radio communication

July 1974

ITU HQ STATION 4U1ITU

Mr Noel Eaton handing over the re-equipped ITU Headquarters station 4U1ITU in Geneva to Monsieur M. Mili, secretary-general of ITU, during the World Administrative Radio Conference/Maritime Mobile. Left to right: Mr Eaton, M. Mili, G3OQF, Mr R. M. Billington, Mr Croze (director of CCITT), DL1YJ, OK1WI (president of IARC) and HB9AAB. (*Report on page 461*)

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ABC
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Microphones Yaesu YD846 hand mike	**£6.32**
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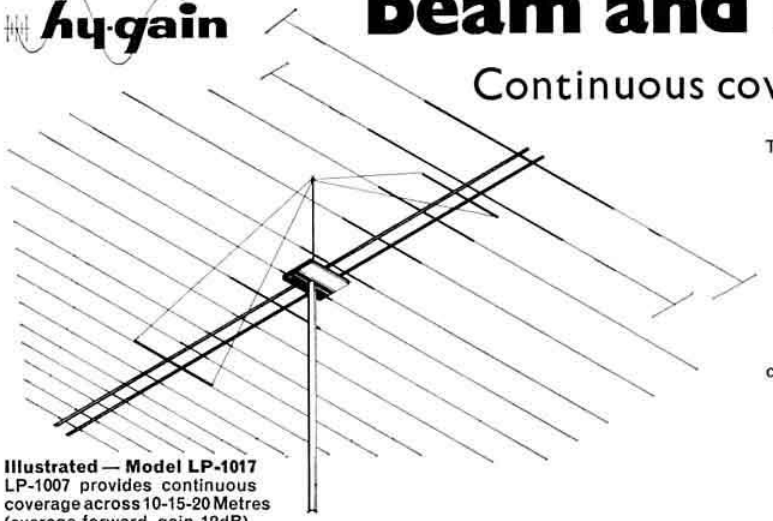

Illustrated — Model LP-1017
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The Hy-Gain LP-1007 and LP-1017 were originally designed as commercial systems for use on marine HF SSB circuits, Embassy and commercial systems. These high performance antennas give the amateur radio operator performance not offered by conventional amateur band antennas.

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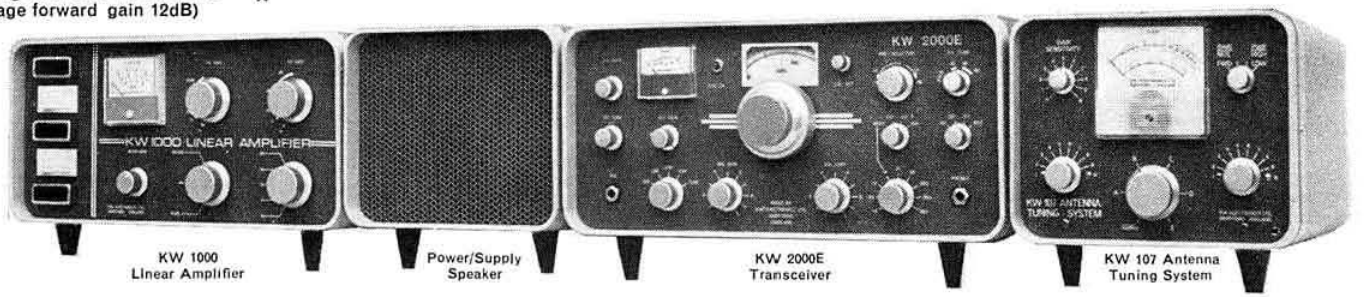

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K/HM-2103.

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HM-2103

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Absorption wavemeter covering 0·8-480MHz in six ranges with meter indication and insulated probe.

The above two instruments are designed to meet the requirements of the UK amateur transmitting licence for frequency measurements up to 500MHz.

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FC70 **£19.00**

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AF I/P 0·5mV (min.) O/P 1 volt RMS at low Z. Contains preamp, limiter, amplifier and ac ve L.P. filter. Suitable for AM, FM, SSB, AFSK etc. May be used with PM-1.

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NBFM Generator FMT-1 = SP-1 plus PM-1. (add prices).

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Kit **£5.20** M & T **£6.20**

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Resistors ¼ & ½W 10ohms to 1Meg (E12) **1½p** ea, Polystyrene capacitors 10pF to 4700pF from **3½p**, Disc ceramics 1pF to 10,000pF **2½p**, Polyester capacitors 0·01μF to 2·2μF from **3p**, Miniature electrolytics from **7p**.

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UPDATED SPECIFICATION

The overwhelming response to the introduction of our 144MHz SSB receiver converter has indicated the requirement for a tightly specified converter for use with modern highly accurate 28-30MHz receivers. To this end we have now standardised the design of our 28-30MHz converter using a zener-stabilised 116MHz crystal oscillator, giving a typical read-out error of better than 1kHz. The converter is now available in the two versions, with and without the local oscillator output facility.

MMC144/28 Price **£16.72** inc VAT
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Noise figure: 2·8dB max. Gain: 27dB typ.
Image rejection: 65dB typ.
Crystal oscillator: 116MHz (zenered)
Frequency error at 144MHz: 3kHz max.
Power supply: 35mA at 12 volts.
116MHz o/p power: 5mW min (LO o/p version)

We have extended our popular range of single conversion converters to include the following I.F.s:
9–11, 12–14, 14–16, 18–20, 24–26, 27·7–29·7, 28–30MHz
Price **£16.72** inc. VAT

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I.F.s available ex-stock: 2-4, 4-6MHz. Price inc VAT **£16.72**
This unit was developed to meet the heavy demand for a converter suitable for use with receivers having better performance at lower frequencies. It uses two dual-gate mosfet mixers, both fed from the output of a 70 or 71MHz crystal oscillator. Selectivity is obtained at the first IF in the 74MHz range, thereby overcoming the usual problems associated with low-I.F. single conversion converters.

70MHz MOSFET CONVERTER

I.F.s available: 4–4·7, 14–14·7, 18–18·7, 28–28·7MHz.
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136MHz SATELLITE BAND CONVERTER

I.F.s available: 28–30MHz and others. Price **£16.72** inc VAT

COMPLETE CONVERTER CAPABILITY

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Price inc VAT **£19.91**
This unit uses a dual-gate mosfet mixer for excellent strong-signal performance preceded by two BFY90 transistor RF stages for high sensitivity. All UHF tuned circuits are printed using Microstrip technology, and a crystal in the 100MHz region is used in the oscillator chain to overcome unwanted beats in the tuning range.

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We manufacture varacter triplers for 432 and 1296MHz. Both are highly stable, with low level harmonic output, and capable of AM operation at the 50% power level. These units are aligned using swept-frequency and swept-power drive sources, the output of each unit being monitored on one of our spectrum analysers. Great attention is paid to harmonic suppression and linearity. All harmonics are greater than 40dB down on the wanted output.

432MHz VARACTOR TRIPLER

Maximum input power at 144MHz: 20 watts. Typical output power (at maximum input): 14 watts. Price inc VAT **£19.25**

1296MHz VARACTOR TRIPLER

Maximum input power at 432MHz: 24 watts. Typical output power (at maximum input): 14 watts. Price inc VAT **£27.50**

144MHz 5 WATT AM TRANSMITTER

5 watts input, six channel crystal controlled.
See April RadCom advert for full details.
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DB65—6 ELE. 15 and 5 ELE. 10 INTERLACED BEAM. Gain 13 dB-15 12 dB-10. Boom length 32 ft. £128

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(Carr. 75p) VAT extra

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The NEW SILENT CDE ANTENNA ROTORS ARE ex-stock. These supersede the previous "Clunk-click" models

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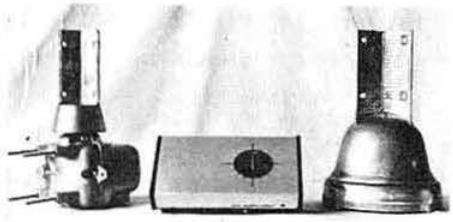

AR30, £25 AR40, £30

NEW MODELS
HAM-2, CD-44
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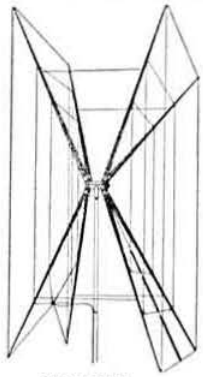
For the most comprehensive service and advice we hope that you will feel free to consult us for advice upon your requirements



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★Forward gain up to 8dB.
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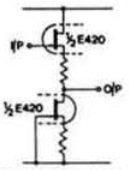

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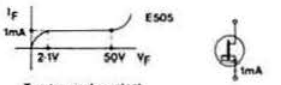

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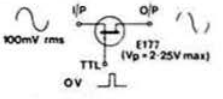

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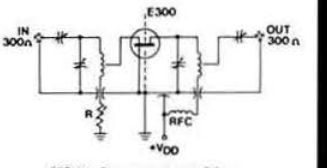

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10021 10037 10062 10087 10112 10137 10158 10162 10187 10212 10237 10262 10287 10437 10465 10486 10513 10549 10908 11250 11500 11550 11859 12250 12287 12312 12337 12362 12387 12412 12437 12412 12487 12500 12512 12537 12562 12587 12612 12637 12687 12712 12737 12750 12762 12787 12837 12900 13062 13075 13087 13112 13137 13162 13187 13212 13222 13227 13229 13237 13250 13262 13272 13275 13304 13312 13337 13350 13387 13412 13425 13437 13462 13487 13500 13540 13590 13640 13690 13729 13739 13740 13747 13749 13750 13769 13779 13789 13790 13799 13809 13840 13890 13940 13972 13990 14112 14250 14408 14416 14500 14750 14762 14787 14812 14848 14887 14898 14912 14937 14948 14962 14987 14998 15000 15012 15037 15048 15062 15087 15098 15112 15137 15148 15162 15187 15198 15212 15237 15248 15250 15262 15287 15294 15298 15311 15337 15344 15377 15500 15511 15512 15537 15544 15561 15562 15577 15587 15594 15611 15612 15637 15662 15687 15712 15725 15737 15762 15772 15837 15887 15912 15937 15962 15987 16837 17906 17916 17926 17946 17966 18247 18250 18372 18431 18497 18662 18747 18872 18997 19122 19247 19372 19497 19622 19747 19872 23620 23720 23820 24420 24620 24720 24820 24920 25020 28000 31200 31225 31250 31275 31300 31325 31350 31375 31400 31425 31450 31475 31500 31525 31550 31575 31600 31625 31650 31675 kHz.

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Membership rates: UK—£5 plus 50p VAT per year (Unlicensed members under 18 years of age—£2). Overseas—£5 (USA $12). Members are asked to notify changes of address without delay.

CURRENT COMMENT

Subscription rates for students

In order to help the younger members of the Society, and especially those who are still undergoing full-time education, Council has agreed that any person who is under 18 years of age, whether he holds a transmitting licence or not, should be able to pay at the associate rate. However, this requires a change in the constitution of the Society and application has been made to the Department of Trade and Industry for permission to make this change, and then if permission is granted the matter will have to be voted on by the members at an Extraordinary General Meeting. This will not be until December this year.

Council also wishes to help members who are over 18 years of age and find themselves in difficulties if they are living on a grant and are undergoing full-time education. If these members write to the general manager with a covering letter from the principal of their college consideration will be given each year to a reduction in the subscription.

Value Added Tax

The Society has protested all along to the authorities that the imposition of VAT on the subscriptions is not within the terms of the law. The Automobile Association also took this point up and won a case in the High Court, following which it is understood that the authorities are conceding that VAT does not apply to the whole of their subscriptions. However, we have had no official notification and Customs and Excise are being pressed to deal with this matter; in fact, we have withheld our quarterly payment of VAT. More anon.

Inflation

Members may have seen mention of the difficulties faced by various societies caused by the spiralling cost of inflation, and the the RSGB is no exception to this. Just consider, for example: the cost of printing *Radio Communication*, which has gone up by 30 per cent since this time last year; high London salaries, and the rise in local authority rates, to name but a few. Of course, the first thought that comes to mind is the amount of the subscription, and although there will not be an imminent increase I think that the writing is on the wall.

J. O. Brown, G3DVV
Honorary Treasurer

QTC AMATEUR RADIO NEWS

WARC/MM

More than 3,000 proposals have appeared in documents originated by national administrations, and the necessity to clear these by 7 June has led to long working hours to accommodate meetings of committees and of the World Administrative Radio Conference itself. Considerable time has been devoted to the item mentioned in the preceding issue of *Radio Communication*, which emerged as a proposal to channelize the maritime mf band, ie 1,605 to 4,000kHz. With the future of the 160 and 80m bands in mind after the next WARC, this proposal was the cause of much activity on the part of the IARU delegation. The wording of the recommendation to the 1979 WARC has now undergone considerable modification and is not now seen as a threat to amateur allocations.

Although the present conference has been only marginally concerned with amateur allocations, the presence of an IARU delegation officially admitted to the proceedings as a recognized international organization is considered to have been more than justified. The cost of sending a delegate not coming from an organization recognized by the Montreux Convention has been assessed at more than £900 by the ITU. Multiply this by three for the attendance of HB9AJU, SP5FM and G2BVN, and the benefits of the IARU status become evident.

A full report of the conference is now in preparation and a brief summary will appear in *Radio Communication*. Unfortunately the space is not available to carry the full details but a limited number of copies of the conference report will be available from G2BVN.

Preparations for the major conference in 1979 have been running for some time and in the months ahead these will be finalized among the three IARU Regions and IARU HQ. The target is quite clear—the formulation of a plan acceptable to all national societies and their respective administrations to provide additional allocations to the amateur service to accommodate the envisaged one million stations by 1982. The task will not be easy but given the support and goodwill of the societies and their members it can be done. A point to remember—although the backing for the work of the IARU comes from national societies, such as the RSGB, the benefits are not confined only to their members: frequency allocations are used by all radio amateurs. Which is one very good reason for supporting *your* national society.

"VHF Communications"

We have been advised by Mrs B. Free that no further enquiries concerning orders for, or subscriptions to, "*VHF Communications*" placed through Echelford Communications Ltd should be addressed to her.

All such enquiries, by letter only, should be addressed to Mr M. Stansfield, 9 Garrick Island, Hampton, Middlesex.

Wireless Telegraphy Act prosecutions

The latest Home Office list of successful prosecutions under Section 1 of the Wireless Telegraphy Act 1949, covering the period February—April 1974, contains seven cases involving a total of 11 people. There were three cases of illegal broadcasting; two cases of illegal transmitting, using callsigns "G3JXM" and "2 Zero"; two cases of unlicensed use of walkie-talkies, and one case of illicit reception. Individual fines up to £100, with costs of up to £40 and forfeiture of equipment, were imposed.

MEMBERS' ADS

As a result of the continuing increases in the cost of printing, referred to by the honorary treasurer in *Current Comment*, the amount charged for Members' Ads has been reviewed by the Finance & Staff Committee. Since the nominal charge of 25p was introduced in April 1972, the amount by which the Society has subsidized this service has increased substantially and it has now become necessary to pass on a proportion of this increase to users of this feature.

Commencing with the October 1974 issue of *Radio Communication*, the nominal charge for each Member's Ad will be increased to 40p. At the same time the maximum number of words allowed for this charge will be increased to **40 including name and address, or callsign and QTHR, and telephone number if any.**

All Members' Ads received up to and including 5 August will be accepted at the old rate and published in the September issue. Thereafter only advertisements at the new rate will be accepted.

The Home Office also advise that as a result of a prosecution instigated by them and brought by the Leeds Trading Standards Department, a dealer in "unlicensable" walkie-talkies was fined a total of £85 on 18 March for offences under the Trade Descriptions Act.

Reciprocal licensing changes

Addresses to which applications for reciprocal licences should now be sent:

Poland—Panstowa Inspekcja Radiowa, Swietokrzyska 3, 00-360 Warsaw.

France—Direction des Telecommunications du Reseau International, Immeuble PTT Bercy, 75584 Paris Cedex 12.

AMSAT subscriptions

Arrangements have been made with the Radio Amateur Satellite Corporation for subscriptions to be accepted in the UK, thus avoiding the necessity for individual membership applications to be accompanied by a dollar remittance. AMSAT subscriptions become renewable on 31 December annually and the amounts payable are: August 1974 to December 1975, £2.80; October 1974 to December 1975, £2.45; annually from December, £2.15. Membership includes the quarterly *AMSAT Newsletter* and application forms are obtainable from G2BVN, QTHR.

AMSAT is a non-profit making organization founded five years ago. It is a membership organization open to all radio amateurs and interested non-amateurs. Its satellite programmes are supported entirely from donations, membership dues and grants.

RAOTA reunion

A very successful reunion of the Radio Amateur Old Timers Association took place at the Bonnington Hotel, London, on 17 May when 71 members and guests were present. Ken Alford, G2DX, who had been re-elected president for a further year at the preceding AGM, was in the chair. After an enjoyable dinner, Louis Varney, G5RV, gave a very interesting talk, illustrated with slides, on the visit he paid to Papua New Guinea.

Advance notice

REGION 1 ORM

Lancaster University

15 September 1974

It is proposed to hold an RSGB Official Regional Meeting in Region 1 during the North-West Amateur Radio Convention.

Complete details later.

In the meantime, see page 475 for details of the convention.

Membership of RAOTA is open to those amateurs who have held a UK full transmitting licence for a period of 25 years at the time of application. Full details can be obtained from the hon secretary/treasurer, Miss M. Gadsden, 79 New River Crescent, London N13 4RQ. Telephone 01-882 1272.

To try and foster more interest in RAOTA, it was decided to try and run a regular net on approx 3·740MHz on the first Thursday of each month at 11am with G2DX as net control, and that members should also contact each other informally at the same time and frequency on Thursdays.

QSL Bureau

Due to ill-health, Mr F. G. Hoare, G2DP, has had to relinquish his post as sub-manager for the series of calls G3YAA to G3ZZZ and this series has been taken over by Mr H. R. Boutle, G2CLP, 14 Queens Drive, Bedford.

Mr M. J. Newton, G3UKW, is now the sub-manager for the series G3UAA to G3VZZ. His address is 2 Marlowe Court, Garforth, Leeds LS25 1PR. Mr D. H. Dell, G3PQF, now handles only the series G3RAA to G3RZZ.

G4AAA to G4AZZ is handled by Mr C. Johnson, BRS31379, 118 Harvest Road, Smethwick, Warley, Worcs; and G4BAA to G4CZZ by Mr R. F. Rawlings, G3WBV, 74 The Lindens, Field Way, New Addington, Surrey. G4DAA upwards is the responsibility of G3VLX.

Mr J. W. Garrett, G3YOU, 201 Bishops Oak Ride, Tonbridge, Kent, handles cards for all BRS and A members.

Stolen equipment

The following equipment was stolen from the RNLI lifeboat house at Borth, Dyfed, during the night of 19-20 May: Pye Westminster type F75FM with five crystals for the 156MHz band, Derritron boat radio type Seaphone 625C, serial No 044, crystalled for the 156MHz band, cylindrical-shaped 7in by 15½in, orange coloured with black panel; Elmic battery charger with time-setting switch, and a digital clock. Any information to RNLI, Borth; Sgt North, Borth 22, or any police station.

The West of Scotland ARS reports the theft from its club-room of a KW2000 transceiver with matching psu and speaker, serial No 126. Any member offered this equipment should contact the police.

The "normal-mode" helical aerial

by D. A. TONG, G8ENN*

A HELIX of wire can be used as an aerial in a number of different ways [1, 2]. When the circumference of each turn and the pitch (ie the distance between turns) are comparable to a wavelength, the helix functions as a beam aerial with maximum radiation along the axis of the helix. For this reason the helix is said to be operating in the axial mode, and the radiation is circularly polarized. But if two helices (or multiples of two) with oppositely-handed threads are stacked, it is possible to make the composite aerial have linear polarization in addition to obtaining increased gain [1, p215]. The dimensions of a helix for use in the axial mode are non-critical and it is surprising that the helical beam is not more widely used than it is. Designs are available in the various radio handbooks [3, 4, 5].

A second mode of operation of the helix is the so-called "normal mode" and it is with this mode that this article will be concerned. In order to achieve the normal mode the diameter and pitch of the helix must be less than $\frac{1}{2}\lambda$. The radiation pattern is drastically changed and maximum radiation now occurs in a direction normal to (ie at right angles to) the axis of the helix; hence the name.

Axial radiation under these conditions is negligible. The polarization is, in general, elliptical but by appropriate choice of dimensions can be made very closely linear. In fact the radiation pattern of the normal-mode helix can be very similar to that of a straight wire and, therefore, it is possible to simulate aerials such as $\frac{1}{2}\lambda$ dipoles, $\frac{1}{4}\lambda$ monopoles, and ground planes by using normal-mode helices. The important difference, however, is that the overall length of such aerials, when made with a helix, can be appreciably less than when made with ordinary linear elements. Two examples of such aerials are given on p383 and p481 of [5], for fixed station and mobile use respectively.

A more recent application of the normal mode helix has been as a replacement for telescopic whip aerials on commercial personal portable vhf transceivers. Telescopic $\frac{1}{4}\lambda$ whips are fragile and cumbersome and have a nasty tendency to be trapped in car doors or to poke people in the eye. Moreover, in a radio system where continuous stand-by operation is essential, the very fact that the telescopic whip is retractable can be a disadvantage since its inconvenience may tempt the operator to retract it, thereby ruining the communication channel. The requirement of continuous stand-by operation is relatively unusual in the amateur context but is likely to be increasingly important as more people appreciate the potential of miniaturized equipment. The requirement presumably already exists among Raynet enthusiasts.

The author's interest in the miniature aerial problem arose after the construction of a pair of pocket-sized 2m transceivers [6]. Initial results using a $\frac{1}{4}\lambda$ piece of wire dangling from the pocket were disappointing whereas a straight whip was highly inconvenient. In contrast a helix 14cm long and 9mm diameter made from a stretched steel spring has proved to be a very acceptable solution. The transceivers have been in continuous daily use by the author and his wife (G8ENO) since July 1972, and the helical aerials are flexible and short enough to allow the sets to be slipped easily into a pocket or handbag (see Photo 1). Naturally one cannot expect the same performance as with a straight whip, but the actual difference is acceptably small. For example, compared with the straight $\frac{1}{4}\lambda$ whip made from steel wire shown in Photo 2, the steel spring helix also shown gives a loss of very roughly half an S-point. The performance of the commercially made helix (made by Panorama Radio Company Ltd, 73 Wadham Road, London SW15) is only just detectably worse than the whip but this helix is appreciably more bulky and less flexible than the home-made aerial (had the home-made aerial also been copper plated the difference in performance between the two helices could well have been less).

Under **Theory**, below, the author attempts to introduce qualitatively the background theory for the normal-mode helix. The quantitative data quoted depends almost entirely on one particular paper by Kandoian and Sichel [7]. This is because most textbooks on aerials dismiss the normal-mode helix very briefly or do not mention it at all. Indeed, the whole subject of spring aerials seems notable for the scarcity of published information. Only after a fairly careful search was [7] discovered, and because it is relatively inaccessible it seems desirable that the results given in the paper should be more readily available. Normal-mode helical aerials designed to give circular polarization are discussed in [8].

The final section of this article will discuss the application of the results quoted in the middle section to specific amateur purposes, although the only one which the author has tried is that mentioned above for personal 2m equipment.

Theory

The relationship between wavelength (λ, in cm), frequency (f, in Hz) and velocity of propagation (v, in cm/s) for any kind of wave propagation is $\lambda = v/f$. It is the frequency of the wave which defines it, and the wavelength depends on the velocity in the particular medium. Radio and other electromagnetic waves in vacuum travel at close to 3×10^{10}cm/s and this figure is normally given the symbol c. We thus have the standard formula

$$\lambda_0 = \frac{c}{f} = \frac{3 \times 10^{10}}{f}.$$

The subscript on λ_0 indicates that it refers to the wavelength in empty space. In media other than empty space, v is reduced, but in a straight wire the reduction is negligible, and given a length of wire, h, the number of exact wavelengths of a radio wave of frequency f which will " fit " into that length is equal to h/λ_0. (Here and in the following discussion "end effects " are ignored). If, however, the wire were to have properties which cause the wave to travel more slowly than the speed of light in empty space, one would have to divide

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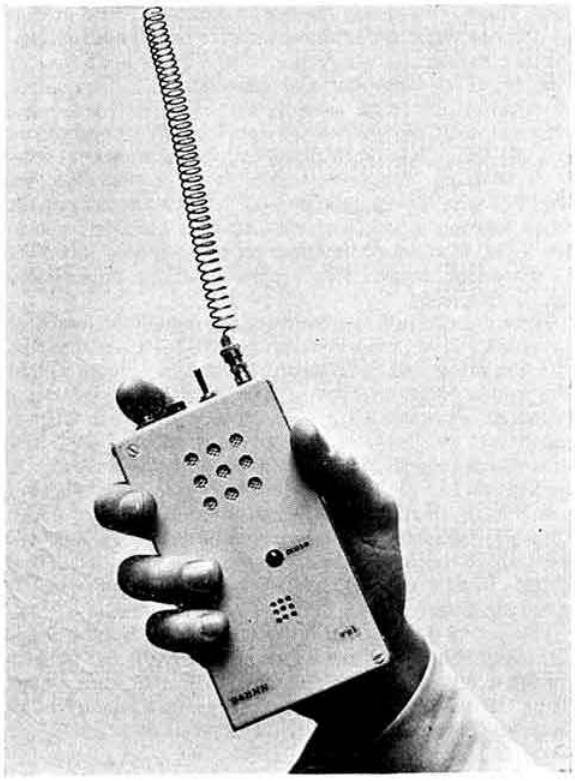

Photo 1. The 145MHz helical aerial in position on the pocket radio for which it was designed. Two-way communication at a range of 150 miles has been achieved using the combination as shown

the length h by a wavelength λ_1 equal to v_1/f where v_1 is the actual velocity in the wire.

Such a wire would enable one to make a $\frac{1}{4}\lambda$ aerial of physical length equal to $\lambda_1/4$ and not $\lambda_0/4$, and would be shorter than one made of ordinary wire because λ_0 represents an upper limit on wavelength. Thus the $\frac{1}{4}\lambda$ whip made from "retarding wire" will be shorter than one made from normal wire by the ratio v/c. A helix with diameter and pitch less than about $0{\cdot}15\lambda_0$ and $0{\cdot}5\lambda_0$ respectively [1] behaves like the hypothetical retarding wire and this then is the basis of the tuned helical aerial.

A further parallel may be instructive at this point. It is often pointed out in texts on aerials that an aerial behaves in a similar way to an open-circuited transmission line of mechanical length equal to $\frac{1}{4}\lambda$ in that particular line. One is quite accustomed to multiplying λ_0 by a "velocity factor" of about 0·66 (for solid dielectric cable) in order to obtain $\frac{1}{4}\lambda$ of line for baluns or matching sections for example. This process is exactly the same as the one mentioned above for the "retarding wire" since the "velocity factor" is just v/c and therefore the factor 0·66 is just a way of saying that a radio wave travels at 0·66 times the speed of light along that kind of coaxial cable. This reduced velocity, called the " phase velocity ", is given by

$$\frac{1}{(LC)^{\frac{1}{2}}},$$

where L and C are the inductance and capacitance per unit length between the two conductors of the transmission line (see, for example, [9]). In order to further reduce the phase velocity, either or both of L and C can be increased and one common way of doing this is to make the inner conductor in a coaxial cable out of a continuous coil, or helix. The helix may even have a ferrite core as well. Such cables are used as delay lines.

The use of a helix instead of a straight wire for a $\frac{1}{4}\lambda$ whip (or any other kind of aerial) is thus analogous to the use of a helix in a transmission line and has the same effect, that is, it retards the passage of an electromagnetic wave and allows the actual physical length of the whip or cable to be reduced.

In order to design a whip using a helix one needs to be able to relate the velocity factor of the helix to its parameters. Kandoian and Sichel [7] have derived such a relationship and their result is

$$\frac{v}{c} = \frac{1}{\sqrt{1 + 20(nd)^{2\cdot5}\left(\frac{d}{\lambda_0}\right)^{\frac{1}{2}}}}$$

In this expression v is the phase velocity along the axis of the helix in centimetres per second, c is the velocity of light, n is the number of turns per centimetre in the helix, d is the diameter of the helix in centimetres, and λ_0 is the wavelength in empty space. A $\frac{1}{4}\lambda$ aerial made from a helix therefore has a length h given by

$$h = \left(\frac{\lambda_0}{4}\right)\left(\frac{v}{c}\right). \qquad (1)$$

This result holds when $nd^2/\lambda_0 \leqslant 1/5$, which is the case unless d is made inconveniently large for the desired purpose.

Normally h, d and λ_0 are known and one needs to calculate the total number of turns N. In this case the expression can be rearranged to give the following more useful equation (in which log 320 is approximated as 2·5):

$$\log n = 0{\cdot}4\left[\log\left(\frac{\lambda_0}{h} - 4\right) + \log\left(\frac{\lambda_0}{h} + 4\right) + \frac{1}{2}\log\lambda_0 - 3\log d\right] - 1 \qquad (2a)$$

Finally,

$$N = nh. \qquad (2b)$$

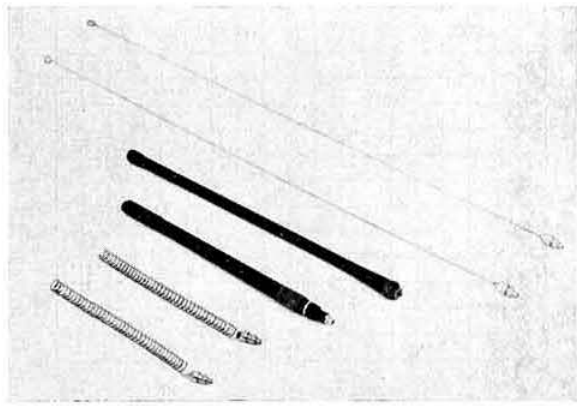

Photo 2. Various aerials contrasted. All except the longest spring aerial are designed to work at 145MHz, the latter operates at 85MHz. The two aerials at the rear are home-made $\frac{1}{4}\lambda$ whips, while the two in the foreground are home-made "spring" aerials

Table 1

Overall length, h (cm), and total number of turns, N, in a helical ¼λ aerial which is resonant at 145MHz and has diameter of 1cm

h	N	h	N
5	28·3	30	34·5
10	32·1	35	32·8
15	34·2	40	29·9
20	35·1	45	25·0
25	35·2	50	15·1

Values of N were evaluated using a HP35 pocket calculator for a complete range of values of h in steps of 1cm, for a helix resonant at 145MHz and with a diameter of 1cm. The results are tabulated in Table 1 and plotted graphically in Fig 1.

It will be seen from Fig 1 that the number of turns needed to resonate at 145MHz depends on the length of the helix. When the helix is around half the length of a normal whip ($\lambda_0/4 = 51{\cdot}4$cm) the dependence on the number of turns is a minimum. As the helix becomes shorter the number of turns becomes progressively more critical.

It is interesting that the actual length of wire used to wind the helix ($\pi dN + h$) is fairly close to a half-wavelength

$$\lambda\left(\frac{\lambda_0}{2}\right)$$

over quite a large part of the range of overall lengths. As pointed out below, however, d and n are not linearly related and therefore the extent to which the length of wire approximates to $\lambda_0/2$ must depend on the actual dimensions of the helix. There is an analogy here with a long solenoid used as an rf choke. Such chokes have a current and voltage distribution along their length similar to that of the normal mode helix [1, p177]. They can also be treated as open-circuit transmission lines and have series and parallel resonance frequencies. Using choke design data from [10] it is apparent that the series resonance frequency for close-wound solenoids of large length-to-diameter ratio occurs when the length of wire is very roughly $\lambda_0/2$. At series resonance the choke becomes an acceptor circuit and is obviously useless as a choke. One should therefore use either appreciably more or appreciably less than $\lambda_0/2$ when winding a choke for a specific frequency.

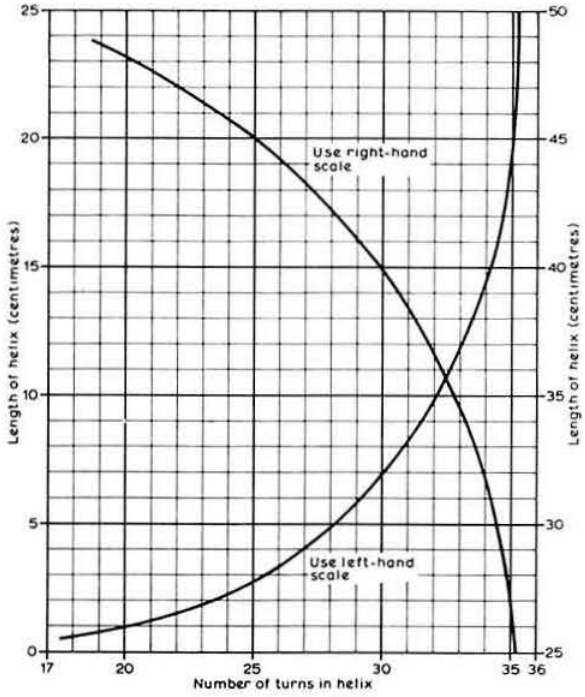

Fig 1. Graph showing the way in which the number of turns (N) is related to the overall length (h) for a normal-mode helix resonant at a constant frequency of 145MHz. Some of the data used to plot the graph is given in Table 1 and comes from equation 2 in the text

There are two points concerning the equations quoted so far which will be important in practice. First we note that equation (1) remains unchanged if the two ratios h/λ_0 and d/λ_0 remain constant. Thus in order to halve the operating frequency of a given helix it is necessary to double *both* the length and the diameter. The total number of turns (N) remains unchanged. (This latter point is more easily seen if the term nd in equation (1) is rewritten in terms of N. Thus $n = N/h$ and therefore nd becomes Nd/h, and if d and h change in the same proportion, N need not alter). This rule is merely stating what one normally takes for granted, that aerials can be scaled in frequency by scaling all dimensions in the same proportion.

The second point is that if the diameter is to alter while still maintaining the same resonant frequency, the term involving d in equation (1) must remain constant, thus n must change to compensate. If the suffix 1 refers to the new diameter and 2 to the original diameter we have

$$20(n_1d_1)^{2.5}\left(\frac{d^1}{\lambda_0}\right)^{\frac{1}{2}} = 20(n_2d_2)^{2.5}\left(\frac{d_2}{\lambda_0}\right)^{\frac{1}{2}}$$

which simplifies to the equation

$$\left(\frac{n_2}{n_1}\right)^{2.5} = \left(\frac{d_1}{d_2}\right)^{3}. \qquad (3a)$$

Taking logarithms of this expression and noting that

$$\frac{n_2}{n_1} = \frac{N_2}{N_1}$$

we get the final result

$$\log\left(\frac{N_2}{N_1}\right) = -1{\cdot}2\log\left(\frac{d_2}{d_1}\right) \qquad (3b)$$

Some values for N_2/N_1 and d_2/d_1 are given in Table 2 and when plotted on "log/log" graph paper give the straight line shown in Fig. 2. We note that as the diameter reduces, the required number of turns increases, but not in the same proportion.

Before discussing applications of the foregoing equations there are three other important properties of the helix to be considered. These are radiation resistance, bandwidth and efficiency and they are treated in order below.

Table 2

Values of $\frac{d_2}{d_1}$ and $\frac{N_2}{N_1}$, where d_1 and N_1 are the diameter and total number of turns of a given normal-mode helix, and d_2 and N_2 are the corresponding parameters of a second aerial which is resonant at the same frequency

$\frac{d_2}{d_1}$	$\frac{N_2}{N_1}$	$\frac{d_2}{d_1}$	$\frac{N_2}{N_1}$
100	0·00398	0·1	15·8
10	0·0631	0·01	251·0
1	1·0		

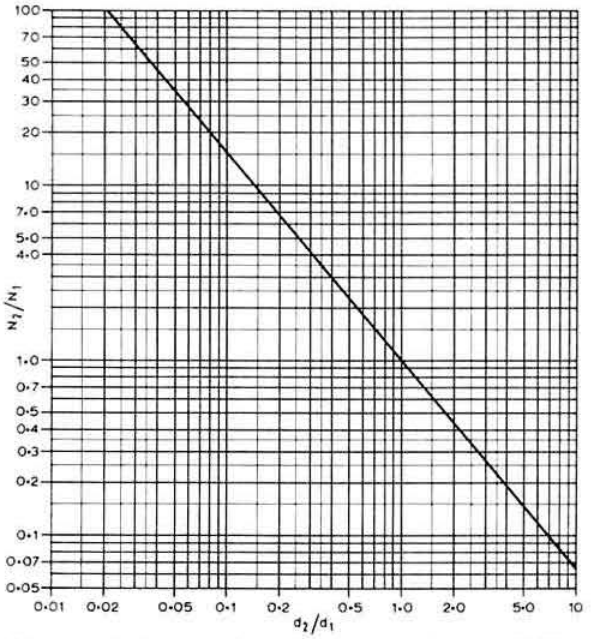

Fig 2. Graph of the data in Table 2. The graph is a straight line when plotted on log/log graph paper

Impedance. The radiation resistance of the tuned helix above a perfect ground plane is quoted in [7] as

$$\left(\frac{25{\cdot}3h}{\lambda_0}\right)^2.$$

Note that this depends only on h/λ_0 and not on the diameter or on the number of turns. In other words if a tuned helix is made which is only, say, one third the length of a normal $\frac{1}{4}\lambda$ whip, its radiation resistance is reduced by the square of one third; in fact to about 4Ω. The impedance presented by the aerial to the transmitter would be the sum of the radiation resistance and resistive losses in the wire.

Actually the helix used on a portable transceiver at vhf and below is far from being on a perfect ground plane and the actual impedance will differ from the value predicted by the above expression.

A technique for quadrupling the impedance of a helical resonator has been described [11] which is analogous to the use of a folded dipole. The helix is bifilar wound and one helix is earthed to the ground plane. The two helices remain electrically isolated throughout their length.

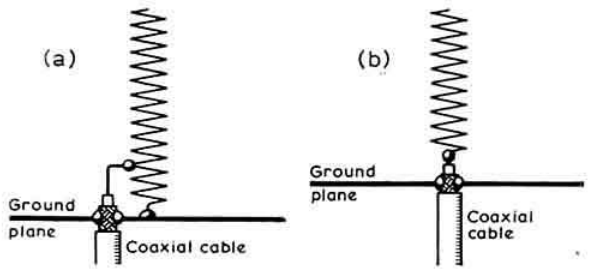

Fig 3. Two ways of feeding a helical aerial, (a) shunt feed, (b) series feed

A commercial version of the normal mode helix [12] is claimed to have an impedance of 50Ω. As can be seen from Photo 2, it differs from the basic type discussed in [7] in that the diameter tapers from $\frac{1}{2}$in at the base to $\frac{3}{8}$in at the tip. The winding pitch also tapers slightly. The use of a tapered pitch is mentioned briefly in the designs given in [5].

There are at least three practical ways of matching the transmitter to a helix. (a) Tap the feeder up the helix as shown in Fig 3a. The position of the tap can be found empirically with an swr bridge. (b) Alternatively, if the helix is to be plugged directly into a transmitter, the output network can be adjusted to match the basic impedance of the helix and the latter would then be series-fed as shown in Fig 3b. (c) Stretch the aerial to a length slightly above the resonant length and then tune out the reactance in the transmitter matching network.

