW/P	467
141	G3JFY	99	27	HE	G6UQ/P	247
142	G3VEF	64	28	HE	GW3BA/P	255
143	G2WS	56	16	DN	G8GCC/P	202

Check logs from G3YBJ, G6CJ, G3SJI, G3WHK/A and BRS28005

1,296MHz BAND RESULTS

Posn	Callsign (/P)	Points	QSOs	County	Best dx	Km	Aerial
1	GW3LTF	2,530	21	BR	G3LQR	312	4ft dish
2	GW3KPT	1,758	15	MG	G3LQR	309	4ft dish
3	G3SXK	1,740	16	ST	G4BEL/P	267	4ft dish
4	G3NNG	1,635	22	BE	GW3NZS/P	136	4ft dish
5	G2RD	1,445	19	SX	G4BEL/P	163	3½ft dish
6	G3WDG	1,402	19	WE	GW3NZS/P	151	4ftdish
7	G3UQH	1,268	13	SE	G3YGE/P	160	2ft dish
8	GW3NZS	1,226	11	RN	G3YHY/P	180	4ft dish
9	G3GRO	1,217	16	SX	GW3LTF/P	192	14-el
10	G4BEL	1,201	10	CE	PA0HVA	285	4ft dish
11	G3YHY	1,165	14	BS	GW3NZS/P	180	34el Pb
12	G4ARD	1,095	16	BS	GW3LTF/P	175	4ft d/24-el
13	G8AFA	1,067	16	WE	GW3NZS/P	130	6ft dish
14	G8ACE	1,005	12	HF	GW3LTF/P	208	4½ft dish
15	G2HDJ	757	12	HE	G3NIL/P	98	24+24-el
16	G3OBD	674	10	WE	GW3LTF/P	127	4ft d/18-el
	G3HBR	674	11	SX	G8ACE/P	125	4ft dish
18	G3NNW	666	11		G3NNG/P	108	6×18-el
19	G3ZVC	632	10	WE	G3SXK/P	114	4ft dish
20	G3NIL	508	7	DT	GW3LTF/P	132	4ft dish
21	G3RZG	459	6	DT	GW3LTF/P	127	3ft dish
22	G8ADP	417	8	GR	GW3NZS/P	81	60°Trough
23	G8BQH	406	6	SD	GW3NZS/P	128	6-el
24	G3TWT	366	6	ST	G3WDG/P	72	8 + 8-el
25	G3YGE	358	4	LE	G3UQH/P	160	3ft dish
26	G3XPT	331	4	NK	G8ACE/P	130	3ft dish
27	G3WQK	329	7	SX	F1BQ/P	130	4ft dish
28	G8AZM	312	5	KT	G8ACE/P	98	4 × 32-el
29	G4ALN	307	5	EX	G3NNW/P	94	4ft dish
30	G4AJC	292	4	KT	G2RD/P	93	4ft dish
31	G8AMU	240	7	SX	G4AJC/P	80	3ft dish
32	G3WOS	173	4	BD	G3NNG/P	75	6ft dish
33	G2WS	146	2	DN	GW3LTF/P	100	8 + 8-el
34	G4ASR	145	4	BS	G8AFA/P	67	3ft dish
35	G8FCK	113	3	BE	G8AFA/P	48	2 × 32-el
36	G3ZEZ	54	1		G3LQR	54	4ft dish
37	G3SHY	10	1	SE	GW3KPT/P	10	15 + 15-el
38	G8BMF	8	1	LR	G2FNW	8	5ft dish

432MHz BAND RESULTS

Posn	Callsign(/P)	Points	QSOs	County	Best dx	Km
1	GW3VXK	3,456	62	CV	G8AMU/P	398
2	GW3LTF	3,204	92	BR	G3LQR	308
3	G4BEL	2,628	80	CE	PA0EZ	380
4	G3UBX	2,592	78	HD	G3XPT/P	302
5	G4AGE	2,472	76	DY	G4AJC/P	288
6	G3SXK	2,460	60	ST	G3XPT/P	362
7	G3NNG	2,166	77	BE	G2BHW/P	300+
8	G8BHQ	2,160	72	SD	G8AMU/P	320
9	G3XPT	2,154	42	NK	GW3VXK/P	386
10	G8BCL	2,142	61	YK	G3RZG/P	335
11	G3YHY	2,088	84	BS	G3VNQ/P	307
12	G3RZG	2,076	52	DT	G3VNQ/P	376
13	G8AVH	2,052	75	SD	GI8AYZ/P	367
14	G2RD	1,986	75	SX	GW3VXK/P	377
15	GW3NZS	1,980	62	RN	G3XPT/P	325
16	G3ZPL	1,962	60	LE	G3RZG/P	315
17	G4ASR	1,950	77	BS	G3YRH	355
18	G8ACE	1,914	73	HD	GW3VXK/P	300+
19	G3UQH	1,824	71	SE	G3XPT/P	245
20	G4AOQ	1,788	68	OX	G3VNQ/P	280
21	G8DGR	1,758	69	BE	G3VNQ/P	325
22	G8BDJ	1,728	68	WE	GW3VXK/P	360
23	G3OBD	1,722	60	WE	G3XPT/P	312
24	G3VZV	1,680	73	BS	G2BHW/P	370
25	G3VNQ	1,668	38	LE	G3RZG/P	380
26	G3HZL	1,644	74	HE	GW3VXK/P	308
27	G3GRO	1,626	65	SX	GW3VXK/P	334
28	G8AMU	1,578	53	SX	GW3VXK/P	398
29	G8AKT	1,554	51	BD	GW3VXK/P	305
30	G8GBY	1,542	41	YS	G3SXK/P	345
31	G3SOU	1,518	59	WE	G3KMS	264
32	G8AFA	1,488	60	WE	G2BHW/P	262
33	GW3HAZ	1,398	51	MG	G3LQR	315
34	G3SHY	1,320	52	SE	G8BXX	227
35	G3HBR	1,278	54	SX	GW3VXK/P	384
36	GW3ZKH	1,242	45	DB	G2RD/P	311
37	G3NIL	1,200	42	DT	G3KMS	305
38	G8DOR	1,194	55	HE	GW3VXK/P	275
39	G3XAC	1,098	41	LE	G3NNG/P	260
40	G3TLM	1,086	63	SY	GW3VXK/P	336
41	G3TWT	1,068	41	ST	G8BCL/P	276
42	G4BBU	1,020	35	YS	G8DGR/P	270
43	G8AYY	990	43	SD	—	—
44	G3NEO	942	35	YS	G3SXK/P	280
45	G3VCP	924	60	SY	GW3NZS/P	237
46	G8AWQ	900	49	SY	GW8GIZ/P	305
47	G2BHW	858	15	CL	G8BZV/P	360
48	G3WZT	852	53	SX	GW3VXK/P	343
49	G3EMK	846	43	SE	—	—
50	G3TGZ	834	35	HE	G8BHQ/P	250+
51	G3NNW	828	44	SX	FIGG/P	270
52	G5UM	792	34	LR	GW3VXK/P	252
53	G8BDO	732	38	SD	G3NNG/P	170
54	GW3OHW	666	19	CG	G8GBY/P	281
55	G3WPO	636	40	SX	GW3LTF/P	260
56	G8ELO	618	29	NR	GW8GIZ/P	175
57	GI8AYZ	612	10	AM	G8AVH/P	365
58	G3WQK	600	36	SX	G4AGE/P	265
59	G3WYT	594	37	HE	G3UBX/P	186
60	G8CUZ	570	37	BS	G3OBD/P	125
61	G3RCV	558	41	KT	G3TGZ/P	125
62	G8AZM	546	29	KT	GW8GIZ/P	182
63	G8EBU	540	37	SX	G3XPT/P	225
64	G8SM	516	34	SY	GW3LTF/P	199
65	G8DIZ	504	31	BE	GW8GIZ/P	230
66	G4ALN	498	32	EX	G3OBD/P	183
67	GW4ABR	486	23	RN	G3RZG/P	193
68	G8DXS	480	24	YS	G3YHY/P	196
69	GW8CFM	474	19	DB	GM3HAM/P	268
70	G8DJE	462	30	EX	G4AGE/P	205
71	G8BEL	450	27	GR	G3RZG/P	150
72	G4AJC	426	19	KT	G4AGE/P	288
73	G3WOS	414	27	BD	GW3LTF/P	180
74	G8DLB	408	29	SX	—	—
75	G4AKA	396	34	SY	G4AOQ/P	220
76	GW3UUS	360	21	MH	G8AVH/P	140
77	G8ADP	348	21	GR	—	—
78	GM3HAM	342	9	LK	GW3VXK/P	290
79	G3ZVC	336	24	WE	G2RD/P	131
80	G8EAY	294	29	EX	—	—
81	G2WS	276	12	DN	G2BHW/P	140
82	G3YCW	270	20	EX	G3GRO/P	110
83	G8CFY	222	15	CH	G8AVH/P	80
84	G8DIU	210	21	SX	G3HZL/P	75
85	G2DSP	198	19	SX	G3YHY/P	93
86	G3ZEZ	186	11	EX	GW3LTF/P	268
87	G3WTP	143	11	BD	G3SXK/P	240
88	G8CLY	126	5	YS	G4AGE/P	128
89	G4BBP	120	10	DY	G3UQH/P	102
90	GM8GJH	66	3	BW	GM8FFK/P	125
91	G3YWM	18	3	SK	G3ZEZ/P	39

Check log from G6TS

CONTEST NEWS

Contests calendar

1972	
9-10 December	— Tops CW Club
1973	
January-February	— 432MHz Cumulative
7 January	— 144MHz SSB Open
13-14 January	— AFS (Rules in this issue)
26-28 January	— CQ WW DX 160
27-28 January	— REF CW
3-4 February	— ARRL DX Phone
10-11 February	— First 1·8MHz
17-18 February	— ARRL DX CW
18 February	— 70MHz Open
24-25 February	— REF Phone
3-4 March	— 144/432MHz Open
3-4 March	— ARRL DX Phone
4 March	— 144MHz Fixed
10-11 March	— BERU (Rules in November issue)
17-18 March	— ARRL DX CW
24-25 March	— CQ WW WPX SSB
7-8 April	— 432MHz Open
8 April	— 80m Low Power
21-22 April	— Bermuda Phone
22 April	— 70MHz Portable
5-6 May	— 144/432MHz Open
5-6 May	— Jubilee Phone
5-6 May	— Bermuda CW
6 May	— 432MHz Fixed
12-13 May	— Jubilee CW
27 May	— 144MHz Portable
9-10 June	— NFD (Provisional)
9-10 June	— 70MHz Open
16-17 June	— Microwave FD
23-24 June	— Summer 1·8MHz
7-8 July	— Jubilee VHF/UHF
7-8 July	— SSB FD
22 July	— 432MHz Portable
12 August	— 70MHz Fixed and Portable
19 August	— 144MHz SSB Open
1-2 September	— VHF NFD
1-2 September	— IARU 144MHz
9 September	— 80m FD
6-7 October	— UHF NFD
6-7 October	— IARU 432/1,296MHz
13-14 October	— 21/28MHz
20-21 October	— 7MHz CW
3-4 November	— 7MHz Phone
3-4 November	— 144/432MHz CW
10-11 November	— 2nd 1·8MHz
11 November	— 70MHz Cumulative
9 December	— 144MHz Fixed

Affiliated Societies Contest 1973 rules

1. The General Rules for RSGB HF Contests, as published in the January 1973 issue of *Radio Communication*, will apply.

2. When. From 1800gmt to 2200gmt on Saturday 13 January 1973, and from 1800gmt to 2200gmt on Sunday 14 January 1973.

3. Eligible entrants. All fully paid-up affiliated societies.

3.1 As the contest is to encourage club activity, it is not in the spirit of the contest that a competing station should be operated by only one operator for all, or nearly all, of the time. Entries which indicate this method of operation may be disallowed.