For hand-portable equipment, methods (b) and (c) are convenient because the helix can then be soldered directly into the inner pin of a coaxial plug. Where a feeder cable is used, method (a) seems ideal and has the advantage that the aerial is its own matching unit.

Bandwidth. In general one finds that the more a tuned aerial is shrunk the narrower becomes its bandwidth [13]. This is the same point made by Moxon [14] that a high-Q system needs only very loose coupling to another circuit to absorb all the available energy from it. The Q of a tuned helix is given in [7] as

$$Q = \left(\frac{\pi}{25{\cdot}3}\right)(60 \ln\left(\frac{4h}{d}\right) - 1)\left(\frac{\lambda}{4h}\right)^3$$

and the 3dB bandwidth of the helix when fed from a generator with internal resistance equal to the aerial resonant resistance is equal to $2f_0/Q$. This represents a lower limit to the bandwidth because resistive losses in the helix will lower the Q below the value predicted above.

For practical vhf helices the bandwidth is not seriously reduced, but compact aerials for lower frequencies need careful tuning and the helix is no better (and no worse) than the loaded whip in this respect (it is better in that its impedance and efficiency are greater).

Efficiency. Resistive losses in the metal of the helix tend to be larger than in a dipole because of the smaller diameter and greater length of the wire. The following approximate expression for the ratio of the power lost in the aerial (P_L) to the power radiated (P_R) is quoted in [7],

$$\frac{P_L}{P_R} = \frac{0{\cdot}2}{Df^{\frac{1}{2}}\left(\frac{h}{\lambda_0}\right)^2}$$

where D is the diameter of the wire, f is in hertz and where the wire is copper. The larger the diameter of the wire, therefore, the greater the efficiency. Similarly the more the length is reduced relative to λ_0, the greater the power which is wasted.

Fig 4 is reproduced from Fig 6 of [7] and shows the length of a helix (h) plotted against resonant frequency for an overall efficiency of 50 per cent for three different wire diameters. Efficiency is defined as

$$\frac{1}{(1 + P_L/P_R).}$$

Substantial length reductions are clearly possible while maintaining usable efficiencies.

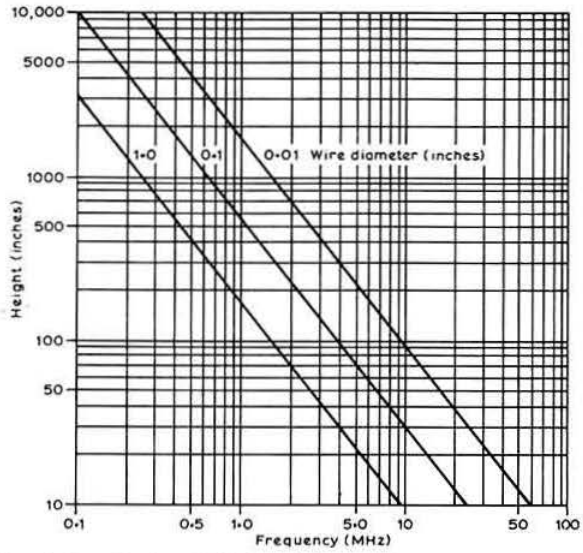

Fig 4. Length of a helical aerial plotted against resonant frequency for an overall efficiency of 50 per cent and for three wire diameters. (Taken from Fig 6 of reference 7)

Practical applications

The foregoing theory is particularly useful in predicting the dimensions of a tuned helix for any frequency. Such a calculation provides a good starting point for further pruning to exact resonance. Perhaps the best procedure is to add, say, five per cent extra turns to the calculated number in a given case and then to remove turns one at a time until maximum radiation occurs from the aerial.

The procedure for finding the "calculated" helix involves using the graphs in Figs 1 and 2. Naturally, if one requires a helix for 145MHz wound with a diameter of 1cm the required number of turns can be obtained directly from Fig 1, and no further calculation is involved. Usually, however, the diameter will be chosen to suit the spring which is available or to suit a former. In this case the procedure is to use Fig 1 to determine the number of turns for a helix with diameter 1cm and with the desired length and then to multiply this number by a factor obtained from Fig 2.

As an example, suppose one requires a helix 20cm long and 1·2cm diameter to be resonant at 145MHz. From Fig 1 the number of turns required if the diameter were 1cm would be 35. The ratio of the actual diameter (d_2) to the standard diameter (d_1) is 1·2/1·0 and the ratio of the actual number of turns (N_2) to the number for a 1cm diameter helix (N_1) is read off from Fig 2 as 0·81. Thus N_2 is equal to $35 \times 0{\cdot}81 = 28$. A suitable starting point for the aerial would be a coil with, say, 32 turns.

When an aerial is required for a frequency other than 145MHz, Figs 1 and 2 can still be used. Since shortened aerials of this type are especially convenient for the 4m band, a useful example would be a helix resonant at 70MHz with length 30cm and diameter 1·3cm. Steps in the calculation are:

(i) Scale the length and diameter of the desired aerial (for frequency f_1) to find the dimensions of the equivalent aerial at 145MHz. In this case the latter would have a length equal to

$$30 \times \frac{70}{145} = 14{\cdot}5\text{cm},$$

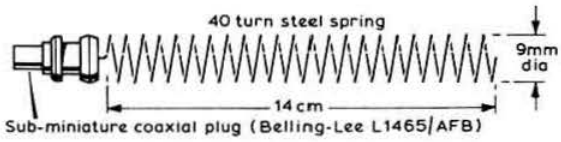

Fig 5. Details of the home-made helical whip for 145MHz

and diameter equal to

$$1{\cdot}3 \times \frac{70}{145} = 0{\cdot}63\text{cm}.$$

(ii) Referring to Fig 1 again one finds that a 145MHz helix 14·5cm long and 1cm diameter has 34 turns.

(iii) Finally a helix with the same length but with diameter 0·63cm has $34 \times 1{\cdot}75 = 59$ turns. (The factor 1·75 is the value of N_2/N_1 which corresponds to

$$\frac{d_2}{d_1} = \frac{0{\cdot}63}{1{\cdot}0}$$

and was obtained from Fig 2).

A suitable starting point for the 4m aerial would be a helix with 63 turns, 1·3cm diameter and 30cm long.

The author's 2m spring aerial was made before Kandoian and Sichel's paper was unearthed and it is gratifying that its dimensions are close to those predicted using the above procedure. The aerial is shown in Photo 2 together with a straight $\frac{1}{4}\lambda$ whip and a commercial spring aerial [12], all designed for the same frequency (145MHz). Detailed dimensions of the home-made aerial are given in Fig 5. The design procedure was purely empirical and involved making over a dozen helices with the same diameter (0·9cm) and varying number of turns. Each one was connected in turn directly to the aerial socket of a 1·5W 2m transceiver [15] and slowly stretched using an insulated rod until maximum reading was obtained on a field strength meter about two yards away. The resonant length was then plotted against the number of turns. The observed points are shown in Fig 6 together with a curve calculated using the theory from [7]. It was found that coils with less than 40 turns showed two maxima, one at a very short length and the other much longer. This behaviour is predicted by the theoretical curve but the observed length was systematically less than the predicted length, possibly partly as a result of the neglected "end effects". When the coil had more than 40 turns no definite resonance was observed. From the theoretical curve it is clear that this is to be expected and this figure, 40 turns, is in good agreement with the theory.

No attempts were made to match the transmitter output stage to the helix and this also could account for some of the discrepancy between the two curves because the reading on the field strength meter would be affected by both matching and resonant frequency. This is substantiated to some extent by the observation that when similar helices were tested in the same way using another transceiver with different output matching conditions the "resonant length" changed slightly. The important point is that the method gives the correct upper limit for the total number of turns; provided less turns than this are used the helix can always be resonated.

The problem of impedance matching to shortened aerials is complicated by their low values of radiation resistance. Normally a portable transceiver will be matched for a 50 or 75Ω load so that it can efficiently feed a remote aerial when necessary. Excellent results can still be obtained, however, when such a transmitter is used with a $\frac{1}{4}\lambda$ whip with a

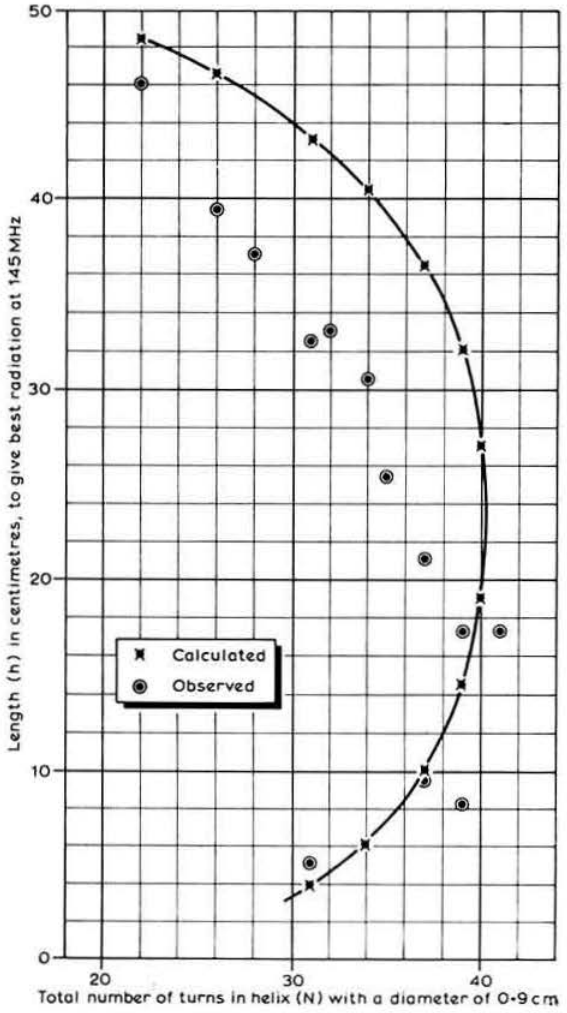

Fig 6. Some experimental results using helices with diameter 0·9cm and with varying number of turns. Most helices showed two resonant lengths. The solid curve was calculated using equation (2). The experimental arrangement was crude and could not distinguish between effects due to resonance and matching

nominal impedance (on a perfect ground plane) of 32Ω. In fact the power lost due to a mismatch by a factor of 2 or 0·5 is only 10 per cent of the total available power; if the factor is as high as 10 or 0·1 the figure is still only 45 per cent. The solution adopted by the author for the pocket transceivers has been to match the tank circuit to the helical aerial using a field strength meter and to tolerate the resulting mismatch to a conventional aerial feeder when the set is used at home. There has been little noticeable reduction in range, and both the forward and return transmission paths usually seem to fade out at the same time when talking between the two identical sets. The best report, so far, using the home-made helical aerial with 100mW rf output has been Q5 S4 at a a range of 160 miles. It is important to carry out the aerial tuning with the set held in the hand if that is to be its normal operating position.

Table 3

Number of turns (N) for helical whips of various lengths (h) for the short-wave bands. All aerials are assumed to be wound on formers with a diameter of ¼in and the overall length is given in feet. Parameters for other diameters can easily be found from Fig 2

Band (h):	Number of turns N				
	2ft	3ft	4ft	5ft	6ft
1·8MHz		3,072	3,254	3,400	3,526
3·5	1,457	1,579	1,671	1,746	
3·8	1,341	1,454	1,539	1,608	
7·05	722	782	826	869	
14·15	358	386	405	418	
21·2	238	254	263	266	
28	178	188	191	187	
30	166	174	175	169	

The design procedure described above can also be applied to aerials for the short-wave bands. Here a former is mandatory and in this case there will be little difference in mechanical complexity between either series or shunt feeding. By tapping the feed at a suitable point up the helix a good match to any feeder should be obtainable. A low-loss former is essential and probably a glass-fibre whip would be very suitable. Such whips are available from suppliers of fishing rods. With hand-portable operation on the short-wave bands in mind, some relevant helix dimensions have been collected in Table 3. On at least the higher frequency hf bands a bifilar helix should be reasonably easy to wind and would quadruple the impedance of the aerial, possibly allowing the use of a series feed.

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A digital frequency display unit

by A. LANGTON*

MOST frequency meters have a wide timebase range, the ability to handle low level signals and a means of measuring time periods and frequency differences, but many of these functions can be omitted from a digital frequency display unit. The availability of medium-scale integration ttl has greatly simplified construction of digital frequency meters, and in the unit to be described flexibility has been extended in a different direction.

It will display (in kilohertz) a transmitter frequency up to at least 40,000kHz directly, or will display the final frequency working from a low frequency output of an harmonic generator. It can also cope with heterodyne systems with or without multiplier chains. Received frequencies can be displayed using local oscillator output, whether above or below the i.f., with or without a vhf converter. The display changeover can be operated by the transmit/receive switch.

* 28 Orchard Road, Aberdeen AB2 3DP

Basic counter

First, a brief description of a conventional basic frequency meter. It consists of a system which periodically samples a signal for a precise period, and during this period counts the pulse repetition rate in a fast decade counter in binary coded decimal form. The information in the counter is transferred to a store or latch, and then to a display system using LEDS, gas tubes or filament indicators. The purpose of the latch is to prevent changing information from being displayed, as the latch only takes information from the counter on receipt of a command pulse, usually called a strobe pulse.

Precisely timed pulses are derived from a crystal oscillator (called the clock) and a series of dividers, and the rate at which the sample is taken is controlled by a low frequency astable multivibrator sometimes governed by the low time-base speeds. Laboratory counters usually have time-base periods of 1μs to 10s.

Timebase

The time base in this display unit is conventional, apart from only having one output frequency of 1kHz, and is very similar to the design by G3XGP published in *Radio Communication* June 1973. The author tried most published circuits using gates or inverters but none of them worked as they were for 1MHz crystals only. A 100kHz crystal is used because it was available, and this circuit worked first time. Capacitor C3 was necessary to remove a small spurious spike in the waveform. The output amplitude is 4·5V peak to peak, with a mark-space ratio of 3 : 2 and short rise time, and is thus ideal for driving ttl circuits. The oscillator and buffer were built in a small Eddystone box, the crystal being wrapped in carpet underfelt for stability and cushioning. Access to the trimmer is a grommetted hole in the side of the box. The dividers are mounted on Veroboard on the outside of the box.

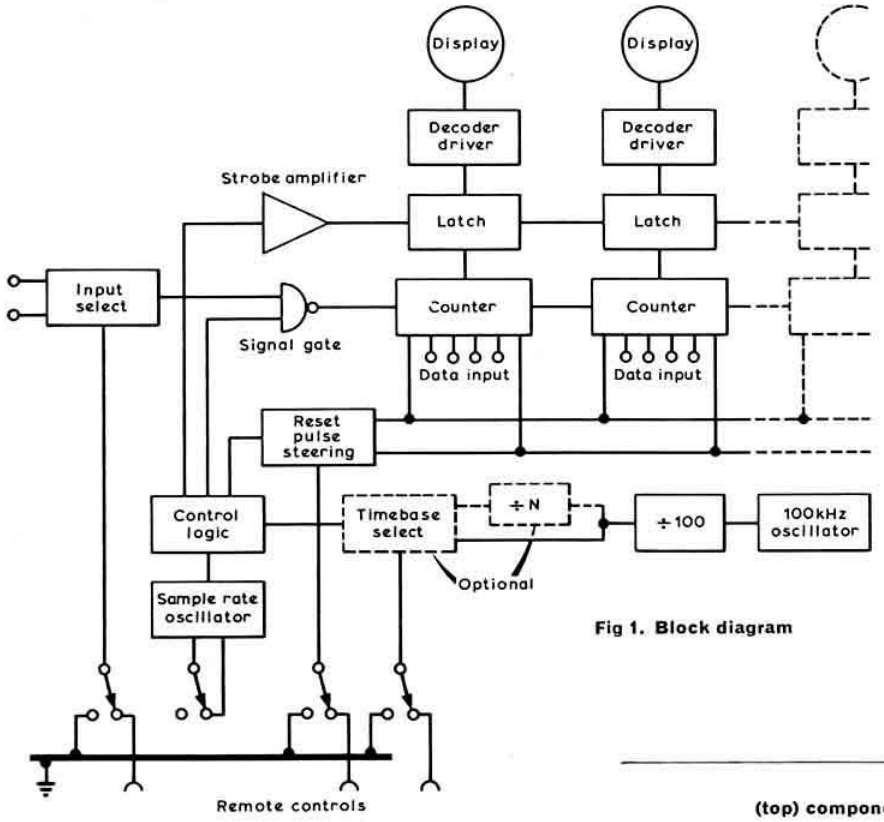
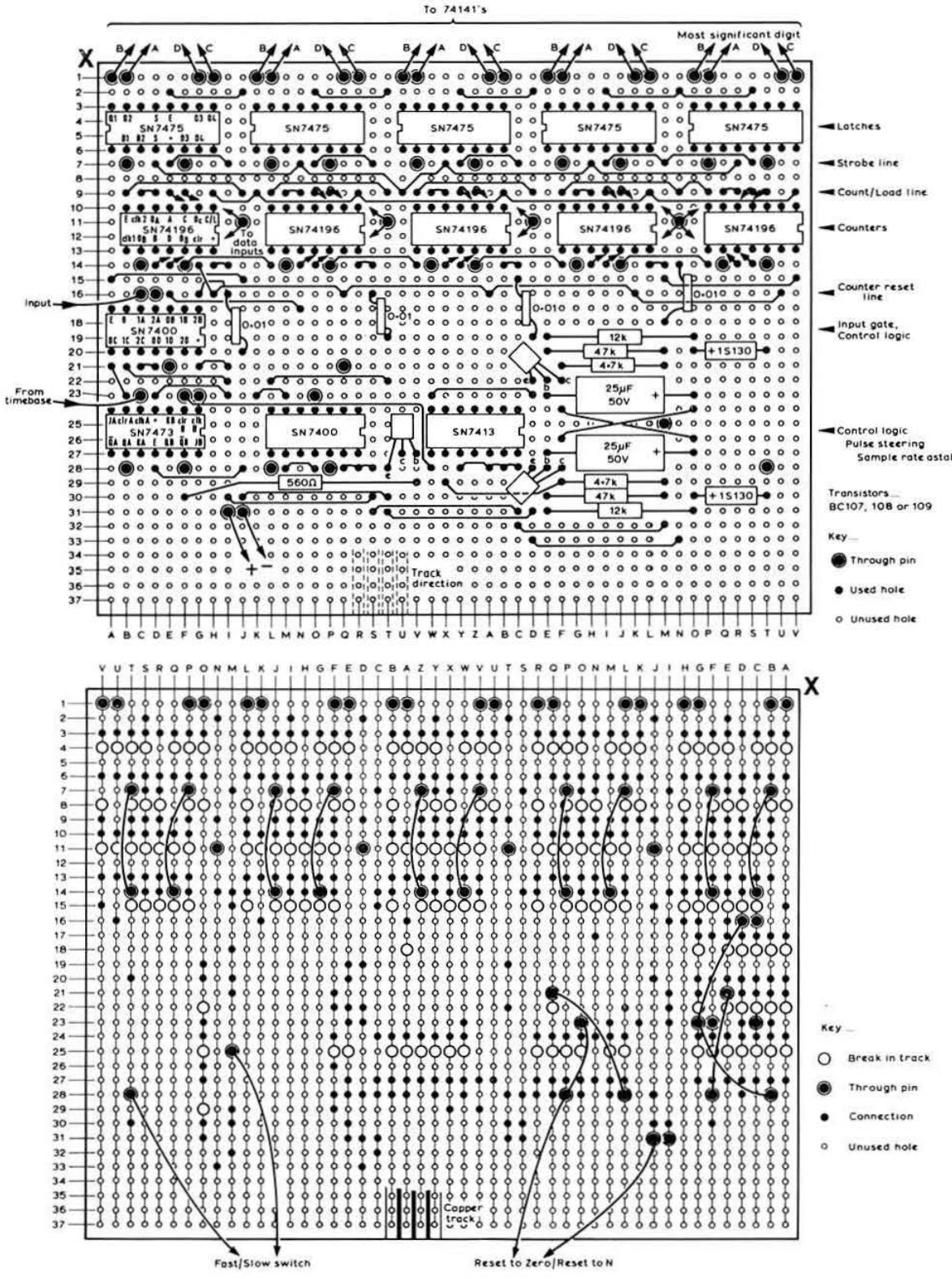


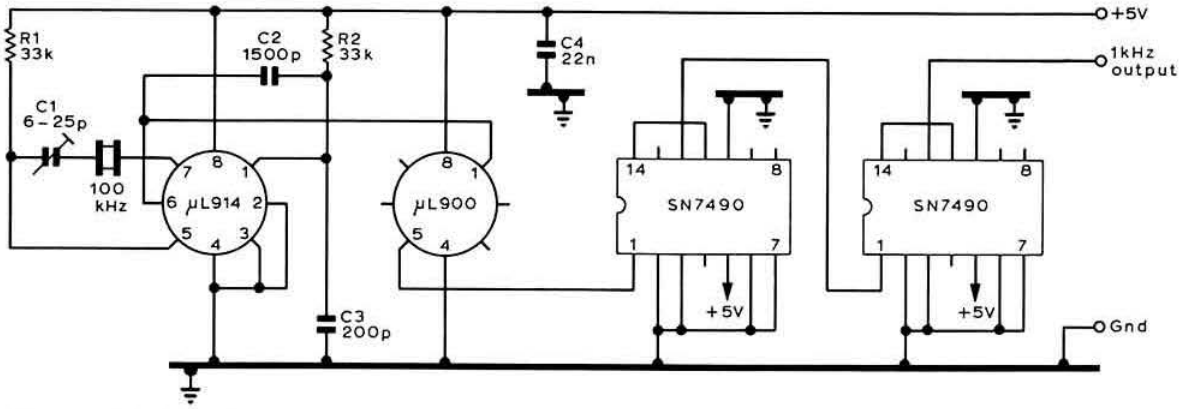
Fig 1. Block diagram

Control logic

The sample rate oscillator consists of a free-running multivibrator, the frequency of which can be increased by switching extra base bias resistors in parallel via a diode switch. The output waveform is shaped in a Schmitt trigger and the frequencies are 2Hz or 0·25Hz. There is no need to control the sample rate oscillator with the control logic, as this is only necessary when long time-base periods are used.

Fig 2. Main control board: (top) component side; (bottom) track side ▶


To 74141's
Most significant digit
SN7475
SN74196
SN7400
SN7413
SN7473
Latches
Strobe line
Count/Load line
Counters
Counter reset line
Input gate, Control logic
Control logic
Pulse steering
Sample rate astable
Transistors
BC107, 108 or 109
Key
Through pin
Used hole
Unused hole
Input
From timebase
To data inputs
Track direction
Copper track
Fast/Slow switch
Reset to Zero/Reset to N
Break in track
Connection



The control logic is built from a 7473 dual flip flop and a 7400 quad gate. When the output of the sample rate oscillator is 0, the two flip flops are set to 0 (Q output). A 1 from the sample rate oscillator enables the flip flops, so the first 1 to 0 transition of the clock input changes Q_A to 1 and this opens the signal gate. The second 1 to 0 transition of the clock changes Q_A back to 0 and Q_B to 1. This closes the signal gate and locks out further clock pulses. The operation therefore consists of 1ms pulses every $\frac{1}{2}$ or 4s. The output from $\overline{Q}_B$ is used to provide the strobe pulse to the latches via a BC109, as the fan-in of five latches is too high for the $\overline{Q}$ output to handle directly. The counter reset line is operated by the sample rate oscillator.

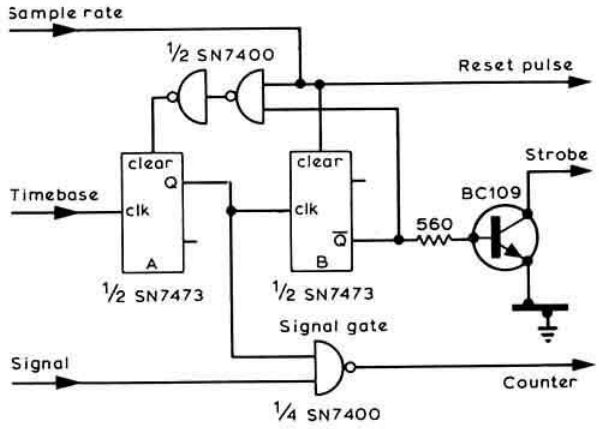
Display

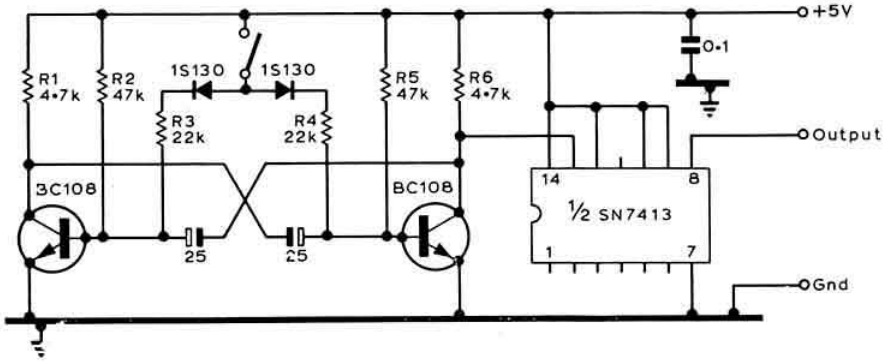
Latch and decoder/driver circuits are conventional, using SN7475s and SN74141s. The decoder/drivers are mounted behind the ZM1020 indicator tubes on a separate board, so the whole assembly can be replaced by an LED system when the price becomes more reasonable. Each tube anode is connected to +170V via a 22kΩ resistor.

Counter

The greatest differences occur in the counter. Most published circuits use 7490 decade counters: these can only be reset to 0 or 9. By using 74196s instead, two advantages emerge. The maximum frequency of operation is raised to at least 40MHz instead of about 20MHz, although this is governed by the input amplifier also. The other is that the counter can be reset to any number from 0 to 9.

In the transmit mode, the counter follows normal practice. The reset pulse is applied to the "clear" terminals of the counters, normally at 1. The extra inputs of the 74196 are the "data inputs" and the "count/load" facility, and these enable the device to be reset to any number, making it capable of working with a receiver. With the count/load at 1, the negative going reset pulse to the clear line resets the counters to zero, but if the clear line is left at 1 and the reset pulse applied to the count/load line, the counters will reset to zero while the pulse is present, but set to whatever is encoded at the data inputs when the count/load line returns to 1. Any desired number can be encoded in BCD by shorting the input to ground (0) or leaving it open-circuit (1). The ABC





TOP
Fig 3. Timebase oscillator and divider

LEFT
Fig 4. Sample rate oscillator

ABOVE
Fig 5. Control logic

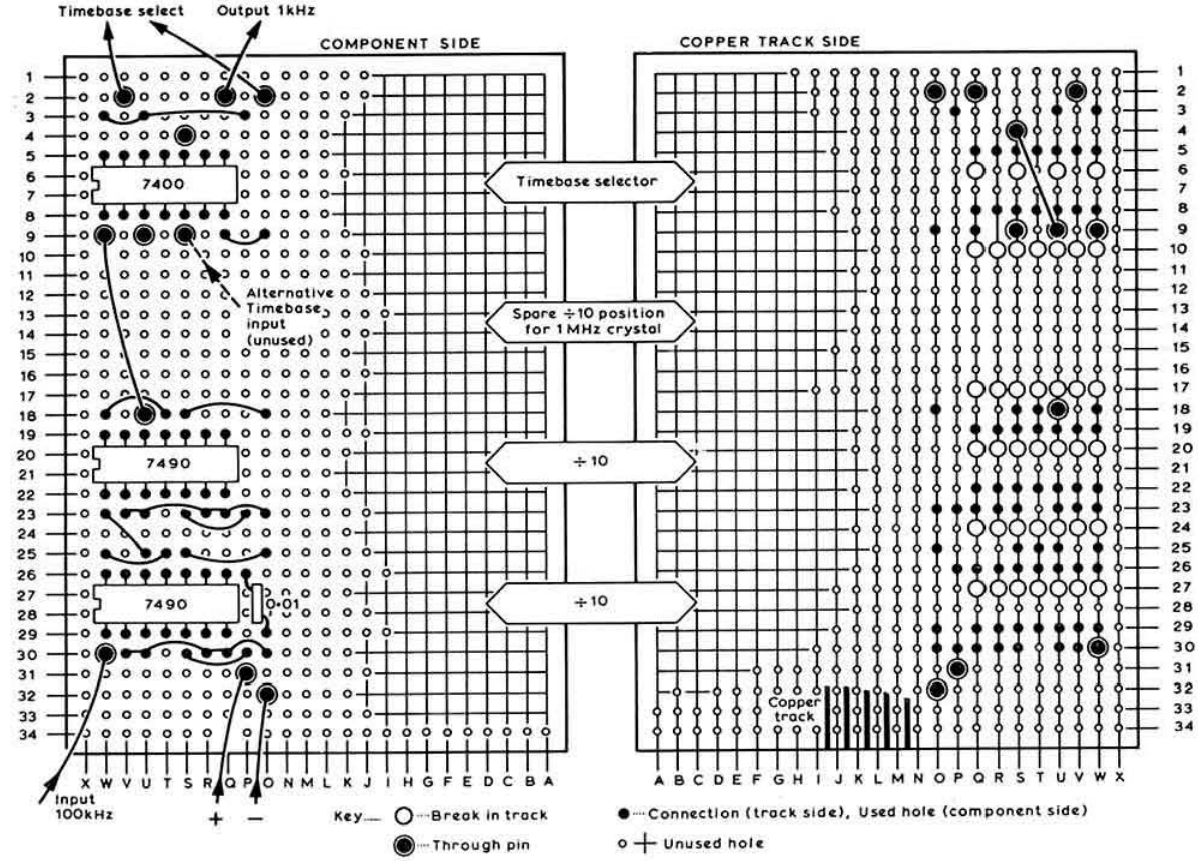


Fig 6. Timebase divider board: (left) components side; (right) track side

and D inputs are 124 and 8 respectively. Fig 8 shows a pulse steering circuit which directs the reset pulse to the clear or count/load lines by operating a control line either by a switch to earth or a remote logic system.

Consider a receiver with a local oscillator below the received frequency. A frequency counter connected to the lo will show a frequency equal to the received frequency minus the i.f. If the counter were reset to the i.f. instead of zero it would count up on the i.f. by the same amount as before and therefore show the received frequency. All that is necessary is to encode the i.f. into the data inputs, expressed as a BCD frequency in kilohertz, and apply the reset pulse to the count/load line.

If the receiver has a local oscillator higher than the i.f., it is necessary to subtract the i.f. This is not directly possible, but the equivalent is to reset the counter to the 9's complement plus one of the i.f. For a count equal to the i.f. it counts up to 99,999. The + 1 already added makes this 100,000, but the counter can only display 00000. The rest of the count is then clocked up, and this is equal to the local oscillator frequency minus the i.f. A numerical example may make this clearer:

Received frequency	7,015kHz	
i.f.	455kHz	
lo	7,470	
Reset counter to	99,999	
	− 455	
	99,544	
	+ 1	
	99,545	99,545
		7,470
		(1) 07,015

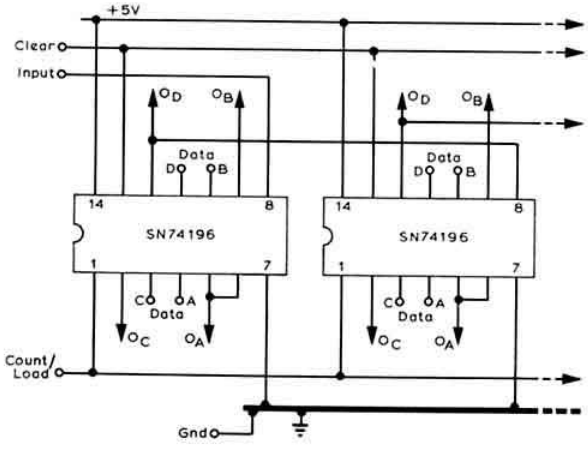


Fig 7. Counter

C • •

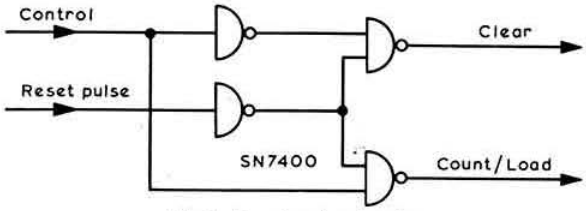


Fig 8. Reset pulse steering

(1) is not displayed as there are only five digits. It is possible to allow for converters also by adding the converter oscillator frequency into the data input as well as the i.f. For example:

Received frequency		144,850kHz		
Converter crystal		116,000		
Converter output		28,850		
Receiver i.f.		10,700		
Local oscillator (low)		18,150kHz	high	39,550
Measure		18,150		39,550
Add	(1)	16,000	Add (116,000–10,700)	
		10,700	(1)	05,300
Display	(1)	44,850	Display (1)	44,850

This assumes that the i.f. is known to the nearest kilohertz. It can be measured by displaying the local oscillator while receiving a known frequency. The same applies to the converter crystal frequency. Fig 9 shows a switching circuit used to give a choice of two inputs, one from the receiver lo and one from the transmitter. This can be operated by a switch or from the same remote logic as the pulse steering circuit. It is therefore possible to select either input and either counting facility via the transmit/receive switch. This gives automatic changeover of display when switching from transmit to receive.

The extra reset to data facility can be used to display the frequency of a heterodyne transmitter or transverter system.

VFO frequency		28,900kHz
Crystal frequency		116,000kHz
Transmitter o/p		144,900kHz
Measure	28,900	
Add	(1) 16,000	
Display	(1) 44,900	

It is possible to change remotely the data inputs via a diode matrix, but the constructional complexity was such that it was not pursued. However, the circuit is shown in Fig 10.

Another extra feature is the ability to divide the time base output further to work with the output from part of an harmonic generator. If the output of a transmitter is derived from a low frequency crystal, it is possible to measure the crystal frequency with the counter and display the output frequency of the transmitter by multiplying the time base

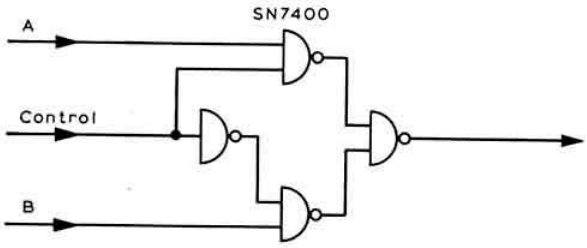


Fig 9. Input and timebase switch

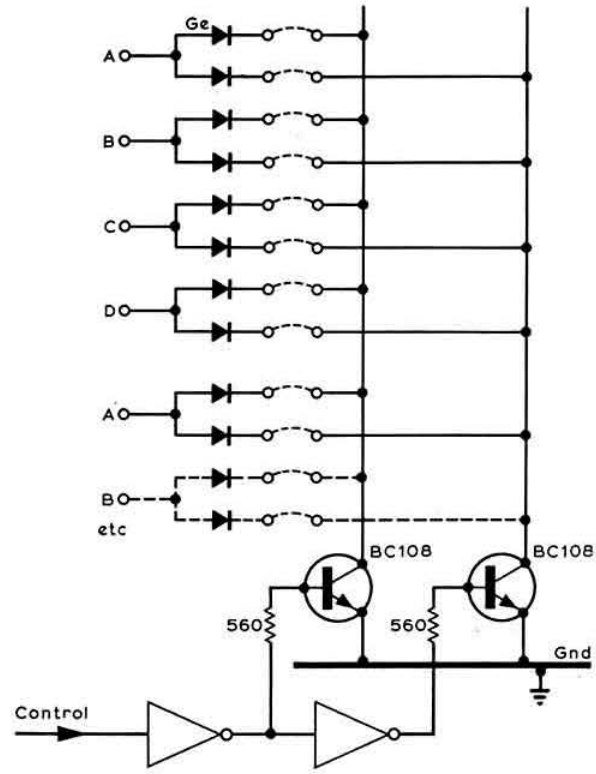


Fig 10. Data input switch

period by the same amount as the crystal is multiplied. (This is the same as dividing the time-base frequency by the same amount). This system would be useful if a vxo were employed. The output of the extra divider can be selected by a switch similar to the input selector and this, too, can be operated remotely.

The system is flexible for if a frequency cannot be measured directly, it can generally be calculated and displayed.

Construction

The counterboard is made from two pieces of 0·1in Veroboard glued together to make it wide enough to carry the five counters in a row, with space between for power rails. Each counter/latch unit is supplied by a separate line, decoupled by a 0·022μF capacitor. The control logic unit is decoupled separately, although powered from the first digit line. The sample rate oscillator is built on to this board for convenience. Liberal decoupling is most important to the success of the finished counter. Wiring between ICs is point to point, the wires being soldered to pins pushed through the board. Surprisingly few crossovers are needed. Once the control logic and first digit have been built, the rest is repetition. No details of input amplifiers and triggers are shown. These depend very much on the frequency and level of the signals to be measured. For general work, the design published by G3XGP (*Radio Communication* June 1973) would be excellent. The display tubes are available from Northwest Electrics and the ICs from Henry's Radio Ltd. Current consumption is over $\frac{1}{2}$A at 5V and 10mA at 170V. The cost was about £20.

EQUIPMENT REVIEW

The Scopex 4D-10 oscilloscope

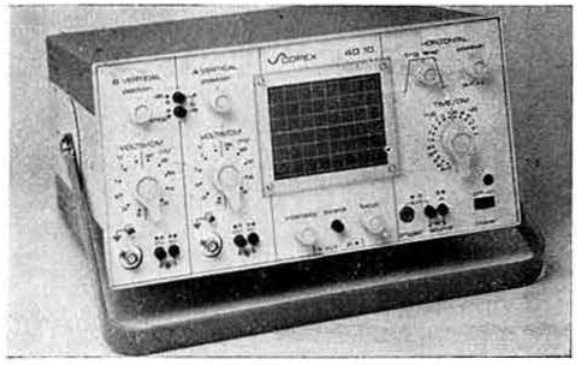
by R. O. PHILLIPS, G8CXJ

THE subject of this review is a dual trace oscilloscope which provides a wide range of facilities and should cover the requirements of most amateurs. The upper frequency of the equipment is 10MHz at a sensitivity of 10mV/cm. The price is £108 plus VAT and a probe kit is available as an accessory at £6.50 plus VAT. A 25MHz version of the scope is also available which is basically similar to the 4D-10 and costs £185 plus VAT.

General description

The 4D-10 is a mains-operated dual-trace oscilloscope using semiconductor components throughout. All of the operating controls and connections are on the front panel, with the exception of the timebase output and the X-amplifier input which are located at the rear. The carrying handle also acts as a stand which can be tilted to pre-set angles.

One of the main features of the scope is that both the timebase and the input sensitivity controls are directly calibrated and as there is no variable control for either function this simplifies measurements. The use of mos components in critical areas should ensure stability and allow long periods between recalibration.



Inputs to the Y amplifiers use bnc connectors but uhf sockets can be provided if required. Each input may be either ac or dc coupled, or alternatively the source may be isolated and the amplifier input grounded to give an accurate zero reference. This selection is achieved by means of two push-button controls associated with each amplifier. Input sensitivity is adjustable from 10mV/cm to 50V/cm; overload protection up to 400V peak is achieved by use of silicon limiting diodes but this figure is only quoted to 3kHz.

Two further push button controls allow trace selection of Channel A only, alternate A and B, or chopped A and B —the frequency of the chopper amplifier is approximately 100kHz.

The 6cm by 8cm display area is provided with a 1cm graticule, the axes of which are subdivided into five for ease of measurement. There is no shroud around the display area and when used under strong lighting the trace visibility was impaired. This was found to be particularly so at the upper end of the frequency range where increased intensity is already necessary. However, the manufacturers have since advised us that they are about to produce a light-ho od for these instruments.

The timebase sweep is adjustable, to pre-set values, from 1μs/cm to 100ms/cm and a × 5 magnifier increases the maximum rate to 0·2μs/cm.

Triggering may be selected from Channel A, an external source, or from the mains supply frequency. The trigger level is adjustable by means of a potentiometer with a split track; this allows for triggering from either the leading or trailing edge of the waveform. This control was found to be particularly easy to use even at the quoted upper frequency limit.

Conclusions

Unlike many pieces of test equipment, only a short period of familiarization was required before maximum advantage could be obtained from the scope. Measurements can be made easily for both amplitude and frequency over very useful ranges. In brief, the scope is easy to operate yet is also capable of being used to make measurements to a sufficient degree of accuracy for most amateur purposes. When compared to similar equipment the 4D-10 represents very good value for money. At the time of writing this report the delivery time was about 36 weeks, but the manufacturers hope that this will be reduced in the near future.

SPECIFICATION

The parameters were checked and all results were found to be in accordance with the figures quoted.

A and B vertical

Sensitivity	10mV/cm–50V/cm (12 calibrated ranges)
Bandwidth (3dB)	dc coupled dc–> 10MHz ac coupled 3Hz–> 10MHz
Input impedance	1MΩ± 3% and 33pF
Risetime	35ns

Horizontal

Sweep speeds	1μs–100ms/cm
Magnifier	× 5
External sensitivity	1V/cm (200mV/cm magnified)
External impedance	1MΩ± 10% and 35pF

Trigger circuit

Sources	External input–Channel A–Power line frequency
Sensitivity	Internal–5mm minimum from 10Hz to 1MHz rising to 3cm at 5MHz External– 300mV p–p 30Hz to 5MHz 600mV p–p 10Hz to 10MHz
Input impedance	220kΩ and 20pF
Power requirements	210–250V ac 25VA
Dimensions (excluding handle)	Height 6in width 12¼in depth 14¼in
Weight	17lb
Obtainable from	Scopex Instruments Ltd, Pixmore Avenue, Letchworth, Herts SG6 1JJ

TECHNICAL TOPICS

by PAT HAWKER, G3VA

A RECENT article by Peter Laurie in *New Scientist* (30 May, 1974) carried the uncompromising headline "No room in the radio spectrum" and noted that overcrowding and electronic pollution are making life increasingly difficult for users of the radio spectrum—especially those operating in the hf band. But it also posed the question: "Do the long-established users really have such inalienable rights to their channels?" While some of the technical details got a bit mangled (do we get American police messages booming out of Channel 1 television sets on two out of every hundred days due to temperature inversions?), few would seriously quarrel with pinpointing radio spectrum management as an important matter of public concern. But as one of the traditional, long-established users, the amateur has a vital interest in clearly justifying his occupation of more than 10 per cent of all frequencies between 3 and 30MHz (an exclusive or shared right to 2·9MHz out of 27MHz). It may not seem much space to us—it could look a lot to others if we do not make good use of those valuable kilohertz.

Parametric hf mixers

As long ago as 1968, thanks to Walter Schreuer, K1YZW, I was able to present in *TT* what I believe to have been the first down-to-earth account of the advantages and disadvantages and performance of parametric up-converters for hf receivers to appear in any British publication. Since then a lot has happened (the doubly-balanced fet switching mixer, for example), but very few design articles have appeared on paramp up-converters used in this application. But now the long series of papers on mixer techniques that have been authored or co-authored by Dr J. Gardiner in recent years has got round to this subject, with "Parametric up-converters as receiver first mixers at high frequencies" by J. G. Gardiner and M. A. M. Ali Zaid, *Proc IEE*, Vol 121, No 5, May 1974, pp 324–332.

Although, for the reasons given in 1968, we do not see this technique coming into wide use for amateur-band receivers, at least until good vhf roofing or ssb filters and spectrally pure stable vhf oscillators are both available at reasonable cost, it remains a subject of interest and may find application in vhf ssb transverters.

Gardiner and Ali Zaid note that the wish to improve overall performance of hf receivers has concentrated on attempts to improve front-end circuits capable of handling a very wide dynamic range of signal inputs while preserving system sensitivity. Currently the most satisfactory circuits tend to be switching type mixers using either Schottky-barrier diodes or FETs as non-linear resistive elements. But with this approach, conversion losses tend to be high so that overall noise figures (unless an rf amplifier is used) will be of the order of 10dB or more.

The authors add: "An improvement in this figure is clearly desirable, and attention naturally turns to active devices of all sorts. Transistor circuits, however, generally prove unsatisfactory, since useful gain can only be achieved under conditions of bias and injection level that prevent the device from being optimized for switching by the local oscillator, and a considerable sacrifice in linearity results."

The paper continues: "The parametric converter, on the other hand, is potentially extremely attractive, since it would appear possible to operate the device in an essential square-law mode, provided that the varactor is of the abrupt junction type (an abrupt junction is a pn junction which, unlike the normal graded junction, has sharply defined impurity concentrations). Moreover it is well known that gain is obtainable from parametric up-converter circuits, and this is expected to be accompanied by relatively little noise originating within the parametric converter itself. Parametric front ends have been described but for various reasons these have proved to be immensely complex and cumbersome, requiring high drive-pump powers and fulfilling very specialized functions."

The authors set out to examine the possibilities of simple parametric-converter circuits as direct replacements for conventional mixer circuits with modest injection levels and of small physical volume. It is argued that the parametric hf mixer is very different from microwave parametric amplifiers and converters which are usually optimized for minimum noise figure and maximum gain compatible with stability and maximum instantaneous bandwidth, and with fixed pump frequencies, adding: "For an hf parametric mixer, however, the gain and noise figure of the circuit are of less importance than the need to obtain positive port impedances (to match the filters terminating the mixer) and the need to preserve a very high degree of stability with pump level variations." The instantaneous bandwidth is also seldom of interest at hf, whereas it is necessary to be able to tune the pump frequency over a significant band.

Gardiner and Ali Zaid set themselves a specification for an hf mixer: gain 0 to 3dB; noise 3–6dB; switched half-octave

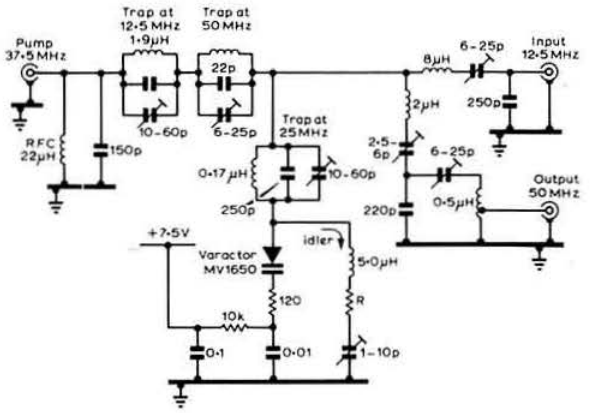


Fig 1. The experimental hf parametric mixer described by Gardiner and Ali Zaid

input circuits; crystal filter output; tunable pump; port impedances positive at input with small real parts to give low signal voltages for maximum linearity (1 to 10Ω typically).

While they admit that some advantages would accrue from a balanced configuration, the experimental work was confined to an unbalanced arrangement using a single MV1650 varactor (a BA102 device was used initially but did not give good results in this circuit). Much of the paper is taken up with detailed circuit analysis and theoretical performance curves; but a later section describes the results achieved from a practical design developed to check how much this would depart from the predicted performance. This took the form of an upper-sideband up-converter (Fig 1) with 12·5MHz signal input, 37·5MHz pump (local oscillator) frequency, and 50MHz i.f. output. Performance was in fact very close to the calculations except that the noise figure was between 1·5 to 2dB higher (possible reasons for this are given).

While the paper touches only briefly on questions of intermodulation distortion and dynamic range (this is the subject of a separate study) some figures given suggest this is impressive (3rd order IPS –62dB for two 100mV input signals and –38dB at the 400mV level, blocking emf for –3dB gain compression 1·75V rms).

For the reasons already suggested, paramp mixers, while of considerable interest for general-coverage receivers, have possibly less appeal for amateur-bands-only models where an i.f. of about 9MHz remains attractive. On the other hand the paramp up-converter could well provide a useful approach for an amateur wanting to obtain a low-level ssb signal at vhf from an hf transmitter; the extremely good linearity should significantly reduce spurii compared with most other methods.

Balanced modulator using symmetrical transistor

The spring 1974 issue of *Mercury* (the journal of the Royal Signals Amateur Radio Society) includes a very practical hint that I cannot recall having seen mentioned in print before, and one which seems well worth bringing to the notice of those to whom *Certo Cito* may sound only like an aptly named tip for the 3.30.

The item suggests that the standard diode balanced mixer or modulator is well known and has a reputation for good performance and reasonable stability under normal circumstances. But when af is applied along with the carrier, the capacitance of the two junctions may not vary exactly in step, so producing unbalance and some increase in intermodulation products and lower carrier suppression.

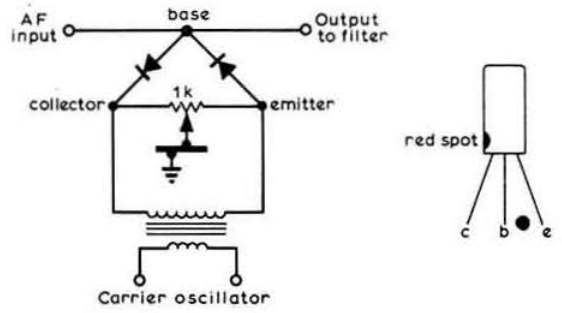


Fig 2. Using a symmetrical transistor such as the OC200 instead of separate diodes in a balanced mixer/modulator circuit

This can be largely eliminated, it is suggested, by using a symmetrical type transistor rather than two "balanced" diodes: Fig 2. For example, the OC200, now of ancient vincent, is one of the symmetrical devices with the two junctions of equal size and shape. It can make a "superb" balanced modulator and is said to provide up to about 20dB better carrier suppression than the usual OA79, OA81 arrangement, and often eliminates altogether the need for a balancing capacitor provided the layout is symmetrical so that circuit strays do not unbalance the modulator.

Ring mixer detector for up-dating old receivers

From Roger C. Arnold of Crowthorne comes an idea for a simple-to-add ssb/a.m. detector for up-dating mechanically-sound but old receivers. He recently converted a BC1147A in this way and feels that the conversion works so well that the idea may be of interest to others.

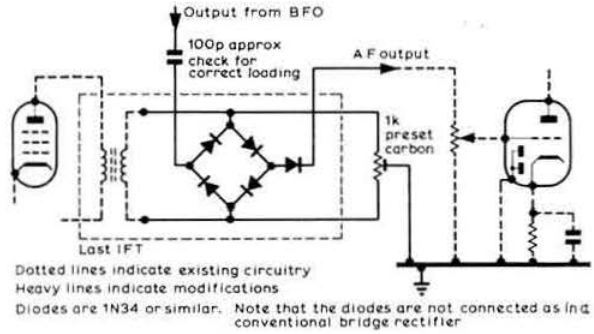


Fig 3. The ssb/am/cw detector for easy incorporation in older valve receivers

He writes: "This ring mixer circuit (Fig 3) can be used with virtually any of the old valved communications receivers. Its main feature is that it requires no switching from the a.m. to ssb mode and has very simple circuitry which can readily be built into the final i.f. transformer can. The only switching that is necessary is to switch on the bfo in the normal cw mode, so one does not even have to modify the front panel to include any new controls.

"It should be noted, however, that the detector can be overloaded by very strong signals and put out of balance, but if the rf gain is backtracked a bit normal ssb reception will be recovered."

This final remark suggests the possibility of using symmetrical transistors in the ring instead of separate diodes as suggested in the item from *Mercury*. I am also not too sure about the effect of the diode in the af output circuit since this would possibly have a "threshold" effect on the zero crossings, but presumably Roger Arnold has not found this a problem in practice.

Folded umbrella aerials

The use of guy wires to provide top loading for short vertical aerials has been described in a number of articles, but a variation is noted in an article by S. U. Nolan "Developments in mf radiator systems" in *Sound and Vision broadcasting*, Vol 15 No 1, Spring 1974.

This points out that many of the developments in mf aerials in recent years have been concerned with giving the

users more for their money, both for broadcasting and maritime radio applications at 500kHz. A typical low-power umbrella aerial consists of a mast with a number of wires (typically nine) attached to the top and radiating outwards at an angle of about 45° to the horizontal.

The main limitations which arise from using a vertical radiator which is short in terms of wavelength are efficiency and bandwidth. It is stated that acceptable values of 90 per cent efficiency and 10kHz bandwidth with an swr less than 1·2 can be achieved with a mast height of only $\frac{1}{10}\lambda$ at frequencies down to about 500kHz (this ties up fairly closely with the figures we gave recently for inductively loaded monopoles for 1·8MHz). An umbrella aerial costs less than the conventional T-aerial in requiring only one mast.

It is claimed that a further simplification results from "folding" the vertical element to raise the impedance at the base to that of a coaxial feeder, so allowing the aerial to be fed directly without any matching network at the bottom of the mast, and also allowing the mast itself to be grounded for lightning protection.

The way this is done is to form a cage of wires running parallel to the mast and with all wires directly connected to the top of the mast and connected together at the base but insulated from ground and the mast: Fig 4.

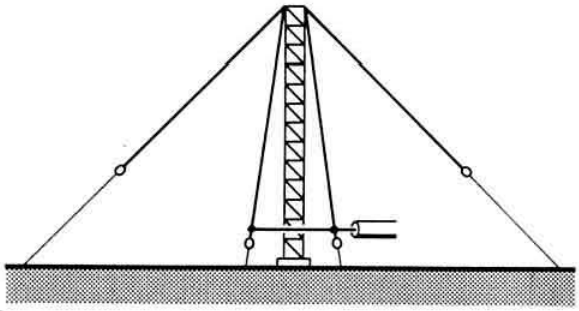


Fig 4. The folded umbrella aerial which allows mast radiators of $\frac{1}{10}\lambda$ or more to be fed directly from low-impedance coaxial feeder

The aerial is made self-resonant: that is to say, the inductance of the mast and cage of wires in parallel must tune with the "guy wire" top capacitance. The input impedance at the base of mast will be purely resistive and about 15Ω; this can be raised to the impedance of the coaxial feeder by the folding process and by adjusting the number of wires in the cage. A rather different way of loading short verticals by means of an inner wire was described some years ago by Brian Rose, G3ULR, (*ART*) but in this case the base of the mast radiator was insulated from ground. In fact the folded umbrella looks quite a useful approach for 1·8 and 3·5MHz, although to be most effective it needs either good ground conductivity or an effective earthing mat of radials.

Huff and puff postscript

A note from Joe Cropper, G3BY, tidies up some of the points left over from previous references to his adaption of the PA0KSB vfo stabilizer. He writes:

"The fact that there are internal timing resistors on the 74121 was of little consequence in my case as I had already fitted the external resistors—and ¼W resistors are as good a way as any of making connections on a printed circuit board. BRS32041 is correct in pointing out (*TT* March 1974) that the output from the 74191 should go to pin 2 of the 7474, although there is no need to make connections to pins 1 and 4. Pins left open are "high". In the original PA0KSB circuit (*TT* July 1973), the input to the 7474 was correctly marked 'D' but given the wrong number; although I used the 'D' input (pin 2) I carried through the original error on my diagram. It seems that 'digital' types have trouble with numbers over 1! The comment about the Q and $\bar{Q}$ outputs from the 74121 (*TT*, March 1974) is appreciated and perhaps I had been carried away by the thought of those unused gates in the 7400 living in idleness on my milliamps! I could have used them for the crystal oscillator, but at the time did not have a suitably active crystal, now I use a surplus 99kHz B7G type which takes off with no trouble at all.

"When I first used the system the vfo was a low-output transistor oscillator and there appeared to be a 'warm-up' time before the control became effective. The reason for this became evident when I changed to an fet Hartley vfo with much more output: the control system then just did not get hold at all and tests showed that the vfo was developing an alarming 10V at the varicap diode!

"The suggested double varicap arrangement (*TT* November 1973) reduced this to about 4V, but this was still too much and after trying many arrangements the one shown in Fig 5 is quite satisfactory. The voltage at the control point is under 0·1V so that control is achieved within a few minutes. There is a negative voltage of 0·3V at the junction of the two varicaps and this point is very sensitive to static pick-up, putting a ripple on the carrier from mains pick-up; but this clears when the vfo is screened. The arrangement has since also been used successfully for nbfm. All these readings were taken on a voltmeter with 11MΩ input.

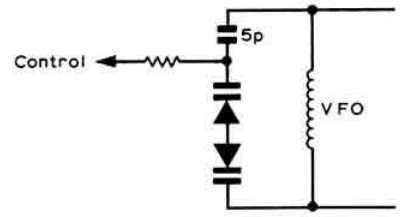


Fig 5. The arrangement finally adopted by G3BY to provide control of a low-C vfo

The fet vfo is low-C, as wide coverage was required: 200pF at 6·5MHz and 50pF at 12MHz, both plus circuit strays. With the 1MΩ resistor in the control feed line the frequency counter showed a variation of 7 or 8Hz about 6·5MHz, but at 12MHz there was overcontrol and drift. A 2MΩ potentiometer was wired in series with the 1MΩ resistor and the hunting was now down to 4 to 5Hz at 6·5MHz and 7 to 8Hz at 12MHz. So I consider a 3MΩ feed resistor would be adequate for all practical puposes with a low-C oscillator. In fact I should say *is* adequate since it is all in use and even the 8Hz variation is quite unnoticeable on ssb. With the more usual high-C vfo, 1MΩ should be quite satisfactory.

"To sum up: with the correction that pin 6 of the 74191 should go to pin 2 of the 7474, the circuit given in the October *TT* will give excellent control."

G3BY also comments on the BRS34402 arrangement but we will have to hold this over for the moment.

Tropo on ten?

In *TT* (March 1974) we included a brief report from 5B4WR on what appeared to be examples of extended ground-wave reception of the 5B4CY 28MHz beacon at distances up to 80km.

Through Alan Taylor, G3DME, the RSGB Scientific Studies Committee has proffered the comment that this could possibly be the result of tropospheric mode propagation and similar to the reception of the GB3SX 28MHz beacon by Martin Harrison, G3USF, at Keele, a path length of about 275km. Another possible example of tropo on 10 are the several contacts between G3DME at Crowborough, Sussex, and F6ASP/M at Blanc Nez, a land/sea path of 104km.

There is, perhaps, a too widely held view that hf and vhf propagation modes are different animals and never the twain shall meet; in fact they not only meet at 30MHz but frequently overlap: ionospheric, sporadic E, auroral, tropo, meteor scatter, moon bounce and all. Another reason why 28MHz deserves much more attention than it gets in sunspot minimum years; a valuable 1·7MHz that others may have their avaricious eyes on.

One-way propagation II

The notes in the May *TT* on one-way propagation provoked a number of letters from readers agreeing that this happens and putting forward possible explanations.

But while "Dud" Charman, G6CJ, stresses that the reciprocity theorem relates to *passive* networks and is not valid for the ionosphere, he believes that as far as amateur operation is concerned the effects that give rise to one-way discussions are more often due to the different signal-to-noise ratios at the two ends than to different path losses. This factor was mentioned briefly in the May notes as one of the possible causes.

G6CJ points out that the reciprocity theorem does not hold good if there is a second generator in the circuit, for example a noise generator. Nevertheless so far as path loss is concerned he comments that as soon as we mix electric and magnetic fields we can get directional couplers. The ionosphere is just such a circuit, acting rather like a piece of ferrite. (Microwave types will know all about the non-reciprocal behaviour of ferrites on the gigahertz bands: this is used to make isolators which depend on the phenomenon of gyro-magnetic resonance exhibited when a sliver of ferrite is placed in a waveguide and subjected to a transverse magnetic field; a typical X-band ferrite isolator can attenuate a wave propagating in one direction by about 20dB for a loss of only about 1dB in the other direction—*G3VA*). The ionosphere is just such another circuit trying to cope with mixed electric and magnetic fields—and in the early days of ferrite isolators G6CJ called them "artificial ionospheres". The F1, F2 split is just this. But what about passive directional couplers, you may be asking? Well the main line is still reciprocal. The forward/backward couplers are not; they are not in the theorem but are branches in the circuit. And, G6CJ adds, *QED*.

Laurie Margolis, G3UML, believes that misunderstandings arise early on when we start thinking of signals being reflected from the ionosphere. Refraction is a more accurate description but there is more to it than this. The ions making up the ionosphere act more like a transducer: as an ion is activated by the incoming electromagnetic wave (hopefully, your signal) it oscillates and re-emits the signal back to earth: the density, temperature, angle of incidence and so on all play a part in determining how strong a signal will come back. And G3UML has a hypothesis that the ions may act differently when approached from opposite directions, with factors such as angular spin, polarization etc coming into the picture. His thoughts on this matter have been reinforced just recently by working a station in Thailand on 21MHz: both stations using X watts p.e.p. with beams at a similar height: signals outwards S7/8; inwards heard only with considerable difficulty.

A third letter on the subject comes from J. A. W. Bate, GW6WB, who has been interested in aspects of the one-way phenomenon for some 50 years and has no doubt that it does exist. He recalls one example about four years ago on 21MHz when a very strong ZS station kept on calling CQ intermittently for three-quarters of an hour and obviously was not hearing anyone, including GW6WB.

He feels there are times when the ionosphere is in a state of turbulence and a "step" forms which may be quite small but enables a signal of correct vertical and horizontal angles of radiation to get through but with signals arriving at the far end well off the great circle path. Sometimes in these circumstances he has made contact by swinging his beam away from the direct path, but this does not always produce the right results.

He disagrees with the Post Office findings on the trans-atlantic path as he feels signals from the UK are better received in the USA than vice versa and has a "dynamo theory" linking this with the rotation of the earth and different impact velocities. But he feels that more research into the whole subject is badly needed.

Signals off the great circle path

The comments from GW6WB raise the very interesting question of just how often *do* signals arrive from other than the correct great circle bearing? This, in fact, is a topic that has been the subject of several professional investigations—but the experts seem to be in total disarray.

Fig 6 shows the remarkable results achieved over a year by H. A. Whate and reported in "The physics of long-distance radio propagation" published by the Radio Research Centre of the University of Auckland about 1968. I have not seen the original report but the diagram is reproduced from a recent issue of *News from Rohde & Schwartz 63* where it is used to support an argument that a rotary log-periodic aerial array can often provide much better signal-to-noise ratios than a fixed rhombic of appreciably higher gain but which may be *too* directional. The bearing of 173° suggests that Whate's findings may have been based on the arrival directions in Auckland, New Zealand, of signals from the UK or possibly Europe, representing a near antipodal path. It will be seen that they indicate a remarkably high incidence of signals coming in well "off beam", with the deviations following a cyclic, seasonal pattern. The Rohde & Schwartz comment is: "These so-called deviations from great circle path are caused by irregularities in the structure of the ionosphere, which may not even approximately act as a plane reflector." And they use this diagram to produce further diagrams well calculated to have anyone operating a long-distance route rushing out and pulling down his fixed rhombic in favour of a rotary that can cope with bearing variations.

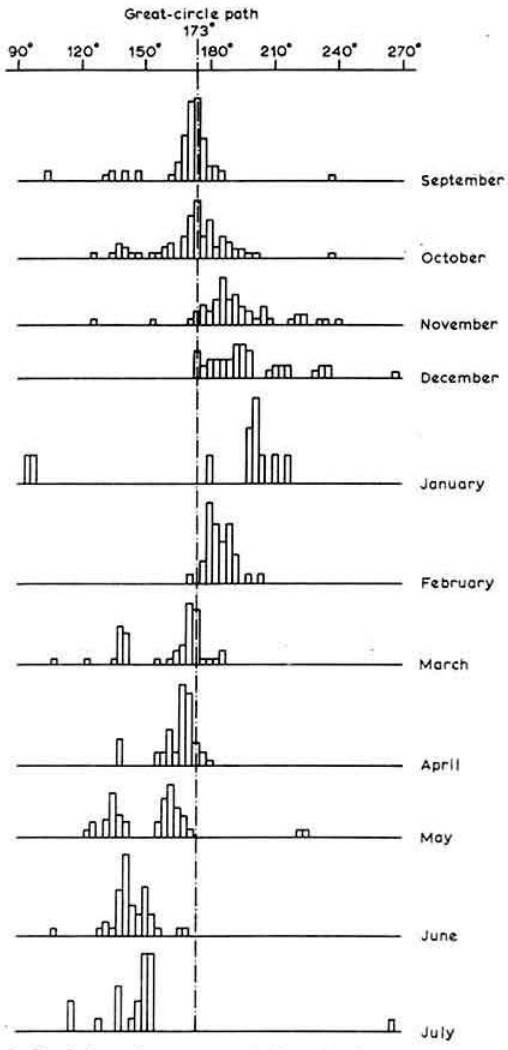


Fig 6. Deviations from great circle path of propagation noted during 11 successive months by Whate in New Zealand

So far so good. One gets a picture of hf signals wandering around all over the place before finally coming in to land in New Zealand. But on the other hand, a later investigation was carried out on different routes by Dr E. N. Bramley of the Appleton Laboratory (formerly RSRS) (*Proc IEE*, Vol 118, No 2, 1971) specifically to discover the influence of directional fluctuations on the gain of rhombic aerials. And his signals seem to have behaved far less drunkenly, as seen in this passage:

"The results of various measurements in the UK . . . may be summarized as follows. At distances up to about 2,000km it is generally possible to distinguish between slow variations (periods of 10min or more) caused by ionospheric tilts, and more rapid second-to-second variations due to small-scale ionospheric and/or ground irregularities. . . . the tilts have an rms magnitude of typically of 1·5° which can give rise to large bearing errors at very short distances but their effect decreases with distance. Bearing variations for single-hop reflections under quiet ionospheric conditions are unlikely to exceed 1°. Under ionospheric-storm or spread-F conditions, this figure may be increased by a factor of two or three . . . bearing spreads of ± 2–3° were recorded on three-hop transmissions over a distance of 6,700km". In fact Dr Bramley argues that bearing spreads would not affect rhombic gain by more than about 1dB—a totally different conclusion from that of Rohde & Schwartz based on Whate's measurements!

When the experts disagree what hope is there for the rest of us? Personally I think that fluctuations on dx signals much greater than those found by Dr Bramley do occur from time to time (I remember Rowley Shears, G8KW, telling me that he noticed this when taking signals from Alaska for the transarctic expedition a few years ago), though possibly the Whate results show that antipodal paths are exceptionally affected. I suspect that it may also depend on the frequency of the signal in relation to muf and whether multiple-hop or chordal hop or even an element of scatter modes are involved, but that is just guesswork.

Ear, ear

Charles Humphreys, GW8GOL, brings to our notice an ingenious technique developed in California to replace the usual headphone/boom microphone combination (or the lightweight system that brings the voice to an ear-mounted transducer along a small acoustic pipe). The basic idea is very simple: use a single small transducer in the outer ear, both as ear-piece to bring the signals in and as a microphone to let you "talk through your ear": Fig 7.

The miniature earpiece functions in the usual way for reception but as a microphone for speech vibrations transmitted through the larynx and oral cavity through the head to the ear regions. It is claimed to pick-up virtually no external sounds unless these happen to resonate with the otolaryngeal system (and even these can be eliminated by additional attenuation). The makers say that it provides good quality speech and can be used with helmets and gas masks and so on.

Various of these "Earcom" devices are being marketed by Lear Siegler Inc of Anaheim, California, and they believe that there are significant differences to the usual concept of bone conduction microphones: Earcom, it is claimed, works

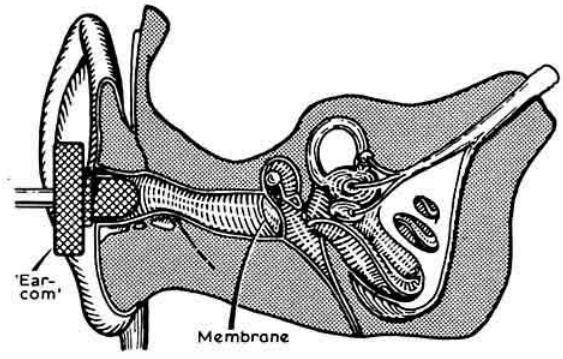


Fig 7. The "Earcom" combined headphone and microphone which picks up vibrations transmitted through the larynx and oral cavity through the head to the ear regions

on voice energy picked up at the ear from the total otolaryngeal system and provides clear, individually recognizable speech.

Of course, whether you speak more sense out of the side of your head than the front, back or off the top depends on you and not Earcom.

"Project Sanguine": dx on 45Hz

Usually I do not comment much on radio communication in parts of the frequency spectrum not available to amateurs, but the American "Project Sanguine" surely cannot pass unnoticed. For it is not every day that one comes across experiments aimed at providing 24-hour world-wide communication with radiated powers of less than 1W; with propagation attenuations of less than 1·5dB per 1,000km; or with signals capable of being picked up well below the surface of the sea. Yet all these wonders seem to be possible at extremely low frequencies—and by that I mean less than 100Hz (yes hertz, not kilohertz or megahertz or gigahertz).

There is a widespread misconception that once you have reached vlf—for example, GBR Rugby on 16kHz, you cannot go much lower in frequency since you would then be in the audio frequency range. This, of course, confuses electromagnetic waves with acoustic waves (an error that will be found in many of the published charts of the electromagnetic spectrum). So let me emphasize that there is no fundamental reason for stopping radio communication at 15kHz or 1kHz or even 100Hz provided that you find some way of launching electrical signals as electromagnetic radiation. Clearly transmitting aerials do not come easy when $\lambda = 3{,}000$km. But if you *can* launch them then you have the same sort of D-layer/earth waveguide propagation that for many years has made vlf stations such as GBR suitable for worldwide communication, but with less and less attenuation/km as you get nearer and nearer to zero frequency (I do not think anyone has yet got round to dc waves or negative "antiwaves" that might give us a whole new spectrum!).

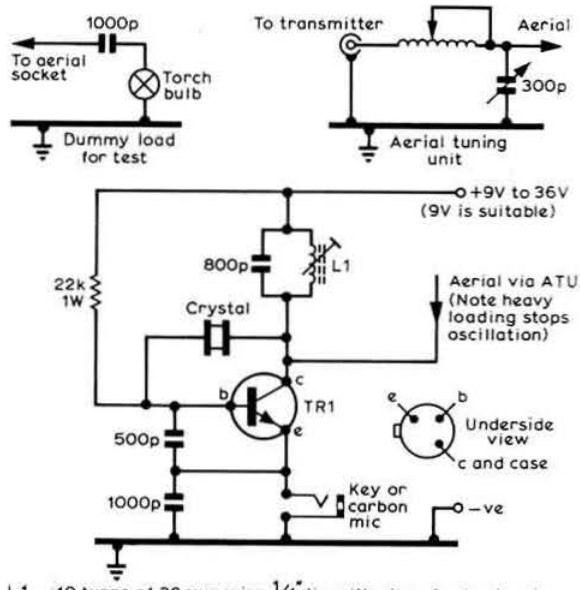
In 1966–67 RCA carried out some experiments using an aerial 176km long (supported on poles) and was able to transmit over a 4,900km path to Iceland on frequencies below 100Hz. Since then Lincoln Laboratory (Mass. Inst. of Technology) under Project Sanguine has used two relatively "short" orthogonal crossed dipoles, each a mere 22·5km long and with the ends grounded (the *poorer* the earth conductivity the better the site) and have been putting decodable signals into Norway, Malta, Saipan and Hawaii on 45Hz and 75Hz. Receivers use air-core loop aerials and the main interference problem comes from atmospherics, although presumably it would be advisable to avoid 50 or 60Hz because of mains radiation. The aerials are so inefficient that the maximum radiated power seems to have been about 0·5W at 45Hz and 1W at 75Hz.

Of course there is a fundamental limitation: you cannot expect to modulate an elf signal with speech or even normal-speed cw. The signalling speed of Project Sanguine was about 0·03bits/s, which I estimate means that it would take about 25min just to send "G3VA" and hardly making for snappy contacts. One gathers that it is conceivable to think in terms of speeding up to about 1 bit/s over a 10,000km path; at least this would let me rap out my callsign in 45s flat!

So I am not suggesting that we should press the RSGB to put in for an amateur elf band but rather that Project Sanguine makes fascinating reading (*Proc IEEE*, March 1974). The test message, just in case you are wondering what you have been getting recently on 45Hz, is *ex scientia tridens* (from knowledge, seapower). I am sure there must be a suitable reply.

Simplest a.m. cw 1·8MHz transmitter?

In *TT* (February) we recently included a simple two-stage 3·6MHz a.m. transmitter used by ZS2D for df hunts. Fig 8 shows full details of an even simpler 1·8MHz rig that Eric Elsley, G3YUR, recommends as a "very, very simple way of getting going on 1·8MHz". Despite the crude modulation technique (simply plugging a *carbon* microphone in the key socket) which tends to result in downward modulation, he gets good reports from up to 10 miles while using only 9V power supply. The arrangement is derived from the 3·5MHz "Optimist" transceiver (see *TT* August and October 1972). With 27V (three PP9 batteries) up to 25 miles range has been achieved. He uses an L-network atu with roller-coaster inductor, tuning for maximum response on a field-strength meter.



L1 ... 40 turns of 32 swg wire, 1/4" dia with slug, for top band
TR1 ... BFY50, 51 or 52 with clip on heat sink

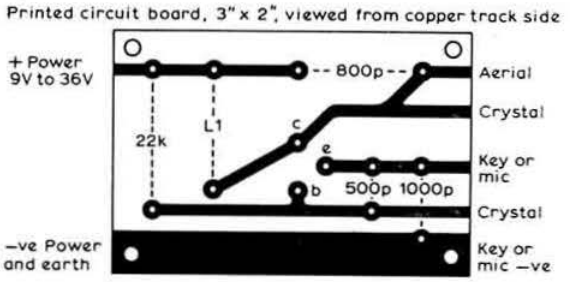


Fig 8. Details of the simple 1·8MHz a.m./cw transmitter built by G3YUQ. With 9V supply it will produce about 0·25W a.m. and about 0·5W cw. About 0·75W a.m. with 27V

Building blocks for the novice

by SVEN WEBER, G8ACC*

Diodes, diodes and diodes — and some experiments with them

(Part 4)

Voltage multipliers

In Part 3 it was shown how a bridge rectifier could be made from two full-wave circuits. Similarly with a half-wave circuit, by placing another diode in the reverse position, giving a negative output, the two combined give an output of about twice the peak input; in other words they become a voltage doubler. As each capacitor is charged on alternate half cycles, so that the output has a ripple of twice the input frequency, this circuit is appropriately called a full-wave voltage doubler (Fig 19). Certain disadvantages with this circuit stem from the common point being half way up the load or capacitor (these should be equal in value), although this construction is useful for feeding operational or other amplifiers. In spite of the circuit being called full-wave, all the disadvantages of half-wave circuits remain: the maximum rms input is still only

$$\frac{V_{peak}}{2\sqrt{2}} = (0{\cdot}353)$$

and the maximum current that should be drawn is only about 80 per cent of the rated I_{diode}. However, one advantage is that the dc currents cancel out in the transformer, so a smaller transformer may be used. Also the centre tap of the load and of the capacitors is at the same potential when balanced, so no current flows along this line which can, therefore, be removed.

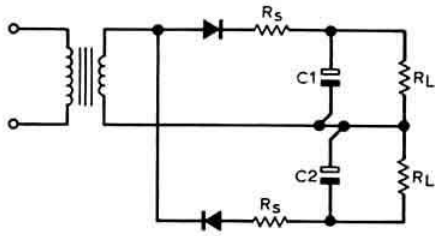


Fig 19. Building up a full-wave voltage doubler

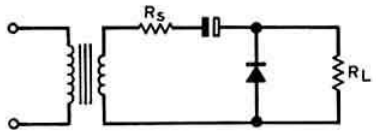


Fig 20. Shunt diode rectifier (half-wave)

If the link between the capacitors and the centre tap of the load is disconnected, the dc current only flows through the diodes and load, consequently a new circuit based on the half-wave circuit of Fig 19 can be made (Fig 20) which is more efficient as regards transformer losses than the original: the capacitor is being charged by the diode and the load discharges it. Care must be taken not to put any extra reservoir capacitance across the load except as in Fig 21, otherwise quite large reactive currents may be drawn from the transformer. Current is current, and power loss due to any resistance is proportional to the current squared, so the transformer could get rather hot if this current were excessive. This circuit is called a shunt-diode half-wave rectifier and is often used for high-impedance voltage supplies such as agc in a receiver.

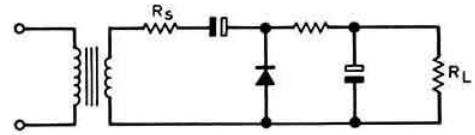


Fig 21. Shunt diode rectifier with reservoir capacitor

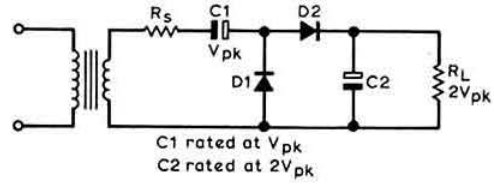


Fig 22. Voltage doubler: shunt half-wave

Adding another diode to the shunt diode, as in Fig 22, alters the effect. On one half of the cycle C1 is charged by D1 and on the other half that voltage is added in series to the voltage of C2 charged by D2 (becoming a very convenient voltage doubler), but C2 is charged only once per cycle, so it remains a half-wave circuit with all its inherent disadvantages The smoothing problems are easier with the earlier full-wave circuit, but the current outputs are in both cases rather limited if anything approaching double voltage is required.

$$\text{If } 2\pi f \frac{C1C2}{C1 + C2} R_{load} > 100$$

and the ratio of load to source resistances is greater than 200:1, the output voltage will not drop below 90 per cent of the full value.

* 132 Murray Road, Rugby, Warwickshire.

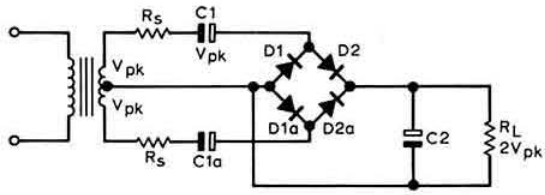


Fig 23. Bridge voltage "doubler", but peak output is no greater than peak input

Combining two voltage doubler circuits, as was done with the two half-wave circuits, to make a full-wave circuit, only results in various versions of a bridge circuit. However, one of these is interesting (Fig 23). The output voltage tends towards the total peak input and the current that can be drawn is not so limited if the reactance of the capacitors is low. This circuit gives an idea of how to get a voltage doubler of somewhat better characteristics by putting two of these circuits back to back. With eight diodes this might be thought rather extravagant, but diodes are cheap and transformers expensive (Fig 24). Complete bridge rectifiers may also be bought in potted form quite cheaply.