3.2 All entries will be classed as multi-operator.

3.3 Entries will only be accepted from stations operating within a 10-mile radius of the normal meeting or hq of the affiliated society.

3.4 Callsigns which have been issued to affiliated societies must be used.

3.5 More than one entry will be accepted from an affiliated society providing that where a club callsign has been issued, that callsign is used by the "A" station.

4. Contacts. CW (A1) only in the 1·8-2MHz band.

Competing stations only (as defined in Rule 3) must send AFS to identify themselves after the report-serial number group, eg 599001 AFS. Repeat contacts may be made during the second session.

5. Scoring. 15 points for each contact with an AFS station, and one point for all other contacts.

6. Logs. Column (5) must be headed "Enter AFS if received". Entries must be sent to the HF Contests Committee, c/o M. Harrington, 123 Clensham Lane, Sutton, Surrey.

7. Trophy. The Edgeware Trophy will be awarded to the affiliated society submitting the highest checked score.

Amateur Television Cumulative Activity Contest

Organized by the British Amateur Television Club

Dates. 8, 16, 24 January; 1, 9, 17, 25 February 1973.

Times. 1930–2230gmt.

Eligible entrants. All amateurs licensed to transmit and/or receive amateur television.

Frequencies. The 70cm amateur band only.

Modes of transmission. A5 with A3 or F3.

Contest exchanges. The contest exchange shall consist of:

1. The sound signal readability and strength report together with the serial number of the contact. (The serial number of the contact shall commence at 001 and advance by one for each contact throughout the entire seven contest periods).

2. The QTH (QRA) locator and the station location (which shall be given by distance and bearing from a well-known town or city).

3. The vision signal report (based on the British Amateur Television Club Reporting Chart Scale of 0–5.)

4. The frequency of the vision signal received as given in the vision caption.

Contest entries. Logs should contain the following information in the following order: **1.** Date and time (gmt). **2.** Callsign of station contacted. **3.** My report of his sound signals and serial number sent. **4.** His report on my sound signals and serial number received. **5.** QTH (QRA) locator received. **6.** Station location as received. **7.** My report on his vision signal. **8.** Line standard of his vision signal—405 or 625. **9.** His report of my vision signal. **10.** Line standard of my vision signal to him—405 or 625. **11.** The frequency of his vision signal as transmitted in his vision caption. **12.** Points claimed for the contest.

Scoring. Each contact shall be scored at one point per kilometre between station locations. Only three out of the seven activity periods may be totalled to make up the contest entry score. All logs should, however, be sent to the adjudicator for the purposes of checking.

Operating sites. Portable, alternative or fixed station sites may be used but the same site must be used for each of the three periods used to make up the contest entry score.

Entries. Entrants may submit two entries if they wish (ie one from a portable site and one from their fixed station location).

All entries must be postmarked not later than 14 March 1973 and should be sent to the adjudicator at: The British Amateur Television Club, c/o White Orchard, 64 Showell Lane, Penn, Wolverhampton, Staffs WV4 4TT. All entries must be accompanied by a cover sheet giving the following information: **1.** Name and address for correspondence. **2.** Callsign used. **3.** QTH (QRA) locator as transmitted. **4.** Station location as transmitted. **5.** Frequency of vision carried as transmitted by vision caption. **6.** Claimed score. **7.** Brief details of the station, ie vision tx pa and power input, vision rx front end, vision source, aerial used. **8.** Best contact. **9.** Any other comments.

General. All entrants must operate within the terms of their licence.

The vision caption(s) used must include the callsign of the station and the frequency of the vision carrier given in megahertz to two decimal places, (ie 436·10).

It is hoped that all entrants will enter into the spirit of the contest and only give their vision carrier frequency by A5 (ie as a vision signal only) as no points will be gained or lost if this is incorrectly logged.

BATC Amateur Television Reporting Charts are available priced 6p each post paid from: BATC Club Sales Officer, Kyres Cross, Peterstow, Ross on Wye, Herefordshire.

CLUB NEWS

Items for inclusion in this section should be sent to regional representatives before the first of each month for inclusion in the following month's issue. They should not be sent direct to the editor.

The date of publication of the following month's issue, first Tuesday in the month, should be borne in mind so that events are not, in fact, history when the details are published. While regional representatives are pleased to receive clubs' events calendars for several months ahead, they still require monthly events lists so that entries can be confirmed or amended.

REGION 1 — RR B. O'Brien, G2AMV

Ainsdale (ARC)—Members should contact N. Horrocks, G2CUZ, for details of meetings.
Blackburn (ELARC)—First Thursday each month, 7.30pm, Edinburgh House, Shearbank Road, Blackburn. Secretary: W. E. Baxendale, G8FDG, "Juverna", Westland Avenue, Darwen, Lancs.
Blackpool (B & DARS)—Mondays, 8pm, Pontins Holiday Camp, Squires Gate, morse tuition—7.30pm.
Bolton (B & DARS)—First and third Wednesdays, Bolton Recreation Club, Kensington Place. Morse tuition at every meeting, further details from G3XUM.
Bury (B & RRS)—Second Tuesday in the month, 8pm, George Hotel, Market Street, Bury. 12 December, (AGM). Secretary—G3RSM. Club net 11.30am, Sundays 145·8MHz.
Carlisle (C & DARS)—Mondays 7.30pm, Currock House, Lediard Avenue, Currock. Secretary—G8GSE, 6 Carlton Gardens, Stanwix, Carlisle GA3 9NP.
Cheshire (Mid Cheshire ARC)—Wednesdays 7pm, Technical Activities Centre, Winsford Verdin Comprehensive School, Grange Lane, Winsford. Nets on 160m, 7pm Mondays, on 2m, 7pm Tuesdays. Details from G3JWK.
Chester (C & DARS)—Tuesdays 8pm except first Tuesday in month which is net night, YMCA, Chester. Details from G8AYW.
Douglas IOM (D & DARS)—Secretary, GD3YUM, will be pleased to hear from any member who intends to visit the island.
Eccles (E & DRC)—Tuesdays, 8pm, Bridgewater School, Worsley, Manchester. Club 2m net, 11am on Sundays on 145·65. All visitors and prospective members welcome. Secretary—G4AEQ, QTHR.
Lancaster University (UOLARS)—Prospective members should write to Phil Jones, Dept of Environmental Sciences. The society's vhf station, G8DOU, is operational on 144MHz rtty and would welcome enquiries about skeds.
Leyland Hundred (ARG)—Second Monday each month, 7.30pm, Rose & Crown, Ulnes Walton, Leyland. Net night Saturdays, 1900bst on 145·8MHz. Details from F. Harrison, 78 Lancaster Lane, Leyland, Lancs.
Liverpool (L & DARS)—Tuesdays 8pm, Conservative Association Rooms, Church Road, Wavertree. Secretary—G3WCS.
Liverpool (NLRC)—Tuesdays, 8.30pm, informal meeting at the "Nags Head", Thornton, Crosby, Liverpool 23. Visitors welcome. Secretary—G3XMG.
Liverpool University (M & DARS)—Prospective members should contact G4AXA through the Students Union or via his home QTH which is 234 Derby Road, Chesterfield, Derbyshire S40 ZEP.
Manchester (M & DARS)—Wednesdays, 7.30pm, all meetings include morse classes. 203 Droylesden Road, Newton Heath, Manchester 10. Secretary—G3IOA.
Manchester (SMRC)—Fridays, 8pm, at the Sale Moor Community Centre, Norris Road, Sale, Ches. The vhf group are again active on 2m, with operation of G3UHF at the club shack—Greeba, Shady Lane Manchester 23, on Mondays from 8pm. 1 December (Talk on aerials), 8 December (Visit of Bill Lowe who will be showing various equipment), 15 December ("A transmitter test oscillator" by P. Torry, G3SMT), 22 December (Christmas Party), 29 December Club closed for "festive season". Visitors are welcome on both Mondays and Fridays. Hon sec—G3WFT, QTHR, D. Holland.
Manchester University (ARS)—G3VUM is active on all hf bands and now also on 2m. Details may be obtained from G4AZA, G3ZNS or G3XDY. The programme of lectures, visits, RAE and morse tuition continues as previously. Enquiries may be addressed to any of the above at the University Union, Oxford Road, Manchester.
Preston (PARS)—7, 21 December, 4 January, 7.30pm, Windsor Castle (private room), St Paul's Square, Preston. Secretary—G. Earnshaw, G3ZXC. Morse practice—7.30pm, main feature—8pm.
Stockport (SRS)—Second Wednesday each month is a discussion night, 4th Wednesday is a lecture night, 8pm, Blossoms Hotel, Buxton Road, Stockport. Secretary—G8BCG.
Thornton Cleveleys (ARS)—First and third Wednesdays, 8pm, St John Ambulance Brigade HQ, off Fleetwood Road North (behind Police Station) Thornton, Lancs. Project Group meets on Fridays, 7.15-9pm, at the Project Laboratory, Rossall School, Fleetwood. Work in hand includes 160 and 2m transmitters and receivers. Further details—G3ZYE.
Warrington (W & DARS)—Starting November the club is meeting every Tuesday; it is hoped to devote alternate meetings to beginners. 5 December ("Construction of digital frequency meter" by G8BLE). Although there will be meetings on 12 and 19 December, there will not be a meeting on 26 December. Thames Board Mills Social Club, Alford Hall, Manchester Road, Warrington. Secretary—G3ZRN.
Westmorland (WRA)—First Monday each month at New Allen Technical College. Acting secretary is N. Stanley, G3UEC, 9 Castle View, Sedgwick, Westmorland.
Wirral (WARS)—First and third Wednesdays each month, 7.45pm, Sports & Recreation Centre (Old Drill Hall), Grange Road West, Claughton, Birkenhead. Secretary—G3WSD.
Wirral (Wirral DX Association)—Last Thursday each month at members' homes. Details of the Christmas Dinner are to be announced shortly. Secretary—G3YSM, 43 Stuart Avenue, Moreton, Wirral. Visitors welcome, please inform sec beforehand.

REGION 2 — RR J. E. Agar, G8AZA

Barnsley (B & DRC)—Meets at King George Hotel, Peel Street, Barnsley, on Fridays at 7.30pm. Details from G3LRP, QTHR.
Bradford (BRS)—Meets at club hq, 10 Southbrook Terrace, Bradford, N7. Hon sec: R. Harker, A7585, 65 Whitby Road, Bradford, BD8 9JN. Tel Bradford 43971.
Easington (EAR & EC)—Meets Tuesdays, 7.30pm at Easington Working Men's Club, and Sunday mornings for activity on the air. Visitors are always welcome. Details from G3VSS, QTHR.
Fulford (FARS)—Meets Tuesdays, 7.30pm at Scout HQ, 31 George Street, York. Hon sec: G5KC, QTHR.
Halifax (NHARS)—6 December (Annual dinner), 20 December (Ragchew), 3 January ("Colour anodising of aluminium" by K. Walton, G3IKS). Hon sec: G3MDW, QTHR.
Harrogate & Knaresborough (H & KRS)—Meets second and third Mondays each month. Hon sec: R. Troughton, G8CRH/G4AZJ, QTHR.
Hull (H & DARS)—1 December (Film show), 8 December (Modern filters), 15 December (Construction competition), 22 December ("Regulated power supplies" by G3AGX), 29 December (Query night). Hon sec: Mary Longson, 4 Chester Road, Hull.
North Riding (NRARG)—Meets at "Alma Inn', Scarborough. Hon sec: G8AZA, QTHR.
Northumberland Morpeth (NRC)—Northumbria Radio Club meets at 3 Wheatsheaf Yard, Morpeth. Details from G3XAI, QTHR.
Otley (ORS)—Meets fortnightly, Tuesdays. 9 January 1973 ("Communication at shf" by J. B. Proctor, G8AWN). Details from D. G. Mott, hon sec, G8BZY, QTHR.
Scarborough (SARS)—Meets Fridays, 7.30pm at Technical College, Scalby Rd, Scarborough. Hon sec: G3VAN, QTHR. Area rep and PRO G8KU, QTHR.
Spen Valley (SVARS)—7 December (Music visit Richard Allan Studio, Birkenshaw), 14 December (Film—M62 motorway), 11 January 1973 (Demo of members equipment), hq, Grammar School, High St, Heckmondwike, 7.30pm. Hon sec: G8DSB, QTHR.
Sunderland (SARS)—Meets at Sunderland Polytechnic. Hon sec: G3XID, QTHR.
Tyneside (TARS)—Meets Monday, 7.30pm, Community Centre, Vine Street, Wallsend-upon-Tyne. Visitors always welcome. Hon sec: G. Lowden, 21 Winefred Gdns, Wallsend, NE28 6EF. Tel Wallsend 627878.
Wakefield (WRS)—Meets alternate Tuesdays, 7.30pm at Youth Centre, Ings Road, Wakefield. Details from G3XVU, QTHR.
York (YARS)—Thursdays, 7.30pm, G3HWW club callsign, 61 Micklegate, York. RAE course is in progress. Hon sec: J. A. Rainbow, 14 Temple Rd, Bishopthorpe, York.

REGION 3 — RR R. W. Fisher, G3PWJ

Birmingham (MARS)—19 December (Cheese & wine and Xmas party), 8pm, The Birmingham & Midland Institute, Margaret St, Birmingham 2. *G3ZMT.*

(Slade)—15 December (Film show by Mr R. Heaton), 29 December ("Photography" by Mr D. Simmonds), 8pm, The Church House, High St, Erdington, Birmingham 23. *G8EYL.*

(South)—6 December (Surplus equipment sale and Xmas party), 8pm, Hampstead House, Fairfax Road, West Heath, Birmingham 31.

Coventry (CARS)—8 December ("Slow scan tv"), 15 December (Night on the air), 22 December (Annual Xmas dinner, Woodhouse Hotel, Princethorpe), 29 December (Night on the air), 8pm, City of Coventry Scout HQ, St Nicholas St, Radford.

Dudley (DARC)—12 December, 8pm, Central Library, St James's St, Dudley. *G3PWJ.*

Hereford (HARS)—First and third Friday of each month, morse tuition every Friday evening, 7.30pm-8pm, 7.30pm, Civil Defence HQ, Gaol St, Hereford.

Lichfield (LARS)—First and third Tuesday of each month, Swan Hotel. *G8EID.*

Leamington Spa (MWARS)—Every Monday 8pm, 28 Hamilton Terrace. *G8CXL.*

Nuneaton (NARS)—First Tuesday in each month, 7.30pm, Nuneaton Technical College, Hinckley Road. *G4AEH.*

Solihull (SARS)—19 December ("Fings ain't wot they used to be!" by G2BFT). 7.30pm. The Manor House, High Street, Solihull. *G4ABV.*

Stourbridge (STARS)—5 December (Informal), Shrubbery Cottage, 8pm), 18 December ("DF working" by B. Simmonds, G3XRH), 8pm, Longlands School.

Sutton Coldfield (SCRS)—11 December ("Colour tv part II)", 8pm, clubhouse, Sutton Town Football Club, Coles Lane. *G8AVH.*

Telford (WARS)—6 December (Films "The printed circuit story", "Atomos", 8pm, Room L9, Walker Technical College), 13 December (Club dinner), 20 December (The club project), 27 December (Informal meeting), 8pm, Ketley Bank Youth Centre, Oakengates. *G3UKV.*

Wolverhampton (WARS)—4 December ("The Bermuda Contest" by J. Bazley, G3HCT), 11 December (Natter nite), 18 December ("Simple df equipment for 1·8" by G3UBX), 1 January (To be announced), 3 January (New Year's Party, Tattersall Suite, Wolverhampton Racecourse), 8pm, Neachells' Cottage, Stockwell Road.

Worcester (W & DARC)—16 December, Crown Hotel, 3 January (visit to Police HQ). For further information, G8ASO (Worcester 29208).

REGION 4 — RR T. Darn, G3FGY

Derby (DADARS)—6 December (Surplus sale), 13 December (Christmas social, dinner and dance) at the Regency Rooms, Ilkeston, (Open evening in the clubroom), 20 December (Christmas Party) in the clubroom, 27 December ("The year in retrospect" members' slides and films). 1930 net Saturdays at 1930 MHz, a.m. only. The clubroom is open for club activities on Mondays at 7.30pm. All meetings at 119 Green Lane, Derby, commencing at 7.30pm. *G2CVV.*

Melton Mowbray (MMARS)—15 December ("VHF, then and now" by G5UM). The meeting is at the St John Ambulance Hall, Asfordby Hill, Melton Mowbray, at 7.30pm. *G3NVK.*

Nottingham (ARCON)—During the month of December the meetings will be held on 7, 14, 21, 28 of the month (not bands, hi). The committee has decided to make the meetings fairly informal and each meeting will consist of an "On the air/natter night". Meetings are held at the Sherwood Community Centre, Mansfield Rd, Nottingham, at 7.30pm. *G4AFJ.*

REGION 5 — RR P. J. Simpson, G3GGK

Bedford (B & DARC)—The AGM was held on 26 October and the chairman, G3UQR, reported on another successful year. G2CLP is the new chairman, and G3XDU treasurer for the coming year. 7 December (RSGB tape/slide lecture—a tour of ARRL headquarters), 14 December ("HF/VHF mobile" by G3SOA and G8ALQ), 15 December (Annual Dinner at Red Lion, Elstow), 21 December ("160m transverter"—G4ACP), 24 December (Club holiday net on 3,670kHz), 28 December (Members slides and films—award for best slide). Meetings 7.30pm, at The Dolphin, The Broadway, Bedford. Hon sec: John Bennett G3FWA, 47 Ibbett Close, Kempston, Beds.

Cambridge (C & DARC)—8 December (Film night), 15 December (Informal), 22 December (Xmas Fayre), 29 December (Informal), 7.30pm at hq, Corporation Yard, Victoria Rd, Cambridge. Hon sec: J. Hern, G3NAC, 5 Acheson Road, Brampton, Hunts.

Dunstable Downs (DDRC)—8 December ("TVI" by J. R. Turner), 15 December (Dennis License of Enthoven Solders Ltd), 22 December (No meeting but club net on 145·05MHz, 2030hrs), 29 December (Between week), 5 January ("Electronic power supplies" by John Gould). Meetings 8pm, Chews House, 77 High Street South, Dunstable. Hon sec: C. G. Powell, G8BPK, 1 Wenwell Close, Buckland Wharf, Aston Clinton, Aylesbury, Bucks.

Shefford (S & DRS)—The club's annual dinner attracted 70 members and guests including the RR. After an excellent meal and speeches, awards were presented for services to the club and to the leading entries in the construction competition. The secretary reviewed another successful year and later in the evening a film show included a record of HF and VHF Field Day activity. Meetings Thursdays at 7.30pm at Church Hall, Ampthill Road, Shefford, Beds. Hon sec: Chris Davies, G8DUY, 17 Brigham Gardens, Biggleswade, Beds.

REGION 6 — RR L. W. Lewis, G8ML

Banbury (ARS)—Meeting at Woodgreen Hall, Banbury, 7.30-10pm, 1 December. Details from G3LTN. Tel Banbury 710623.

Cheltenham (RSGB Group)—First Thursday of each month, 8pm, Royal Crescent Hotel, Clarence Street, Cheltenham. *G2FWA.*

Gloucester (ARS)—First Thursday in each month at the Oddfellows Club, Barton Street, Gloucester, 7.30pm. Also each remaining Thursday in the month at the Drill Hall, Education and Leisure Centre, Chequers Road, Gloucester. *G3MA.*

North Bucks (ARS)—11 December, 8pm, (Junk sale). All meetings second Monday each of month at Wolverton Youth Club. *G8AAT.*

Oxford (O & DARS)—Second and fourth Wednesdays of each month at 7.30pm in the University Mansfield Road Club. 13 December ("Front end selectivity and noise"), 27 December (no meeting). Hon sec: D. R. Ward, G4AOQ, 2 Lincoln Road, Oxford.

South Bucks (VHF Club)—First Tuesday in each month at Bassetbury Manor, High Wycombe. 5 December (Social meeting at Chequers PH, Prestwood). All visitors are welcome. Further details from hon sec: G8DDM.

REGION 7 — RR R. S. Hewes, G3JDR

Acton, Brentford & Chiswick (ABCRC)—19 December ("The FTDX101 transceiver" by G3CCD), 7.30pm, Chiswick Trades & Social Club, 66 High Road, Chiswick, W4. Hon sec: W. G. Dyer, G3GEH, QTHR.

Ashford, Middlesex (Echelford ARS)—11 December (ARRL film "Hams world wide" and other films), 28 December (Natter nite), 7.30 for 8pm, St Martin's Court, Kingston Crescent, Ashford, Middlesex. All visitors welcome. Hon sec: Vic Higgs, G3WVJ, QTHR.

Barking (BR & ES)—14 December (No details received), 7.30pm, Gasgoigne Recreation Centre, Gasgoigne School, Morley Road, Barking, Essex. Hon sec: H. Davidson, G3FZP, QTHR.

Bexley Heath (North Kent RS)—7, 21 December (No details received), 7.30 for 8pm, Congregational Church Hall, Chapel Road, Bexley Heath. Hon sec: Maurice Lee, G4BAZ, QTHR.