As the connection between the two bridges and the transformer centre tap has the same potential (assuming balance between capacitors and diodes), the link between them may be removed since no current flows along it (Fig 24a). But to cope with practical components, the link may be necessary to avoid going above the piv rating for any diode.

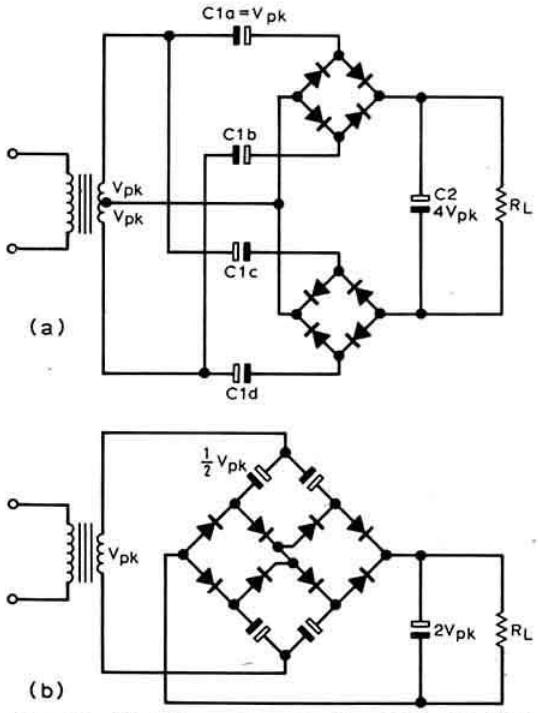


Fig 24. (a) Double bridge voltage doubler. (b) Double bridge doubler redrawn without link from transformer centre-tap

If the rms input voltage is considered as being the total across the secondary, it may be as great as $2\frac{1}{\sqrt{2}}$ (= $\sqrt{2}$ or 140 per cent) times the rated diode piv. Put the other way round, the piv of the diode need only be $\frac{1}{\sqrt{2}}$ times the total rms input, and the capacitors can be rated similarly—which is an advantage over the previous circuits. The output voltage is almost twice the input peak and the current drawn can be 160 per cent of the diode rated figure, although the transformer has to cope with at least twice this value. This circuit is a useful way of getting 2,000V out of a cheap 350-0-350 transformer with 500V piv diodes. The regulation with this circuit is better than that for the simpler doublers and at high voltages than at low. It will stay within 10 per cent of $2 \times V_{peak}$ if

$$2\pi f \frac{C1C2}{C1 + C2} R_{load} > 50$$

and if the ratio of load to source resistance is greater than 100:1. For example, if the source voltage was 700V rms (ie 2×350), all the capacitors were 4μF and R_s was less than 800Ω then the current available before the voltage dropped to 90 per cent (ie 1,800V) would be about 25mA.

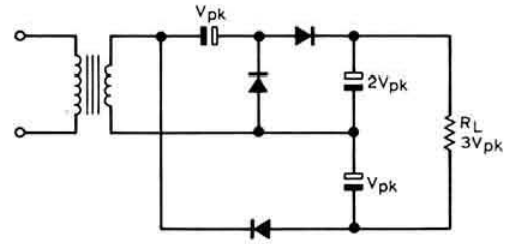


Fig 25. Voltage tripler

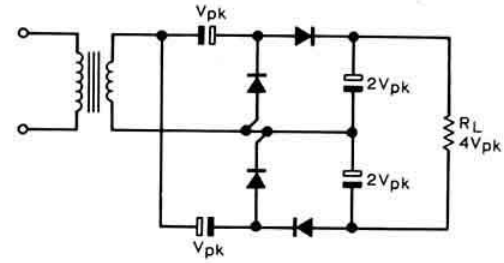


Fig 26. Voltage quadrupler

Multiplying still further: taking Fig 22 and adding on a half-wave circuit as shown in Fig 25 gives a tripler; and if the original circuit is doubled back to front, a quadrupler is the result (Fig 26). This can also be done by altering the input connections as in Fig 27. The quadrupler has the disadvantage of having a higher voltage capacitor in the multiplying circuit than in Fig 26. However, it shows the way to get at will any multiplication factor that is needed. This multiplier chain is the famed Cockcroft-Walton circuit.

Due to the low capacitance and short thermal constant of most sc diodes, they can be easily damaged by transient or surge voltages above the piv. The most common cause is transformer switch on/off surges which can be limited to a

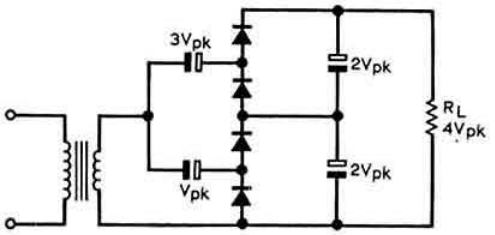


Fig 27. Cockcroft-Walton circuit: voltage quadrupler

safe value by fitting a damped capacitor across the transformer secondary—the capacitor to limit switch-off surges and a damping resistance in series to safeguard from switch-on peaks (Fig 28). The value of C is usually calculated as being

$$\frac{K \times \text{Total transformer VA rating}}{(\text{Diode piv})^2}\ \mu F,$$

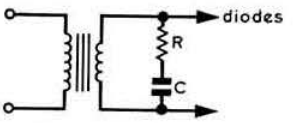


Fig 28. Damping of switching surges

where K is 400 with all stalloy cores and C cores above 200VA and 700 with C cores below 200VA. R is given by

$$38\sqrt{\frac{R_{load}}{C}},\ (C \text{ in } \mu F).$$

These formulas are approximate for 50Hz mains frequency. To be on the safe side it would be advisable to have diodes with their piv rating at least 20 per cent above the expected value.

Voltage stabilization will be discussed in Part 5.

RSGB NATIONAL MOBILE RALLY

Woburn Abbey, Bedfordshire

(Rock Garden site—new location)

Sunday 4 August 1974

From 11am

Attractions will include a large trade exhibition, RSGB bookstall and enquiries stand, grand raffle, Raynet stand, BARTG stand, and a bring-and-buy stand. All will be under cover.

Bring-and-buy rules: (*i*) All items to be marked with vendor's name, callsign, and price expected. (*ii*) All items to be coded "1 of 1", "2 of 4" etc. (*iii*) No item accepted for sale after 2.45pm. (*iv*) All unsold items to be collected by 5pm. (*v*) The RSGB accepts no responsibility for unclaimed items. (*vi*) 10 per cent commission will be charged on each item sold.

The RSGB makes no charge for entrance to the rally but all visitors must pay for entrance to Woburn Park, in which the rally takes place, at the current rate per car irrespective of the number of passengers.

All the normal Woburn attractions will be available at small extra charges. Various bars and cafes are available nearby.

How to get there:

From the south via the M1—Leave the M1 at intersection 13 **not 12 as signposted.** Turn left off motorway and follow signposts through Husborne Crawley to Woburn Abbey.

From the south via the A5—Turn right at Hockliffe and follow the A50 to Woburn.

From the north via the M1—Leave the M1 at intersection 14 and follow the A50 to Woburn.

From the north via the A5—Turn left at A418, 5 miles south of Fenny Stratford, and follow to Woburn.

From other directions make for the points indicated above and proceed as indicated.

Avoid routes signposted to "The Wild Animal Kingdom" or "Game Reserve". The rally takes place in Woburn Park and correct routes are signposted to "Woburn Park" or "The Abbey". Also watch for RSGB signs.

MICROWAVES—1,000MHz and up

by DAIN EVANS, G3RPE*

The GD 3cm expedition

On 25 May GM3OXX walked six miles and climbed the best part of 2,000ft up Snaefell on the Isle of Man with 70lb of 10GHz, 70cm and 2m gear and camping equipment on his back to operate /P from the top. His reward for his efforts were contacts with GW4BRS/P on Snowdon, GM8BKE/P in England and GM3DXJ/P in Scotland, all of which are almost certainly firsts on 10GHz. The actual paths worked are shown in the figure. Also shown is the 243km path covered by GM3OXX and GW4BRS as reported last month. Recordings of the broad-band broad-accent signals from GM3OXX made on Snowdon, from both GM and GD, were played at the meeting reported below. They were very convincing. It was hoped that GI8AYZ would also be on, but he suffered from the local troubles, such as having no electricity to heat his soldering iron and no petrol for transport.

This weekend's efforts now bring the total of countries worked on this band to eight: G–F, G–GW, G–GC, G–GD, G–GM, GW–GM, GW–GD and GM–GD.

A new 23cm beacon

The 23cm beacon GB3DD has been on the air since early May. It was built by the Dunstable Downs Club and is sited on the Downs at QRA ZLO8E. The site is 670ft asl, and the aerial, a 2-element Yagi beaming NNW, is at 135ft. The transmitter is all solid state and produces 18W, and is keyed every 20s with a frequency shift of 800Hz. Its frequency is just below 1,296.05MHz.

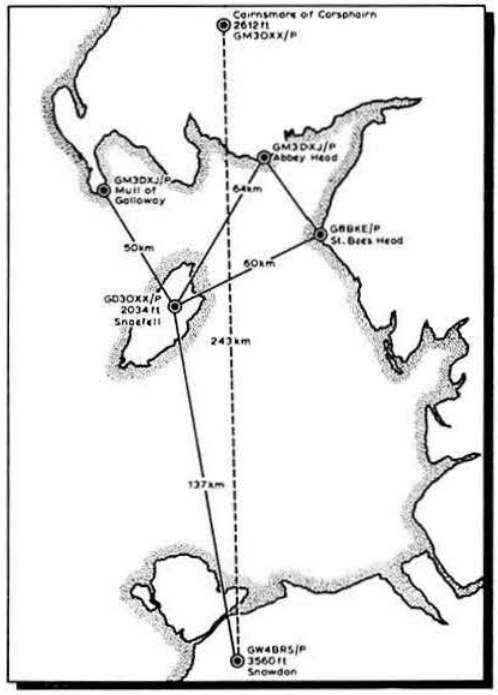
It has so far been heard in Bristol, Cambridge, London, Leek in Staffs, Suffolk, Peterborough and on the south coast. G3JVL, whose Hayling Island QTH is a few feet above sea level, can hear the beacon at all times with a minimum strength of about 8dB above noise in a 200Hz bandwidth. He has noted an early morning lift on many occasions with the signal rising up to 48dB above noise. All reports comment on the excellent stability of the signal which can be copied for hours in a 200Hz bandwidth without the need to retune.

Reports on range of the beacon, both under normal and abnormal propagation conditions, will be welcome. Please send via GB3DD or direct to beacon keeper G3ZFP.

Background material on microwaves

The well-known microwave component manufacturers, Sivers, have produced three booklets called *Microwave experiments* which will be most useful to anyone not familiar with microwave techniques. Most of the components likely to be used by amateurs are covered at exactly the right level of detail, starting with waveguide, klystrons and standing wave bridges and going through to isolators, circulators and YIG filters. The booklets describe not only the basic components but, a most valuable feature, how they are fitted together to perform particular operations and then how to make the relevant measurements. Copies are available from Sivers Lab UK Office, 1a Borehamgate, Sudbury, Suffolk.

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



Paths covered on 10GHz during the recent GD expedition. The broken line represents the 243km path covered on 11 May

EHF allocations

It is understood that the FCC now permits USA amateurs to operate at the following frequencies: 48–50GHz, 71–84GHz, 152–170GHz, 200–220GHz and 240–250GHz, and at any frequency above 275GHz. These bands correspond to those defined as "non-allocated" at the ITU Space Conference in 1971. All the bands fall within regions of fairly low atmospheric attenuation.

A microwave round table

About 40 amateurs gathered on 1 June at the new palatial IBA Engineering centre near Winchester to discuss informally items of current microwave interest. The meeting grew out of a widespread feeling that there simply was not nearly enough time at the VHF Convention in April to meet everyone. It is unfortunate that the desire to fit in this gathering before the June contest left time for little publicity: word of mouth, letters and GB2RS were used and it is hoped that not too many potential participants were missed. It proved to be an enjoyable and constructive day, and thanks are due to the Hayters, Don and Anne, who did all the donkey work. A second meeting has been planned, tentatively for 17 November in the Oxford area.

Main points arising from the discussion next month.

FOUR METRES AND DOWN

by JACK HUM, G5UM*

"Appointed for special function"

Look up the definition of "Committee" in the *Concise Oxford Dictionary* and you will find that it reads "Body of persons appointed for special function by (and usually out of) a (usually larger) body".

That definition fairly describes the two committees whose work does much to chart the course of metre-wave activity in this country today. These committees are the VHF Contests Committee and the VHF Committee. Each is part of a larger body, the Council of the RSGB, and each is answerable to it.

Perhaps the activities of the VHF Contests Committee are the better known of the two, for rarely a month passes without some reference or other to metre-wave contests to come or to the results of those which have gone. Massive occupancy of the metre-wave bands which contests foster can do nothing but good by enforcing high standards of equipment design and of operating expertise. It is pointless to go out on a portable contest foray in a state of blithe unpreparedness, oblivious of the possibility that the gear or the men behind it are unlikely to hold out for the full duration.

Something else which the intensive occupancy of contests provides is a fund of information about propagation quirks simply because so many observers are simultaneously in the field (at times literally). In few other areas of radio is this level of mass observation possible.

The activities of the VHF Committee are less evident, less dramatic but in the long run likely to have a profound effect on the metre-wave scene. On the committee are two Council members: G3FZL (the Committee's chairman) and G3USB. Television is well represented by G6KQJ/T (Malcolm Sparrow is chairman of BATC); so is the Class B licensee's voice by the presence of G8AXA and G8AZU. The other members are G3COJ, G3JHM, G3PSH, G3RPE, with G5UM doing duty as secretary. G3HBW is a corresponding member: his counsels as a long-serving VHF Committee man were sorely missed when he went to South Africa, but at least contact with him is preserved in this way.

Regular agenda items are:

VHF beacons. At each meeting the operational state of the RSGB beacon chain is reviewed, either from on-air observation or from beacon keepers' reports, or both. If unserviceability occurs, beacon keepers advise headquarters at once for broadcast over GB2RS, and also tell the committee. Of major concern is the replanning of the whole 2m beacon network as a result of the introduction of the new band plan. It has been decided that GB3VHF should go on 144·15MHz, and its old equipment, which had given outstanding service for many years, replaced by a new solid-state transmitter. Other beacons to be relocated in frequency are GB3GW, GB3ANG, GB3DM, GB3GM; it is hoped to place them in the band 144·125 to 144·150 (GB3CTC at 144·129 is already in the new beacon zone). New frequencies, though, must be co-ordinated with the rest of Europe, eg HB9HB is to go on 144·125MHz, so great care must be exercised before a final choice is made. As for the 4m beacons, the south coast GB3SX may well be back on the air by now with a completely new transmitter; and to give a better site to the ever-reliable GB3SU, at present deep in the heart of Sheffield, a proposal has been put to the Home Office to relocate it high up on the Derbyshire peaks near Buxton.

UHF beacons. In view of the experimental value of uhf, the VHF Committee has given close attention to these beacons, working actively with groups on the spot. Already GB3DD is in operation on Dunstable Downs on 1,296·05 MHz. Plans are in hand for other beacons on 70cm, probably from Bolt Tail, Devon, and on 3cm from St Catherine's Point on the IoW.

Repeaters. The great success of the GB3PI experiment (every repeater is licensed as experimental) caused many groups up and down the country to decide that they too would like to have a go. It is Society policy in respect of repeaters that very high standards shall be maintained, and each proposal is scrutinized to ensure that it contains a fully detailed technical specification together with justification for a repeater service to be established locally, bearing in mind the area to be covered and the experimental objectives. Hence there is usually a lengthy period of discussion before any proposal is given RSGB approval: only then can the case be put to the Home Office. Their consideration of proposals has been taking six months or more: hence the time scale between the original proposal and the issue of a licence can be as much as a year. It is fair to say that only the most dedicated and competent groups are likely to succeed with repeater applications, but there *are* such groups up and down the country: their efforts will probably result in a gradual growth of the repeater network, including, it is hoped, some devices in the 70cm, 23cm and even 3cm bands. Linear repeaters are also receiving consideration, but as yet no specific proposals have been formulated

Band plans. These are now no longer UK-only but involve consultation with other countries' national societies.

There is also discussion with the membership on this always sensitive subject, and special meetings are called where on-the-spot clarification might be useful.

* * *

Some typical agenda items, then, of great topicality. Usually there are half a dozen more at any VHF Committee meeting; the issue of the latest FMD parchments is one of them (the number issued since the VHF Committee was born more than 20 years ago now approaches 800). All this thriving activity is directed towards improving the lot of the vhf worker; non-members of the RSGB benefit from it, too, even though they pay nothing towards the annual cost of the VHF Committee's budget. Members' subs do.

Because metre-waves are the biggest growth area in British amateur radio today, and the people within it particularly articulate and technically well versed, there is never any shortage of agenda items.

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

The year's biggest contest

This month's "Jubilee" four-bander contest will be a proving ground for the bigger event a couple of months later, VHF NFD, but with the significant difference that in July you can use only one band at a time as against all four simultaneously with four separate callsigns in the September contest. But have you considered dropping 144MHz? This thought has been expressed by more than one group contemplating operation in this year's VHF NFD, who reason that amateur communication "state of the art" is least fostered by monotonous points piling on 2m, and who are put off by the subsequent volume of paperwork entailed.

Look at last year's results, where the winners would still have held their commanding lead without the 144MHz leg! It is conceded that few if any other groups could have afforded to do so, and that in a multi-callsign event, where all four stations are hard at it all the time, the sacrifice of the 144MHz component of the final score would be an unnecessary self-inflicted wound.

Not so in the "Jubilee": aided by a multiplier of five on the 70cm band, a well-equipped all-modes contestant could find enough stations to work in the 24-hour period to maintain a significant lead. If doubts exist that there *are* enough stations to occupy such a contestant for the full time, see last month's comment by the VHF Contests Committee (p. 398) that the overall count of callsigns on 70cm during the spring cumulatives exceeded 300. That is more than some people work on 2m!

"Monotonous points piling on 2m." Is this not what contests are for? There are those around who believe that it is not.

Contest news

Fortunately the fears of G3SHY (*FMD* May) that no telegraphists would be available for the 70MHz Portable event because it clashed with NFD were set at rest when the VHF Contests Committee brought it forward to 2 June. And telegraphists were needed, for this once again was a contest in conditions all too normal, by the sheer accident of the isobars. No key, no scoring points: it was as simple as that. Many of the a.m. portables, wavering up and down in the intense QSB which characterized the contest, will have lost dozens of dx-scoring points through failure to recognize A3J and A1 calls directed at them. On the other hand, there was much cross-mode working between the sidebanders and telegraphists—who in most cases were the same persons.

From 1 July to 30 September, the VHF Contest for Departement 59 (North of France) takes in activity on all bands from 144MHz up. But F1AGY, who is organizing it, makes the point that the French will be using 430-433MHz, 1,220-1,260MHz (the latter well outside the tuning range of most UK 23cm rigs) and 2,300-2,450MHz only by special authorization.

"Now where was I?" again

John Ridd of St Leonards on Sea, G8BQX, does not think that the VHF Contests Committee has knocked QTH absurdities firmly on the head. He feels that it should arrange for British metre-wave contests to conform with IARU Region 1 practice and drop the sending of the QTH altogether.

He believes that blanket locations such as "Hastings" or "8k SE of Lewes" can be misleading, and that pinpoint locations of some favoured vhf sites, although well known, do not appear on some large-scale maps.

It would be useful to have a comment from the VHF Contests Committee as to whether or not the standard locator designation is regarded as being sufficiently precise. The Continentals evidently think it is.

QSL uniformity

Last month's illustration of the novel G8HBR design of QSL has prompted BRS34364, Leo Craven of Alvechurch, Birmingham, to offer the comment that ". . . it amazes me that millions of dull and uninteresting QSL cards are sent across the world only for the senders to wonder why they do not always achieve a reply".

On his own card he includes a potted history of Alvechurch dating back to 780AD, but tells *FMD* somewhat wryly that ". . . one of the problems is getting the printer to do what you want". He paid for rounded corners to his card and never got them, and the text on the info side was not laid out as he asked. Moral: insist on a proof of the final type-corrected version before giving the printer the go-ahead.

Nearby, Tom Rock, BRS32870, produced a QSL carrying an illustration of Birmingham Art Gallery and clock tower, and its attractiveness has brought a good pay-off in replies received.

Down with that dipole

How the dipole-in-the-loft habit established itself for 4m aerials is not clear: probably through people's desire to give the band a try without the need to put up anything elaborate or expensive in the first place, coupled with a belief that a 4m aerial is unduly obtrusive compared with a 2m one.

Condemning oneself to an aerial of unity gain when most roof spaces will accommodate at least a three-element prevents full justice being done to an always interesting band. Why in the roof space, anyway, with its consequent built-in attenuation and distortion of polar diagram?

Note the experience of the professionals at G8PY, the "Pye base station" at Nottingham. Initial operations there on the 4m band were with a dipole at 80ft, but when a 4-el was commissioned at 50ft the improvement was dramatic in spite of the lesser height. Where the dipole failed to lift the receiver squelch on a weak signal on a given lobe-heading, the beam not only lifted it but gave three extra S-points into the bargain.

Few "four meteorites" have the high-mast and high-site advantages enjoyed at G8PY: but even at the average urban location more elements on the 70MHz skyhook—and more air around it—will produce a nationwide range plus more QSOs (especially on A1 or A3J) that will surprise those who hitherto "made do with a dipole".

Mind that varactor

After hearing some of the peculiar noises emitted on 432MHz from stations using varactor output stages, one comes to the conclusion that much more needs to be learned about the device and how to drive it (in both senses). A recent contest was spoiled for many participants by emissions from an ill-adjusted varactor output stage that were audible over a radius of 50 to 60 miles and a tuning range of more than a megahertz (or more, according to where you happened to be sitting). Other stations at other times experience difficulty in achieving any reasonable percentage of modulation when

using the device, to the frustration of the user and of those lying in wait for a mighty carrier to have some voice intelligibility impressed on it.

Those who have hitherto been luckless with varactors on 432MHz would doubtless welcome comments from members who have been more fortunate in setting them up to give good sounding a.m. as well as the more usual fm with which the device seems to be favoured.

In the estimation of many, commissioning varactors is not the easy route to starting on 70cm. What is, then? Why, valves!

Simple starter for 70cm

For the benefit of the many who say "Yes, I'm thinking about 70cm but haven't got round to it yet" it is worth repeating that the simplest route to getting started on the band is to use nothing more than a modulated tripler of the valve type. Pundits decry the technique, but those who attempt it find that it pays off.

Take one QQVO3/20A valve. Equip its input with a typical 144MHz push-pull tuned circuit complete with coaxial link. Equip the output circuit with a pair of copper-rod inductor lines 3in long tuned across the remote ends with a small butterfly capacitor. Feed ht on to them through rf chokes close wound with 6in of 30swg tapped at the mid-point of each line but reposition these for best output once you have persuaded the tripler to deliver rf. Add a simple output loop as described in *Radio Communication Handbook*.

Now apply plenty of drive to the input from a 10W to 15W 144MHz transmitter. Try for 3mA through a 39kΩ grid resistor. When the butterfly output capacitor is rotated to resonate at 432MHz, out comes the rf.

Modulating a tripler is sometimes aided by connecting a couple of 27kΩ resistors across the modulation transformer and taking their centre point to the screen-grid pin of the 3/20A. Cut-and-try the values for most acceptable upward modulation.

By these simple means many a net which now operates on 2m could be transferred with profit (and more privacy) to 70cm, in short order and little cost. Having "tested the water" in this manner the next larger and longer job will be to build yourself a really good transmitter for the band (again see the *Handbook*.) Starting with a modulated tripler is good training for the larger project.

What, then, *is* a larger project? It could be the classical 3/20–into–3/20 design in the *Radio Communication Handbook*, or something even more state-of-the-art than that, eg, a single-sideband transmitter running considerable power.

After the GM foray, what next?

Success in working the GM3JFG/8AGU/P expedition to Scotland last month came to those who commanded plenty of erp on 70cm. Smaller levels of dc input paid off under cw conditions when propagation was right; for example, on the evening of 30 May when the GM team in Kirkcudbright worked 432MHz telegraphists in Berks, Beds and Bucks at a range of 300 miles along a pronounced duct system.

For most of the time high power A3J was essential if GM8AGU/P was to be raised regularly as the team moved across Scotland from SW to NE; an orderly queue formed up on 432·2 to make the most of another superbly operated "AGU/JFG special".

But what happens next? The question comes from G4ALN of Chadwell Heath in Essex. He deplores the fall off in occupancy which follows any popular expedition or contest. Like others, he emphasizes the value of GB3SC, always audible at 105 miles; but more beacon-stations-who-will-talk-to-you are required on 70cm, and many could be using the simple starter delineated above.

Regular activity begets activity, and those who wish to detect some should monitor the G4ALN-ON5FF schedule every Tuesday, Thursday and Friday, 8pm on 432·2MHz with A3J. When it finishes 'ALN methodically pans the beam to N, NW and W and seeks further contacts anywhere in the band, any mode.

Further activity would be promoted, suggests G3KMS of Bolton, if operators returned to the former habit of putting out a call at 9pm every night and repeated the process frequently until the contacts came.

A topical tailpiece from G8FEV of Abingdon: "As I drive around I see that most chimneys sprouting 2m aerials also have their piggy-back (status symbol?) arrays for 432MHz. If the owners of these spent even a quarter of the time operating on 70cm instead of complaining about the supposed lack of activity and dx on the band, they might be in for a very pleasant surprise."

VHF conventions, GM and DL style

If you move quickly you could take in two vhf conventions in September. In addition to the Dundee one on 28 September already announced, there is to be an attractive international event at Weinheim in Germany from 20 to 22 September. A wide-ranging lecture programme covering many aspects of vhf, uhf and shf has been arranged, and although the proceedings will be in German account will be taken of the convention's international flavour and the fact that many visitors will attend from neighbouring countries. Fox hunts on 2m, 70cm and even 23cm are promised, as is a series of social events and a dance.

Further details may be had from the DARC VHF Manager, DJ1XK, at D-7750, Konstanz 16, Im Grun 7, West Germany.

Beacon news

News has just arrived that the crystal to put GB3VHF on 144·15MHz has been received and that tests are about to commence.

News from GC

Many people monitoring the A3J portion of 2m have been intrigued by the appearance on the band of GC3YIZ. He is using a KW2000A into a home-constructed transverter delivering 50W p.e.p. Jim Martin is willing to set up skeds with 2m men at any reasonable time. Write to him at "Bonne Chance", Marais Lane, Vale, Guernsey.

It is worth remembering that Guernsey and Jersey now count as separate countries. Earlier this year the VHF Committee sought the guidance of Council on the status of the two islands in view of their listing in the ARRL Countries List as two countries. The answer was reported in *Council Proceedings* last month that they could be classed as separate countries for FMD Award purposes.

Here is another factor which should persuade people to

beam to the far south more often: GC2FZC of St Peter Port is invariably on the band whenever a 432MHz contest takes place. During the 26 May event the Sutton Coldfield beacon was consistently RST539 at 230 miles range, but the few weak amateur signals heard suggested that nobody bothered to beam GC-wards. Next time perhaps they will—and there are two contest opportunities this month to do so.

...and from GD

Never travel without your 4m equipment. That is Peter Lennard's motto. When a business trip to the Isle of Man occurred, GD3VPS/P was put on to 4m for three nights from a 950ft site near Castletown, to make 40 contacts in 13 counties, most of them to the far south, which was a degree of activity on the "lowest vhf" that gave the lie to the legend that nobody is ever on.

And a hint to "four meteorites" who persist in sticking to 70·26 with neither tuning-off nor bfo facilities: all except 10 of the 'VPS contacts from the island were on cw.

Through the rafters for a "Senior"

Compelled through circumstance to use his 6-element Yagi inside the roof-space of his Nottingham home, Stan Read did not allow this order of attenuation to discourage him from having a go at the 144MHz Senior Transmitting Award for G2ATM. He moved to the present QTH in 1969, which meant that he had to start from scratch: cards collected for an old QTH do not count for a new one.

"Getting the cards in was more difficult than making the QSOs," says 'ATM, as many have said before him. So it took four years before the needful 15 plus 60 tally was achieved. Now Senior No 54 is on his wall.

An analysis of contacts throws light on how intelligent use of several modes brings in the dx. Stan Read is a noted cw man, and may be heard most Monday-telegraphy nights at the bottom end of 2m. So it was not surprising to observe that 16 of the longest haul contacts towards the "Senior" came on the key. When in due course A3J was installed (a KW2000 as prime mover into a TW Phase 2) the collecting rate accelerated. What was notable among the sideband verifications was 15 from the GM8AGU/P expedition to Scotland in 1971. In all there were 26 cards for ssb communication. The remaining 33 were a.m.

Apropos "Seniors", it may be appropriate to remind the metre-wave listening fraternity that Four Metres and Down Certificates are available to them in this category. They are hard to get (so are the QSLs) but represent a challenge which some will feel is worth attempting.

Come to that, one could do with a few more applications for 'Listener Ordinaries'. The keen metre-wave BRS or A man of today is tomorrow's transmitting expert: getting the feel of the bands is best done by the concentrated listening on them which must precede the submission of an FMD claim.

Holiday-time expeditionaries

30 June to 13 July (on now): the Southend Group GM Expedition, using GM8FUF/P on 144·22 and GM8FXB/P on 432·22MHz, visiting Dumfries, Kirkcudbright, Wigtown, Ayr, Renfrew, Bute, Argyll, Dumbarton, Lanark and Peebles but not necessarily in that order, one evening and morning per county, next county to be announced during evening period, receive any mode and operate co-channel or split as required. The early morning plan is to activate 2m from 0700 to 0730 and 0800 to 0830, and 70cm from 0730 to 0800. The evening format is 2m 1900 to 2000 ssb and 2100 to 2130 fm, then 2200 to 2330 ssb, while on 70cm it will read 2000-2100 ssb, and 2130-2200 ssb/fm (all times bst).

26 July onward, Chris Gare will be activating several northern counties for the benefit of 4m operators, Cumberland on 26 July and across to the county of Durham for the 70MHz contest on 28 July, with the possibility of operating in Northumberland on 27 and 29 July. A quick sae to him at 2 The Avenue, Hitchin, Herts, will fix skeds for the night of 26 July after 1800gmt. Callsign G3WOS/P will be heard on both ssb and cw, and possibly a.m.

17 to 24 August: a team from the Lichfield ARS will put GM8FQE/P and GM3NAS/P on to 144·17MHz with high power A3J in several counties of mid and north Scotland, every evening from 1800gmt and early mornings whenever possible. QSLs will be sent automatically via the bureau for all QSOs, says Roger Smethers, G3NLY, the club's hon sec.

Although Huntingdonshire disappeared into Cambridgeshire on 1 April, it will continue to count for FMD Award claims until 31 December. On 17 August it will be activated by the March club with G3PMH/P on 144·2MHz ssb from 1700-2200gmt, transferring to 432MHz on request. On 18 August activity will coincide with the low power contest on 2m. Send an sae to G8BFX for skeds.

What they say

"When you are sending CQ on sideband the distant listener has only your voice peaks on which to turn his beam. It helps him to orientate it on to you if you sustain a steady carrier for a few seconds during the CQ"—G8CUP.

"Tuning over 2m the other night I came across a couple of local stations in QSO. One of them was actually having to *explain* to the other (a not so recently licensed G8-plus-three) all about these peculiar QSL things, how to get them, what they were for and how to send them on. Whatever happened to all those *radio amateurs* who used to be on 2m?"—G3KSU.

"Does the RSGB have a suitable award 'for the advancement of vhf' which Peter Lennard, G3VPS, might be considered for? He has done more than most in keeping the 4m band alive with his many wanderings to rare counties"—G3HBG.

"A QSL card is probably the only written contact between two strangers. The old saying comes to mind 'You never have a second chance to make a first impression' "—BRS34364, Birmingham.

" 'Now where was I?' I was in AK03d. Perfectly clear. Perfectly concise. No wasted seconds. Beautifully timed to match the QSB rate"—G8BQX.

25 YEARS BACK

"The First 420Mc/s Tests. The problem confronting the Contests Committee in organising a 420Mc/s event will be clear to all members familiar with the present state of activity on this new U.H.F. allocation. Scattered throughout the country are isolated groups of members experimenting on the band, mostly with simple equipment, and achieving ranges of anything from a few to some 30 odd miles . . . it was with such thoughts in mind that the Committee drew up its plans for the Society's first U.H.F. contest. . . the contestant submitting the best entry will be recommended for the award of the Arthur Watts (G6UN) Trophy"

RSGB Bulletin, July 1949

THE MONTH ON THE AIR

by JOHN ALLAWAY, G3FKM*

4U1ITU

On 16 May the IARU presented new equipment and furniture to the ITU, and 4U1ITU now has four stations capable of operation on bands from 1·8 to 30MHz. However, the members of the International Amateur Radio Club at Geneva who are responsible for the running of the station are unable to deal with the very large number of incoming QSLs. To avoid further disappointment all QSOs will be confirmed by a QSL despatched through the bureaux, and operators are requested *not to send direct QSLs to 4U1ITU*. During the recent operation on the occasion of World Telecommunication Day more than 1,200 QSOs were made from 4U6ITU. All of these contacts have been confirmed by QSL through the bureaux.

Top Band news

VK3CZ has very kindly sent in a copy of his 160m log for the period 16 January to 16 May 1974. This shows that he had been on the band virtually every day during that period and made the following contacts: G3SZA (25/1), OK1ATP (2/2), G3ZYY and G6CJ (5/2), G3RBP/A (on 6, 7, 8 and 9 February), PA0HIP (8/2), W1BB (21/2), WA8IJI (24/2), JA2GQO, JA1HKP, JA2UEO and JA7NI (17/3), and W1HGT and WA8IJI (both on 21/4). He heard UK signals on 18 days, the last of which was G6KW (?) on 22 March. Art's new trapped vertical is now up and seems to be receiving signals from DHJ comparable to those received on his 260ft dipole.

The latest *W1BB 160 Meter DX Bulletin* mentions that because Loran A is much less accurate than Loran C or OMEGA it is to be phased out by 1 July 1980. A recommendation that the 160m band be restored as an exclusive amateur band in the USA is expected. In the year beginning 1 September 1973 Stew contacted 136 different stations in 45 countries, in the previous year his total was 102 and 32 respectively. He reports trying out the aerial described by G3XAP in *Radio Communication* December 1973, with excellent results. W5RTQ achieved the unusual feat of contacting five continents in one night—only Africa was missing from a WAC.

DX news

To commemorate the 50th anniversary of the Russian amateur radio magazine *Radio*, five amateurs in each of the 10 USSR districts will be allowed to use the prefix "R" rather than the usual UA/UB/UC etc, for 24 hours starting at 2100 on 3 August. A series of USSR stations using the numerals 30 (eg U30R) were in evidence during May and June and their purpose was to celebrate the 30th anniversary of the liberation of Soviet territory from Nazi occupation. It is believed that stations in the UP30 series will be on the air on 13 July. Frequencies have been given as 3,510, 3,648, 7,010, 7,085, 14,010, 14,210, 21,010, 21,310, 28,010 and 28,600kHz.

Readers who may be wondering what has become of INDXA will be pleased to learn that K3RLY is now back on the scene. News of BV2A is that he was given permission to use 100W of ssb as of 18 April and should now be found on 14,218 and 14,025kHz. YK1AA is now retired and has more time for amateur radio; however, he has lost his beam and rotator and INDXA is helping with replacements. A beam is also on the way to VR1AA. Several dxpeditions are being considered and Wallis Is (FW8) is closest to being ready. An up-to-date survey of the QSLing situation for stations for whom the association acts as QSL manager is as follows: VR1AA—current and up to date. CR5AJ—logs slow but usually arrive. VR1AC/KB6CU—no logs received for six months. ST2SA—logs slow. XT2AA—"hates to QSL" but W1AM may be able to help. FY7AF—no problems.

JA8IEV/JD1 will be on Minamitorishima until mid-August and will be on all bands but mostly on 3·5 and 7MHz cw. SM2DWH/S2 was due to close down on 11 June, but further Bangladesh activity has come from PA0IWH/S2 who has been worked on 14MHz ssb; he will be there until June 1975. VS9MHC, VS9MPB and VS9MWH have all been on the air from Gan; QSLs for all three may be sent via G3KDB. 9M8VLC has been recorded as active on 14MHz ssb, he is using an FT101 transceiver and a dipole aerial. Jacky, 3B6CF, is being supplied with a beam by VQ9R and will remain on Agalega Is for another year or so. FR7ZL/T is active once more from Tromelin Is and will be there until the end of July. He operates mainly around 14,095 and 14,137kHz between 1600 and 1900. QSLs go to F8US who only has logs for the period commencing 28 February 1974 (please send three IRCs and sae).

VK9NI has left Norfolk Is and is now VK2RR. VK9RH should have returned from his leave in New Zealand by July. A new station has been reported on the air from Tonga in the form of A35AK who is said to prefer operating on 21,400kHz from 0500, mostly at weekends. VR1PD has been joined on the British Phoenix Is by KH6GKD who is licensed there as VR1PE. Your scribe logged KP6EQ on 14MHz ssb at the end of May, the operator was obviously unprepared for the consequences which followed the breakthrough of his signals into Europe.

Those still looking for a contact with Macao will be pleased to learn that CR9AK has now returned and may be visited by one or more "guest operators" later in the year.

Fred Laun, LU5HFI, whose exploits were described in June *MOTA*, has now returned to the USA and is in better health.

TR1BB was being operated by ON4DE and ON5AZ who were with the Belgian Red Cross in Gabon. At time of writing they were to be found daily at 1100, 1300, 1500 and 1700 on 14,295kHz. It is not known how long this might continue.

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DXCC

Official Bulletin No 482 from ARRL announces the deletion of both Tibet and Zanzibar from the ARRL Countries List. Contacts made after 31 May 1974 with Tibet will count as credit for China, and those with Zanzibar for Tanzania. From 1 July endorsement stickers will be issued in increments of five above the 300 level. (See also *Awards*).

News from overseas

Peter Smith, ex-GW3TJE, has written from St Helena to say that he is now licensed as ZD7PS and will be on the island until May 1975. He will be on all bands 1·8 to 28MHz, mainly on cw, and using a KW2000 transceiver with G5RV and vertical aerials. His location is about 2,000ft asl and reports to date suggest that he should put out a good signal. Peter will QSL all contacts but considerable delays will occur due to the infrequent mail service (see *QTH Corner*).

Contests

The All Asian DX Contests

Rules for these contests were outlined in May *MOTA*. A supply of rule/summary sheets has now been received and copies may be obtained by sending an sae to G3FKM.

The Colombian Contest

0001 20 July to 2359 21 July.

All bands 3·5 to 28MHz, both phone and cw. Single operator single or multi-band, and multi-operator single transmitter sections. Exchanges consist of RS/T plus serial QSO number, starting from 001. Contacts with HK count five points, with other countries two, and with own country one point. Final score is the sum of the QSO points for each band multiplied by the total number of DXCC countries worked. Certificates will be awarded to the leading station in each country provided that this station has made 50 contacts. Use separate log sheets for each band, indicate the country multiplier the first time it is worked, and include summary sheet. Post before 30 September to: LCRA, Concurso Independencia, Apartado Postal 584, Bogota, Colombia.

County Hunters CW Contest

0000 27 July to 0600 29 July.

Stations may be worked on each band and exchange QSO number, category (F=fixed, P=portable, M=mobile), RST, state/province/country and county for USA stations. Contacts with fixed stations count one point, with others three points. Multiply total by number of different USA counties worked. Frequencies to watch are 3,575, 7,055, 14,070, 21,070 and 28,070kHz. Post logs before 1 September to: CW County Hunters Net, c/o W9MSE, 64 N Pioneer Parkway, Fond de Lac, Wis, 54935, USA. (Entrants with more than 100 contacts must include a check sheet of counties contacted.)

Awards

The DXCC Award

In a letter to all IARU societies dated 1 May 1974, W1CW has pointed out that due to increasing costs the ARRL's policy of returning all DXCC applicants' QSL cards by registered first-class mail, even if insufficient (or no) return postage had been included, would have to be changed. From 1 July 1974 all new applications for DXCC must be accompanied by $3·50 or the equivalent in IRCs. This will cover the return postage as well as a DXCC lapel badge and the DXCC certificate. All applications reaching ARRL after 30 June will be held until the applicant submits the necessary amount. For those already holding the certificate, membership pins denoting the fact are now available price $1 plus postage (or equivalent in IRCs).

The Senigallia Marathon and Award

This runs from 15 June to 2400 14 July, on all bands 3·5 to 28MHz, ssb only. Contacts with Senigallia count three points, and may be made with the same station each day on each band. QSOs with I6YF count nine points. Eligible stations include I6s ASH, BKV, CDG, DKI, DVX, GSL, IG, LCP, PCM, PDD, POX, RAQ, TM and YF. Winners in Italy, Europe, and outside Europe categories will receive a week's holiday in Senigallia as a prize. The Velvet Beach 1974 Award will be awarded to anyone who has scored 15 or more points (for European applicants) and encloses 10 IRCs. Send logs to: Sezione ARI, PO Box 41, 60019 Senigallia, Italy. Listeners may also apply for the award.

The DX CPLS Award

Awarded by REP for the following contacts (all made after 1 January 1960)—CT1, CR6 and CR7—five each, CT2 and CT3—two each, CR3, CR4, CR5, CR8 and CR9—one each, PT1 and PY0—one each, and five contacts with each of PY1, PY2, PY3, PY4, PY5, PY6, PY7, PY8 and PY9 (a total of 71 confirmed contacts). Send 10 IRCs to CT1ZR, Ferreira do Zezere, Portugal, and enclose certified list of QSLs.

Dxpeditions

OH2BH, OH2MM, SV1GA, and possibly one other, are expected to be on the air from Mt Athos early in July. At the time of writing no further details are available.

The KP6KR and KP6PA expedition should have taken place between 19 and 26 June. This was to have been mounted by the Northern California DX Foundation and considerable difficulty was expected to be encountered in making a landing. A further expedition by another group has been forecast to take place during September, but some sources say that this group has not been given permission to make the trip.

According to *DX'press* AP2KS is preparing an expedition to Burma and S Yemen. Licences have been applied for.

JA1OCA has been given the callsign C21DX and will be on the air from Nauru in late August. He hopes to be active until mid-September and will have two stations with linears, and aerials will include both beams and dipoles. All bands 1·8 to 28MHz will be covered on cw and ssb. Anyone wishing to make a schedule is invited to write to Isao Numa, Central PO Box 1409, Tokyo, Japan. Last Year JA1OCA/C21 made over 2,000 contacts and hopes to make many more this time.

VQ9D and VQ9BP are considering a visit to Des Roches Is in late June or early July. K5QHS will be in Guadeloupe from 4 to 6 July with an F0/FG7 call, frequencies to be used are mentioned as 14,198 and 14,205kHz but other bands will also be used.

World Telecommunication Day

During the period around this time many stations were on the air with special commemorative prefixes. Some of these are listed below with stations to whom QSLs should be sent.

QTH Corner

A6XG	via OD5GU, P. Randall, PO Box 4393, Beirut, Lebanon.
A6XN	Box 3330, Dubai.
A35AF	Box 19, Vava'u, Tonga.
BV2A	via INDXA, PO Box 125, Simpsonville, Md, 21150, USA.
EI1VGL	P. Bavassano, via Bardoneccia 99, I-10139, Italy.
FG7AO	J. M. Vezina, PO Box 54, Rouyn, Que, J9X 4Y4, Canada.
FM0AYZ	Dr S. Hutson, K5QHS, Box 2588, Hot Springs, Ark, 71901, USA.
HR6SWA	Hal Hoots, 4 Bandera Drive, Bedford, Mass, 01730, USA.
K6JAN/HK0	via W6DAB (see ZF1JN).
IZ3SRL	Box 29, Trieste, Italy.
JA8IEV/JD1	via JA8JL, 237 Fukuzimi, Toyohira, Sapporo 062, Sapporo, Japan.
KC6CW	PO Box 101, Ponape, E. Caroline Is, 96941.
KP6KR **KP6PA**	N. California DX Foundation, Box 717, Oakland, Cal, 94604, USA.
KX6MV	via WA6HRS, PO Box 611, Sunnyvale, Cal, 94088, USA.
PA0IWH/S2	PO Box 681, Dacca, Bangladesh.
TJ1AF	BP 27, Bertova, Cameroun.
VE3AII/SU **VE6CBJ/SU**	via VE1AL, c/o 846 George Street, Sidney, NS, Canada.
ex-VP8KF	J. Wright, G3VPW, Reservoir Cottage, Redhill, Nottingham, NG5 8PE.
VS9MHC **VS9MPB** **VS9MWH**	via G3KDB, 28 Scotch Orchard, Brownsfield Park Estate, Lichfield, Staffs.
XV5AB	G. Johnson, USAID/ETA, APO San Francisco, Cal, 96243, USA.
ZD7PS	P. G. Smith, PO Box 34, St Helena Is, S Atlantic Ocean.
ZF1JN	via W6DAB, 12661 Byron Av, Grenada Hills, Cal, 91344, USA.
3B8Dd	G. R. Smith, G4AJJ, 161 Stepney Road, Scarborough, Yorks.
3D2CC	via VE6AKV, 7612 23rd St SE, Calgary, T2C 0V1, A1, Canada.
5U7AG	BP 210, Niamey, Niger.
9M8VLC	PO Box 908, Kuching, Sarawak.
9Y4AP	A. Papworth, 25 Station Road, Over, Cambridge CB4 5NJ.

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

In each case the special callsign's suffix was "ITU": WO1 (WA2UWA), WS1 (WA2UWA), WT1 (WA2UWA), KD1 (K1ZND), KD3 (WA3PZO), KE1 (K1DAL), KF1 (W1DMD), KJ1 (WA1STN), KK1 (WA1UWC), KL1 (W1RSS), KO1 (WA1PID), KP1 (WA1PID), KQ1 (W1NXZ), KX1 (WA1NXZ), KY1 (W1DGJ), WD2 (W2TUK), WP2 (WA2CCF), WQ2 (WB2GGM), KC2 (WB2EQE), KD2 (Buffalo ARC), KE2 (WA2DHG), KF2 (WB2OEU), KH2 (WA2UWA), KK2 (WA2UWA), KM2 (WA2UWA), KO2 (WA2BCK), KP2 (WA2UWA), KQ2 (LIDXA), KR2, KS2, KW2, KX2 (all to WA2UWA), KY2 (WB2FVO), KB3 (W3CRE), KD3 (WA3PZO), KE3 (K3CR), KJ3 (W3GTY), KK3 (W3KT), KQ3 (W3AZD), KU3 (K3CHP), KW3 (WA2UWA), KX3 (W3AU), WV4 (W4IML), KD4 (W2GHK), KE4 (K4ZA), KK4 (W4WSF), KR4 (K4ZCP), KX4 (W4REZ), KZ4 (WB4SGV), KH5 (W5RTQ), KQ5 (WB5IZN), KR5 (K5PFL), KT5 (WA5LES), KX5 (W5SBX), KY5 (K5RWK), WD6 (WA6FIT), WF6 (W6CUF), WI6 (W6ISQ), WT6 (W6NUT), WW6 (W6KG), WX6 (WA6AUD), WZ6 (W6SC), KD6 (W6LS), KE6 (W6KG), KF6 (W6ANN), KK6 (W6PAA), KO6 (K6SDR), KT6 (W6NJU), KU6 (WA6AHF), KX6 (WB6AGF), KZ6 (W6GBY), KD7 (WA7RRK), KF7 (K7LTV), KT7 (K7NHV), WC8 (WA8TDY), WI8 (W8RSW), WJ8 (WA8GPX), KC8 (K8DYZ), KD8 (K8MFO), KI8 (WB8EUN), KJ8 (K8CJQ), KQ8 (W8II), KY8 (W8SHM), WD9 (W9AES), KD9 (W9MTT), KS9 (WA9LZA), KW9 (K9WEH), KY9 (W9JUV), KZ9 (W9AES), KD0 (K0SGJ), KU0 (WA0TKJ), KX0 (W0PGA).

Brazilian special calls were as follows: PP1 (PY1SQ), PP3 (PY3BDE), PQ7 (PY7ARX), PR1 (PY1SQ), PR2 (PY2ON), PR3 (PY3BXW), PR6 (PY6CO), PR0 (PY2DSE), PS2 (PY2JY), PS5 (PY5OE), PS0 (PY7NS), PU2 (PY2ASA), PU3 (PY7DX), PU6 (PY6AFZ), PU7 (PY7AZQ), PV0 (PY4LW), PW0 (PY4LW), ZV1 (PY7APS), ZV6 (PY6AM), ZV0 (PT1AA), ZW4 (PY4AKL), ZW7 (PY7BQA), ZX1 (PY1BMB), ZX2 (PY2DSQ), ZX4 (PY4KL), ZX6 (PY6TW), ZX8 (PY8JO), ZY2 (PY2FRW), ZY4 (PY4AKL), ZZ4 (PY4KL) and ZZ6 (PY6SB). Other special stations included SK0ITU (SK0CC), SQ0ITU (SP5BB), XJ3ITU (VE3WT), YU0ITU (YU0SRJ) and 8R7ITU (Box 164, Georgetown, Guyana).

Odds and ends

WA0TNW (first licensed in 1967, and formerly /W6, /W4 and DA1SU) is now GM5BCV. His equipment consists of a Swan 400, with a 400ft long wire, three-element wire beam for 7MHz, and three-element quad aerials for 14, 21 and 28MHz. Sully finds many wishing to work the GM5 prefix, and the county of Kincardine.

GC8HT is very active from Guernsey and produces a duplicated sheet showing his times of operation on the various bands from 1·8 to 28MHz. Copies may be obtained by sending an sae to PO Box 100, Guernsey, CI.

G2FPR's callsign is being used by a pirate on 14MHz cw and 21MHz ssb. He only operates on 72 and 144MHz using cw and a.m.

G3WW has been making further progress with sstv and has made a contact with G3YQC while operating /M from his car in motion, he wonders whether this is another sstv "first"? GW3DZJ has already received his own pictures back from Oscar 6 and if /M pictures could be sent by the same route this could be the ultimate in dx /M sstv.

G4CFX has received about 20 QSL cards for contacts he is alleged to have made on 14 and 7MHz ssb. He would like it to be known that he only operates on 144MHz fm.

Band reports

Sunspot activity continues to decline and the recent fine weather has provided alternative attractions for some regular contributors, but many thanks are due to the following for supplying the logs from which this section has been compiled: G2HKU, G4QK, G4RZ, G5JL, G6GH, G3GVV, G3IZJ, GW4BLE, BRS17567, BRS17991, BRS25429, BRS31301, BRS34775, A7785, A8298, A8306 and A8312.

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

1·8MHz. 0000 *VE1MX, W1HGT.*

3·5MHz. 0000 CP1EU, VP8NP. **0500** *ZLs 3FZ, 4IE, 4KF.* **0600** *EA8CG.* **2000** HV3SJ. **2100** JY3ZH, ZS3AK. **2200** EP2VJ, FP8DH, ZS1MH, ZS5LB, 5Z4BZ. **2300** EL7F, PYs, 9G1DY, 9L1JT.

7MHz. 0000 CR5AJ, CT2BG, ZP5AR. **0100** 3D6AJ. **0400** FG7AO, PYs. **0500** HC2TV, *LU1CAB, MIC* (QSL via I4EAT), *W6/W7s*, XE1CCW, ZF1TZ. **0600** CE3ED, VKs, ZLs, 7X2AH. **2000** TR8DG. **2100** ZS6ZE, 7X2MN. **2200** 4W1AF, 9G1DY. **2300** CP8BSS, *FG7AN*, PZ1AP, TF3AW, *VP9GR.*

14MHz. 0200 HC8GI. **0400** AP2AD. **0500** W6/W7s, YS1AG. **0600** FO8s AQ, DO, and EG, HR6SWA, ZK1DX. **0700** *A9XO*, W6LUV/KB6, KH6s, KP6EQ, KS6s, CC, EZ, OJ0MA, ZL4NJ/A, 3D2CC, 5W1AU. **0800** *FO8EE*, KS6EM. **0900** KX6BU. **1200** FP8DE. **1400** DU1EG, 9VIRR. **1500** VS5s LH, MC. **1600** KG6JAR, XU1DX, YB7AAU, 4U6ITU, 9M8VLC. **1700** FB8ZD, XV5AB, YK1KAS, 5U7BB, 4W1GM. **1800** HS1WR, SM2DWH/S2. **1900** SU1MA, 9K2DE. **2000** A6XG, YK1KAS, P29EJ,

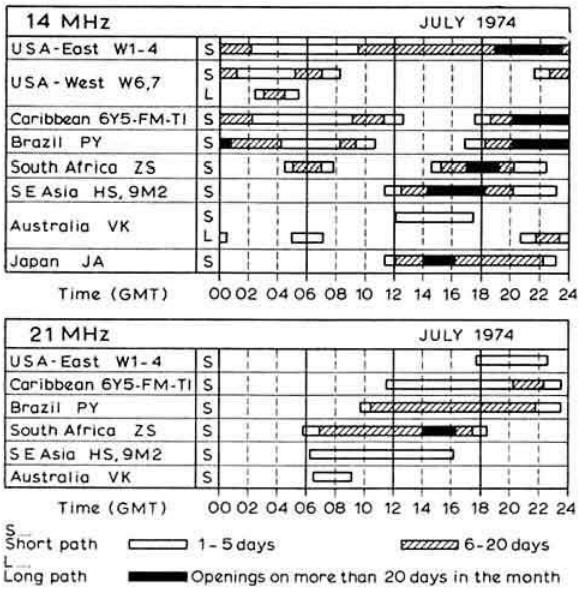
Propagation Predictions

These predictions are by and large the same as for last month. DX conditions on the hf bands are still not favourable. A small compensation will be the more frequent short-skip conditions over distances of about 500–2,000km, caused by sporadic E transmission.

14MHz will remain the main carrier of dx traffic, especially during night time. The possibility of dx traffic via the indirect path is once more pointed out. As it is now winter in the southern hemisphere, traffic with South Africa will cease early. Central African stations, such as those in Zambia and Rhodesia, will be heard longer than those in South Africa. The same applies to corresponding conditions on **21MHz**. There will be no noticeable change on **7** and **3·5MHz** compared with last month.

Readers will have noticed repeatedly that stations in the area indicated are not audible. This is especially the case when the time given does not correspond to the main working period of the dx countries. Contacts will be at their best if the time given in the predictions coincides with the main operating time of overseas stations. This particularly applies to countries with few amateurs.

The mean provisional sunspot number for May 1974 was 42·3 with considerable solar activity occurring during the first half of the month. On five occasions the daily figures exceeded 100. The predicted smoothed monthly sunspot numbers from the Swiss Federal Observatory for September, October and November are 24, 23 and 22 respectively.



ZD7SD, **2100** A9XW, TR8DG, VP2MA. **2200** DU1NRS, PZ9AA, VPs 1PW, 2SG, 2VBG, *2VCE*. **2300** CP5GK, FY7AQ, TA2QR.

21MHz. 0000 VE8ZH, W1/W2. **0100** W8s. **0700** JAs. **0800** JAs, 3D6AJ. **0900** HM1UN, JAs, JY5TMJ. **1100** A51PN, DU8BA, KS6EM, VR4BS, VU2ABV, 3D6AW. **1200** VS6DD, ZS2MI, 5R8s, CU, SD. **1300** FR7ZL. **1400** AP2AG. **1500** A51PN, DU1EJ, KC4AAC, VP8KF, VS5s MC, MP, 3B6CF. **1600** VQ9NLB, VS9MB, XW8BP. **1700** EA9EA, ZS3AW, 6W8ITU. **1800** A9XO, FP8CT, HC1XG (QSL via G8VG), HC9WT, ZD8TM, 5U7s, 5X5NK. **1900** *DU2RA*, FY7AE, VQ9BP, W6s, ZD8KO, *9M2FK*, 9Y4RR. **2000** FG7AO, *FP0VQ*, *LUs*, *PYs*, ZF1SB, 4W1AF. **2100** CXs, HCs, *KG4FX*, *KH6EEO*, Ws, XQ3AL (Chile). **2200** ST2SA. **2300** W1, W2, W0.

28MHz. 0800 *OD5HI*, *5B4AU*. **0900** CR7SK. **1100** CT2BG. **1200** 9J2DT. **1400** OD5AC, PYs, ZEs. **1500** CR6HQ, HV3SJ, PYs, TUs, 4U1ITU, 5X5NK. **1600** HZ1AB, KZ5JM, TR8DG, VP8HZ, VQ9HCS (using 5w.), VQ9R, 5B4BM, 6W8EG, 9Y4EH. **1700** CR5AJ, TJ1EZ, TU2DB, W2HCW, 5U7BA, 9X5JC. **1800** CR4BS, LUs, PYs, 4X4BK. **1900** KV4AD, SV0WKK (Crete), ZF1SB. **2000** CE3PY, CXs, LU7FAG. **2100** HH2IF.

Many thanks to all correspondents and to the following news sources for information obtained therefrom: **World Radio News**, the **DX'ers Magazine** (*W4BPD*), **Long Skip** (*Nick Sawchuk*), the **West Coast DX Bulletin** (*WA6AUD*), **DX'press** (*PA0INA/PA0TO*), the **Ex-G Radio Club Bulletin** (*W3HQO*), **DX News Sheet** (*Geoff Watts*) and the **29 DX Club Newsletter.**

Please send all items for **August** issue **to reach G3FKM no later than 10 July**, and for **September** issue **by 5 August**

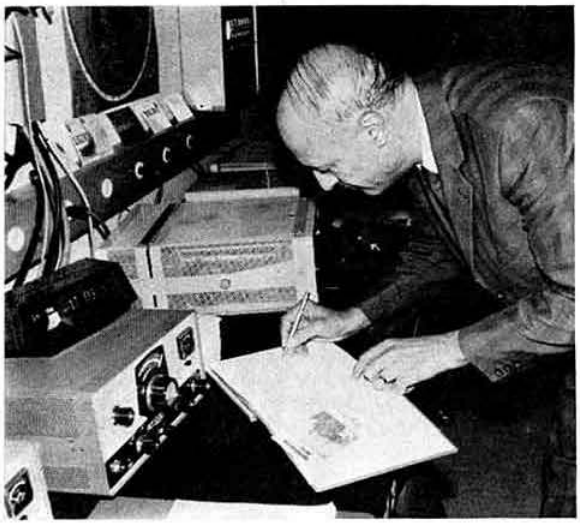
4U1ITU PRESENTATION

4U1ITU is the unique call of the amateur service station located in the headquarters of the International Telecommunication Union at Geneva. Following the building of a new tower block to enlarge the ITU accommodation it had become necessary to move the station to a new location in the headquarters building. It was decided to use this move as the opportunity to provide new furniture and equipment for 4U1ITU. The work involved has not been easily accomplished and visitors to the ITU, as well as members of the IARC, have made considerable efforts.

Mr Noel Eaton signs the 4U1ITU log-book during the handing over ceremony

Their work culminated on 16 May the eve of World Telecommunication Day, when Noel Eaton, VE3CJ, President of the IARU, formally handed over new equipment and

furniture to Monsieur M. Mili, Secretary-General of the ITU. This was accepted by Monsieur Mili with warm thanks and he placed the equipment in the hands of the IARC for its future operation. After the formal ceremony a contact of excellent quality took place between 4U6ITU (the call used on the occasion of World Telecommunication Day) and GB2ITU located at Tonbridge School. Monsieur Mili spoke from 4U6ITU to express his thanks for the greetings transmitted from GB2ITU.



Monsieur M. Mili signing the log-book at 4U1ITU after accepting the station on behalf of the ITU

At the time of this ceremony the World Administrative Radio Conference for maritime telecommunications was in session at Geneva. The opportunity was taken to invite heads of delegations from the conference, and also amateurs serving on national delegations, to a reception held in the ITU building. This was attended by some 160 persons, many of whom took the opportunity to see the new 4U1ITU installation.

The new equipment and furniture for the station was jointly provided by IARU headquarters and IARU Region 1. There are now four operational stations, one of which comprises a Yaesu FT101 transceiver with remote vfo and FL2100 linear provided by Western Electronics (UK) Ltd. Another station intended for the use of visitors to 4U1ITU comprises Heathkit mono-banders for 80m and 20m. The work involved in setting up the new equipment and aerials was an international task shared by radio amateurs from North America and several countries within Region 1.

Special event stations

British Airways
GB3BA will be operative from 28 June to 7 July to celebrate the merger of BOAC and BEA into British Airways. The two main activity days will be 29 June and 6 July, and operations will be mainly on 80m ssb. Special QSL cards will confirm all contacts.

Finchley Carnival, 11–13 July
The Southgate Radio Club will operate GB3SFG on 2m, 4m, 160m and 80–10m in connection with this event at Victoria Park, London N3.

Dagenham Town Show
GB2DTS will be operated by Barking Radio & Electronics Society on the hf bands and on 2m from 1400 to 2200 on 13 July and from 1430 to 2000 on 14 July. Visitors will be welcome at the stations which will be in the marquee at Central Park, Dagenham. An exhibition of past and present radio equipment will be on display. Fun fair and fireworks for the non-amateur visitors.

Scottish Scouts
The Scout HQ station in Scotland , GB3SHQ, will be operational on 80 to 10m and 2m, and possibly 160m, a.m./ssb/cw during the International Patrol Jamborette at Blair Atholl from 16 to 26 July. QSL direct or via GM3OWU.

Sutton Manor High School
During Sutton Manor High School's 75th Birthday Fete on 20 July, GB3SMH will be operated on 20 and 80m ssb and 2m a.m./fm, from 1330gmt to 1800gmt, by members of the school's amateur radio society.

Ounsdale Comprehensive School
This school's fete will also be held on 20 July when GB3OCS will be operational on 2m a.m. and 80m ssb. QSL via G3ZYT, QTHR.

Lytchett Steam Rally
Exhibition station GB3LSR will be operating in conjunction with Lytchett Steam Rally and Old Time Fair at Lytchett Matravers near Wimburne, Dorset, on 20–21 July. Bands: 80, 20, 15 and 10m ssb; 2 and 4m fm.

Polegate Steam Engine Rally
Southgate ARS will be there on 20–21 July with GB2SS hf bands station, and talk-in from GB3SS on top of Firle Beacon from 10am on 2m, fm and ssb, on both days. GB2SS and GB3SS will be linked by rtty. No trade stands. The rally will be held near Wilmington opposite the "Long Man" 2 miles west of Polegate on the A27. G4BCO, QTHR, for details.

Northampton Borough Show
Northampton Radio Club will operate GB3NBS at Abington Park, Northampton, off A45, during the show on 26, 27 and 28 July. Bands 160 to 10m ssb and 2m a.m., fm and ssb. Non-transmitting demonstrations of sstv and rtty also possible. Details from G8GHZ, QTHR.

"Peak '74"
GB3PK will be operational during the Derbyshire Scout and Guide International Camp at Chatsworth Park from 27 July to 3 August, where over 6,000 Scouts and Guides are expected. Bands: 80, 40, 20, 15 and 10m; operators G4BPW, G3GQR, G3LOV, G3IMP. All contacts will be confirmed by a special QSL card.

Brownsea Island Jamboree
Over 600 Scouts and Guides are expected at this jamboree to be held from 20 August to 1 September. GB3BIJ will be operational on all hf bands, and G8FFG/P will operate on 2m.

Looking ahead

3-10 August—GB3RN operational on board HMS *Belfast* in Pool of London.
24-26 August—GB3RN operational during Portsmouth Navy Days.
14-15 September—North-West Amateur Radio Convention, University of Lancaster, Bailrigg, Lancaster.
28 September—Scottish VHF Convention, Region 12 ORM and Zone G Conference, Dundee.
31 October-2 November—Midland National Amateur Radio Exhibition, Leicester.
25 November—RSGB lecture at the IEE.

SWL NEWS

by BOB TREACHER, BRS32525*

Activity

Listeners may be interested to know that the transequatorial 160m tests take place this year during June and July daily between 0000–0030. Stations in the northern hemisphere will call "CQ DX Test" during the first 2½min of each 5min period and southern hemisphere stations will use the alternate 2½min. Europeans and Asians will transmit on 1,825–1,830kHz. W/VE and South Americans will be on 1,800–1,808kHz and ZS on 1,930–1,935kHz. Your scribe will be pleased to publish listeners' findings in a later *SWL News;* also in the next issue will be details of a 10m set listening period which will probably take place at the end of September.

The Cray Valley Radio Society's 6th SWL Contest will take place on 15/16 September. The rules will be published in a future issue of *Radio Communication* but those requiring a copy of the rules and log sheets in advance should write, enclosing a large sae, to Mr C. Henderson, A7460, 76c The Avenue, Beckenham, Kent. The results of the 5th SWL Contest will also appear soon, by which time the winners will have been notified.

This month's mail

Stanley Sharred, A8313, sends in a very full report this month and it certainly seems that he allocates a very large proportion of his time to listening on the amateur bands. His latest acquisitions on 160m cw include VP2EEC, KZ5AA and VP2LBJ, to take his all-time score up to 27. It is unlikely that there are many listeners in G-land who can boast a heard total to better that. Stanley had also heard that during the 160m transequatorial Top Band tests, II4FGM was to be active.

Keeping it in the family is David Sharred, A8312, and the month for him was capped by the 10m openings which produced 48 countries for David. It seems a very useful ploy to make another member of your family interested in the hobby, because in that way you can virtually guarantee that when a new country appears the one using the rig at the time logs the station, calls for his brother who also collects a new one. David mentions VP8NP on Argentine Is, which for DXCC purposes counts as Falkland Is. ZS2MI is the only station active from Marion Is. VQ9HCS is currently on Astove Is and this counts as the Seychelles Is. However, Harry was on Aldabra Is during late 1972/early 1973 and was indeed very active on 15 and 20m.

Irwin Brown, BRS33211, comments that at his QTH the bands had been in terrible shape but the occasional openings on 10m compensated slightly for this.

David Whitaker, BRS25429, now has 198 countries heard on 80m ssb and hopes soon to be celebrating a "double ton" on this band.

Andrew Cullup, A8187, writes from Whittlesey, near Peterborough, for the first time. Andrew's favourite bands are 80, 20 and 15m on which he has heard some good dx signals this year, including XW8, P29, 9M2 and 9M8 all on 20m ssb. Andrew reports hearing A9XO from Bahrain; A9 replacing MP4B.

The ITU contest on 18 May has triggered off many enquiries regarding the location and in some cases the validity of the numerous prefixes heard during the contest. Over 100 different prefixes all using the suffix ITU were active and to give the location and QSL information here would fill two pages. However, briefly, special prefixes were issued to stations mainly in the USA and Brazil to commemorate ITU day. All the prefixes commencing with the letter K or W were in the USA. PP, PR, PS, PU, PV, PW, ZV, ZW, ZX, ZY and ZZ prefixes were all operating from Brazil. Other special ITU prefixes included XJ3 (VE3), 8R7 (8RI). If anyone requires QSL information for any of these callsigns, drop the writer a line with an sae. (See also pp 459-60—Ed)

Terence Rozier, BRS33947, is another first-timer to *SWL News*. Terry has taken the May RAE and is hopeful of passing. If successful he will be active on 2m and will be looking for skeds up to 0200 daily! Terry's main interest seems to lie in 2m and he has an 8-over-8 Yagi at 120ft into an RA1 Sentinel converter and preamp, and he has a Codar T28 for 80 and 160m coverage.

Tony Cann, A7970, writes from St Austell to inform listeners that during the summer VK2AVA has skeds with ON4UN on 80m ssb. Listen around 2030gmt on and around 3,695kHz.

George Viner, BRS33541, comments on his 160m activities. This year, up to when he wrote, George had cw verifications from VP8KF, VXIKE, EP2BQ, 4S7GV and OH1SJ on ssb. He is still waiting for confirmation from VE3 and 4U1ITU. One early morning session produced signals from a WB6 on 1,803kHz, but as he sent the suffix a commercial cw station came on channel and blotted him out. George runs an AR88LF and a Trio 9R59DS into a 180ft long wire at 40ft which, judging by his QSL returns, seems to work out very well indeed.

QRT—Keep the news and comments coming and all being well *SWL News* will next appear in the September *Radio Communication*. Up-dated entries for the table should reach the writer by 2 August.

1974 HF Countries Table

		10	15	20	40	80	160	Total	
1	A8482	42	146	190	110	130	0	618	ssb
2	A8312	48	128	158	82	87	21	524	ssb/cw
3	BRS25429	48	107	152	89	115	9	520	ssb
4	BRS33211	47	94	167	72	105	9	494	ssb
5	A8313	39	116	135	71	84	24	469	ssb/cw
6	BRS25901	10	83	161	71	85	5	415	ssb
7	A8606	13	101	155	49	82	2	402	ssb
8	A8320	0	56	122	59	70	6	313	ssb
9	A7460	25	73	79	78	41	14	310	cw
10	A7317	0	58	100	14	43	1	216	ssb
11	A8187	17	42	99	8	39	1	206	ssb
12	BRS34658	9	40	63	21	23	5	161	ssb
13	A8358	2	21	101	6	13	8	151	ssb

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

CONTEST NEWS

70MHz Open Contest, April 1974, results

The number of entries in this contest, and the comments of quite a few of the competitors, give the lie to the idea that 4m is moribund. The gentle (?) goading of late seems to have had the desired effect, with new converters, VFOs, sideband, and all sorts of state-of-the-art goodies on the band. Nevertheless, the pile-up on 70·26 prompted the suggestion that "they should have a contest all their own"

There were a large number of cross-mode contacts, and this is a welcome feature that could with advantage appear more on 2m. However, not enough a.m. stations "listen own channel" before tuning. Several stations suggested a two-hour ssb only contest, and others want a cw contest, either separately or tagged on to a phone event. The large variety of "stations worked" suggests that there were still stations to work when time ran out—a better state than sitting waiting for the rest to catch up after having worked everything.

The stations out on a limb in GM, West of England, and GI (with one obvious exception!) ask for beams to be turned west, north and northwest, respectively; yet some stations did so and "nothing heard"!

P.W.W.

FIXED SECTION

Posn	Call sign	Score	QSOs	Cnty	Best dx	Km
1	G3NHE	406	61	YS	GI3FFF/P	337
2	G3NEO	376	58	YS	GI3FFF/P	338
3	G3OHH	355	49	SD	GI4DBB/P	370
4	G3XBY	310	57	WK	GI3FFF/P	395
5	G3OQT	221	43	KT	GI3FFF/P	—
6	G5UM	220	40	LR	GI3FFF/P	360
7	G3OIT	215	53	EX	GI3FFF/P	555
8	G3JYP	211	25	WD	G3OBD/P	412
9	G3NPI	182	52	BE	GW4BUC/P	295
	G3EKP	182	25	LE	GI4DBB/P	315
11	G3OJE	181	59	SY	GW4BUC/P	353
12	G3LVP	173	41	EX	GI3FFF/P	555
13	G3YQW	153	47	SX	GW4ABR/P	282
14	G3VHH	148	54	EX	G3XCS	325
15	G3PGN	146	42	EX	GI3FFF/P	535
16	GD2HDZ	142	18	IM	G3OBD/P	405
17	G3HBQ	134	26	SY	GI3FFF/P	570
18	G3ZRF	131	40	SX	G3OHH	270
19	G3FIJ	122	24	EX	GW4BUC/P	385
20	G3WJG	117	37	BS	GW4ABR/P	228
21	G5HD	108	30	WE	GW4BUC/P	285
22	G3OUF	86	22	BS	GI3FFF/P	490
23	G4AAW	84	36	SY	GW4ABR/P	260
24	G3PEN	77	23	EX	G3VPF/P	260
25	G3VLF	69	9	DY	—	—
26	G3XMZ	54	24	SY	G3VPF/P	176
27	G3NFA	46	32	SY	G3TDM/P	105
28	G4AGQ	28	12	YS	GI3FFF/P	327
29	G3TAL	10	6	HE	G3VPF/P	60
30	G3ZYS	8	6	SY	G3OIT	62

PORTABLE SECTION

Posn	Call sign	Score	QSOs	Cnty	Best dx	Km
1	GI3FFF	713	67	AM	G3DAH	605
2	GW4BUC	625	65	CV	G3DAH	428
3	GW4ABR	505	61	RN	G3DAH	340
4	G3TDM	408	74	WE	GI3FFF/P	459
5	G3OBD	385	76	DT	G3JYP	411
6	G3VPS	369	83	SX	GW4BUC/P	384
7	G3VPF	347	63	DT	GW4BUC/P	280
8	G3PFM	343	77	WE	GW4BUC/P	260
9	G3TAA	328	82	KT	GI3FFF/P	560
10	G3IZD	322	80	SX	G3GXI/P	325
11	G3CDG	264	46	GR	GI3FFF/P	425
12	G3KSU	216	46	HE	GI3FFF/P	550†
13	G3ZKE	208	55	EX	GI3FFF/P	520
14	GI4DBB	193	45	LY	G3OHH	369
15	G3RQZ	181	61	SY	GW4ABR/P	260
16	G3GXI	170	28	—	G3VPS/P	354
17	G4ALE	163	35	KT	GW4BUC/P	425
18	G3LCH	97	19	WE	G3GXI/P	255
19	G4AMH	83	35	SY	GW4ABR/P	240
20	G3KIN/A	63	44	SY	G3VPF/P	175
21	G2FJA	58	22	KT	G3VPF/P	240
22	GM4AWB	21	7	SG	G3JYP	205

Disqualified: G3BOC, Rule 14; G3MXH, Rule 14. Thanks for checklogs from: G3YSC, G3ZCI/A and G4CQF.

March 144MHz Open and Listeners Contest

"SSB from GW; Cndx poor; snow wx" should have been the headlines for the portable stations there and others at altitude in G-land. The contest appears to have been enjoyed by most participants despite some comment that the contest has developed into one for ssb with a.m. stations lagging. Bad signal complaints were minimal. Some confusion was caused over the new band plan, especially for the ssb channels of the conversion of transceivers to the lower part of the band. Propagation was generally poor but fair dx was obtained by some stations.

The Mitchell Milling Trophy and certificate goes to GW3UCB/P University College of North Wales Group; GW8BHH/P receives the runner-up certificate. The fixed station G8FOT combined Universities of Manchester Group receives an award certificate; G3MHE, the runner-up certificate. F.M.

PORTABLE

Posn	Callsign	Points	QSOs	Cnty	Best dx	km
1	GW3UCB	1,840	297	DB	FIKJ/P	613
2	GW8BHH	1,571	239	RN	PA0CIS	610
3	GW3FEC	1,528	164	BR	G3AES	350
4	GW3OXD	1,310	209	RN	FIBVH/P	625
5	GW3WAS	1,282	250	DB	G3IOR	300
6	G3WZT	1,126	243	SX	FICLL	665
7	G8GSX	1,079	250	SY	GD2HDZ	456
8	G8FAB	1,001	206	WE	ON4PB/P	420
9	G4BEM/A	874	237	SD	G4BWH	263
10	G4CXJ	798	194	BE	PA0AWL/A	410
11	G8GCC	645	175	SD	FIBHL/P	405
12	G8CXI	641	201	SY	GD2HDZ	430
13	G8FEG	633	154	SX	DC0DZ/P	523
14	G3WRA	604	160	HD	FIBHL/P	210
15	G4APJ	562	143	EX	GM8CNK/P	—
16	G3KIN	546	181	SY	GD2HDZ	431
17	G8ELO	537	159	NH	GD2HDZ	320
18	G8HJH	512	132	DY	G8GCP/P	280
19	G3XZW	506	131	ST	FICVE/A	275
20	G8GIY	475	147	DY	PA0RD	460
21	GM8CNK	468	60	WG	G3WZT/P	480
22	GW3ITZ	464	135	DB	G3WZT/P	306
23	GW8HQA	430	114	MG	G8HSG/P	213
24	G8GCP	421	113	SX	G8FOT	315
25	G8HSG	409	91	YS	GW8BHH/P	415
26	G4BSP	382	123	YS	—	—
27	G3WCB	369	123	OX	G4ARE/P	202
28	G4CAR	361	103	SD	G8FEG/P	256
29	GW8FNC	336	88	MR	GM8DMZ/P	220
30	G3JQA	303	87	YS	G3WZT/P	380
31	G8GPO	300	76	YS	GW3FEC/P	320
32	G8GPR	291	85	WD	G8FBF	300
33	G3NTJ	283	117	LE	G4CQR	290
34	G4CPM	258	84	KT	GW8EHR	280
35	G8HVY	245	78	DT	GW3UCB/P	245
36	GW3ZXD	231	65	MH	G8HSS/P	165
37	G4ARE	226	61	DN	G8GXE	215
38	G8IBB	205	38	YS	G8GSX/P	320
39	G3SAD	199	77	HF	GW3WAS/P	233
40	G3WOA	193	82	HF	GW3UCB/P	230
41	G3OUR/A	185	63	OX	GW3UCB/P	178
42	G8FCV	129	57	KT	ON4PB/P	305
43	G4BYP	109	47	LE	G3WZT/P	325
44	G8DRS	91	37	KT	PA0CIS	155

FIXED

Posn	Call sign	Points	QSOs	Cnty	Best dx	Km
1	G8FOT	833	199	LE	FIBHL/P	495
2	G3NHE	709	163	YS	G8FEG/P	292
3	GD2HDZ	535	67	IM	FICCP	610
4	G4BWH	338	105	KT	GW8BHH/P	315
	G8FBF	338	71	CE	GMCNK/P	450
6	G4AEZ	333	105	MX	G3JQA/P	290
7	G4CWW	332	100	SD	G3BHW	273
8	G3WSC	329	128	SX	F9FT	352
9	G4BWG	289	111	LD	G3JYP/P	385
10	G3OHC	278	70	WK	GM8CNK/P	295
	G8GHZ	278	78	NR	GM8CNK/P	360
12	G8AHK	250	120	SY	G4BEM/A	262
13	GW6TM	243	61	DB	G8FDJ/A	230
14	G4BVE	240	75	LE	G3WZT/P	325
15	G8CMJ	227	62	NR	G8GPR/P	257
16	G8GXE	223	96	BS	ON4PB/P	353
17	G8ERW	222	64	HF	GW3WAS/P	238
18	G8ECO	213	82	SY	G8FOT	255
19	G8FVR	173	78	LD	ON4PB/P	310
	G3LCH	173	85	SY	G8FOT	275
21	G8GVA	162	66	LR	G8AHK	165
22	G8IDZ	148	106	LD	—	—
23	G8CTT	140	66	KT	GW3UCB/P	255
24	G8EEM	136	46	YS	GW3OXD/P	197
25	G8CUB	117	55	EX	GW3UCB/P	270
26	G3VWI	114	41	WK	G3WZT/P	170

Posn	Callsign	Points	QSOs	Cnty	Best dx	Km
27	G8EYC	110	87	LD	G3WCB/P	95
28	G8EFR	103	50	SD	G4CXJ/P	120
29	G8HSX	96	34	NR	GW3WAS/P	130
30	G8GBN	91	61	LD	G8FEG/P	103
31	G3XBM	85	25	CE	GW3UCB/P	242
32	G4CIB	72	22	GR	G3NHE	183
33	G3XFW	68	38	ST	GW3ZXD/P	114
34	G8HVC	63	27	WK	G3JYP/P	220
35	G8BKR	59	33	GR	G3PWJ	115
36	G4BZD	54	24	YS	G4APJ/P	240
37	G8HYH	50	42	KT	G3WZT/P	97
38	G5BDB	43	23	LE	GW8BHH/P	118
39	G3RQJ	34	18	KT	G3OUR/A	110
40	GC3HFN	26	10	GY	G4ARE/P	160
41	G8FBJ	7	5	YS	G8GPO/P	—

Chelmsford DF Qualifying Event results

On 28 April, 20 teams assembled at Great Dunmow to take part in the first qualifying round of the year. On the first transmission good signals were heard from both stations by all competitors, but on the second transmission at 1400 only station A was heard; the reason for this lack of signal from transmitter B is still something of a mystery. The location of station A, G3KPJ/P, was in a small wood close to the A131 approximately seven miles south-east of the start, and the location of station B, G3WMM/P, was on a bridleway approximately five miles north-east of the start. Due to the lack of signal from station B at 1400 hours, all competitors made for station A, and first to arrive was B. Bristow at 1431, quickly followed by seven other teams in the next five minutes. All competitors successfully located this station.