Burnham Beeches (BBARC)—7 December (Selection of Mullard films), 21 December (Special Christmas meeting), 8pm, Hedgerley Scout Hut, Hedgerley, Nr Slough, Bucks. All visitors welcome. Hon sec: Nina Appleby, G8ENX, QTHR.

Cheshunt (CDRC)—1 December (No details received), 8pm, Methodist Church Hall, opposite Theobalds Station, Cheshunt. Hon sec: Richard Ludwell, G3ZZQ, QTHR.

Chingford (Silverthorn RC)—Every Friday, 7.30pm, Friday Hill House, Simmonds Lane, Chingford, E4. Further details from hon sec: K. S. Arnold, G3XNP, QTHR.

Cray Valley (CVRS)—7 December ("RTTY"—talk and demonstration by C. R. Whitmarsh, G8CIU), 8pm, Congregational Church Hall, Court Road, Eltham, SE9. 21 December (Pre-Christmas meeting), 8pm, Park Tavern, Passey Place, SE9 (next to car park). Hon sec: P. F. Vella, G3WVP, QTHR.

Croydon (Surrey Radio Contact Club)—19 December (No details received), 8pm, "Swan & Sugarloaf", Brighton Road, South Croydon. Hon sec: Sid Morley, G3FWR, QTHR.

Crystal Palace (CP & DRC)—16 December (Junk sale and Christmas party), 8pm, Emmanuel Church Hall, Barry Road, SE22. Hon sec: Geoff Stone, G3FZL, QTHR. Tel 699 6940.

Dartford Heath (DF Club)—1, 15 December (No details received), 8pm, Club House, Broomhill Road, Dartford. Hon sec: Maureen Worby, G3XVC, QTHR.

Dorking (DR & DRS)—Second and fourth Tuesdays, 8pm, "Surrey Yeoman", Dorking. Hon sec: P. Gilby, 6 Hawkwood Rise, Gt Bookham, Surrey.
Ealing (E & DRS)—Every Tuesday, 7.30pm, Northfields Community Centre, Northcroft Road, Ealing, W13. Details from hon sec: J. E. Alban, G3JEA, QTHR.
East London RSGB Group—17 December (AGM), 3pm, Wanstead House, The Green, Wanstead. Further details from Ron Broadbent, G3AAJ, QTHR.
Edgware (E & DRS)—14 December (Quiz and NFD film). No meeting on 28 December. 8pm, Watling Community Association, 145 Orange Hill Road, Edgware. Hon sec: Alan Masson, G3PSP, QTHR.
Gravesend RSGB Group—Mondays at 7.30pm, "Windmill Tavern", Shrubbery Road, Gravesend, Kent. Area representative: P. F. Jobson, G3HLF, QTHR.
Guildford (G & DRS)—8, 29 December (No details received), 8pm, Model Engineering HQ, Stoke Park, Guildford, Surrey. Hon sec: Peter Hopwood, G8CQM, QTHR.
Hampton Court (Thames Valley ARTS)—6 December ("Linear amplifiers" by G8SM), 8pm "The Three Pigeons", Portsmouth Road, Long Ditton, Surrey. PRO: Rob Muir, G3LHN, QTHR.
Harlow (DRS)—Every Tuesday, 8pm, Mark Hall Barn, First Avenue, Harlow. Club station now operative on 80-10m ssb/cw. Club net Sunday mornings, 10.30 on 28·8MHz, members use frequency most nights at 2100gmt. Hon sec: V. Heard, 106 Vicarage Road, Harlow, Essex.
Harrow (RSH)—Every Friday, 8pm. Please note change of QTHR to Harrow Sea Cadets HQ, Woodlands Road, Harrow. Refreshments available during evening. Hon sec: Leslie Light, G3KDL, QTHR.
Havering (H & DARC)—13 December (G3JVZ films), 27 December (CW dx competition), 8pm, British Legion House, Western Road, Romford. Hon sec: Sam Hobday, G3SKV, QTHR.
Holloway (Grafton RS)—Mondays (RAE). Fridays (Morse and club night), 7.30pm, Archway School Annexe, Whittington School, Highgate Hill, N19. At the 27th AGM the following officers were elected: President, A. Wennell, G2CJN; Vice-presidents, G2AHB, G2AAN, G3RX, G3AFC, G3ALE, G3BWQ, G3MMC, G3KGC, G8PC; Chairman, A Bristow, BRS25779; Hon sec, H. D. Ashcroft, G8AYU; Hon treas, A. Baker; Contests, B. Bond, G3ZKE. Committee: J. Hitchens, G8GBN, I. Roberts, G4ASH, T. Coleman G8EEI, R. Royall, G8ESP. G8AYU, QTHR.
Ilford (ARS)—Every Thursday, 8pm, 50 Mortlake Road (off Ilford Lane), Ilford. Hon sec: F. G. Jarvis, G3HIW, QTHR.
Kingston (K & DARS)—13 December (Junk sale), 8pm, "Penguin Lounge", 37 Brighton Road, Surbiton, Surrey. Hon sec: Dick Babbs, G3GVU, QTHR.
Loughton (L & DRS)—8 December (Informal,) 22 December (Christmas meeting), 8pm, Loughton Hall, near Debden Station. Hon sec: David Bowers, 12 Theydon Park Road, Theydon Bois, Essex.
New Cross (Clifton ARS)—Every Friday, 8pm, New Cross Road, London, SE14. Details from hon sec: R. A. Hinton, 38 Camilla Road, Bermondsey, SE16.
Northolt (BEAARS)—First Thursday in the month, BEA Trident Club, Western Avenue, Northolt, Middlesex. (This club is open to non-BEA employees by invitation. Contact David Evans, G3OUF. Tel Amersham 21573 for details).
Paddington (P & DRS)—Every Wednesday, 8pm, Beauchamp House, Warwick Crescent, W2. Further details from hon sec: Mike Pawley, G8AWV, QTHR.
Purley (P & DRS)—1 December (Natter nite), 15 December (Sid's films), 8pm, Lansdowne Hall, Lansdowne Road, Purley. Hon sec: Alan Frost, G3FTQ, QTHR.
Reigate (RATS)—7 December (No details received), 8pm, Nutley Hall, Nutley Lane, Reigate, Surrey. Hon sec: F. H. Mundy, G3XSX, QTHR.
Scouts (Baden Powell House ARG)—7 December (To be arranged), 8pm, Baden Powell House, Queensgate, South Kensington, SW7. Hon sec: Alf Watts, G3FXC, QTHR.
Southgate (SRC)—27 December (No details received), 8pm, Civil Defence Hut, Howes Road, N11 (near Arnos Grove underground station). All visitors welcome. PRO Steve White G3ZVW, QTHR.
St Albans (Verulam ARC)—20 December (No details received), 7.30 for 8pm, Town Hall, St Albans. All visitors very welcome. Hon sec: Hugh Young, G3YHY, QTHR.
Sutton & Cheam (SCRS)—19 December (No details received), 8pm, "The Harrow Inn", Cheam, Surrey. Hon sec: Jack Korndorffer, G2DMR, QTHR.
UK FM Group (London)—Second Tuesday in December, 7.30 for 8pm, Scout Hut, Hayes Road, Southall, Middlesex. Details from PRO: Mike Tooley, G8CKT, QTHR.
Welwyn (Mid Herts ARS)—7 December (No details received), 8pm, Welwyn Civic Centre, Welwyn, Herts. Hon sec: Peter Wilcocks, G8AIE, QTHR.
Wembley (GECARS)—Every Thursday, 7pm, Sports Club, Preston Road, North Wembley. (This club is open to non-GEC members by invitation. Tel Dain Evans, G3RPE, at 01-904 1262 during business hours for details).
West Middlesex ARC—Meets at Greenford Community Centre, Oldfield Lane, Greenford, Middlesex. Details of meetings from John Hedges, G3MMQ, QTHR.
Wimbledon (W & DRS)—8 December (AGM), 29 December (Club project), 8pm, St John Ambulance HQ, 124 Kingston Road, Wimbledon, SW19. Hon sec: F. W. Hill, G3WDO, QTHR.

REGION 8 — RR D. N. T. Williams, G3MDO

Canterbury (EKRS)—21 December (Light and seasonal), 18 January ("Adjustment of ssb linears"), 3 February (Annual Dinner Dance, tickets available from hon sec.). Further details of meetings from G3MDO, QTHR.
Brighton (BTCARC)—11 December (Informal evening at the club station). Details of future meetings from G2CMH, QTHR.
Canterbury University (UKC)—Details of future meetings from K. Beesley, G3XUS, Eliot College, University of Kent at Canterbury.
Crawley (CARC)—Meetings held monthly at Trinity Congregational Church Hall, Ifield, Crawley.
Eastbourne (SARS)—December ("Pulse code modulation" by R. Milton), January ("Transistor transmitters" by G8CFZ), February ("Frequency division multiplex" by G8CVV). Hon sec: G3ZQB, PRO: G3JFM.
Horsham (HARC)—5 December (AGM), 19 December (Informal, at the "Star", Roffey).
Maidstone (MYMCAARS)—All meetings at "Y" Sports centre. First and third Fridays devoted primarily to the beginner.
Medway (MARTS)—Meetings held every Friday at Aurora Club, Gillingham. 7.30pm. Further details from H. E. Willis, 111 Laburnham Road, Strood.
Tunbridge Wells (WKARS)—15 December (Xmas party). Further details from H. E. Richards, 17 Reynolds Lane, Tunbridge Wells.
Worthing (W & DARC)—Meetings held every Tuesday, 8pm, at Rose Wilmot Youth Centre, Littlehampton Road, Worthing. Details of future meetings from G8ETL, 12 Bramble Crescent, Worthing.
Mid-Sussex (MSARS)—Details of future meetings from hon sec: G3RXJ.

REGION 9 — RR H. W. Leonard, G4UZ

Best wishes for Christmas and the New Year. Keep those newsletters rolling in.
Bristol (City & County RSGB Group)—18 December (More potted lectures), 7 to 10pm, Becket Hall, St Thomas Street, Bristol 1. *G3ULJ.*
Bristol (BARC)—Every Tuesday, 7.45pm, 24 Bright Street, Barton Hill, Bristol 5. *G3XEI.*
Bristol (University ARS)—Most Saturdays, 2.30pm, Dept of Physics, Royal Fort, Tyndalls Park Road, Bristol 8. A morse class is being run by G3WDG on Wednesdays. Further details of activities from G8CVS.
Cornish (CRAC)—First Thursday in month. 7 December ("Closed circuit tv"), 4 January ("Fault location on underground cables" by G3FXL), 7.30pm, SWEB Social Centre, Pool, Camborne. Visitors most welcome. *G3WKP.*
Newquay Group (CRAC)—Fortnightly on Wednesdays, 7.30pm, Treviglas School, Newquay. G3THT, Newquay 4512. Further details of Cornish and Newquay Group gladly supplied by G3NKE.
Exeter (EARS)—Every Tuesday, 8pm, Community Centre, St Davids Hill, Exeter. Further details from A. W. Bawden, 232 Exwick Road, Exeter, EX4 2BA.
North Devon (NDRC)—Second and fourth Wednesdays of month. 13 December (Talk), 27 December (No meeting), 7.30pm. "Grinnis", High Wall, Sticklepath, Barnstaple. It is hoped to start an RAE course on a night other than Wednesday. If interested please contact G4CG as soon as possible. *G4CG.*
Plymouth (PRC)—First and third Tuesdays of month, 7.30pm, Virginia House, Bretonside, Plymouth. Hon sec: S. E. Martin, 32 East Park Avenue, Plymouth PL4 6PF.

Saltash (S & DARS)—First and third Fridays of month, 7.30pm, Burraton Toc H, Saltash. Further details from G3ZHM.
South Dorset (SDRS)—First Friday of month, 7.30pm, Alma Road section of Weymouth Technical College. *G3VPF.*
Taunton (T & DARS)—Fridays, 7.30pm, Jelalabad Barracks, The Mount, Taunton.
Torbay (TARS)—Every Tuesday, 16 December (Christmas party and draw), 7.30pm, Bath Lane, rear of 94 Belgrave Road, Torquay. Visitors always welcome. *G3NQD.*
Weston-super-Mare (WsMRS)—Second Friday of month, 7.30pm, Lewis Room M3, Worle Comprehensive School, New Bristol Road. *G3PQE.*
Yeovil (YARS)—Every Thursday, 21 December (RSGB tape lecture), 7.30pm. The Youth Centre, 31 The Park, Yeovil. *G3NOF.*

REGION 10 **RR D. M. Thomas, GW3RWX**

Blackwood (ARC)—Fridays 7.30pm, Oakdale Community Centre, Oakdale, Mon. *GW3TUG.*
Barry College of Further Education (ARS)—Thursdays 7pm, College of Further Education, Colcot Rd, Barry, Glam. *GW3VKL.*
Cardiff (RSGB Group)—Monday 11 December 7.30pm (Annual Christmas social). Will those who intend to be present please let sec know in good time, as catering is on a local basis by society members. *GW3GHC.*
Haverfordwest (ARS)—Tuesdays, 7.30pm, HQ, Rosemary Lane, Haverfordwest, Pembs. *GW3YBB.*
Hoover (ARC)—Mondays, 7.30pm, Hoover Social Club, Hoover Works, Pentrebach, nr Merthyr, Glam. Mr F. E. Tribe, c/o Hoover Works, Pentrebach.
Pembroke & District (RSGB Group)—Last Friday in each month, 7.30pm, at the Defensible Barracks, Pembroke Dock. Pembs. *GW3LXI.*
Pontypool (RSGB Group)—Tuesdays 7pm, at the Educational Settlement, Rockhill Rd, Pontypool, Mon. *GW3JBH.*
Port Talbot (ARS)—Meets second Tuesday of each month, 7.30pm, at the Rail and Transport Club, Station Rd, Port Talbot, Glam. *GW5VX.*
Sully & District Short-wave Club—Tuesdays, 7pm, at the Annexe, Sully Bowls & Social Club, 59 Port Rd, Sully, Glam. Unfortunately the club has lost the services of its energetic secretary, Glyn Maggs, GW3ZSV, who has taken employment in another area. He is succeeded by Steve Lamprey, GW4AMV, to whom all correspondence should now be addressed.
Rhondda (ARS)—Meets at Rhondda Transport Employees Club & Institute. Details of meetings from GW3PHH.
Swansea Radio Society—Meets on first and third Tuesdays of each month at 7.30pm. Meetings are also held on second and fourth Tuesdays of each month when RAE and morse classes are held. All meetings at the Palace Bar, High St, Swansea. Further details from Mr D. E. Connor, 54 Talley Rd, Penlan, Swansea SA5 7EU.
South-east Wales Raynet Group—Details from GW3ZFG. Tel Cardiff 62411.
University College of Wales, Cardiff (ARS)—Details from Mr Simon Northeast, secretary, c/o Students Union, Dumfries Place, Cardiff.
University College of Wales, Aberystwyth Radio & Electronics Society—Enquiries concerning activities and meetings from the society secretary, c/o Students Union, University College of Wales, Aberystwyth. Club callsign: GW4BGG.

REGION 11 **RR P. Hudson, GW3IEQ**

Conway Valley (CVARC)—14 December (Raffle and junk sale—bring and buy, Ray Jones, GW3MDK), 11 January 1973 ("Transistor voltage regulators" by Brian Clarke, GW3HGL), the main programme ("Receivers" by Dr David Last, GW3MZY). Meetings prompt 1930, The Quarries, Llanddulas, Abergele.
Rhyl (R & DARC)—12 December (Film show), 9 January 1973 ("Power supplies" by J. Lawrence, GW3JGA), Mona Hotel, Market St, Rhyl.
Bangor (UCNWARS)—Meetings alternate Thursdays at 1715 in the small lecture theatre of the Engineering Dept, Dean St, Bangor.

REGION 12 **RR A. J. Oliphant, GM3SFH**

Aberdeen (AARS)—Fridays, 7.30pm, 8 Blenheim Lane, Aberdeen. *GM3HGA.* Tel Aberdeen 33838.
Dundee (Kingsway Technical College ARC)—Wednesdays 7pm (Morse practice—6.30pm), Kingsway Technical College, Old Glamis Road, Dundee. Visitors always welcome. A beer and skittles social evening will be held in the "Golden Pheasant", Macalpine Road, Dundee, on Friday 8 December at 7pm. Further details from GM3VEY. Tel Monifieth 3577. Please note the club will be closed over Xmas and the New Year—no meetings will be held on 27 December or 3 January.
Inverness (IRS)—Fortnightly on Fridays at 7.30pm. Next meeting 15 December. Cameron Highlander's Memorial Youth Club, Planefield Road, Inverness. Mr L. Bell, 114 Glenurquhart Road, Inverness.
Lerwick (LRS)—Every Tuesday at 7pm, Clubrooms, Abbsbrae House, Lerwick. *GM4BBL.* Tel Lerwick 1238.
Lhanbryde (MFARS)—Wednesdays, 7.45pm, St Andrew's School, nr Lhanbryde, Elgin, Morayshire. *GM3UKG.* Tel Clochan 225.
Queen's Own Cameron Highlander's Memorial Youth Club Radio Section—Tuesdays, 7.30pm, Planefield Road, Inverness. Section caters for all young people from 13 years interested in learning, and obtaining practice in, the elements of radio technique. Mr Bill Begg, 68 Tomnahurich St, Inverness.
Thurso (CARS)—Second Tuesday in each month, 7.30pm, Scapa House, Thurso. *GM4BKO.* All visitors welcome.

REGION 13 **RR V. W. Stewart, GM3OWU**

Berwick (BARS)—Last Sunday in each month, 3pm, Tweed View Hotel. Further details from C. H. Crook, G3YOG, 19 Hatters Lane, Berwick upon Tweed, or from the AR, G. Shankie, GM3WIG, 8 Ettrick Terrace, Hawick, Roxburghshire.
Dunfermline (DRS)—Second Wednesday in each month 7.30pm, cctv studios, Queen Anne School, Dunfermline. Further details from G. Martin, GM3NVQ, 42 Rose Street, Dunfermline.
Edinburgh (LRS)—Second and fourth Thursdays, 7.30pm, 66 Hanover Street, Edinburgh. Further details from K. C. Henderson, 97 Ganton Road, EH5 3NH. (Phone 552 2147).
Glenrothes (GDARC)—First Sunday in each month, 7.30pm, Old Nursery Buildings, Leslie, Fife. Details from A. B. Givens, GM3YOR, 41 Veronica Crescent, Kirkcaldy, Fife.

REGION 14 **RR M. A. Comrie, GM3YRK**

Ayrshire (AARG)—3 and 17 December, 7.30pm, YMCA, Howard Street, Kilmarnock.
Greenock & District (ARC)—Tuesday and Friday at 7.30pm, Watt Library, Union Street, Greenock. Visitors welcome. All enquiries to secretary.
Glasgow University Radio Club (GURC)—14 December (Annual junk sale).
Falkirk & District RSGB Group—9 December, 7.30pm, Temperance Cafe, Lint Riggs, Falkirk.
West of Scotland (ARS)—1, 8, 15, 22 and 29 December, 71 Virginia Street, Glasgow. Visitors welcome. Enquiries to secretary, Mike Parks.

REGION 15 **RR J. Thompson, GI3ILV**

Belfast (B & D RSGB Group)—Monthly meeting Wednesday, 20 December at 8pm, 90 Belmont Road, Belfast 5.

REGION 16 **RR D. F. Beattie, G3OZF**

Chelmsford (CARS)—First Tuesday of each month, Marconi College, Arbour Lane, Springfield, Chelmsford, at 7.30pm. Details of meetings from G3YNV.
Colchester (NEETCARS)—Every Wednesday, 7.30pm, at the North-East Essex Technical College, Sheepen Road, Colchester. Details from E. T. Jacobs, 26 Pondfield Road, Colchester.
Gt Yarmouth (GYRC)—Last Tuesday of the month, 7.30pm, at the Central Library, Gt Yarmouth. Details from A. D. Besford, 49 Blake Road, Gt Yarmouth.
Ipswich (IRC)—Where possible, two meetings each month. Only one meeting this month—13 December. Meetings at Handford House, corner of Ranelagh Road and the main London road (A12), at 7.30pm. Details from G3YWM.
Norfolk (NARC)—Every Wednesday, 7.45pm, at the Crome Community Centre, Telegraph Lane East, Norwich. Details from G8BLD, the Rectory, Framingham Pigot, Norwich, Norfolk NOR 45W.
Southend (S & DRS)—Every other Thursday, 7.30pm, at the Flarepath Canteen, Southend Airport. Next meeting—14 December. Details from G3AXN.

University of East Anglia (UEAREC)—Meetings are held during the term times, and details are available from Mike Wade, BIO 2, University of East Anglia, or from G3IOR.

REGION 17 **RR L. N. G. Hawkyard, G3ZKR**

Basingstoke (BARC)—Meetings first and third Saturday of each month, Chineham House, Popley, 7.30pm. *G3CBU.*
Maidenhead (MDARC)—4 December (Home construction contest), 7.30pm, at Victory Hall, Coxgreen, Maidenhead. *G3VMR.*
Harwell (AERE ARC)—Meetings on third Saturday of each month, also informal meetings and junk sales every Friday lunch time. 7.30pm at the Social Club, AERE, Harwell, Berks. *G3NNG.*
Southampton (RSGB Group)—Saturday, 9 December at the Lanchester Building, Southampton University. Every Wednesday evening at the Clubroom, Kent Road. RAE Course, Fridays, 7.30pm. *G3ZKR.* Tel 73378.
Swindon (SDARC)—Club meetings at Penhill Junior School, Swindon. *G3YKC.*

OBITUARIES

Mr W. Bowen, GW4CC
Wilf Bowen, of Swansea, died on 28 June. He was active on all hf bands, with a special interest in mobile operation.

Mr C. W. Nicholls, G3NXF
Clive Nicholls, of Kidderminster, died on 22 October, aged 62. He had been active on hf bands since 1959.