To the relief of the operator of station B, the arrival of Terry Haywood at 1525 confirmed that the signal was in fact audible to competitors but Terry had not signed in at the start and was just taking part for the practice. After a few minutes the sound of further competitors was heard, and the first official contestant, Ian Butson, located the transmitter at 1530, followed very closely by Bill North and Trevor Gage.

From the 19 entries, 17 teams located both stations. Ian Butson was presented with the Mid-Essex DF trophy as the highest placed entry from the Colchester, Chelmsford or Laindon radio clubs. Subject to confirmation, I. Butson and W. North go forward to the final. The event was organized by M. Hawkins on behalf of the Chelmsford club.

			Time of arrival	
			Station	Station
Posn	Name	Club	A	B
1	I. Butson	Chelmsford	1437½	1530
2	W. J. North	Chiltern	1434	1531
3	T. C. Gage	Oxford	1433	1532
4	B. M. Bristow	Oxford	1431	1545
5	M. Easterbrook	Dartford	1449	1550
6	J. Everist	Dartford	1432½	1601
7	R. J. Parsons	Essex University	1458	1604
8	G. Foster	Stratford-on-Avon	1435	1604½
9	G. A. Whenham	Coventry	1506	1604½
10	E. L. Mollart	Oxford	1448	1605
11	D. F. Beattie	Chelmsford	1436	1605½
12	W. L. Pechey	Chelmsford	1438	1605½
13	P. G. Wells	Dartford	1525	1606
14	P. Hudson	Dartford	1524½	1606½
15	C. D. McEwen	Crawley	1432	1615
16	D. E. Newman	Rugby	1524	1615½
17	P. Tyler	Oxford	1500	1617
18	G. N. Coleman	Colchester	1452	—
19	P. Woollett	Dartford	1601	—
*	T. Haywood		1433½	1525

* Unofficial entry

South Manchester DF Qualifying Event results

On 19 May, 11 teams assembled at the start, a lay-by near Crewe. The weather was sunny and warm, and both transmitters were received at good strength. About half the teams selected station A first while the remainder chose B.

Station A, G3FVA/P, operated by Dave Holland, G3WFT, from the middle of Wrinehill Wood, was well hidden under thick brambles and branches. The aerial was in the form of a giant letter H, 400m long, with the transmitter connected along the centre span. This produced some very unusual results with competitors' df sets; one competitor wandered away from the tx every time it went on the air and another problem was to find the way out of the wood. First in were Trevor Gage and George Whenham at 1445, followed by Mike Hawkins at 1504. Most competitors wandered around a long time before getting in.

Station B, G3UHF/P, operated by Ron Smith, G3SVW, was even more of an endurance test, being located at the top of The Cloud, about 340m high. The transmitter was hidden under rocks next to cliffs, and used an inconspicuous fine-wire aerial. Competitors had a long uphill run to get into the vicinity of the transmitter, and most arrived in various stages of exhaustion. First in was Derrick Newman at 1501 followed by Phil Williams at 1525.

Station A was about six miles from the start, Station B about 14; the road distance between was 24 miles.

			Time of arrival	
			Station	Station
Posn	Name	Name	A	B
1	T, C. Gage	Oxford	1445	1605
2	M. P. Hawkins	Chelmsford	1504	1617
3	G. Whenham	Coventry	1445	1620
4	E. L. Mollart	Oxford	1641	1504
5	D. E. Newman	Rugby & Slade	—	1531
6	P. M. Williams	Slade	—	1525
7	D. Kennedy	Goole	1540	—
4	C. Scholefield	S. Manchester	1541	—
9	J. R. Vickers	Stratford	1554	—
10	J. McBurney	S. Manchester	1623	—

One competitor failed to locate either transmitter.

M. P. Hawkins qualifies for the final under Rule 1 as last year's winner, and G. Whenham is excluded as joint organizer of the 1974 final. Subject to confirmation, T. C. Gage and E. L. Mollart qualify for the national final.

144MHz QRP Contest Rules

Date: 18 August
Times: 0900–1700gmt

All entries and checklogs to: VHF Contests Committee, c/o G8ACJ, "Easedale", Woodway, Merrow, Guildford, Surrey GU1 2TF.

The following general rules, published in the January 1974 issue of *Radio Communication*, will apply: 1, 2, 3, 4b, 5a, 6a, 7a, 8b, 9a, 10a, 11–26.

The maximum dc input to the final stage must not exceed 1W, as defined by the terms of the licence: the maximum p.e.p. output on A3J is thus 2⅝W.

1,296MHz Cumulative Contest rules

To assess the demand for a 1,296MHz Cumulative contest in 1975, a trial run will be held on the three weekends between VHF and UHF Field Days.

Dates: 15, 22, 29 September
Times: 0900–1200gmt

All entries and checklogs to: VHF Contests Committee, c/o G8ACJ, "Easedale", Woodway, Merrow, Guildford, Surrey GU1 2TF.

The following general rules, published in the January 1974 issue of *Radio Communications*, will apply: 1, 2, 3, 4b, 5b, 6b, 7a, 8b, 9a, 11–26. 10b.

Only the best activity period will count for the final score, but please send in logs for any other periods so that activity can be assessed. Rule 10b is otherwise unchanged.

DF Qualifying Round—Stratford-upon-Avon

Date: 21 July 1974.
Map: OS Sheet 151 Stratford-upon-Avon new 1:50,000 series.
Assembly: 1300bst for start at 1320bst.
Location: On Edge Hill, NGR 380480.

This event is being organized by members of the Stratford-upon-Avon Amateur Radio Society, and intending competitors are asked to notify Mr I. A. Cobbold, G3RPJ, 184 Loxley Road, Stratford-upon-Avon, Warwickshire, of the numbers in their parties requiring tea, as soon as possible and not later than 12 July.

DF Qualifying Round—Oxford

Date: 4 August 1974.
Map: OS Sheet 164, Oxford new 1:50,000 series.
Assembly: 1300bst for start at 1320bst.
Location: East end of Shotover Plain 1½ miles west of Wheatley NGR 570064.

This event is being organized by members of the Oxford Radio Society, and intending competitors are asked to notify Mr R. Pearce-Boby, 63 Bartlemas Road, Oxford G3JLE, telephone Oxford 46329, of the numbers in their parties requiring tea, as soon as possible and not later than 27 July.

RSFB 21/28MHz Telephony Contest rules

The following amendment has been made to the rules published on p328 of the May issue.

General

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

6th BARTG VHF RTTY Contest

When: 1700–2300gmt 14 September and 0600–1200gmt 22 September 1974.

Eligible entrants: Licensed amateur radio stations within Zones 14 and 15 who are permitted to use rtty as a mode of operation. Portable operation will be allowed but must be from one location for the duration of the contest. Contest logs from short wave listeners will also be very welcome.

Bands: 144MHz and 432MHz bands.

Messages will consist of: time of start of contact; time in gmt and to consist of full four figures; RST report, normal three-figure system; Message number consisting of a three-figure number starting with 001 for the first contact made; QRA Locator (Standard five-symbol locator) or QTH given either as a town or as a bearing and distance in kilometres from a town. The town must be capable of identification on a normal tourist road map.

Points: All two-way rtty contacts will score in accordance with the distance chart shown below:

Band multipliers as follows:

144MHz band × 1; 432MHz band × 6.

Distance:

0–50km	scores 1 point	250–300km	scores 11 points
50–100km	„ 3 points	300–350km	„ 13 „
100–150km	„ 5 „	350–400km	„ 15 „
150–200km	„ 7 „	400–450km	„ 17 „
200–250km	„ 9 „	and pro rata	

Scoring: If both bands are used the two scores will be added. Portable station scores will not be listed separately

Logs: Use one log per band. Logs to contain the following: date, time of start of contact, RST report, message number, callsign of station worked, his RST and message number, QRA or QTH received, estimated distance and points claimed

ALL LOGS MUST BE RECEIVED BY 28 OCTOBER 1974 TO QUALIFY.

Awards: Certificates will be awarded to the top scorers and runners-up in each country. The judge's decision will be final and no correspondence can be entered into in respect of incorrect or late entries.

Send your logs to: BARTG VHF Contest, c/o Eric Yeomanson, G3IIR, 32 Gaynesford Road, Forest Hill, London SE23 2UQ, England.

1974 National Amateur Television Contest result

Posn	Callsign	Points	QSOs	Best dx	Km
		Section A			
1	G6KQJ/T	1464	19	GW6AGR/T	110
2	G6ACR/T	732	8	GW6AGR/T	130
3	G6AHJ/T	682	9	G8HNN/P	58
4	G6AGT/T	234	4	GW6AGR/T	90
5	G6ADS/T	164	8	G6GDR/T	18.5
6	G6AEC/T	160	3	GW6AGR/T	42
7	G6AJL/T	136	7	G6AGG/T	18
8	G8AJP/T	134	7	G6AGG/T	20
9	G6AJN/T	120	6	G6AGG/T	24
10	G6AHK/T	7	1	G6AHE/T	3.5
		Section B			
1	GW6AGR/T	1820	9	G6KQJ/T	110
		Section C			
	G8HNN/P	665	10	G6AIE/T	102

Although there was an increase in activity this year the number of entries is still disappointing. Certificates of Merit go to the leading stations in each group. BK

Contests calendar

6-7 July	—"Jubilee" VHF/UHF & SWL (Rules in June issue)
13-14 July	—SSB Field Day (Rules in March issue)
21 July	—432MHz Open (Rules in June issue)
21 July	—Stratford-on-Avon DF Qualifying (Rules in July issue)
28 July	—70 MHz Open (Rules in June issue)
4 August	—Oxford DF Qualifying (Rules in July issue)
18 August	—144MHz QRP (Rules in July issue)
24-25 August	—All Asian DX (CW)
1 September	—Dartford Heath DF Qualifying
7-8 September	—VHF NFD & SWL (Rules in March issue)
14-22 September	—6th BARTG VHF RTTY (Rules in July issue)
15 September	—80m Field Day
15,22,29 September	—1,296MHz Cumulative (Rules in July issue)
22 September	—DF Final—Coventry and Rugby
5-6 October	—UHF NFD & SWL (Rules in April issue)
5-6 October	—VK/ZL/Oceania (phone)
12-13 October	—VK/ZL/Oceania (CW)
12-13 October	—21/28MHz Telephony (Rules in May and July issues)
October	—Start of 70MHz Cumulative
October	—Start of 432MHz Cumulative
19-20 October	—7MHz CW (Rules in June issue)
20 October	—432MHz SSB
2-3 November	—7MHz Phone (Rules in June issue)
2-3 November	—144MHz CW
9-10 November	—Second 1·8MHz
8 December	—144MHz Fixed

Mobile rallies calendar

7 July—Longleat MR.

14 July—South Shields MR, Redwell School, Prince Edward Road, South Shields. Organized by SS & D ARC; details from G3SFL, QTHR.

14 July—Anglian MR, Stanway School, Colchester. (Details in this issue).

21 July—Cornish Radio Amateur Club MR, Cornwall Technical College, Pool, Redruth. (Details in May issue).

21 July—Polegate Steam Engine Rally. (See under Special Event Stations in this issue.).

4 August—RSGB National MR, Woburn Abbey.

11 August—Torbay MR, Newton Abbot Rugby Club ground. (Details in July issue).

11 August—Derby MR. (Details in July issue).

18 August—Preston ARS MR. (Details in July issue).

18 August—Bromsgrove Mobile Picnic. Organised by Bromsgrove & DARS. Avoncroft Museum of Buildings.

29 September—Peterborough MR, Walton School. Talk-in on 160m and 2m. Details from G8GNV, QTHR.

NOTE: The Wessex rally scheduled to take place on 21 July has been cancelled.

NOTE: The date of the South Shields rally has been changed to 14 July.

NOTE: The Saltash MR scheduled to take place on 18 August has been cancelled.

NOTE: The date of the Peterborough rally has been changed to 29 September.

Mobile rally news

Northern Mobile Rally report
The new venue at Victoria Park Hall, Keighley, proved to be very popular with visitors to this annual rally organized by Otley Radio & Electronics Society on 19 May. Fifteen traders attended, children enjoyed the cartoon films, A. R. Bailey, G3IBN, won the best mobile rig contest, and D. Kitson, G3TRK, won the Number of Components in the Jar competition.

Part of the large crowd which attended the Northern Mobile Rally. *Photo: C. Cooper*

Anglian Mobile Rally, 14 July
At Stanway School, Stanway, Colchester. Organized by the Colchester and Ipswich radio clubs. Talk-in station GB3AMR on 80m and 2m. To be opened by Anglia TV personality Dick Graham. Plenty of traders and entertainment for the family.

South Shields Mobile Rally, 14 July
To be held at the Redwell County Secondary School, Prince Edward Road (A1300), South Shields, and organized by South Shields & District ARC. Talk-in stations on 160m and 145·8MHz. All the usual attractions. Further details from F. Harrison, 42 Woodlands Road, Cleadon, Sunderland.

Torbay Mobile Rally, 11 August
Organized by the Torbay ARS, this rally will be held at the Newton Abbot Rugby Club ground. Talk-in on 1,862MHz by G3NJA/A and on 2m by new club call G8IUI (145.0) from 10am. Display by the Army of radio and signals equipment. Competitions, trade stands, refreshments and bar facilities.

Derby Mobile Rally, 11 August
To be held at Rykneld Schools, Bedford Street, Derby, from 12 noon. Talk-in stations G3ERD/A on 160m and G2DJ/A on 2m operational from 11.30am to 3pm. Brass band concert, children's competitions, tombola, club stand, junk sale, trade stands, refreshments. Further information from Tom Darn, G3FGY, QTHR, tel Ripley 2972.

OBITUARIES

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

Mr A. Ashfold, GW5AB
Albert Ashfold, a member of the RSGB since the 'thirties, died on 25 May. Until some months ago he was continuously active on all bands down to 2m, and was well known in the South Wales and Somerset areas.

Mr M. A. Brett, G3HBE
Maurice Brett died on 29 April at the age of 54. He was a long-time member of the Midland ARS and was responsible for organizing the first RAE course in Birmingham. He was active on 80m and was particularly interested in WAB.

Mr F. V. Evans, G3BCK
Fred Evans died on 27 May aged 56. He was a long-standing member of the RSGB, and was a QSL sub-manager for many years up to the mid-'fifties.

Mr J. Hudson, G4NS
Jim Hudson died on 22 May aged 65. He was a popular figure on 80m phone where his voice was well known to old timers and newcomers alike.

Dr W. E. O. Parker, G6BY
Bill Parker died on 5 May in his early 70s. A member of Weston-super-Mare RS, he was well known on 80m and especially on 20m in the USA where he had a daily contact for a year with a station in Boston.

Mr D. Phillips, G2BAT
Dave Phillips died on 1 May at the age of 67. He had been interested in amateur radio since the 'thirties and operated on the hf and vhf bands. He was a member of both Falmouth and Salisbury radio clubs.

Mr H. W. Pope, G3HT
Bill Pope died on 8 May at the age of 84. He was licensed as PZX in 1911, was a sea-going operator for several years, and had been associated with the wireless/radio industry nearly all of his life. Bill was a founder member of the Edgware & District Radio Society and served on the committee of that society for many years. He had also served on the RSGB HF Contests Committee and always took a great interest in Society affairs. Bill was always willing to help younger members, many amateurs obtaining their licences through his patient tuition and consideration.

Mr L. Saunders, G3NEA
Len Saunders died on 26 April aged 68. A past member of Bristol RSGB Group and a member of Weston-super-Mare RS, he was very active on the hf bands.

Mr N. Turner, G4NT
Norman Turner died on 29 April at the age of 63. He was chairman and managing director of Ernest Turner Elecrical Instruments Ltd. First licensed in 1939, G4NT was active on all bands either from his works or his home QTH or from the mobile rig in his car. He ran a daily net with F6AYF, VE3BXZ, VE2JS, VP9K, 8P6AZ, 8P6EX, and last but by no means least 8P6BC with whom he had no fewer than 2,011 QSOs. He was president of the Chiltern Amateur Radio Society and a staunch supporter of amateur radio; many will remember his enthusiasm and generosity in the popular series of Norman's Hamfests held at Chiltern Works from 1946 to 1968.

REGION 15 ORM REPORT

A well-attended Official Region Meeting was held on 11 May at the Windsor Hotel, Holywood. Talk-in facilities, which proved very helpful to those visitors travelling through Belfast, were provided on 2 and 4m by the Bangor & District ARS, GI3XRQ.

The chairman, RR Jim Thompson, GI3ILV, opened the proceedings by welcoming the President, Mr G. R. Jessop, G6JP, on his first visit to Northern Ireland, and Mr D. A. Findlay, G3BZG, general manager, for the second time within a year.

Mr Jessop said how pleased he was to visit GI and to report to the meeting on the excellent progress made by the Society in recent years. He closed by throwing out a challenge for the future: "We must devise means to attract more people to participate in our activities."

Mr Findlay recalled his previous visit less than a year ago when he represented the Society at the Marconi Kemp 75th anniversary celebrations at Ballycastle. He paid a warm tribute to the organizers of the event and to those who had participated to make it the great success it had been.

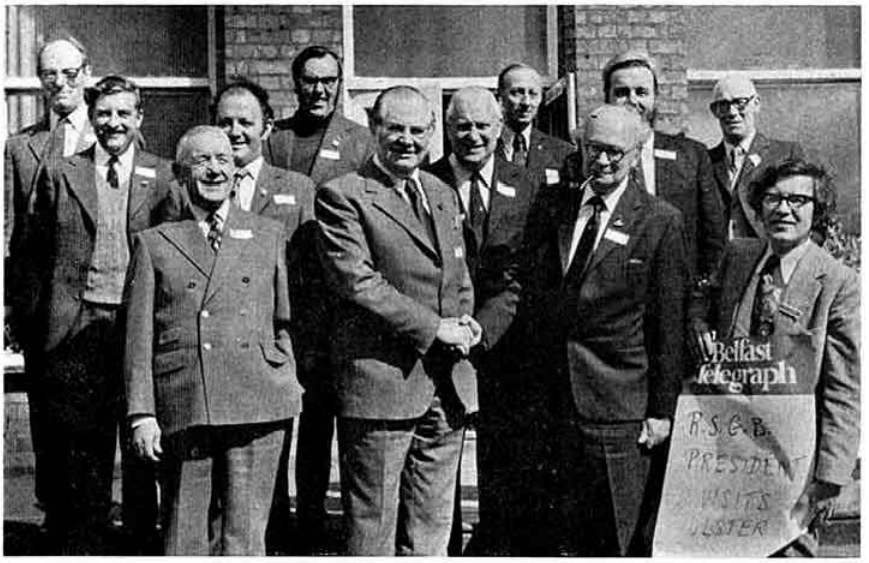
"The Mid-Ulster Group with 50 members was in a healthy state," Ivan Gracey, GI3WEM, was able to report, and continued "there was always an interesting programme at the meetings held on the first Sunday of each month."

Ian Kyle, GI8AYZ, represented the new North Ulster Group formed only two months ago with 25 members, and already plans were being made to hold a mobile rally in September in the Antrim area.

Ron Parsons, GI3HXV, spoke of his 10 years as sub-manager of the GI QSL Bureau, made possible only by the wholehearted support of his xyl in dealing with the incoming and outgoing mails.

The GB2NI 2m beacon had been on the air for two years, and Hugh Irvine, GI3TLT, said that it would be replaced within a matter of weeks by a new one using the most modern design techniques and a lot less electricity!

Eddie McNally, GI3SXG, reported that RSGB Slow Morse transmissions would be started by him in the near future, probably on 3·5MHz.



Northern Ireland RSGB officers meet the President and general manager

Welcoming RSGB President G. R. Jessop, G6JP, to the Region 15 ORM is Zonal Manager Bill McGonigle, GI3GXP, with (from left) Eddie McNally, GI3SXG, (slow morse); Jim Thompson, GI3ILV, RR Region 15; Syd Foster, GI3GAL, (news reader); Hugh Irvine, GI3TLT, (beacon keeper); Terry Barnes, GI3USS, AR Belfast Group; Doug Findlay, G3BZG, RSGB general manager; Ron Parsons, GI3HXV, QSL submanager; Howard Campbell, GI8FOK, deputy RR; and extreme right, Ian Kyle, GI8AYZ, AR North Ulster Group (with a "bill" from the local evening paper)

Photo: GI3GTR

In making references to the forthcoming world frequency conference in 1979, Doug felt this would be perhaps the most important conference for amateur radio in the lifetime of the hobby and said that now was the time to prepare ourselves to hold the band allocations we had at present. To this end he felt that we must make as much use as possible of all our frequencies and maintain as high a standard of operating as possible. Doug then expressed the sincere thanks of the Society to the GB2RS news readers who, week after week, year after year, faithfully and selflessly provided a great service to amateurs. He noted that Syd Foster, GI3GAL, had just completed 10 years' service.

In calling upon Bill McGonigle, GI3GXP, Region 15 Zonal Manager to address the meeting, Jim Thompson felt he spoke for all in GI in thanking Bill for his excellent work on behalf of the amateurs in the province; it was fitting that he should be representing them for a second term on Council. Replying, Bill said that it was a great honour and pleasure for him to hold his present office. He always strove to give the best impression of GI and would continue to give all the help and encouragement possible to the movement.

Then followed reports from the three RSGB groups in GI. Terry Barnes, GI3USS, for the Belfast Group said that in spite of having to change venues three times in recent times the monthly meetings were still well attended and indeed the numbers were up on some years ago.

To round off the reports, Syd Foster, GI3GAL, the GB2RS news reader in GI, said that the Sunday morning stint was not a chore for him and he particularly enjoyed the sked afterwards for reports, which now lasted over an hour, such was the following in GI, EI, GM and the North of England.

GI3ILV then thanked all those who had presented such excellent reports on the state of the art in Northern Ireland and took the opportunity of thanking Howard Campbell, GI8FOK, deputy RR, who had made all the arrangements for the ORM.

An open question and answer session followed when a wide range of subjects of interest to the members were discussed, ranging from repeaters to the future of amateur bands; and from contests to the problems of mobile operating in GI during the present security situation. This last item produced a lot of discussion and ideas, with the RR and ARs agreeing to take the matter up with the appropriate authority to see if a solution could be found.

Over 60 members and their wives attended an informal dinner in the evening when all had the opportunity of meeting the President and Doug in a relaxed atmosphere, and some over-the-air friends for the first time. The fact that the "party" ended well after midnight is sufficient evidence of a very successful Region 15 ORM.

It is pleasing to report that a draw held during the afternoon session resulted in £10 being sent to the RAIBC.

GI3GTR.

YOUR OPINION

The Editor
Radio Communication

Sir—Readers will be familiar with *World at their finger tips*, written for the Radio Society of Great Britain by the late John Clarricoats. This book covers the history of the Society, and the work of many of its members, from 1913 to 1963.

The Society has honoured me with the task of writing a sequel to this book in order to have a record of events compiled from first-hand sources. During the past decade there has been a tremendous advance in all fields of radio communication, much of which has come about through the dedicated work of the RSGB and its members.

In order for me to make a success of this book, and do justice to the Society, I **must** have information, and therefore I appeal to individual members, club secretaries, and affiliated societies to send me details as soon as possible about their achievements during the past 10 years. Do not be modest, tell me all about it, and if possible please send a *spare* photograph with the report.

I would like to have this information by 31 August 1974 . . . There is much to do, and I hope to complete the work within the next two years.

I shall not be able to reply individually, or return information or pictures (unless specifically requested); however I do express my thanks in anticipation of help in this important task.

Ron Ham,
"Faraday," Greyfriars, Storrington, Sussex, RH20 4HE.

The Editor
Radio Communication

Sir—This letter is not intended to stir up a class war, nor indeed to wield a big wooden spoon; but is meant in all sincerity as a thought-provoking exercise on the question of the destination of amateur radio.

I refer to the relative decline of Class A operators and the ever-increasing number of Class B. "World of Amateur Radio" (*Wireless World* March 1974) shows that over the past five years the number of Class B operators has increased at twice the rate of Class A (1,500 "A", 3,000 "B"). I personally find this rather alarming and wonder what the membership feels.

In particular I am apprehensive over the lack of interest by the majority in cw operating; the almost total take over of *Radio Communication* by the u/vhf fraternity; even, in my own club, by the complete committee (bar one) being G8s. My pleas to "come and join the men" are in vain, and, for the first time since 1959, the Wolverton/North Bucks ARS will not be represented in NFD this year. Just how many more clubs are suffering from the same malaise? (Interested readers will no doubt remember my reference in an earlier letter to the use of a microphone in NFD shortly).

Of course the real blame for this lies with the originators of the Class B licence. There should be a time limit on the Class B holders, say two years, after which they either take the morse code test and join the men or else give up. Yes! Even that threat may be necessary if we are not to become a nation of u/vhf operators.

Nobody is asking these newcomers to remember and use the code. They can forget it immediately they pass the exam if they wish. At least they will have made the effort and, who knows, there may be just a few who find cw attractive enough to keep it up. If we can only add a few to the ranks of true "sparkers" it will be worth it At least the rest can use the hf bands (use or lose).

So please, do not hurl insults. Let us have some genuine suggestions. Facts are facts. Soon the Class B operators will outnumber the Class A operators. Then our hf allocations will rapidly disappear for good.

D. A. Shepherd, G3LCS

The Editor
Radio Communication

Sir—I should like to reply to Mr Milne's letter published in the March issue of *Radio Communication*.

I realize that no-one is in a better position than he to judge the status quo of the present QSL Bureau and I accept his point of view that much extra work is generated by out-of-zone operation. However, I do question the need for a separate sub-manager for GW, GM and GI. Postage stamps for England, Wales, Scotland and Northern Ireland are valid within any of the four countries mentioned One sub-manager for all stations would solve a large part of the problem without major changes to our prefix and suffix system.

For example: G4XYW, GW4XYX, GM4XYY and GI4XYZ would all use the same sub-manager and thus when G4XYW goes for a holiday in Scotland no extra work would be caused by cards for GM4XYW/P going astray.

This system would work for all British amateur stations except the 150 or so who live in Guernsey, Jersey and the Isle of Man.

I should like to make it quite clear that I fully recognize and respect the country status of all "G" prefixes and I feel sure that this would not endanger the autonomy of the countries involved.

In conclusion I would lend my support to the introduction of separate prefixes for Guernsey and Jersey.

Rob Martin, G3WKH

The Editor
Radio Communication

Sir—I sympathize with the problem that Mr Milne, G2MI, faces when having to sort QSL cards for stations using different prefixes. However, he could easily end his difficulties by allocating each QSL Bureau sub-manager with a series of callsigns such as 8CAA-8EAA; and, for example, cards for G3ZOD, GM3ZOD/P, GW3ZOD/P, GD3ZOD/P would go to the same manager, rather than four different ones. Moreover, this is within Mr Milne's power. Changing the Home Office regulations is certainly not.

Graham Smith, G3ZOD

The Editor
Radio Communication

Sir—Over the last few months I have been trying to ignore the constant stirring up of the mode-war in various columns, but yet another appeal for cross-mode contacts in *FMD* has provoked this letter.

Basically I am an fm, fixed-channel, pro-repeater man, both fixed and mobile. My equipment for use on the IARU channels is NOT compatible with a.m., ssb or cw. To undertake extensive modifications to either home-brew or commercial equipment is both unnecessarily complex and expensive.

However, I am now operational (for dx purposes) on ssb in the lower portion of the band (144·15–144·5MHz) with ssb and cw capability ONLY. Here I would not take kindly to being forced to work fm stations on equipment that would render them unintelligible.

Let us have no more of this mode war but let people use their equipment as they feel fit, selecting the mode, (and part of the band) appropriate to their needs.

Adherence to the RSGB-sponsored band plan would immediately solve the situation.

Graham B. Packer, G3UUS

The Editor
Radio Communication

Sir—We understand that members of our Society who have considered moving into the Milton Keynes Development area have been deterred from doing so due to the policy adopted of not allowing anyone to put up any external aerials. We have now heard that this policy is only intended to cover vhf radio and television aerials but it is having an undesired effect on our members. The Development Corporation has agreed that radio amateurs must be catered for and are prepared to site them in suitable areas.

Through your columns we should like to bring these facts to the notice of our members and should like prospective newcomers to contact us so that they are not deterred by the general aerial policy, which the Development Corporation says will not apply to amateur radio aerials.

Royston S. King, G8CHK,
Hon Sec, Milton Keynes & DRS

The Editor
Radio Communication

Sir—I have recently constructed a phase-lock vfo for 2m similar to the ic design described by Dr A. Gschwindt in your September 1973 issue. Readers may be interested to know that the drift in the 18MHz output was 8Hz in the first 20min after switch-on from cold.

I did find that, to make the overtone crystal oscillator work, a 330pF capacitor was required from the junction of the crystal and pin 4 of that ic. Dr Gschwindt has agreed that this may be necessary with some crystals and asks me to pass on the information.

R. C. Marshall, G3SBA

CLUB NEWS

RSGB Affiliated Societies and Clubs, and RSGB Groups, are invited to submit items for inclusion in this section to their Regional Representatives (not direct to the editor), whose addresses appear on page 429 of this issue, for inclusion in the appropriate regional section.

Items of news and dates of forthcoming events should reach RRs by the following dates: 30 July, 1 October.

REGION 1 **RR B. O'Brien, G2AMV**

Ainsdale (ARC)—Thursdays fortnightly, 8.15pm. 4, 18 July; 1, 15, 29 August. Ainsdale Scout Headquarters. Further details from N. Horrocks, G2CUZ, QTHR.

Blackburn (ELARC)—First Thursday in each month, 7.30pm. YMCA, Shearbank Road, Blackburn. Visitors always welcome. 4 July, (Talk on Pye equipment with details of conversions for amateur use), 5 September (Junk sale). Secretary W. E. Baxend G8FDG, "Juverna", Westland Avenue, Darwen, Lancs.

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

Bolton (B & DARS)—Third Wednesday in each month, 8pm. Clarence Hotel, Bradshawgate. 17 July ("Receivers", by G3SPB), 21 August (Amateur tv demonstration by G3ZPL and G4AQB). The club has its first ever attempt at putting on a stand at the Belle Vue Convention this year. The stand was simple but very successful and we appeared to attract a few more members for the club. There is a 2m net on Sundays at 1200gmt on 145·73MHz. Secretary S. Macdonald, G4AQB, 8 Archer Avenue, Bolton.

Bury (B & RRS)—Second Tuesday in each month. The Mosses Community Centre, Cecil Street, Bury. Informal meetings every Tuesday, also morse classes. A big response to the club's advert in the April issue of *Radio Communication* for the G8GTP Handbook of Modifications for the Pye Cambridge, was received by Mike Horrocks, G8GTP. Mike has donated the money, less printing expenses, to the club's transmitter fund. G3RSM, who is the editor of *Feedback*, the club's monthly paper, is giving a talk on standing waves at the July meeting.

Carlisle (C & DARS)—Mondays, 7.30pm. Currock House, Lediard Avenue, Currock. Carlisle. Full details from secretary G8DVD, QTHR.

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; on 10m, 7.30pm Thursdays. On Tuesdays RAE classes and slow morse transmissions are available. Please see secretary G3SIQ for details. Chairman is G3JWK.

Chester (C & DARS)—Tuesdays, 8pm. YMCA, Chester, except the first Tuesday in each month which is a net night on 145·08MHz and 433·15MHz. Further details from G8AYW, G6AHC/T, QTHR.

Douglas IoM (D & DARS)—Secretary GD3YUM will be pleased to hear from any member who intends to visit the island.

Eccles (E & DARC)—Tuesdays, 8pm. Bridgwater School, Worsley, Manchester. Club 2m net 1100gmt on Sundays on 145·66MHz. All visitors and prospective members welcome. Secretary G4AEQ, QTHR.

Lancaster University (UoLARS)—Wednesdays, 7pm. Furness College, together with RAE and morse classes. The society is active on the hf bands and 2m using G3ZBY and G8DOU. The rtty gear is also operational on these bands. Skeds and visits welcomed. Enquiries please to Colin Pegrum, Department of Physics.

Leyland Hundred (ARG)—Second Monday in each month, 7.30pm. "Rose and Crown", Ulnes Walton, Leyland. Net night Saturdays 2000gmt on 145·8MHz. Details from F. Harrison, G3XII, 78 Lancaster Lane, Leyland, Lancs.

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

Liverpool (NLRC)—Tuesdays, 8.30pm. Informal meetings at the "Nags Head", Thornton, Crosby, Liverpool 23. Visitors welcome. Secretary R. B. Porter, 11 Cranmore Avenue, Crosby, Liverpool L23 OQD.

Liverpool University (UoLARS)—Every lunchtime in the radio shack in the Students Union. Formal meetings are on Mondays at 7.30pm. We are active on all bands up to 70cm. Visitors are always welcome. Secretary Mike Harbach, G8GMC, Radio Society, c/o Students' Union, 2 Bedford Street North, Liverpool.

Manchester (M & DARS)—Wednesdays, 7.30pm. All meetings include morse classes. 203 Droylesden Road, Newton Heath, Manchester 10. Secretary G3IOA.

Manchester (SMRC)—Fridays, 8pm. Sale Moor Community Centre, Norris Road, Sale, Cheshire, with morse practice before lectures. The vhf and df lads meet on Mondays 8pm at the club shack, "Greeba", Shady Lane, Manchester 23. It is hoped to run a number of df practice events during the year; anyone interested contact G3WFT, QTHR. Visitors are welcome on either Mondays or Fridays.

At the AGM on 17 May, the following were elected to the committee: chairman, M. J. Ware, G4BJT; vice-chairman, W. M. Furness, G3SMM; hon secretary, D. Holland, G3WFT; hon treasurer, R. N. Barker, G3UTL; vhf member, C. Scholefield, G8GDM; senior members, R. P. Smith, G3SVW; G. Clark, G4AHX; J. McBurney, G4AUR; junior member, S. Kershaw, G4CZS.

5 July ("RAEN", by J. Scarborough, G3MBQ), 12 July (Night on the air), 19 July ("DC to ac inverters for domestic use", by J. A. Salthouse), 26 July (The club will meet at the special event station for the Manchester Show at Platt Fields, Manchester), 2 August ("Coaxial cables, waveguides and fibre optics", by P. Jones, G2JT), 9 August (Final radio theory), 16 August (Mystery lecture), 23 August ("The history of radio—part 1—up to 1920", by P. Stewart), 30 August (Review of club activities).

Manchester University (ARS)—G3VUM is active on all bands 160—10m and also on 2m. The programme of lectures, visits, RAE and morse tuition continues as previously. Details from secretary G. T. Phelan, G8EPS, University Union, Oxford Road, Manchester M13 OPL, or G3AOS, QTHR.

NRSA Convention, 1974 report

The annual convention of the Northern Radio Societies Association was held on 12 May at Belle Vue, Manchester, and drew the usual large attendance of radio amateurs, with many YLs and XYLs. A welcoming ceremony took place at 1pm and Mr Basil O'Brien, G2AMV, the Region 1 representative of the RSGB, did the honours.

Club stands presenting various aspects of amateur radio were organized by the following member societies, Bury & Rossendale Radio Society, Bolton Radio Society, Otley Radio Society, Manchester & District Radio Society, Stockport Radio Society, Liverpool Radio Society, South Manchester Radio Society, Dial House Radio Society, Eccles Radio Society and Lancaster University Radio Society.

The trophy for the club stand competition was carried off by Stockport Radio Society who displayed a predominance of home brew equipment. This competition was judged by Mr J. Petty, G4JW, RSGB Council member. Stockport Radio Society were doubly successful by the fact that they also carried off the trophy for the quiz organized by the Eccles Radio Society.

Outstandingly good exhibits were presented for the home-construction competition, including an sstv monitor, 2m tx/rx, converters and test equipment. The overall winner of this competition was Dennis Mott, G8BZY, who came up with a well-constructed digital frequency meter.

There were talk-in stations on 2m and 160m operated by South Manchester Radio Society and Dial House Radio Society using the callsign GB3NRS. A demonstration of sstv was given by the British Amateur Television Club. Other features of the convention included trade stands and the ever popular raffle.

The organizers would like to thank everyone who helped make this year's convention such a great success, and they would particularly like to mention:
G2AMV; Mrs E. O'Brien, G3WIO; G4JW; the traders, without whom the convention would not be possible; and not least the ladies who looked after the reception area and sold raffle tickets.

The date of next year's convention has been provisionally fixed for Sunday 13 May at the same venue. All northern clubs are eligible for membership of the NRSA, annual subscription £1, which qualifies them for the club competition and their members to enter for the home-construction competition. Club secretaries should contact John McKinnon, chairman, NRSA, 8 Cotswold Close, Ramsbottom, Via Bury, Lancs.

University of Manchester—Institute of Science & Technology (ARS)—G3CXX is active on all hf bands, and G8FOT on 2m and perhaps 2cm. Items for club magazine/newsletter or letters from intending members gratefully received by G8GOS, 66 Howard Road, Kings Heath, Birmingham B14 7PQ.
Preston (PARS)—7.30pm. "Windsor Castle" (private room), St Paul's Square, Preston. Morse practice 7.30pm, main feature 8pm. 4, 18 July; 1, 15, 29 August.
Stockport (SRS)—Second and fourth Wednesdays in each month, 8pm. Blossoms Hotel, Buxton Road, Stockport. Secretary G. R. Phillips, G3FYE, 6 Ross Avenue, Davenport, Stockport.
Thornton Cleveleys (ARS)—First and third Wednesdays in each month, 8pm. St John Ambulance Brigade HQ (off Fleetwood Road), North Thornton, Lancs. Project group meets on Fridays, 7.15—9pm, Project Laboratory, Rossall School, Fleetwood. Work in hand includes 160 and 2m transmitters/receivers. Please note acting secretary is J. Duddington, G4BFH, The Grove, Thornton Cleveleys, Blackpool.
Warrington (W & DARS)—Tuesdays, 8pm. Thames Board Mills Social Club, Alford Hall, Manchester Road, Warrington. Secretary G. H. Read, 2 Princess Avenue, Great Sankey.
Wirral (WARS)—First and third Wednesday in each month, 7.45pm. Sports & Recreation Centre, Grange Road West, Claughton, Birkenhead. Secretary G3YGL, QTHR.
Wirral (Wirral DX Association)—Please note change of day. Last Tuesday in each month at members' homes. Visitors are welcome. Please inform secretary G3XJZ, QTHR, beforehand.

Special Region 1 Events
Merseyside members meet for lunch on the first Monday in each month. It is essential to book beforehand and obtain details of the venue from either G3VQT or G2AMV.
1 September—Exhibition at Warrington, Peninsular Barracks.
14, 15 September—Weekend convention at Lancaster University.

REGION 3 — RR B. Kennedy, G3ZUL

Birmingham (MARS)—Birmingham and Midland Institute, Margaret Street. G8GOC.
(Slade)—Alternate Fridays, 8pm. Committee Room, Church House, Erdington. *G4BRT.*
(South)—3 July (Film show). 8pm. Hampstead House, Fairfax Road, West Heath, Birmingham 31. *G8GDZ.*
Bromsgove (BDARC)—Change of venue. Club now meets at the Avoncroft Museum of Buildings. Mr J. Harvey, BRS19682, 22 Elm Grove, Bromsgrove.
Coventry (CARS)—Fridays, 8pm. Baden Powell House, St Nicholas Street, Radford Road, Coventry. *G3TFA.*
Dudley (DARC)—9 July ("Weather satellites"), 23 July ("New devices in industrial electronics", by G3YZP), 6 August ("Piped tv", by G4CFP), 20 August (Informal). 7.45pm. Central Library, Dudley. *G8HHK.*
Hereford (HARS)—First and third Fridays in each month. Civil Defence HQ, Gaol St, Hereford. *G4CNY.*
Lichfield (LARS)—First Monday and third Tuesday in each month. The Swan Hotel, Bird Street, Lichfield. *G3NLY.*
Mid-Warwickshire (MWARS)—Mondays, 8pm. 28 Hamilton Terrace, Leamington Spa. *G8GDY.*
Solihull (SARS)—The Manor House, High Street, Solihull. *G4AEJ.*
Stourbridge (STARS)—2 July (Informal), 15 July ("Metalwork for the radio amateur", by G3ZYT), 6 August (Informal), 19 August (No meeting). Third Monday in each month. Longlands School, Brook Street, Stourbridge. Informals at Shrubbery Cottage, Heath Lane. New members very welcome. *G3ZVK.*
Sutton Coldfield (SCRS)—8, 22 July (Informal). Alternate Mondays. Central Youth HQ, Clifton Road, Sutton Coldfield. *G8ALO.*
Telford (TDARS)—3 July (G3ZME/P somewhere in Salop), 10 July (Visit to Ironbridge B power station), 17 July (A display of gear and talk by G8ARS of Telford Communications), 24 July (Construction of component boards), 31 July (Films and slides of Whit expedition and NFD), 21 August (Proposed visit to Granville Colliery). Wednesdays. Ketley Bank Youth Centre, Near Oakengates, except the first Wednesday in each month when at Walker Technical College, Near Wellington. *G4AXZ.*
Willenhall (W & DARS)—3 July (Talk on fire prevention), 17 July (Slide lecture on Apollo missions), 31 July, 14 August (Natter nite), 28 August (Visit to the West Midland Press). Morse classes are held at the end of each session. The Three Crowns, Stafford Street, Willenhall. *G4CFR.*
Wolverhampton (WARS)—Neachells Cottage, Stockwell End, Tettenhall, Wolverhampton. *G3UBX.*
Worcester (W & DARC)—1 July (Night on the air), 20 July (Treasure hunt), 5 August (Social evening, wives and young ladies welcome), 17 August (To be arranged). Contact G8ASO for details of 20 July and 5 August meetings. Tel Worcester 29208.

REGION 4 — RR T. Darn, G3FGY

Derby (DADARS)—10 July ("Your licence queries answered", by Fred Ward, G2CVV), 17 July (DF practice night No 4), 24 July (Film show), 31 July (Surprise night), 7 August (Surplus sale by auction), 11 August (Derby mobile radio rally at Rykneld School), 14 August (Open evening), 21 August (DF practice night No 5), 28 August (Film show). 7.30pm. The Clubroom, 119 Green Lane, Derby. Visitors are always welcome. *G2CVV.*
Derby (NHCAARG)—5 July (Preparation for Diamond Jubilee Contest), 6 and 7 July (RSGB Diamond Jubilee VHF/UHF contest), 12 July ("Meteorology", by G. Clamp, G3YTX), 19 July (Night on the air), 26 July (Walking df event in the Alvaston area), 2 August (Surplus sale), 4 August (DF event No 6), 9 August (Technical film show), 16 August (Musical quiz, by P. Neal, G3WFU), 23 August (Constructional project No 3), 30 August ("Closed circuit television", by J. Wilson). 7.45pm. Friday evening meetings in Room 7, Nunsfield House, Boulton Lane, Alvaston, Derby. *G4CTZ.*
Grimsby (GRAS)—4 July ("Hobbies for all" organization), 18 July (VHF NFD organization), 1 August (Open night), 15 August (Open night), 29 August (Open night). 7.30pm. Alternate Thursdays. Community Centre in Duncombe Street, Grimsby. *G8HAE.*
Lincoln (LSWC)—3 July (Project night or open forum), 10 July (Film night), 17 July (Treasure hunt), 24 July (On the air), 31 July (Closed for trips week). Wednesdays. The Lincoln Astronomical Society, Westcliffe Street, off Burton Road, Lincoln. *G. F. Coggan.*
Nottingham (ARCoN)—At the recent AGM the following officers were elected: president A. Veitch, G8FRB; chairman Geoff Dover, G3AFJ; vice chairman D. Molyneaux, G3YUT; treasurer R. Price, G4CKG; secretary F. Charingham, G8HLD; committee G8FWH, G3WFV, G3TVY, G3XPM, G8EYV. Every Thursday. Sherwood Community Centre, Mansfield Road, Nottingham, and commence at 7.30pm. *G4AFJ.*
Spalding (SADARS)—5 July ("Direction finding", by G3YFS). The Teachers Centre, Knight Street, Pinchbeck. 21 July (D/F hunt). 2.30pm onwards. 2 August (Club junk sale and swap night). "Ship Albion", Albion Street, Spalding, 7.30pm. Visitors to all meetings welcome. *G3VPR.*

REGION 5 — RR P. J. Simpson, G3GGK

Bedford (B & DARC)—The club said farewell to its clubroom at The Dolphin Inn after several years and moved two doors away to the United Services Club, The Broadway, Bedford. A separate shack is available and G3WTP will soon be active again. 4 July (Shack night, G3WTP on the air, and technical discussion), 6, 7 July (VHF Jubilee), 11 July (SSB Field Day plans, and "Building an el-bug" by George Parker), 18 July (Shack night and RR's visit), 21 July (Outing to Science Museum and GB2SM), 25 July ("Microwaves"), 1 August (Shack—vhf special), 4 August (RSGB rally at Woburn), 8 August ("PCB techniques", by G3FWA), 15 August (Shack night—test gear), 22 August (Members' equipment), 25 August (Club net 28·610MHz and 144·48MHz at 1030am), 29 August (Shack night). Thursdays, 7.30pm. Hon sec G. E. Parker, 12 Dawlish Drive, Bedford.
Cambridge (C & DARC)—5 July (Visit to Burwell CEGB switching station), 12-14 July (GB3RSC special station for Scouts and Guides on Newmarket Heath), 19 July ("A.M. Cambridge—conversion to fm," by G3WWJ). No meetings in August. 6 September ("Ship to shore"—film and talk). 7.30pm. Hon sec John Fellows, G3YRZ, 8 North Street, Burwell, Cambridge.
Cambridge University (CUWS)—Following reorganization G6UW is active on the hf bands with 160m and 2m to follow. Alternate formal and informal meetings on Tuesdays; newcomers please meet the club at The Societies Fair, 8-9 October, in Cambridge. Chairman Dave Holburn, G3XZP; secretary John Robinson, G4AZX (QTHR or Christ's College during term).
Dunstable Downs (DDRC)—5 July (Junk sale), 12 July (Between week), 19 July ("How to talk in cw", by G3HAL), 26 July (Between week), 2 August (Acquisition of club equipment—discussion), 9 August (Between week), 16 August ("Beginners approach to rtty,"

by G3WLM), 23 August (Between week), 30 August ("GB3PI repeater Mk2", by G3VEH and G3USB), 6 September (Between week). 8pm. Chews House, 77 High Street South, Dunstable, Beds.
Peterborough (PE & RS)—19 July ("UFOs"), 16 August (To be arranged). The annual Peterborough Mobile Rally is on 29 September at Walton School, Mountsteven Road, Walton. Meetings at 7.30pm. Scout Hut, Occupation Road, New England. ASR Peter Chilcott, G4BBA, 258 Coneygree Road, Stanground, Peterborough.
Shefford (S & DRS)—4 July (Junk sale and programme planning), 11 July (Demonstration of radio control at Sandy Place School, Sandy, at 8pm), 13 July Shefford spectacular), 18 July (Open night), 22 August (VHF NFD final planning), 29 August (Amateur equipment), 5 September (PC boards and rtty). 8pm. Church Hall, Ampthill Road, Shefford. Hon sec Bob Squire, 10 Brittains Rise, Lower Stondon, Henlow, Beds.

REGION 6 — RR L. W. Lewis, G8ML

Cheltenham RSGB Group—First Thursday in each month, 8pm. Royal Crescent Hotel, Clarence Street, Cheltenham. *G6KII.*
Cheltenham (CARS)—Wednesdays, 8pm. St Marks and Hesters Way Community Centre, Brooklyn Road, Cheltenham. *G8DVA.*
Milton Keynes (MK & DRS)—(Formerly North Bucks ARS)—Second Monday in each month. Wolverton Youth Club. 8 July ("Interstellar communication"), 12 August (Chat night and junk sale). 20-27 July (Club expedition this year will be to Northumberland). *G4AFN/P, G8CMK.*

REGION 7 — RR R. S. Hewes, G3TDR

Acton, Brentford & Chiswick (ABCRC)—16 July (Current changes in the amateur world—discussion), 20 August (G3CCD as F0UT in France). 7.30pm. Chiswick Trades and Social Club, 66 High Road, Chiswick W4. Hon sec W. G. Dyer, G3GEH, QTHR.
Addiscombe (AARC)—Tuesdays, 9pm. "Prince George", High Street, Thornton Heath. Hon sec S. F. Knowles, G3UFY, QTHR.
Ashford, Middlesex (Echelford ARS)—8, 25 July, 13, 29 August. 7.30 for 8pm. St Martin's Court, Kingston Crescent, Ashford. Visitors very welcome. Further details from hon sec Alan Wenham, G3ZXA, QTHR. Tel Sunbury-on-Thames 86440.
Barking (BR & ES)—Each Tuesday and Thursday (Informal and constructional evening), 7.30-10pm. Wednesdays (Operating the club stations). Westbury Recreation Centre, Westbury School, Ripple Road, Barking, Essex. Hon sec J. R. Wiles, social sec R. Clarke, G8BXC, QTHR.
Burnham Beeches (BBARC)—First Monday in each month, 8pm. Hedgerley Scout Hut, Hedgerley, Near Slough, Bucks. Hon sec E. Brown, 20 Balmoral Close, Cippenham, Slough.
Cheshunt (CDRC)—First Friday in each month, 8pm. Methodist Church Hall, opposite Theobalds Station. Hon sec Richard Ludwell, G3ZZQ, QTHR.
Chingford (Silverthorn RC)—Every Friday, 7.30pm. Friday Hill House, Simmonds Lane, Chingford E4. Visitors very welcome. Hon sec C. J. Hoare, G4AJA, QTHR. Tel 01 529 2282.
Cray Valley (CVRS)—First and third Thursday in each month, 8pm. Eltham United Reformed Church Hall, 1 Court Road, SE9. Hon sec Peter Vella, G3WVP, QTHR.
Croydon (Surrey Radio Contact Club)—Third Tuesday in each month, 8pm. "The Ship", 47 High Street, Croydon. Further details from hon sec Sid Morley, G3FWR, QTHR. Tel 657 3258. New committee elected at AGM: chairman, Bernard Wynn, G8TB; vice-chairman, Maurice Fogg, G8GGX; treasurer, Ted Jones, G3EUE; technical liaison and press officer, John Johnston, G8FZF; ordinary members, Peter Burton, G3ZPB, Arthur Simpson, G3YRB, and Rex Morrison, G3KGA.
Crystal Palace (CP & DRC)—20 July, 17 August (To be announced). 8pm. Emmanuel Church Hall, Barry Road, SE22. Hon sec Geoff Stone, G3FZL, QTHR. Tel 699 6940.
Dartford Heath (DF Club)—5 July, 2 August (Club nights). 8pm. The Scout Hut, Broomhill Road, Dartford. Hon sec Maureen Worby, G3XVC, QTHR.
Esher (Thames Valley ARTS)—First Wednesday in each month, 8pm. King George's Hall (next door to fire station), Esher, Surrey. PRO Rob Muir, G3LHN, QTHR.
East London RSGB Group—No programme until September.
Edgware (E & DRS)—Second and fourth Thursday in each month, 8pm. Watling Community Association, 145 Orange Hill Road, Edgware. Hon sec Alan Masson, G3PSP, QTHR. Tel 01 950 6827.
Farnborough (Bromley RC)—Third Monday in each month. Rear of Farnborough (Kent) Village Hall (opposite "The Woodman" public house). Details from Derek Morgan, 59 Bassetts Way, Farnborough, Kent.
Gravesend RSGB Group—Mondays, 7.30pm. "Windmill Tavern", Shrubbery Road, Gravesend, Kent. Area representative P. F. Jobson, G3HLF, QTHR.
Guildford (G & DRS)—Second and fourth Fridays in each month, 8pm. Model Engineering HQ, Stoke Park, Guildford, Surrey. Hon sec Dave Coltart, G3SYM, QTHR.
Harlow (DRS)—Tuesdays, 8pm. Mark Hall Barn, First Avenue, Harlow, Essex. Hon sec Vic Heard, 106 Vicarage Wood, Harlow, Essex.
Harrow (RSH)—3 July (business meeting), 10 July (DF hunt), 17 July ("WX", by Mike, BRS32524), 31 July ("Shipping", by G3WRO). August meetings to be arranged. 8pm Harrow Sea Scouts HQ, Woodlands Road, Harrow, Middlesex. Refreshments available during evening. Hon sec Les Light, G3KDL, QTHR.
Havering (H & DARC)—Second and fourth Wednesdays in each month (main meetings). Alternate Wednesdays are informal natter nights, 8pm. British Legion House, Western Road, Romford. Hon sec K.S. Hutchinson, G4ALN, QTHR.
Holloway (Grafton ARS)—Fridays, 7.30pm. Archway School Annexe, Whittington School, Highgate Hill N19. Hon sec H. D. Ashcroft, G8AYU, QTHR.
Ilford RSGB Group—Thursdays, 8pm. Mortlake Road, (Off Ilford Lane), Ilford, Essex. Hon sec Derek Sapsworth, G3YMW, QTHR.
Kingston (K & DARS)—10 July ("History and development of radio components", by Tony Cockle, G3IEE), 14 August (Tape and slide lecture), 8pm. Tolworth Scout HQ, Stirling Walk, Raeburn Avenue, Surbiton, Surrey. Hon sec Dick Babbs, G3GVU, QTHR. Tel Kingston 2801.
London, UK FM Group—9 July (To be announced), 28 July (Mobile treasure hunt—S20 main channel), 13 August (Outdoor meeting—venue to be announced. Talk-in fm channel S20—145·5MHz), PRO Kris Partridge, G8AUU, Apartment 10, 74 Woodside, Wimbledon SE19. Tel 01-946 7843.
Loughton (L & DRS)—Second and fourth Fridays in each month, 8pm. Loughton Hall nr Debden Station. Hon sec P. J. Lawler, G4CMD, QTHR.
New Cross (Clifton ARS)—Every Friday, 8pm. 225 New Cross Road, London SE14. Details from Hon sec R. A. Hinton, 48 Camilla Road, Bermondsey SE16.
Northolt (British Airways, European Division ARS)—First Thursday in each month. Trident Club, Western Avenue, Northolt, Middlesex. (This club is open to non-BA employees by invitation. Contact David Evans, G3OUF, tel Amersham 21573 for details).
Paddington (P & DRS)—First Thursday in each month, 8pm. Beachamp Lodge, Warwick Crescent, W2. Hon sec Mike Pawley, G8AWV, QTHR.
Purley (P & DRS)—First and third Fridays in each month, 8pm. Lansdowne Hall, Lansdowne Road, Purley, Surrey. Hon sec M. H. Roach, G3TWJ, QTHR.
Reigate (RATS)—2 July, 6 August (Natter nights). "Marquis of Granby", Hooley Lane, Redhill. 8.30pm. 16 July (Burns Electronics), 20 August (Members' evening). St Mark's Church Hall, Alma Road, Reigate. 8pm. AGM results: chairman, G3NKS; vice chairman, G3ZYX; secretary, G3XSZ; treasurer, G8AMU; committee members, G3XIG, G3ULH, G3KAX. Hon sec F. H. Mundy, G3XSZ. Tel Reigate 43130.
St Albans (Veralum ARC)—17 July ("The Ordnance Survey", by Mr R. Dickson, surveyor-in-charge at Luton Office), 21 August ("Field effect transistors", by Bryan Harber, G8DKK). 7.30 for 8pm. Market Hall, St Albans, Herts. Visitors very welcome. Additional meetings on first Wednesday of each month during summer, 7.30pm. Salisbury Hall, London Colney (5km SE St Albans on the A6). G3VER will be on the air. Hon sec Hugh Young, G3YHY, QTHR.
Southgate (SRC)—Second Thursday in each month, 8pm. The Green, Winchmore Hill N21. Hon sec Brian Oughton, G4AEZ, QTHR.
South Kensington (Baden Powell House Scout ARG)—Third Tuesday in each month, 8pm. Baden Powell House Queensgate, S Kensington SW7. Hon sec Alf Watts, G3FXC, QTHR.
Sutton & Cheam (SCRS)—16 July ("Getting going on 4m"—G3LCH will describe his home constructed 4m transmitter), 20 August (To be announced). 7.30pm. The Library, Cheam. Hon sec Alan Keech, G4BOX, QTHR.
Welwyn (Mid Herts ARS)—Second Thursday in each month, 8pm. Welwyn Civic Centre, Prospect Place, Old Welwyn. PRO Maurice A. Pyle, G2BLA, QTHR. Tel Welwyn 4685.
Wimbledon (W & DRS)—Second and last Fridays in each month, 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)—4 July (Junk sale). First Thursday in each month. Westgate Hall, Canterbury.
Dover (SEKYMCAARC)—First and third Wednesday in each month, 7.30pm. Dover YMCA. Further information from G8DRS, QTHR.
Mid-Sussex (M-SARS)—Marle Place, Leylands Road, Burgess Hill. Further details of meetings from G3RXJ, QTHR.
Medway (MARTS)—Fridays, 7.30pm. Aurora Hotel, Gillingham. Further details from C. R. Blackmur, G8FHN, QTHR.
Horsham (HARC)—First Wednesday in each month. Civil Defence HQ, Moons Lane, Brighton Road, Horsham. Details of meetings from G3NPF, QTHR. Tel Horsham 66290.
West Kent (WKARS)—Alternate Fridays. Adult Education Centre, Monson Road, Tunbridge Wells. Further details from hon sec S. Emlyn Jones, 36a London Road, Southborough, Tunbridge Wells.
Eastbourne (SARS)—First Monday in each month. Victoria Hotel, Latimer Road, Eastbourne. PRO G3JFM.
Worthing (W & DARC)—Rose Wilmot Youth Centre, Littlehampton Road, Worthing. Details from G8ETL, QTHR.
Maidstone (MYMCAARS)—"Y" Sports Centre. First and third Fridays devoted to the beginners.
Crawley (CARC)—Fourth Wednesday in each month. United Reform Church Hall, Ifield, Crawley. Details from G3MGL, QTHR.

REGION 9 **RR H. W. Leonard, G4UZ**

Bath (B & DRG)—Wednesday, 8.30pm. The Crypt, Church of the Ascension, Oldfield Park, Bath. Details from G8DRK. Tel Bath 23465.
Bristol RSGB Group—7 July (Longleat Mobile Rally), 22 July ("The first 30 years, 1912-1942", by W. Alford, G2DX), 18 August (Bristol mobile picnic), 19 August (Business meeting). 7pm. Becket Hall, St Thomas Street, Bristol 1. *G3ULJ.*
Bristol (BARC)—Tuesday, 7.45pm. 24 Bright Street, Barton Hill, Bristol 5. *G4BZZ.*
Bristol (Shirehampton ARC)—Fridays, 7.30pm. Twyford House, Shirehampton. Prospective new members most welcome. *G4BOL.*
Bristol (University ARS)—Most Saturdays during term time, 2.30pm. Dept of Physics, Royal Fort, Tyndall Avenue, Bristol BS8 ITL. Full details from G3WDG.
Cornish (CRAC)—First Thursday in each month, 7.30pm. SWEB Clubroom, Pool, Camborne. Cornish Mobile Rally on 21 July at Pool.
West Cornwall (CRAC)—Alternate Wednesdays, 7.30pm. The Guildhall, Penzance. Full details of Cornish and West Cornwall clubs from G3NKE, QTHR. Tel Camborne 2419.
Exeter (EARS)—Second Monday in each month, 7.30pm. ATC Hut, Colleton Hill, The Quay, Exeter. Hon sec Jack Bawden, 232 Exwick Road Exeter EX4 2BA.
Newquay (N & DARS)—Alternate Wednesdays 7.30pm. 41 Crantock Street, Newquay. Full details from G3THT, QTHR.
North Devon (NDRC)—Second and fourth Wednesdays, 7.30pm. "Crinnis", High Wall, Barnstaple EX31 2DP. *G4CG.*
Plymouth (PRC)—First and third Tuesdays, 7.30pm. Virginia House, Bretonside, Plymouth. Hon sec S.E. Croft, 2 Crozier Way, Mutley, Plymouth. Visitors always welcome.
Saltash (S & DARC)—First and third Fridays, 7.30pm. Burraton TOC H Hall, Saltash *G3XWA.*
South Dorset (SDRS)—First Tuesday in each month 2 July ("Aircraft communications and radio navigation aids", by G3WAO), 28 July (4m contest), 6 August (Visit to air traffic control RNAS Portland) 7.30pm. Lecture Hall, South Dorset Technical College, Newstead Road, Weymouth *G3WAO.*
Taunton (T & DARS)—Fridays, 7.30pm, Jelalabad Barracks, The Mount, Taunton. Hon sec G Swetman, "Little Copse", Monkton Heathfield, Taunton. Tel West Monkton 298
Torbay (TARS)—Every Tuesday with special meeting on last Saturday in each month 27 July (Talk), 31 August (Open meeting). 7.30pm Rear of 94 Belgrave Road, Torquay. Visitors to Devon always welcome. 11 August (Torbay Mobile Rally at Newton Abbot). *G3UIQ.*
West Dorset VHF Group—First Friday in each month, 8-10pm. Dorset Association of Youth Clubs, York Road, Dorchester. Chairman G8HVQ. Hon sec Mrs Val March, 27 Great Western Road, Dorchester.
Weston-super-Mare (WsMRS)—Second Friday in each month, 7.30pm. Room Lewis M2, Worle School, New Bristol Road, Worle. *G3PQE.*
Yeovil (YARS)—Thursdays, 7.30pm. The Youth Centre, 31 The Park, Yeovil. *G3NOF.*

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

Barry College of Further Education (ARS)—Thursdays, 8pm. Barry Rugby Club, Reservoir Road. Details from sec GW3VPB.
Blackwood (ARS)—Meeting during July and August will be held at the Ambulance HQ, Blackwood, due to summer vacation. Fridays, 7pm. Details from sec GW3KYA.
Cardiff RSGB Group—Second Monday in each month. BBC Social Club, Newport Road, Cardiff. Details from GW3GHC.
Hoover (ARC)—Mondays, 7pm. Hoover Social Club, Pentrebach, nr Merthyr. Details from sec GW3RNC.
Glamorgan VHF/UHF Group—Third Tuesday in each month. NCB Social Club, Tonddu, nr Bridgend. 16 July ("VHF ssb", by GW3ZTH). Details from sec GW3ZTH.
Monmouth (ARS)—Details from GW8GPX.
Pembroke (RSGB)—Last Friday in each month. Defensible Barracks, Pembroke Dock. Details from GW3AKO.
Pontypool (RSGB)—Tuesdays, 7pm. Educational Settlement, Park Hill Road, Pontypool. Details from GW3JBH.
Port Talbot (ARC)—Second Thursday in each month. Rail and Transport Club, Station Road, Port Talbot. Details from G. Watson, 19 Kelvin Road, Clydach, Swansea.
Rhondda (ARS)—Every other Thursday, 7.30pm. The Transport Employers Club, Porth. Details from GW3PHH.
Sully and District SWC—Tuesdays, 7pm. Sully Bowls and Social Club, 59 South Road, Sully. Details from A. Dixon, 37 Bellevue Cres., Cardiff.
Swansea (ARC)—2, 16 and 30 July; 13 and 27 August. Commercial Inn, Killay, Swansea. Details from GW4BIQ.

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

Rhyl & District (R & DARC)—7.45pm. New Ambulance Station Lecture Room, Mercia Drive, Rhyl.
Conway Valley (CVARC)—11 July (Outside visit to GPO exchange, Colwyn Bay, conducted by GW3MDK). Second Thursday in each month, 7.30pm. The Quaries, Llandulas, Colwyn Bay.
Bangor (UCNWARS)—Meetings held during autumn and spring terms 1974-75. Session to be announced.

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

Berwick (BARS)—Last Sunday in each month, 3pm. Tweed View Hotel. Further details from G. Shankie, GM3WIG, 8 Ettrick Terrace, Hawick, Roxburghshire.
Dunfermline (DRS)—Second Wednesday in each month, 7pm. Queen Anne High School (TV studios). Further details from D. G. L. Anderson, GM8HEY, 10 Cairneyhill Road, Crossford.
Edinburgh (LRS)—Second and fourth Thursdays, 7.30pm. Adult Education Centre, Riddles Court, High Street. Next meeting in September. Further details from J. B. Howie, GM8DIJ, 39 Marionville Road.
Glenrothes (G & DARC)—First Sunday in each month, 7.30pm. Old Nursery Buildings, Leslie, Fife. Special meeting for project groups every Wednesday. Further details from GM3YOR, QTHR. 7 July (Aurora).
St Andrews (UStAARS)—Details from R. Marchant, GM3ZCQ, Dept of Physics, North Haugh, St Andrews.

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

Ardeer (ARCARS)—Thursdays, 7.30pm. Ardeer Recreation Club, Stevenston, Ayrshire.
Ayrshire (ARG)—6, 20 May, YMCA, Howard Street, Kilmarnock. Further details from hon sec R. D. Harkness, GM3THI, 55 Woodend Road, Alloway, Ayrshire.
Falkirk & D RSGB Group—Temperance Cafe, Lint Riggs, Falkirk. Further details from J. Ramsay, GM3OQI, 78 Wheatlands Avenue, Bonnybridge, Stirlingshire.
Greenock (G & DARC)—GM3ZRC Tuesdays & Fridays at 7.30pm. Watt Library, Union Street, Greenock. Enquiries to hon sec N. C. Henderson GM3LYI, QTHR.
Glasgow (GURC)—George Service House, University Gardens, Glasgow. Details from hon sec, c/o Dept of Engineering.
Mid-Lanark RSGB Group—Each Friday with alternate meetings informal. Contact GM3KMG, QTHR, tel Hamilton 28759, for further details.
West of Scotland (ARS)—Wednesdays and Fridays. 81 Virginia Street, Glasgow. Chairman Tommy Hughes, GM3EDZ. Enquiries to Mike Parks, GM8HBU, QTHR.

REGION 15 **Deputy RR H. J. Campbell, GI8FOK**

Bangor (B & DARS)—First Friday in each month, 8pm. Redcliff Hotel, Seacliff Road, Bangor. Hon sec N. S. Newell, GI3YMY, QTHR.
Belfast RSGB Group—Third Wednesday in each month, 8pm. 90 Belmont Road, Belfast. New members and visitors made most welcome. Further information from H. J. Campbell, GI8FOK, QTHR.
Mid-Ulster RSGB Group—First Sunday in each month, 3pm. At GI4BAC, QTHR. All welcome. Hon sec R. F. S. Sinton, GI3ONF, QTHR.
Queen's University of Belfast Radio Club—Each Tuesday, 8pm. 37 Fitzwilliam Street, Belfast. CW practice sessions Wednesdays 1.30 onwards. All welcome. Details from Miss Ruth McCullagh, Ogilvie Hall, Queen's Elms, Malone Road, Belfast 9.

REGION 16 **RR E. T. Jacobs, BRS32513**

Chelmsford (CARS)—First Tuesday in each month, 7.30pm. Marconi College, Arbour Lane, Chelmsford. Details from W. L. Pechey, "Berkeley" Tye Green, Good Easter, Chelmsford.
Colchester (CRA)—Most Wednesdays, 7.30pm. Stanway School, Stanway, Colchester. Details from E. T. Jacobs, 26 Pondfield Road, Colchester.
Colchester (UoEARS)—Details from hon sec J. Masterton, G8FUL, Eddington 6.
Great Yarmouth (GYRS)—Last Thursday in each month. 67 Southdown Road, Great Yarmouth. Details from hon sec A. D. Besford, G3NHU.
Ipswich (IRC)—10 July ("Slow scan," by J.G ee). Handford House, Ranelagh Road, Ipswich. Details from hon sec P. Hubert, G3YWM.
Lowestoft (L & DARC)—Twice weekly, 7.30pm. YMCA, Park Road, Lowestoft. Details from hon sec R. P. Finch, G4AJO.
Martlesham (MRS)—Details from G. Murchie, G8AXU, Post Office Research Centre, Martlesham.
Norwich (Norfolk ARS)—3 and 10 July (Inter-club quiz), 17 and 24 July ("Mechanical music", by E. Murray-Harvey). 7.45pm. Crome Community Centre, Telegraph Lane East, Norwich, Norfolk NOR 36T. Details from J. M. Draper G8BLD, Framingham Earl 2271.
Norwich (UoEAR & EC)—Meeting room 029 UEA Village. Details from hon sec P. Gowen, G3IOR.
Stowmarket (S & DARS)—Details from hon sec K. J. Bertrard, 35 Curwen Road, Stowmarket.
Vange (VARS)—Every Thursday, 8pm. Youth hall, Barstable Community Centre, South Riding, Basildon. Details from Mrs D. Thompson, 10 Feering Row, Basildon.

REGION 17 **RR L. N. G. Hawkyard, G5HD**

Bracknell (BARC)—Mondays. Cooper's Hill Community Centre. Morse sessions etc. *G3YMC.*
Reading (RARC)—Alternate Tuesdays, 8pm. "The White Horse", Emmer Green. *G4BLT.*
Bournemouth (Wessex AR Group)—First Friday in each month and the Monday 17 days later, 8pm. "Cricketer's Arms", Windham Road. *G8BBN.*
Portsmouth (P & DARC)—Wednesdays, 7.30pm. Portsmouth Community Centre, Malins Road, Buckland, Portsmouth. Visitors and new members welcome. *G3CNO.*
Winchester (WARC)—Fridays. Antrim House Basement, Cross Road. *G4BKE.* Tel Win 61133.
Harwell (AERE RC)—Third Tuesday in each month, also informal meetings every Friday lunch time. Social Club, AERE, Harwell, Berks. *G3NNG.*
Swindon (SDARC)—Wednesdays. Penhill Junior School, Swindon. *G3YKC.*
Farnborough (F & DARC)—Second and fourth Wednesday in each month. 8th Air Scout Hut, Rectory Road, Farnborough. *G8ECO.*
Maidenhead (M & DARC)—First and third Tuesdays in each month 7.30pm. British Red Cross Hall, The Crescent, Maidenhead. 6 July (The work and technical developments of the IBA), 14 July (Club picnic), 16 July (Junk sale), 1 August (RF power transistors), 20 August (Arrangements for VHF Field Day). *G3FVC.*
Basingstoke (BARC)—First and third Saturday in each month. Chineham House, Popley, Basingstoke. *G3CBU.*
Southampton (RSGB Group)—10 August ("The RSGB and the radio amateur", by Doug Findlay, G3BZG), 12, 13, 14 July (Exhibition tent at the Southampton Show; talk-in stations on 2m, 4m, and 80m). Visitors welcome. *G4AEU.*

RAYNET

by S. W. LAW, G3PAZ*

At the meeting of the Raynet Committee on 11 May it was noted that there appeared to have been a reduction in the amount of correspondence and news from groups. Chairman G3BPT asked that this be publicized in order that groups everywhere would realize that the Raynet Committee functions successfully in proportion to the volume of information flowing in from those whom it is its function to represent. So please send in your news and comments as often as you can; the committee wants to hear from you, whatever the tone of your opinions. It goes without saying that news of activity and development is essential to the committee in order that an overall picture may be seen and, if necessary, acted upon for the benefit of the service as a whole. Although we may not have the space available to publish each and every item submitted, you may rest assured that a record is kept of all matter sent in, and we take this opportunity of thanking our regular correspondents for their news and various comments.

Midland members may care to note that Yorkshire are always on 145·26MHz on Thursdays from 2000 onwards; net control, G3PLI. For those south of the Thames, Surrey operate a regular reporting session on Wednesdays from 2030 on 70·365MHz and 145·15MHz from either controller G3HVE or G2CPX, the latter packing a powerful punch with a linear on 4m when required. In fact there are signals about on both 2m and 4m on most nights from Raynet groups too numerous to list here, so listen around, eg SE London, 70·355MHz (G3IIR).

Glass houses?

Naturally, when listening for Raynet signals it is helpful to refer to the frequency list published from time to time. The current issue is a little out of date and the committee has been taken to task for not providing current information. The galling point here is that some of the very groups making these comments are the ones from whom no information is forthcoming as to their own frequencies! G3GJW, who, in addition to his commitments as a committee member and Kent controller, undertakes the compilation of the frequency lists, has the utmost difficulty in extracting the information from certain quarters and spends a considerable amount of time and postage on this onerous task. So please do not just say that your group uses 2m and/or 4m, but give precise data.

Group news

We understand that, due to re-grouping with respect to new boundaries, the original title "Teesside" is now changed to the Cleveland Raynet Group. Also affected will be the new arrangement for two groups covering Cheshire and (part of) Wirral and Clwyd. New is the group at Wisbech under G8FBU; also the new group now getting under way at Leicester. Then we have Northampton under G8GHZ, and in N Ireland the Mid-Antrim under John Smythe, GI4BWM. In addition we have enquiries for group formation from Guernsey and Aberystwyth in progress. Going well is Kennet and Loddon with G3OWF reporting excellent support from BRCS. Of particular interest is some brisk talk in the BRCS organ in connection with the situation brought to light by the Summerlands fire on the Isle of Man, where it has been pointed out that a Raynet service would have been invaluable at the time of that disastrous incident. Support would be most welcome in the Inverness/Aberdeen area where GM8GDM is a lone member who feels that there is scope for group formation.

To date our registrations secretary reports 37 new applications and no less than 137 re-registrations. Incidentally, please remember that sae when you write; it will be very much appreciated.

Exercise messages and narrative

New groups who may lack ideas for exercise paperwork may care to apply to G3MBQ or G3GJW, QTHR, who invite more experienced groups to send in used material to assist newer members in this matter.

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* 130 Alexandra Road, Croydon, Surrey CR0 6EW

NORTH-WEST AMATEUR RADIO

CONVENTION

Lancaster University, 14-15 September, 1974

Full accommodation will be provided in rooms on the University campus. A dinner will be held on the Saturday evening and will be addressed by a well-known guest speaker. Optional Saturday lunch will also be available on that day for those arriving during the morning. After a formal opening at 2pm, a programme of lectures as detailed below will be supplemented by films, demonstrations and an exhibition. There will also be a special station GB2NW on all bands, a raffle, constructors' competition and a coach tour to the Lakes on Sunday. An RSGB Region 1 Official Regional Meeting will also be held towards the end of the convention on Sunday afternoon.

THE SPEAKERS

J. F. Craine, GW3XNU	currently working on phase-locked loops, filterless sideband generation and detection, and binaural detection.
E. L. Devereux and **A. J. H. Knight**	from Cable and Wireless Ltd—will discuss the practical aspects of h propagation.
Dr Dain Evans, G3RPE	well known for his microwave activities, will talk about the latest techniques.
J. R. Hey, G3TDZ	"Taking your shack with you" . . . or how to go portable.
B. Meaden, G3BHT	speaking on hf mobile operation.
E. L. Mollart	will present a film and talk on amateur radio direction finding.
L. E. Newnham, G6NZ	the RSGB Historian, has a large collection of slides to accompany his talk on the early days of amateur radio.
J. B. Tuke, GM3BST	"How to receive weather satellite pictures", from an authority on the subject.
Dr L. Wilson	of the University Lunar Group—a unique opportunity to see and hear in detail about the moon.

To book places, please fill in and detach this form and return with payment by 16 August to: **The Secretary, Amateur Radio Society, The University, Lancaster, LA1 4YQ.** Cheques should be payable to the North-West Amateur Radio Convention. Additional booking forms are available from the same address.

Full weekend, accommodation and lectures	**£7.50**
Saturday only, including dinner, lectures	**£3.50**
Sunday only, with meals and lectures	**£2.50**
Lectures only, no meals	**£1.50**
Optional Saturday lunch	**£1.00**

I enclose cheque for £.....

Name..... Callsign.....

Address .....

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.

Post to : MEMBERS' ADS, "RADIO COMMUNICATION", 35 DOUGHTY STREET, LONDON WC1N 2AE

FOR SALE

Koyo 177OR 11-band mains batt portable S-meter bto new, £35. 80m transceiver linear amp table cabinets, £20. Mixer linear and 1000V power unit, £20. Both home-brew. Ono. G3PVT, QTHR. Tel 021 747 2529.

Offers for EMI 14in industrial tv monitor type 7/14. Prefer buyer collects. G3PEM, QTHR.

Eddystone 888A, vgc, £60. Eddystone 840C vgc, £39. Murphy TR902 high band tx/rx base station, TT20 pa (QQO3-20A), £12. Murphy TR821 169MHz mobile tx/rx, requires psu, £4. G3WEX, QTHR. Tel 021-354 4265.