Mr T. Wood, G3JRR
Tom Wood, of Dover, died on 2 October. He had been chairman of SE Kent (YMCA) Radio Club for many years, and was well known in the Dover and Medway areas.

We have also been advised of the deaths of **Mr J. R. T. Dealey, G6DT,** in August, and **Mr J. Rimmer, G2ARV**, in September, aged 74.

15th Jamboree on the Air 21-22 October

1st Hale Barns Group Scouts, GB3HBB
This group once again put on the air a station operated by Geoff Barnes, G3AOS, and Peter Swann, G3WWX. In all, some 200 contacts were made with 50 countries, and included 40 overseas Scout stations and 38 British Scout contacts. Two of the most interesting contacts were with W3USS, the USA amateur radio station in the Senate Buildings on Capitol Hill, Washingtoh DC; and with ZD8RR on Ascension Island.

1st Hassocks Scout Group
Miss José Brooker, G3ZZZ, one of this group's Cub Scout Leaders, represented the group an 80 and 20m for most of the weekend. Forty-three Scout stations were worked, 18 of them in nine European countries.

11th Keighley (Cullingworth) Scout Troop
Northern Heights ARS operated station G2SU/A at this troop's headquarters. Seventy contacts were made on all five hf bands and on 2m. Equipment was an FT101, FL200B, EA12, and a 12AV and trap dipole aerials. Diversion was provided by cctv, a teleprinter, and a display of "Radio 1925 style".

Baden Powell House, London, GB3BPH
All bands 160m to 2m (except 4m) were used by this station to work 141 Scout Jamboree stations in 18 countries. The most interesting dx contact was a three-way with VO1EI (1st Grand Falls, Newfoundland) and PJ2CE (7th Marcsius Group, Curacao.) On 2m an interesting contact was made with the London Gang Show at Golders Green, GB3LGS.

DIAMOND JUBILEE YEAR

Next year is the RSGB's sixtieth anniversary and to mark the occasion a large number of events are being planned which will take place in many parts of the country. A calendar of these events is being drawn up and this will be published at the beginning of 1973.

Secretaries of clubs and societies affiliated to the RSGB who are planning rallies, conventions, dinners and other activities for the Diamond Jubilee Year are asked to contact headquarters so that these events can be incorporated into the calendar. All correspondence relating to the Diamond Jubilee Year should be addressed to: The Secretary, RSGB Diamond Jubilee Committee, 35 Doughty Street, London WC1N 2AE.

Diamond Jubilee HF Contests

Two special hf contests for British Isles members will be held next year as part of the celebrations to mark the occasion of the RSGB's Diamond Jubilee.

A phone contest will be held on 5 and 6 May, and a cw contest on 12 and 13 May. All hf bands from 160m to 10m may be used, and only contacts between stations within the British Isles (ie G, GC, GD, GI, GM and GW) will count for points. Each contest will run from 0600gmt on the Saturday to 1800gmt on the Sunday, but only 24 hours operation will be allowed each weekend. The contests will be open to all members of the Society resident in the British Isles holding a Class A licence. Special prizes will be awarded to the winner of each contest, with certificates for the runners-up and country leaders.

Receiving contests for RSGB members not holding Class A licences will take place at the same time.

The full rules will be published soon.

Cubs, Scouts, Venture Scouts and Leader watching Miss José Brooker operating the Hassocks jamboree station

MEMBERS' ADS

These low-cost flat-rate advertisements are accepted as a service to members of RSGB. They must be submitted on the Members' Ads order form printed on the last page of each issue 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 25p (stamps not accepted). They will not be acknowledged. Those not clearly worded or punctuated will be returned. No other correspondence concerning this service can be entered into.

The closing date for each issue is the 4th 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. 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.

Members are advised to enclose a stamped addressed envelope when replying to advertisements.

See the current order form on the last page for further details.

FOR SALE

RCA/ET4339, 1·7 to 20MHz, 200W, a.m./cw, contains 4 txs, pr TY2/125s, individual ATUs, psu & mod common; two 6ft racks, convrtble lin coils, etc, £35; will break, prices sae. Rugby ATS, G4APD. G. Mortimer (treas), Rugby ATS, 9 Horne Close, Watts Lane, Hillmorton, Rugby, Warks. Tel Rugby 5141, ext 205.

New vhf/uhf semicondctrs half list 2N3866(12), 55p; MFE3007(50), 45p; BFY90(12), 50p; Qnty GE 25V, 5W, voltage regltrs, type PA264, 50p; data sheet. **Wanted.** Kokusai MF455-15K filter with spec data and sideband xtal. GM3JHL, QTHR.

One BAY96 £3; two 2N3632 £4 ea; Class D wvmtr £3; 28-30MHz Panadaptor, type ALA2, needs attn £5 ono; G8ATK 2m tx pc/strip 3/10 pa with valves, requires psu and xtal, £7.50; modulator PP EL84s to suit £7.50; var mics, carr extra. GW8EHK, QTHR.

DX40, vgc £15 ono. GM3CYZ, QTHR. Tel 041-883 8733.

Yaesu FTDX560, 1 yr old, little used, immac cond, no mods or marks, 80/20/15m inverted-V incl, £165 for a complete 80-10 ssb stn. G3SXP. J. Redford, 84 Honington Rise, Honington, Bury St Edmunds, Suffolk.

R216 communications rx, 19-157MHz, a.m./fm/cw, with ac power unit and cct, offers over £50 only; Pye Bantam wkg on 130·4MHz, offers; ssb xtal fltr 1,400kHz, £4. G3NGK, QTHR. Tel Beaconsfield 3109.

Microwaves 4m cnvtr 14-16MHz i.f. £9.50; 2 QQVO6/40A + bases £1.50 ea; two VCR139 crt + bases £1.50 ea, hand dynamic mic 100K £1.25; Hewlett Packard ac valve vmtr £6; homebrew hf swr bridge £2; tvi fltrs rx hpf and tx lpf £1.25 ea. G4AWJ. G. Thomas, 9 Highcroft Cres, Heathfield, Sussex. Tel 2454.

Hammarlund HX50 tx, exc cond, all bands ssb and cw, 90W, a.m. 20W, with manual, £90 ono; Heathkit DX40 with manual, good cond £15 ono, del can be arranged. G3JKB, QTHR. Tel Garston 74667.

4m tx/rx, mod B44, invtr psu, QQVO3-10 pa, tunable rx, with fet front end, £10; 4m 3-el J-beam £2.50; 160m tx/rx a.m./cw 10W homebrew, using command rx, self contained, £5. G3QC, QTHR. Tel Blidworth 3915.

Trio 9R59D £30; KW2000A, ac psu, £150; dc psu £25; KW600 lin £75; Electroniques transistor IFTs, 1·6MHz, 455kHz and diode o/p, 50p ea; Q coils 120/150μH, 1·5/3·0mH, 20p ea, offers. G3VLL, QTHR.

KW202 with spkr, mint; KW Vespa Mk2 with psu, mic; KW aerial switch, dummy load, Hansen swr bridge, trap dipole with balun and feeder; all interconnecting cables, offers invited. Glenn, Tizard Hall, South Side, Princes Gdns, SW7. Tel 01-584 9902.

Number of 1W amps, less transistors and 3 capacitors, 50p; comp with cct describing use as intercom etc, £1. Bonner, 104 The Drive, TW14 OAL. Tel 01-890 4577.

Lab gear Top Bander £10; Labgear LG50 £15; R220 £3; Class D wvmtr £3. G3PPH, QTHR. Tel 051-525 2162.

Quantity single pole rotary c/o switches, 10p ea, post free. **Wanted** Heathkit Mohican, must be cheap. G3WZD, 30 Parklands Rd, Hassocks, Sussex, BN6 8JZ. Tel Haywards Heath 51691, ex 403.

UR1A rx, 0·5–30MHz, 4 band, good cond, £18 ono; 20W EL34 push-pull trnsfrmr, 4/5Ω o/p, £1.50; three 8μF 750V dc block capacitors, 60p ea; 2μF 350V dc block capacitor 25p, plus postage. D. French, 18 Ladysmith Ave, Brightlingsea, Essex, CO7 0JD.

Marconi R220 rx wkg, 4m Philips EL3302 cassette recorder, ideal shack use, with 3 BASF C63, £19; **Wanted** High Band base stn suitable 2m beacon use, also beam. EI5CD. Desmond Walsh, Ballylynch, Carrick-on-Suir, Co. Tipperary, Eire.

Pye 2207 boot mount tx/rx, complete with control unit and all connctng leads, unmod, easily convrtd to 4m, £12, plus 50p pp. G3ZTV, QTHR. Tel Norwich 44602.

R107 £10; BC348Q £20; AR77E £25, with hndbks, R208 £8; Eddystone 659 £22; pr type M tx/rxs £5; Brennel Mk5, type M tape rcrdr, Cadenza mic, £55, offers consdrd, all good order. G3JT1, QTHR.

Little used KW Atlanta with vfo £160; KW swr bridge £7; good secondhand 2000B £150; two /M aerials, offers. G3YQE, QTHR. Tel 01-592 7800.

Lafayette HA230, communications rx, 550kHz—30MHz, S-mtr, bfo, Q-mult, bndsprd, smart appearance, manual, £15, callers only, evgs, w/end. G. Harris, 17 St Anne's Rd, Headington, Oxford. Tel 64243.

New TRW PT31981 transistors, sim PT3500 or 2N3553, 28V 2·5W fm out, 175MHz, 35p, p & p 5p; new Electroniques tuner GC166 £4, p & p 25p. QTHR, G8AAE.

Complete rtty stn comprising Creed 7B with silence cover, auto tx, 7TR perforator, FSY-1 terminal unit, FSK audio osc, all power supplies, £55 ono; BC348Q rx £15 ono; electronic organ. G3XWW, QTHR. Tel Oxshott 2783.

Creed 7B £11; 656 auto tx £8; 7E printer (late version of 7B), 240V ac motor, overlap cam, rf suppressed, £17, silence cover £3, 66c psu, + /-80V, 160V dc £4. J. T. Evans, 16 Pertwee Drive, Gt Baddow, Chelmsford CM2 8D, Essex. Tel Chelmsford 72055.

New vhf/uhf semicondctrs, half list, 2N5849(4), £16; MM1620(5) £14.09; 2N5848(3) £7.85; MM1697(3) £6.16; 2N5644(7) £3.17; 2N5846(2) £1.94; 2N5589(2) £1.92; 2N5641(1) £1.63. Other similar devices available. GM3JHL, QTHR.

Pye pocket phones 70cm, tx £20; rx £25. **Wanted** Cambridge fm, high band. Page, Seacroft, Clos du Murier, St Sampsons, Guernsey, CI. Tel Guernsey (0481) 47278.

160m /M tx/rx, compact, smart, works well, 12V dc psu, £10 ono; Pye Ranger, boot mntng, complete with tx/rx xtals for 2m, unmodified, £5, ono; Radiostructor scope 3in tube with manual, works well, £3 ono, can del. G3YYG, QTHR. Tel (after 6pm) Hemel Hempstead 57547.

Signal gnrtr af/rf, 50MHz + 1MHz xtal oscIltr, smart homebrew, works well, £3 ono; 240V ac geared motor, 200rpm, 10lb/in torque, mounting base, compact, new, £1.50 ono; Yale locking double pole switches flush fitting, new, with keys, 50p ea. G3YYG, QTHR. Tel (after 6pm) Hemel Hempstead 57547.

Radar display unit, 16in, and rx, complete and in wrkng order, can be inspected by appt with view to rsnble cash offer, bring strong transport and assistants. J. Elsworthy, 2A Steele House, High St, Dovercourt, Essex.

Send sae for list of eqpmnt and comps for sale, rtty, tv, etc. **Wanted** to buy or borrow hndbk for Labgear LSP30 manpack, also want 2m fm handheld rig Pye, GEC, etc. B. Robertson, Toll House, Wilburton Rd, Stretham, Cambs.

Eagle vvmtr £8; Eagle mini-lab test unit £5; Pye audio osc £5 ono; Grampian 562A pa amp £12; 4 Wharfedale 8in spkrs in cabs £1 ea. P. Elms, 110 Arundel Rd, Walton, Peterborough, PE4 6JA.

HW17A Heathkit 2m tx, good cond, no mods, manual, £44. G3UYT QTHR. Tel 01-584 0187.

Solartron CD711A scope in perf cond with manual, £50 delvd; 40ft tower all steel, 2 sectn, telescopic, only few weeks old, £40; you arr dismantling and removal, part exch welcome. GW3UCJ, QTHR. Tel Briton Ferry 2376.

Mercury cells, have been stored for some time, tested for voltage before despatch, eg 1·34V per cell, ideal for trnsstr work etc, fraction of orig cost, send 10p for samples. D. R. Roberts, 23 St Martins Park, Haverford West. Tel H/west 2409.

Yaesu FT250 5-band tx/rx, 240W, inspctn/dem London, £89, no offers. Ring Monday, Wednesday or Friday, 01-727 5641, ext 25, or write Toby, 13 Wood Lane, Isleworth, Mddx TW7EF.

CR70A, vgc, co-ax aerial socket, £15 ono. J. P. Dunbar, Room 324, Falmouth Hall, Princes Gdns, London SW7 1LU. Tel 01-589 9207.

Building digital clocks, vmtr, etc ? Used Mullard numicaters, ZM1080, 85p ea + 10p p & p, sae for quantity quote. M. S. Turner, 25 Roland Drive, Hempnall, Norwich, NOR 64W, Norfolk.

30ft al tower in two 16ft sctns + base, £35 ono; KW2000A inc ac and dc power units £125, delvd 50 miles. G3LQB, QTHR. Tel Worcester 820577.

KW Vespa mkII £85; Trio JR500S with Codar Q-mult £45. G3YJZ, QTHR. Silverthorn Radio Club. Tel 01-804 8074.

Complete ssb/cw stn 160-10m rx, 1·6MHz i.f., xtal filter, tx 1-6146 PTT, £30, ono, buyer coll. G3ONL, QTHR.

KW Valiant £15, little used since last overhaul. G3KYX, 36 Neeld Cres, NW4. Tel 01-202 6816.

HRO, some bndsprd coils, miniature valves front end, stab osc psu, £18; Lafayette amateur bands only, HA500 £20; GEC miniscope £5; R1155, no mods £2. G8CZH, QTHR.

Panda Explorer tx, 150W, 80-10m with atu; National NC100X rx with matching spkr; Hallicrafter SX17 rx with matching spkr. Garex trnsstr modulator, 15W, offers, buyer coll. G3ICX, QTHR. Tel Pershore 3165.

Sony CRF230 fm/lw/mw/19sw bands, cost £365, exc cond, £250 ono, buyer coll. Charsley-Thomas, Hillview, Frogham, Fordingbridge, Hants. Tel Fordingbridge 53416.

2m Pye 35W tx a.m./fm, fully modded, 3-20pa inc xtal, 19in rack mounting, £30; Class D No 2 wvmtr inc spares £12; Unica URIA rx, 550kHz-30MHz, trnsstr, £16; buyers coll. G8FHN. Tel Medway 63365.

EA12 rx £155; FL200B, FR100B ssb tx and rx, £170 the pair; all items in orig packing, very little use. G3HHD, QTHR. Tel Nazeing 2037.

KW Vanguard tx 160m to 10m, 50W, vgc, little used, complete with hndbk, £25. N. Pope, c/o Amateur Radio Society, Students Union, 2 Bedford St North, Liverpool 7.

Frequency mtrs BC221AH £20; TS174U, 20-80MHz, TS175U, 80-1,000MHz £40, inc cal charts, PSUs, TS175U, no cal, £15. G3SIT, QTHR.

HT supply 1,500V, tapped 1,250, swinging choke smoothing etc, sep unit, all fb, includes extra pr unused 846As, offers. G4GJ, QTHR. Tel Bingley 2965.

Hy-Gain aerial trap vertical 18AVQ, 6 mths use, will swap good /M all band aerial with cash adjustment, value of Hy-Gain, £22 inc carr. GW3MP, Solway House, 15 Wood Street, Sandycroft, Deeside, Flints.

Excellent Lafayette HA350 ham bands 1μV sensitivity rx in orig box with manual, spkr, calbtr, £44 ono; stereo hdphns cost £2.70, accept £1.30. D. Barker, 26 Elliott Drive, Inkersall, Chesterfield, Derbys, S43 3DP. Tel Staveley 2796.

2m mosfet cnvrtr 28 to 30MHz i.f., new, £9.95. G3OLB, QTHR. Tel Oldbury (Glos) 4559.

Pye base stn 2702V high band, cnvrted for 2m, QQVO6-40 pa, ptt, switching for extrnl rx, £40, offers consdrd; sae full details, buyer coll. GW8EHQ, QTHR. Tel Cardiff 62411.

KW Atlanta + psu £160; remote vfo £25; vox £6; Shure 444 mic £11; dummy load £4; aerial switch £2.50; 3-tier trolley on castors £3; as new, little used, lot £190. G3XCF, 83 Meeting Lane, Penketh, Warrington, Lancs.

KW2000A ac psu £150 ono; Hudson AM108 mkII 12V dc 70·26/70·375 xtals fitted, £7 ono. G3LQI, QTHR, 79 South Street, Lancing, Sussex.

4CX250Bs, used, £1.75; 100kHz oct xtals 75p; mtrs square 2½in-1mA, 200μA, 500μA, 3½in-100mA, 10mA, 5mA, 4A, 2A, 85p ea. **Wanted** base chimneys, will swap 2 4CX250Bs for comp base/chimney. R. Marriott, 28 Astrop Rd, Middleton Cheney, Banbury, Oxon.

Selling up, your price, mains trnsfmrs, chokes, cndnsrs, steel cabs, mics, moving coil, xtal, mtrs, comps, topband tx, partly built units, rectifiers, valves, coils, xtals, high speed relays, other relays, power units. G3DFS, QTHR. Tel 021-354 7769.

Pye Westminster, vgc, £30; 2 Pye Cambridge, cond as new, £25 ea, one with remote vfo covering 2m band, all high band fully modded 2m, xtals extra if required. R. Payne, 18 Willian Rd, Hitchin, Herts. Tel Hitchin 50519.

Trio JR310 rx, new April 72, £50; Codar PR40 preselectr, new £5; new *Radio Communication Hndbk* £2.50. R. S. Yates, 55 Park View, Moulton, Northampton. Tel Northampton 41283.

Creed 75R teleprinter with tech hndbk and operators manual, £40; Marconi rtty terminal unit, type HU-11 with tech hndbk, £40; Mosley 10m ground plane aerial, model DI-10, boxed, never used, £10. Nigel Boyd, 4 Kings Avenue, Eastbourne, Sussex. Tel Eastbourne 31844.

KW Vespa Mk2 tx, ac psu, 6LQ6, pa, exc cond, inc hndbk, will del rsnble dist, £80 ono. G3ZYS, QTHR, 92 Elmstead Gdns, Worcester Pk, Surrey.

FL DX500 tx, good cond, £95 ono, callers strictly by appt only. G3YZZ, QTHR. Tel Littlewick Green 2791.

SB101 tx/rx with ac psu in SB600 spkr unit, SB610 scope Monitor HD-10 electronic keyer, all 110V ac 50/60 cycles, currently running successfully through trnsfmr, G3ZNI QTHR. Tel Oxshott 3321.

HW17A with dc psu halo /M aerial and 8-el Yagi, checked and tuned by Heathkit, little used, perf cond, £54, G3ZNI, QTHR. Tel Oxshott 3321.

R1155 unmodded with df, good wrkng cond, £15.50; (1155 psu available), rx 1·5-18MHz ac/dc bfo etc, good cond, £15. **Wanted** AR88D or LF, cash or pt exch. Webb, 91 Gallows Hill Lane, Abbots Hill Lane, Watford, Herts. Tel Kings Langley 64172.

Trio 9R59DE, little used £30 or exch EC10. G3EJO, QTHR. Tel 021-373 1350.

HW100 ac power supply £100; Moseley V4-6 plugs and co-ax £7; buyers coll; FT241 xtals channels 327, 324, 2 off, 4 off, resp, 25p ea. G3IZJ, QTHR. Tel Farnborough 48561.

Homebrew 160m am/cw tx, nice hammerfinish cab, 5763 pa, 6BW6 mod with mains psu, suit beginner, £5. G3ZZD, QTHR. Tel Tunbridge Wells 34117.

Sommerkamp FTDX150 mic, Diamond KB104, 14.21.28, vert aerial, 5-band G whip, £160 ono; 70cm QRO am tx, 4CX250B pa, spare pa valve, 6ft rack, 70cm G8ABP conv 28-30 i.f., aerial relay, £75 ono; Akai 4000D tape deck, £60 ono. G3LJB, 10 Atterbury Close, West Haddon, Rugby. Tel West Haddon 674.

KW Atlanta, remote vfo, £30, as new. G3ULX, QTHR. Tel Minehead 3454.

UR1A rx exc cond £17 ono. G4BJB, Holme Cottage, Church Lane, Ruscombe, Twyford, Berks.

Mullard R/C bridge, manual, £4; dc Avo Minor £3; four 1mA clear fronted mtrs 5 × 4in, £1.50 ea; B2 rx spkr, pu cab circ, £6; TCS rx and tx manual spares, £8; carr extra. GM3JHL, QTHR. Tel Fauldhouse 433.

G8ARV transistor tx, 3 xtal channels, 2W out, comp with PTT mic, relays, etc, £16; K340 Klystron, new and boxed, offers. **Wanted** Memomatic Stolle rotator. J. S. Roberts, 57 Farndale Rd, Newcastle upon Tyne 4.

Trio JR310 with Hamgear PMII and 2m cnvrtr, mint, £70 no offers, buyer coll. G. Thompson, 49 Widney Avenue, Selly Oak, Birmingham 29. Tel 472-4678.

CD568 Solartron scope, good cond, £25; no 19 set in fair cond with B set and ic, £5; R3673 20-90MHz, needs modfcn, only £3. **Wanted** AR88 for above scope or p/exch. S. Terry, Kynance, Stratford Rd, Watford, Herts.

Viceroy Mk1, vgc £38; buyer check and coll; 10-160m cnvtr, built-in psu, £6.50 ono; several HRO coilpax, 35p or 40p; xtals 15p or 20p. post extra, sae enquiries pse. G3CDR, 157 Dartford Rd, Dartford, Kent. Tel Dartford 26976.

TW 2m Nuvistor cnvrtr, i.f. 4-6MHz, new £10; B40C as new, manual all cnnctrs, etc, £40; 2m 8MHz and 12MHz FT243 xtals, sae for list. **Wanted** New boxed 6BA6s, 6BE6s, 6C4s. G3GUU, QTHR.

Koyo KTR1770 11 waveband rx, mint cond, exc prfrmnce, 4vhf, mw, lw, mb and 4 sw 1·6 to 30MHz, bfo fine tune battery/mains, amazing reception near airport, £65 ono. L. D. Ireland, Carnhell Green, Cambourne, Cornwall. Tel Praze 236.

Pye Vanguard Hi-band unmodified; hndbk but no contr unit, £10. G3ZZK, QTHR. Tel 01-476 4050.

32ft Heathkit galv steel tower, dismantled, with h/duty thrust bearing, £20; AR22 rotator and control unit £12; Panda Cub tx 160-10m, £20; metered atu £2. Tel evenings Thanet 31069.

RUT5 rx, exc cond, covers 75-40MHz in 8 overlapping bands, xtal-controlled usb/lsb with 78-page manual, orig cost 6,000 francs approx, sell or exch for exc fm communication rx. Derek Sutton, 13 Fairway Ave, Gainsborough, Lincs.

Going QRT all perf KW204 tx £110; EA12 rx £130; MSK4 keyer £16; Heath 1012U scope £25; 14AVQ £8; Microwave 2m cnvtr £10; 8 + 8 £4; KW Ezee-Match £4. G3WAU, QTHR. Tel Witcombe 3315.

898 dial, mint, £4.50; AR88 tuning gang C £1; Electroniques SM2 dial 75p; EC10 mk1, mint, mains psu, £42; LG300 RF unit, good cond, £16, all plus carr. G4LA, QTHR. Tel Hexham 2734.

Trio JR310 with cal and narrow fltr, 20hrs use, offers over £70. W. A. T. Brunton, 4/13 Orchard Brae Ave, Edinburgh. Tel 332 5566.

KW2000A £120; HA350 £50; Honda 1·5kW gnrtr E1500E, £100; custom built 1,000W linear £50; 115V gnrtr 1,000W £50; Cambridge AM10D £20; Courier £15; both on 145·8MHz; Polyquad quad kit unopened £20. A. F. Gartshore, 11 Moss Road, Waterside, Kirkintilloch, Glasgow. Tel 041-776 6627.

Heathkit GR78 rx, all mosfet rf stages, 200kHz-30MHz, amateur bndsprd, built-in accumulators, perf cond, offers around £55; Weir 2m cnvrtr almost new £10. G8FRV, The Rectory, Lawshall, Bury St Edmunds, Suffolk IP29 4PB. Tel Hartest 357.

Codar CR70A, exc cond + phones and spkr £12, buyer coll. F. A. Billington, 69 Meadow Waye, Heston, Middx. Tel 01-570 6490.

Heathkit SB101 tx/rx, prof wired, 6146Bs, spare valves, £150; AR22 rotator £15; will del S England. A. R. Clemmetsen, Flat 2, Hill House, Buckhorn Weston, Gillingham, Dorset.

BC221E, exc cond, orig charts, built in psu and spkr £15, carr paid. G3UI, QTHR. Tel Halifax 60574.

Xtals 8272·5, 8317·5, 8328·75, 8340·0, 8351·25, 8362·5 New @ 25p 8700·0, 9487·5, 12700·0 13304·1, Used @ 15p (Cathodeon P19s). **Ladder** Stecalloy extend to 20ft, at half today's price. Collect. **Welding plant** BOC gas. Complete in detail. At half today's price. Collect. Partics on request. Call and see. K. M. Heath, 235 Thorne Road, Wheatley Hills, Doncaster DN2 5AR.

Lo-band a.m. Murphy base stn tx/rx, 6-40 pa, £25; Lo-band Murphy Rover 10W, hybrid /M £10; Murphy dash mtg Lo-band /M £5; Storno Viscount Hi-band fm /M £15, plus others. T. Wiltshire. Tel Mortimer 332582.

Basic Electronics 6 parts, new, £3.90 set; Parmeko trnsfmr 230/50V i/p 300V 125mA, o/p lt 6·3V 4A, 6·3V 1A new, £2; trnsfmr 220/50V, 425V 200mA o/p 6·3V, 4A, £3. H. H. Seymour, 6 Chichester Bldgs, Swan Mead, London SE1 4RY.

Heathkit 10-18U scope, bandwidth 4·5MHz, two months old, mint cond, £45 ono. Stephen East, 27 Hurst Road, Buckhurst Hill, Essex. Tel 01-504 4318.

Lafayette HA600 rx, immac, hardly used, £40. **Wanted** Info on RCA aircraft rx CRV-46151. G. S. Starling, 207 Shirley Road, Croydon, CRO 8SB.

CR100 communications rx, 60kHz-30MHz, gd cond with hndbk, £15, buyer coll. A. Henry, 27 Longworth Avenue, Coppull, Nr Chorley, PR7 4PJ, Lancs.

Hammarlund SP600, cab model, as new, with manual, £110; USAF type TS505D, new with manual £28; BC221 brand new £25; Advance Electronics mains stblzr, 1·3kVA, perf, manual, £23, all plus carr. G3GUU, QTHR.

KW2000B and KW1000 lin, mint cond, little used, £250 ono. Nuttall. Tel Abergavenny 3273.

Solartron CT816 scope DC-6MHz, XYZ inputs, inbuilt xtal calbrtr £18; Heath RA-1 fitted product detector £20; 19 set variometer atu, 75p; Codar PR30 prslctr, £4. **Wanted** G2DAF or G3PDM rx (75% completed), 2m beam. All ono, plus del. T. Ellis, 13A Lower Edgeborough Road, Guildford, Surrey. Tel Guildford 66704 after 7pm.

KW201 amateur band rx comp with spkr, 160-10m, new valves fitted where required, aligned by KW, £60; Mosley SWL7 trap dipole aerial £4. M. J. Horder. 152 Maidstone Road, New Southgate, London N11 2JP. Tel 01-368 0218.

WANTED

Buy or borrow cct diag and other info on Minimitter rx no MR44. E. A. Elliott, 24 Nutter Rd, Cleveley, Lancs.

HRO bndsprd coils, JE etc, any useful info on mods cct data etc in exch + cash for STC AM663, fully transistorized /M in need of convrsn. Raymond Withers, 245 Stourbridge Rd, Halesowen, Worcs. Tel 021-550 4550, after 6pm.

Base and chimney for 4CX250B. Fox, 83 Oakridge Rd, Basingstoke, Hampshire.

Filament trnsfmr 7·5V 5A Woden DT2, audio single plate to push pull grids 2 : 1 or 3 : 1 valves, TZ40S 6B4GS. G3LBN, QTHR. Tel Walkern 352.

Marconi tone sender, type RF150, suitable for recording bridge RB150/2, state cond and price. G5SU, QTHR.

Eddystone dial, type 898. D. K. Jagger, 27 Penmaen Walk, Culverhouse Cross, Cardiff. Tel Wenvoe 454.

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Electroniques HB166T, mkII. J. Greenwood, 112 Long Brandocks, Chelmsford CM1 3JR. Tel Chelmsford 421223.

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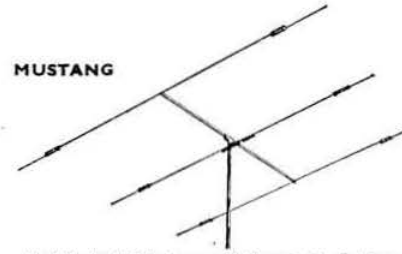

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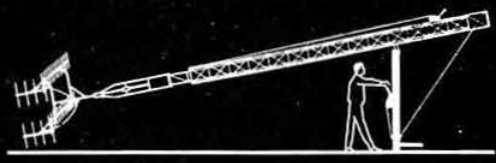

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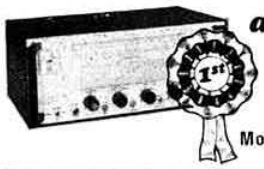

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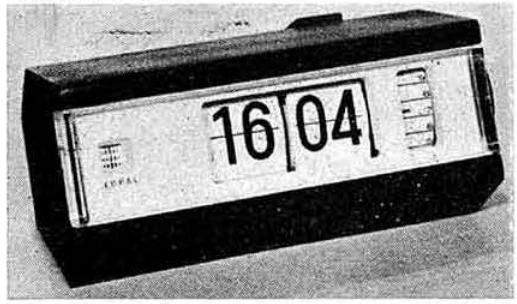

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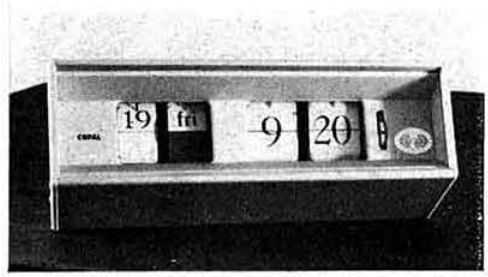

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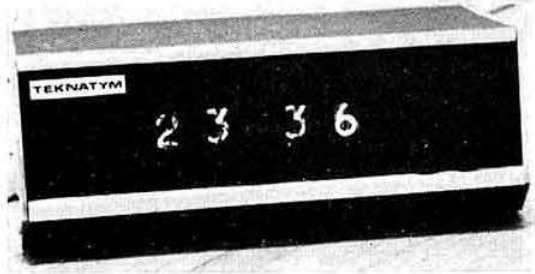

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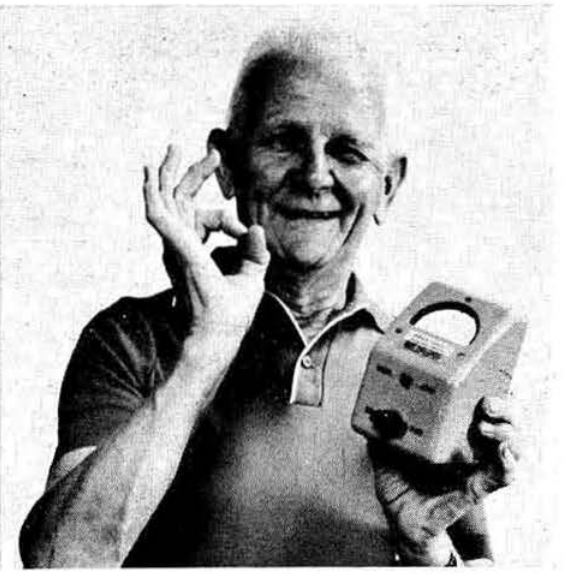

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		34·000 in HC18/U *	£1·60
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MHz		35·500 in HC18/U *	£1·75
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