Racal RA17 rx in very good condition with manual, less cabinet, £165. Buyer inspect and collect. G3TJL. Tel Wokingham 783998.

Marconi 801A signal generator 10 to 310MHz, £50. Electroniques transistor amateur bands coil pack, £20. Imhof steel cabinet for 19 x 10·5in panel 19in deep, £8. All first class condition. G8DFT. Tel 01-942 1230.

Trio JR500SE 10-80m rx + WWV, superb condition with manual and original carton, £37. *Wanted:* Heath HW17. TW Communicator 2. G8DEV, QTHR. Tel 0789 68554.

Collectors item. German Hitler regime "Peoples radio". Complete but needs restoring. Offers. 24 crystals in 13MHz to 20MHz range, £8. Q5er with 12V dynamotor, perfect, £7. Command transmittter, £4. G3WIF, QTHR, Tel Bristol 293738.

FM base station 25W low band complete with 5 Lancon personal transceivers, batteries, charger, manual, £60. Buyer collects. G8CXL, QTHR. Tel 0926-22404.

RX SP600, £85: rx BC312M, £10. Erskine D/beam scope 13A, £20. Heathkit aud/gen ac pu, £20. Heathkit RC bridge C-3U, £10. Nombrex sig/gen type 27, £8. Codar Q/mult, £3. Canadian Roller Coaster No 2, £2. Buyer inspects and collects. Mrs A. Bedwell, 82 South Road, Sully, Glam. Tel (0222)-530394.

Yaesu FT401, little used and perfect, offered at £100 under current list price. Delivery no problem. G2KF, QTHR. Tel 072 681 2337.

Going QRT: FT200 25 SS tower telescopic winch 40ft TA33 AR22 feeder cables atu test gear gdo 2m conv 6-element Yagi. Tape recorders, books, valves, etc. Valued over £300. Best offer considered. G3MLP, QTHR. Tel 09334 2469.

Magnum Six rf speech processor for FT101, as new, £45. AR88D rx, not wkg, £16. LG300 with matching modulator, £20. Part exchanges. Why? GW3SFC, QTHR. Tel Aberdare 4880 after 6pm.

Yaesu FR50B, £45. Trio JR60, £40. KW77, £45. All receivers good condition. Exchange any of above for Eddystone 680X with cash adjustment. S. Smith, 19 Hyde Road, Kenilworth, Warks. Tel Kenilworth 54609.

Swop: Vox single manual organ for SB650 or SB620. *For sale*: HW32A/HP23A ac supply etc. Heath Cotswold speaker, two AM25B Vanguards with h/b. *Wanted*: 100ft tower. Sensible offers or ideas. G3LDI, QTHR. Tel Wymondham 3463.

Marconi uhf signal generator TF517F/1, £12. B44 Mk3 mains variable rx tuning, £4. Eddystone 659 mw/sw rx with bfu, £12. Midland aircraft band converter, £2. Weston 774 valve tester with handbook, £5. G3ZZP, QTHR.

Lafayette HA500 80/40/20/10/6m bands re-aligned with new dial, £25. G4PS, QTHR. Tel Fleet 3525.

Hand portable GEC Lancon midband rx/tx, unmodded complete with circuits and nicads, £9.50. Eddystone 898 dial, new unused, £6.50. Professional made alloy case 16in × 8in × 10½in with blank chassis, £3. G8EVP, QTHR.

Mobile power supply for all Heath or KW transceivers, £20 or why to swop? G3VCJ, QTHR. Tel Cooden 4726.

2m fm-cw tx 8W output, QQVO3-10 switched crystals, 19in rack mounting 3½in high, home brew design with circuit, £8 inc 3 crystals. UM3 Woden modulation transfmr, excellent condition, £4.50. G3LTF, QTHR. Tel 0245-58439.

Hygain 18-HT, never erected, £85. Hygain SJ2S4-362 2m J-pole, unused, £30. LM14, immaculate, manual, spare valves, £25. Solartron high stab psu AS516 250/300V, suitable LM14, £10. Copper 6in × 20ft roll, £8. Buyer collects. R. Pragnell, 9 Broadwalk, Heston, Middlesex. Tel 01-570-9909.

Transformers, new 2250V or 2250V, 1500VA, £5 each. Valves new TY4-500, TY4-400 QY4-250, TY2-125, offers. Meters 0-10mA MC, 3in × 3in, £1 each. G3HVX, QTHR. Tel Hereford 2821.

Storno Viscount 2m fm, 4 channels control box, ½λ Bantex aerial, all cables, deliver Reading area July, £30. Crystals 144·48 tx/rx Storno, £2. *Wanted:* KW2000 200A Vespa or similar. GW3YTL, QTHR. Tel Llanpumsaint 254.

Trio JR500S rx including top band, fitted 100kHz crystal calibrator, excellent condition, going transceiver, £40 ono. *Wanted:* Mini beam, TA33JR or similar. Also rotator to suit. Will collect. G3YYG, QTHR. Tel Hemel Hempstead 57547 after 6 pm.

KW Vespa Mk1 (6146B) + psu, ptt, £65. RAI, spkr, £25. Lowther fm tuner, £2.50. R208 (bulky) 10-60MHz, collect, free. T/P, rolls, 11/16 tape, 30p. Pye Vanguard 2m a.m./fm 6 chan + controls, £30. G3XCT, QTHR. Tel Otford (Kent) 2357.

TV camera, composite video output good vidicon and lens working, £20. Also ssb tx home-built 5 band 180W as new complete with psu, £35. Offers B44, Ranger. G3MEO, QTHR. Tel 852465.

Cossor CC701 mobile dash transceiver inc xtals on 145MHz, 6 channel 12½kHz spacing all transistor 5W a.m. output inc mic, speaker and full service manual, £42. G8FHN, QTHR. Tel Medway 63365.

AVO valve characteristic meter Mk IV, £15 carriage extra. G3YVP, QTHR. Tel Wigan 82437 after 4pm.

Star SR-550 amateur bands rx (anl, avc, s-meter, xtal calibrator) plus Codar PR30 preselector. Good condition, the pair, £30. G3XZO, 62A Mayfield Road, Swaythling, Southampton.

SE406 swr meter, £2. Mod, tfmr EL84s into 3'20, £1. Burns lpf, £4. Tech TE-15 gdo, £8. BC221 + stab psu, £20. Garex 2 mobile, ex cond, 2m Halo, 75p. 1MHz xtal marker, £2. G8ESK, QTHR. Tel Bradford 45611.

KVG-XF9B filter plus 9001·9kHz crystal, £10 ono. Pair of TY3-250-plus bases, £5 ono. Crystals 46·666MHz, 3·000MHz, 75p each. Control box for Vanguard FM25B, £1. Inverter transformer for 12V Vanguard, £1. Cooper, 12 Black Barn Lane, Usk, Gwent.

Heathkit SB102 HP23A psu, SB600 speaker, 16 months old, £200, including microphone. Four 813s, brand new, £2.50 plus postage, G3XMX, 7 Hambledon Court, Harnmanswater, Bracknell, Berks. Tel Bracknell 26050.

KW Vespa Mk2 with companion RX201 KW107 atu in very good condition, offers, £190. *Wanted:* Liner 2 ssb transceiver FT101 or FT200 transceiver. Heathkit monitor scope. Please ring between 6 and 7pm or write. R. C. Andreang, 10 Vermont St., Beverley Road, Hull, Humberside. Tel 0482 45140.

IC21 2m fm transceiver with matching rx vfo, rx switched fm, a.m. bfo, (tx automatically switched, very narrow deviation for ssb QSOs), 8 xtals, swr meter, 12V dc and mains, £179. Securicor paid. G8DRW, QTHR. Tel Eastbourne 31192 (office hours).

AR88D mint, £35. TW2 10W tx, £15. AC psu, £6. TW Nuvistor converter 28-30MHz, £12. 2m 10W a.m. tx built-in psu ptt c/o rly, £20. G3YNC, QTHR. Tel 01-521 3008.

Marconi H4000 transceiver, 6 channel 1·5-15MHz 100W p.e.p. a.m. ssb, all transistor except pa, fixed-mobile mounting kits 12V dc mains—internal psus, remote atu. Shure mic, new boxed but tested ok handbook, £85. G4BLJ, QTHR. Tel 0273-503980.

Solartron CD5235/2 manual (photostat), £2.50. HRO manual (military), £1.50. HRO dial, almost new, £1. AR88 main dial, 50p. Variety Parmeko etc transfs, state needs. G2DAF rx components, 5 gang var, 50p. 465kHz ifts xtals. Also quantity FT241s all around 465kHz, X-over meter for swr, £1. Kindly add post or sae enq. G3ESB, QTHR. Tel Derby 671536.

"Radio Communication" from April 1966 to Dec 1973 inc, offers invited. G3UYV, QTHR. Tel 0482-48435.

1971 edition "Radio Communication Handbook", like new, £2.50 post paid. R. Matteis, The Old Swan, Marsh Gibbon, Oxon OX6 OHH. Tel Stratton Audley 509.

Marconi TV5 tx, rx, £5 each. Genuine Marconi morse keys, £5. Valves ex-equipment 813, £1.50. 6146 80p. Mod transformers 25W, £2. QF41 new, £1. Inverter psu 12V dc 425V 125mA output, £6. Carriage extra. GM3BQA, QTHR. Tel North Berwick 2519.

144MHz linear, 150W, built-in psu, Imhof chassis, £25. Kilowatt 144MHz linear, no psu, needs attention, £25. Pye tx 50W a.m./cw, built-in psu, £15. Osker SWR-200 power meter, £15. Buyer collects except meter. R. McHenry, 2a Park Town, Oxford. Tel 0865-56321.

BC453B Command rx, 190-550kHz, 24V dynamotor operated, £5. DC 12V mobile power supplies, 280V at 100mA (two), £4 and £5 (relay switched). Three 2C39As, untested, £1.50. Carriage extra on all items. G3WBP, 89 Trenchard Close, Newton, Notts.

G3TDZ 2m portable transceiver required completion. Rx/tx ok, modulator unfinished. All new xtals. Sell for component cost. G3NXD, QTHR. Tel Kidderminster (0562) 850570.

House, Petts Wood, 13 miles London, 1936 semi-det, three beds, large garage/workshop, quiet position near station, shops. Good vhf site, £13,250. G3OHD, QTHR. Tel Orpington 24138.

Late G2BYI. NCX500, £130. AR88D, £35. Panda Cub, £19. Valient, £15. ET4332, £10. BC221, £10. 1500V 500mA pu, £6. 1kV 500mA pu, £5. 6ft 6in by 19in rack, £8. ET4332 tranny, £5. Modtranny, £5. All ono plus carriage. G3KPO, QTHR. Tel 077 584 485.

All band a.m./cw 50W table-top transmitter. Built-in power supply, £20. G3MHF, QTHR. Tel Eastbourne 54655.

Detached house, 2 rec, 3 beds, double garage & space, ⅓acre plot, 40ft mast including planning permission, 350ft asl, 25 mins Charing Cross, £22,950 ono. G3VLX, QTHR. Tel 01-467 8093.

FT200 + ac psu with 2m transverter QQVO3/20APA with all leads and aerial c/o relay, £200 ono. Lorenz LO15 page printer with silence cover and FSR11 TU with manufacturers notes, £35 ono. G8FQM, QTHR. Tel 01-360 1760.

Labgear E5021 150W tx with unopened spare 813. Marconi HR110 0·5/30MHz, £20 each ono. Pair linesource loudspeaker assemblies Marconi, £7. Tokai stereo amplifier, £9. PSU 500V 0·25A etc, stabilovolt control c-cores, £8. G3MPH, QTHR. Tel Cheltenham (0242) 59935.

AR88 rx, with manual, spare valves, calibrator, £28. 160—80m tx, 10W a.m., offers. *Wanted:* VVM with rf probe. G4CRH, QTHR. Tel 2724.

Complete 2m home/mobile station, frequencies 144·17 144·31, 144·40, 144·48, 144·81, 145, a.m. or fm spot freq oscillator. RX vfo controlled, no spurii 12½kHz bandwith ic discrim J-Beam square halo, £40 ono. G8DLT, QTHR. Tel Broadstone 5370.

Codar T28 rx, £12.50. Codar mobile psu, £5. Top band G whip, £5. Top band Tavasu whip, £5. Pair RCA 6146 not used, £3.50. Eddystone 958 dial, almost new, £6. AM10D tun rx bandscan, two channels transmit, £28. G3OBI, QTHR. Tel 021 357 5126.

Digital morse code generator, 128-bit storage. Like Feb 74 page 86 less relay and transistor. Will insert your callsign in place of mine, £16. G3TJT, QTHR. Tel Doncaster 65472.

All components for CG/G2DAF linear and psu, pair 813 meters, cabinet, only needs assembly, £18.50. "Globemaster" 10/15/20m 3el beam, £9.50. KW trap-dipole, £6. Z Match with dummy load, £6. 12 new HRO (rx) valves, £2.50. G2HCV, QTHR. Tel 01-954 2960.

Inoue IC7OOR transistorized rx, £55 ono. Nombrex 29X signal generator, £20. Oskerblock power and swr meter, £15. Panel mounted variac 8A, £8. Prinzflex 500 SLR f3·5, £18. Prinzlite Compmatic exposure meter, £8. G8GGV, QTHR. Tel Romford 64658 (work).

House. Four bedroom with gas central heating in Kidderminster, excellent vhf QTH, £12,650 will haggle. G3MWQ, 3 Albert Road, Wellington, Telford. Tel 55735.

Marconi TF373D impedance bridge, £10. Lucas 11AC alternator, control units, ammeter, £15. 30ft Unimast, triangular, £20. Buyer collects. R-1132A and psu, £5. 4m Ranger tx, 5-chan, no xtals, £5. All plus carriage. G3MOE, QTHR. Tel Cheltenham 24217.

NCX5 Mk 2 transceiver (digital readout), excellent condition, £155 including National matching psu. Also prop-pitch motor, condx as new, what offers? 2m JXK converter 28-30 i.f., requires realignment, offers. GM3CRY, QTHR. Tel 033 485 219.

Heath HW17A 2m tx/rx modified for fm/a.m. on rx and tx, spare valves, output transistors, manual, £48 ono. HG10B 2m vfo with spare valves and manual, £22 ono. Prefer buyer collects but would deliver reasonable distance. Pilags, 43 Bartons Dr, Yateley, Hants. Tel Yateley 871555.

Trio 9R59DS receiver fitted stabilizer with SP5DS speaker, perfect condition, £40, buyer collects. G4CQK, QTHR. Tel Walton-on-Thames 27199.

Property late G2BYI: vhf/rx BC639A, £10. HRO, £10. BC221, £10. Valient, £15. Panda Cub, £19. Panda atu, £5. 16mm talkie projector, pa amplifiers—speakers, 19in racks. All plus carriage. G3KPO, QTHR. Tel 077 584 485.

2m fet converter 3·9—5·9MHz i.f. built with psu into grey hammertone finish diecast box with circuit, £7.50 carriage extra. G3KZU, QTHR. Tel Oxford 63000.

F27AM base station mint 12½kHz, £40 ono. High band. R. Harrall, 10A Hayes Rd, Deanshanger, Milton Keynes MK19 6HW. Tel Stony Stratford 3054.

24ft mast, 2in dia dural with 1½in dia extension. 70cm 18-el Parabeam, 2m, 8-el Yagi, offers? Buyer to collect. *Wanted:* Information on Murphy MR960 mobile transceiver to buy or borrow. G8AWV, Pawley, 52 Sumatra Rd, London NW6. Tel 01-794 9934.

Transceiver RCA ssb-L1 separate vfo, £40. Details on request. G3EJO, QTHR. Tel 021-373 1350.

888A very late model, best offer around £80. Complete with home brew speaker, plinth and S-meter. G8CDP, QTHR. Tel 0642 38237.

Zener diodes, similar BZY88, 100 untested for only 25p. G8GPO, PO Amateur Radio Club, 200 Marton Road, Middlesbrough TS4 2EP.

PCR3 with internal psu, £6. R1155, no psu, £3. AM115 base rx working on 145·00, £5. All working ok. Creed 7B with 24V motor, suitable for overhaul or spares, £5. Buyers collect. B. Rogers, 26 Shipley Rd, Ifield, Crawley, Sx.

AVO valve characteristic tester Mk2, manuals, spares, transit case, £30. Solartron CD514 scope, manual, £30. Both items vgc. *Wanted:* HRO5T in original condition. Also HRO mx manual and b/s coils. G3GUU, QTHR.

Trio TS510 and PS510 with external vfo, crystal calibrator, cw filter, excellent condition, £150. G4CEC, QTHR. Tel Rushden (Northants) 58488.

2m fm receiver. 12 channel using standard FT2FB crystals, £15. Xtals available 145·15, 147·75, 145·55, £1.80 each. Xtals frequencies MHz 72·000, 72·175, 72·400, 72·500, 72·525, 72·920, £2 each. Xtals all frequencies MHz 2·658, 4·500, 5·000, 6·250, 7·520, 10·937, 15·011, 18·027, 24·006, 41·663, 43·333, 43·500, 44·666, 47·710, 44·766, 45·000, 46·200, 46·375, 51·250, 51·750, 52·250, 52·750, 53·250, 53·750, £1.50 each. 2m mosfet converter in di-cast case, £10. Planair 4in fan 250/110V ac operation, £5.50. Shure 201 microphone, as new, £4. 2m a.m. solid state transmitter, crystal controlled using 36·00 to 36·5MHz crystals, £15. Xtals for above tx: 36·050, 36·200, 36·250, 36·475, £1.50 each. G8FQX, QTHR. Tel Oakley (Beds) 3235.

SB220 Heath linear, £185. KW2000B with ac psu, 6146Bs in pa, £165. KW Q multiplier, £6. Europa 2m transverter, £45. Reason for sale—buying Collins S Line. G3XVF, QTHR. Tel Norwich 56782.

Instapiano electronic piano with sustain pedal and carrying case. Five octave, six months old, £125. G8IAM, 3 The Oast House, Old Wives Lees, Chilham, Kent CT4 8AS. Tel 0227 76 423.

G3TDZ type portable 2m tx/rx, less batteries, £25. 2m rx for a.m./ssb/fm transistor plus ic circuit. Requires 12V supply, £20. 2m Class C transistor amp 1W input for approx 20W output, £18 ono. G8CEX, QTHR.

R1155A plus power/speaker, good cond, working well, offers? Also Cinderella collectors items: Phantom state passports, £3/£2, send for selection. Also sell paid cheques or exchange other collectors. Keen swap trade worldwide anything. Brian Smith, PO Box 4, Uckfield, Sussex.

Trio JR500SE excellent condition, 200kHz calibrator, speaker and manual, £40. R1475 rx, 2-20MHz, complete with psu, £10. Class D wavemeter, mains powered, with transit case and manual, £5. Amplivox Jetlite boom mic headset, £3. P. Schofield, 31 Barcroft Rd, Bolton BL1 6JA. Tel Bolton 46537.

Indicator tubes, side viewing, wire ended, two sizes, 1in or 1½in high, (state preference), 50p each. Tested before despatch. G3WXZ, QTHR. Tel Needham Market (Suffolk) 720 422.

Collins 51J2/4 rx, excellent condition, £150 ono. Buyer collects. G3VCW, QTHR.

AVO valve voltmeter, £7.50. SWR meter 100μA, £2.50. Four Mullard BY122s for psu, £2.50. One zener diode BYX22/200, 25p. 15W inverter, needs attention, £2. Two Hunts capacitors 16μF 500V, new, £1. H. H. Seymour, 74 Harold Estate, Pages Walk, London SE1 4HW.

Triplett sig generator model 1632 100kHz to 120MHz, meter, 1MHz xtal, 5 valves, £14. Mains tran 590V at 600mA sec, £3. 50W output tran, pair EL34 to 3/15Ω Gardners, £5. G8GQS, QTHR. Tel Gainsborough 3940.

Creed No 1B auto tx, £5. Keyboard perforator No44 Mk2, £5. DC psu for HW12 or similar, £10. Marconi AD108D rx £5. Marconi TF517/1 vhf sig gen 150—300MHz, will go down to 144MHz, £5. G3MNV, QTHR. Tel 021 353 3012.

H/brew 160m a.m. tx + psu £5. CRT modulator monitor, £5. Prefer buyer inspects. G3ZJF, QTHR. Tel Windsor 68364.

SB102 cw filter psu, SB640, SB600, offers please. Collins 75S-1 + speaker, £140. CW filter + xtal for same, £15. Drake R4B + MS4, £160. All immaculate. *Wanted:* KWM2. Also T4XB. G3MPN, QTHR. Tel Wymondham 3382.

KW Viceroy tx psu/acr, £45. Trap dipole built to KW spec using KW traps-balun with 97ft 75Ω coaxial cable, £10. G4CJY, QTHR. Tel 0494 444417.

Sommerkamp 277 transceiver, FV101 vfo. Mosley Mustang aerial, CDE AR22 rotor, preselector hamgear, 3 mics, all little used, vgc, £300 ono complete. J Stroud, 39 Lee St, Horley, Surrey. Tel Horley 4889.

KW204 tx, £145. Sky Buddy rx, £10. Copies of *Radio Communication* back to pre-war, 60p per volume. Buyer collects, property late G5UH. Enquiries to G2IK, QTHR. Tel Bristol 777375.

Creed 3X printer, £3. Solatron AS562 klystron psu, fully metered int/ext mod, £5. Creed 7B spares, state wants and price. Radio control tx crystal, £1. Valves: 829B 832A 807, offers. G3REP, 10 Hill Top Rd, Cheltenham. Tel 28054.

Eddystone 750 rx, excellent condition, £38. G3OLI, QTHR. Tel 0272 656682.

RTTY filters, sealed, 600Ω, 1,200 to 2,200Hz, £2. 900 to 2,450Hz, £1. 10·7 to 12kHz, £1. Various narrow bandwidths for cw or single tone, £1. G3SBA, QTHR. Tel 05827 4815.

R1132 receiver with psu, £3 ono. Polaroid Swinger black and white camera and case, £4 ono. *Wanted:* Gen on coils for Tech 16 GDO? Also handbook for Eddystone 358 receiver, buy or borrow. G4DBW, R. Hammond, 43 Durant Rd, Hextable, Swanley, Kent. Tel 82 64356.

That old type valve you want. I may have it; sae your requirement. Used but ok, 50 available. G2ANB, QTHR. Tel Hockley 3278.

KW2000 tx/rx. Recent overhaul by KW. Good cond, £120. KW600 linear amp, £85. G3ZSQ, 110 Cheltenham Rd, Bradford, Yorks. Tel 0274 58433.

Emigrating S Africa? Cottage 30 miles south Johannesburg, on ¼ acre. Two bedrooms, garage with spare room (shack) attached. Price R16,000. Write for details. D. Tranmer, Box 234, Meyerton, Transvaal.

Pye Vanguard AM25B tx aligned on 2m, rx needs slight attention, complete with cable, control box and handset, £20. Sentinel 144MHz converter 4-6MHz i.f, £12. Buyer collects Vanguard. K. Haywood, 14 Lynton Ave, Flixton, Urmston, Manchester.

Urgent sale. FT2FB as new, 144·48, 144·60, 145, 145·55, £85 ono. Also Microwave Modules 2m a.m. transmitter and receiver, £50. Must sell quickly. G8BNX, QTHR. Tel 540 1479.

FR50B with top-band and 2m, £60. Heathkit GR64 receiver 9·5-30MHz with bandspread, £10. Hallicrafters S-95 Civic Patrol receiver 152-173MHz, £5. Codar CR-70, £15. G4AQA, QTHR. Tel 0482 655856.

Swan 350 transceiver with cal and external vfo ac psu, £175. Trio JR500SE, £42. Telford tunable i.f. 28-30MHz TC7MKZ, £30. High power balun, £7. Sony 101 tape recorder, £20. Prefer buyer collects. P. N. Lewis, 20 Annes Walk, Caterham-on-the-Hill, Surrey CR3 5EL.

Codar CR70A general coverage receiver, new condition, £18. Buyer collects. S. Wyatt, 55 Ridgefield Rd, Cowley, Oxford OX4 3BX. Tel Oxford 43634.

FRDX400 rx, FLDX400 tx, matching spkr plus connecting cables etc. Liner 2 ac psu 144·1—144·33, R216 rx ac psu. 4m Sent conv 28-28·7, AM25B on 70·260, AM25T on 145·8, 4m J Beam 4el, crystals for 4 and 2m various valves etc. GI3ZSC, QTHR. Tel 023 844 378.

As new Microwave Modules converter (2m) i.f. 27·9, 29·7, suitable Trio etc. Also two 8MHz xtals, £15 or exchange for mint BC221. G3NJC, QTHR. Tel Doncaster 49237.

QTH London. Double fronted 4 bed house, three reception, garage, cellar, boarded loft/QTH/workshop, 60ft garden, trains London, and shops 5min, £15,000. A. A. Coutts. Tel 01-679 0032.

Racal RA17L, vgc, £180. Pye 3820V base transmitter 6-40 final, 25W rf output, crystal for 144·47MHz ± 40kHz vxo (nbfm), £50. Parmeko transformers 400-0-400 at 400mA, £2. 5V 6A 0-40-45V 0·4A 2× 6·3 6A, £2. 34 Forlands, Weston, Portland, Dorset. Tel 0305 820661.

DX1OOU, vgc, in regular use, £32. G3YNV, QTHR. Tel Maldon 55641.

Five digit freq counter, £30. Transistor ssb generator 5-5·5MHz, £20. RF speech clipper, £20. IC keyer, less paddle, £5. Q5ver, £6. 200kHz phase lock freq standard, £6. G3PJT, QTHR. Tel Comberton 3137.

DX40U and VF-IU Heathkit, £17. HA-350 rx Lafayette, £45. G3SQG, QTHR.

FT200 FP200 mic, new PAs driver, £140. 4m base stn 60W fm tunable a.m. rx, £25. Cambridge AM1OD rx tunable 6W rf, £23. 455kHz fm i.f., £2. Enq sae, buyer collect pse. G4BXD, QTHR.

"RSGB Bulletins"; complete volumes: 33, 34, 36, 37, 38, 39. Other volumes between 30 and 43 available but incomplete. Complete volumes, £1. Incomplete volumes, 50p to 75p. Sae with any enquiries. M. Peters, 42 Gorselands, Newbury, Berks. Tel Newbury 5747.

230 ac/dc rotary converter, £5. 1196 rotary converter, £1. VCR517B plus screen, £10. MU metal screen, £1. VCR139 and scopecase, £3. 1927 radio, £20. 1933 radios, £2. A. A. Coutts, 31 Alloa Road, Ilford, Essex. Tel 590 5042.

Clearance of shack. Sae for list of large and small items. *Wanted:* QSO with any RC410 or RC411 owners to swop ideas and mods. G3AAJ, QTHR.

RG17 coaxial cable. Extremely low loss (0·4 of RG8). New unused 93ft length, £28. Buyer collects. G3FNJ, QTHR. Tel 01-866 4680 evenings/weekends.

B24 mini beam 2 element, 5 months old, £20 ono or exchange considered. G4CJI, QTHR. Tel Huntingdon 810569.

Microwave Modules 70cm converter, £16 ono. Yaesu UD844 desk mic, £7. STC 10·7MHz xtal filter, offers. Butterfly trimmers with shaft 12 + 12pF, 50p ono. Smiths instrument cases as May advert. *Wanted:* IC2F. G4DCQ/G8DCQ, QTHR.

Philpotts G2DAF cabinet with blank chassis, accepts 898 dial, £5. Three instrument cases 17in × 8in × 11in, £5. Collins TCS rx 1·5–12MHz, good order, needs psu, £6. 2m Pye Ranger base station with manual, £10. GM8CJW, QTHR. Tel 0324 26367.

Pye six-channel AM1OD Cambridge completely modified for 2m except for rf board which untuned, a.m. or fm on transmit or receive. Crystals for 144·480, 145·00, 145·80, excellent condition, good working order, £37·50. GM4AZC, P. I. Martin, 41 Ottoline Drive, Troon, Ayrshire KA10 7AN.

Crystal calibrator BW270 100kHz, 1M, 5M, £3. Racal 1001CC demodulator MA139, £3. KW110 Q-multiplier, £5. AVO test osc CT378, 2-225MHz, £5. Heath Q-multiplier GD125, £4. KW amateur band converter 3·5—30MHz, £7. Buyer collects. MacGregor, 166 Ellenborough Rd, Sidcup, Kent.

Eddystone EC10 Mk2 with type 924 ac/psu, and type 945 dc/psu. Few hrs use only, perfect working condition, less than 6 months old (unwanted gift), £82 ono including carriage. K. Arasu, School House, Brighton.

Type 13 oscilloscope with full circuits, £15. Spare tube, blue trace, £3. 14in tv monitor (405 line), £10. G8CGK, QTHR. Tel Ross-on-Wye 2715.

Complete station comprising 1155 receiver with built-in power supply and speaker, and all band home brew 40W tx. Good working order, £28. Also heavy duty 450/650V psu, £5. G3WIF, QTHR. Tel Bristol 293738.

HRO dial and sm drive assy, £2. Haynes 6/10kV rf eht unit, £2. Pair unused Philips filter crystals, 456·2 and 453·8, £3. Several new 813s and 6L6Gs. Offers. G3WIF, QTHR. Tel Bristol 293738.

Sentinel dual gate mosfet vhf converter i.f. 2-4MHz 144-146, £10. D. Cole, 99 Benhurst Ave, Elm Park, Essex. Tel Hornchurch 55143.

Telford TC7 Mk2 with built in G8AEV converter, £40. Laboratory psu 200-500V 0·5A regulated, 500V 0·5A unregulated, 6·3V 10A ac, buyer collects, £15. *Wanted:* IC700R. G8DRE, QTHR. Tel 01-500 8712.

WANTED

Drake T4-XA, T4-XB, or T4-XC, with or without psu; Bird 4352 vhf wattmeter. R. McHenry, 2a Park Town, Oxford. Tel 0865-56321.

SB500 Heathkit transverter. Mills, Tanglewood, The Ridge, Lt Baddow, Chelmsford CM3 4RX. Tel Danbury (024541) 3494.

Circuit diagram for Reflectograph model 500 tape recorder (used for morse tuition). Loan for photocopy, against deposit if required. G4CTE, ex G8AWX, QTHR. Tel Sutton-on-Sea 753.

Gash CR100 dials and drives needed. G8FPT, QTHR. Tel 01-504 4942.

TX, rx xtals 145MHz for Pye Cambridge. Please state price reqd. R. Exley, 35 Wood St, Doddington, Cambs.

KW2000 or KW2000A/B with ac power supply required in good working order. All inquiries will be acknowledged. Please write, or telephone after 6pm to, R. Alban, 15 Mountjoy Place, Penarth, Glam. Tel Penarth 707794 code (0222).

AM10D, good working order, tunable rx. G3SQM, QTHR. Tel Hambleden 443.

Cossor scope model 339 or 3339 only list component values wanted or scrap unmodded chassis, quote price. G3AGX, QTHR. Tel Hull 822276.

Youngster just taken RAE needs 6-channel 12V Ledex switch, 6 receive trimmer coils, empty control box for AM10B, selector switch for control, rx and tx xtals for 2m. Send price/details please. P. D. Clarke, 26 Woodfield Rd, Solihull, Warks B91 2DN. Tel 021-705 4220.

Remote vfo and dc power unit for Heathkit HW17A to complete lp gear for Scout group. State price and condition. Also handbook for Trio rx JR310. G8MRZ, Mike Harriman, 4 Rosebery St, Leicester. Tel 0533-20117 (day).

Any information on Cossor tx type T109 AB5 circuit or handbook to buy or copy. G3OMF, QTHR. Tel 05643 2190.

New valves types E180F, ECC189, 6AS6, 6BE6W, 6AK5W, DP 16-22, 6BA6, 6AU6, 12AT7, 1X2B, 6AL5, 6DC6, 6BA7, 6AN5WA, 6AQ5, 5ADP1, 3JP1, CV279, 6CW4. Good price paid for TSG10 tdms, must be mint condition. A. Fletcher, 62 Moorbridge Lane, Stapleford, Nottingham. Tel 0602 397446.

Keyboard, computer type Alpha-numeric, non-mechanical, for conversion to rtty use. G3YKB, B. Hodgson, 234 Gillingham Road, Gillingham, Kent. Tel Medway 571909.

Complete morse course records and books required by schoolboy wishing to take RAE. S. Pocock, 57 Golden Avenue, Angmering-on-Sea, Sussex BN16 1QX. Tel Rustington 4123.

2m beam. DC psu for HW32A, and aerial. KW E-zee match. Scope. Rotator. RF signal generator. Xtals for AM10D 44 and 8MHz range. Tape recorder. GI3AOB, QTHR.

SSB transceiver for 80m (or with 40m) with 12V dc psu for mobile use. G3ZVU, QTHR. Tel Oxted (Surrey) 4277 after 1930hrs or weekends.

Electroniques general coverage coil pack. Valve or transistor type. Codar CR70A comm rx, or similar. G3WIF, QTHR. Tel Bristol 293738.

Hammarlund HX50. Mains transformer (200-240V input) required; or complete tx scrap or u/s, (providing txfr ok). Reasonable price. G2WI, 115 Charterhouse Road, Orpington, Kent. Tel ORP 29716 after 6pm, except Friday.

12AVQ or similar vertical aerial. *For Sale:* 2m low noise converter 28MHz i.f., £3.50. 2m Yagi, £1.25. Mains psu/amp, £1. 380V 250mA oil-filled transformer, £2 or exch. Why? G3VFG, QTHR. Tel 0532-757692.

XF9As or two identical 4-pole crystal filters at any frequency above 1MHz. Shure 444 mic. Blower suitable for 4CX250B 650-0-650 transformer at 250mA. G4AFI, QTHR. Tel 061-368 9372 (evenings).

Remote vfo for KW Atlanta. XF9B filter with crystals. SEI filter QC1246AX with or without crystals. P. Smith, 49 Hucknall Avenue, Ashgate, Chesterfield, Derbyshire S40 4BZ.

Drake TC2 and SC2 transverter combination. G8HXL, 65 Crompton St, Chelmsford, Essex.

Eddystone 898 dial. Good appearance and condition. Please state price. All replies answered. G3HES, QTHR.

Schoolboy requires manual and circuit diagram for Sommerkamp FR100B receiver, expenses paid, please write. D. Sherwen, 101 Main st, Frizington, Cumbria CA26 3PE.

Kokusai mechanical filter MF-455-10CK, prefer with crystals. GW3KAJ, QTHR. Tel Wenvoe 454.

KW2000A, Heath HW101 or similar tx/rx. Alternatively late model Viceroy tx and amateur band rx, eg Heath HR10B. J. D. Burling, 41 Park Mount Drive, Macclesfield, Cheshire. Tel Macclesfield 25154.

Transformers 500/1kV 200mA mod transformers. Tuning capacitors 500/1000pF 1kV wkg. Any electronic scrap chassis, components, meters etc. Please ring me if you are clearing out. P. Heap, 198 Abbots Road, Abbots Langley, Watford, Herts. Tel Kings Langley 63889.

AVO model 7 or 8 cash plus brand new QQVO640A, good price paid. All letters answered. G3UHH, QTHR. Tel Watton 238.

Rotator for 2m beam, about £15. Info also on practical mods to Heath HW-7. G4BXN, QTHR. Tel Oxted 5619.

Transceiver HW12A, NCX3, HW101 etc. Must be in first class condition and complete with power supply. G3WY QTHR. Tel Evesham 45497.

KW2000A dc psu. G3VHA, QTHR. Tel Kingswinford 4258.

FT101B, also G whip multimobile aerial Osker power/swr meter or similar and BC221, all must be mint. Offers to George L. Baxter, 251 Harrogate Road, Eccleshill, Bradford, Yorkshire. Tel 0274 639823.

Got a licence but no gear! Can anyone help with mobile 2m a.m. tx/rx preferably boot mounting with tunable rx. Pye AM25T or why? Details and price please. G8ISX, D. J. Wright, 74 Woodride, Orpington, Kent BR5 1PY. Tel Orpington 29586.

KW107 Supermatch, Yaesu FV101 vfo, FL2100 3 element hf beam TH3 or similar and Europa transverter. G8DYY, QTHR.

Lafayette HA55 aircraft band receiver. G3MQY, QTHR. Tel Ringwood 4625.

Inoue IC-210, clean, need not be working. Cash waiting. G8BIH, QTHR. Tel Alton 82739.

Transceiver KW2000 or similar, must be in good working order and tidy. Please reply to: A. K. Langford, 93 Grove Road, South Woodford, London E18 2JY. Tel 01-530 2878.

HRO bandspread coils covering amateur bands. Must be in good condition. GI3YDH, QTHR. Tel Belfast 643913.

SP-5D speaker. B. Smith, 30 Dorset Road, Bridgwater, Somerset TA6 5PR. Tel 51357 after 6pm.

Heathkit RA1 or HRO. Must be in good condition. Cash waiting. S. Alderton, 2A Goldings Road, Loughton, Essex. Tel 01-508 3013.

Scope Erskine Laboratory Scalby Model 2W—buy or borrow operating instructions and circuit diagram. Also circuit for Tech PV-58 valve voltmeter. G3SUB, QTHR. Tel Skirlaugh 312.

Electronic keyer EK9X or similar, also Trio receiver JR65 or JR102. G3YFI, QTHR. Tel 093786 2502.

Two 58MHz or 116MHz crystals or source of supply. G3PHJ, QTHR. Tel 55624.

Marconi CR-300 or similar lf receiver covering 15-600kHz required. GC3NCJ, 34 Elizabeth Avenue, SB, Jersey. Tel 0534-42044.

Operating instructions for Trio JR500S receiver, buy or borrow. Also HC6U/HC18U on 4·3333MHz. G8FUT, QTHR.

Mixer crystals for 9MHz i.f.—11MHz fundamental, 25·0, 32·0, 32·5 and 33MHz 3rd overtone, also bases. GM4AQO, QTHR.

SSB a.m. tx covering 160m, 80m, 20m, complete with psu. K. Mullaney, 100 Birdbrook Rd, London SE3 9QP.

Receiver: general coverage or amateur bands. Good working condition. Commercial or ex-Govt. State price and carriage. GI3UFH, QTHR.

52Ω dummy load and atu for KW rig. *For sale:* Eddystone 730/4 with set spare valves and manual, £65 no offers, buyer collects if satisfied after necessary check. A. R. Peel, 55 Buckswood Dr, Gossops Green, Crawley, Sussex.

PA237 ics; "101 ways to use your sweep generator"; Schematic low-band Ranger; uhf or dual standard colour-bar generator. G2FWA, QTHR. Tel Bishop's Cleeve 2229.

HW 12A tx/rx preferably with both ac and dc psu, no mods. GM4BTD, QTHR. Tel Lesmahagow 3459.

Eddystone 770R Mk2. G8AKS, QTHR. Tel 66311.

Service manual Eddystone 730/4 receiver. Also mains psu for Pye Cambridge AM10D. *For sale:* Crystals HC25U or HC18U 10·300, 10·250, 34·825, 35·683, 37·325, 44·000, 41·000, 72·525, 72·245, 78·825, 80·506, 55p each. G3HBG, QTHR.

Creed model 7 teleprinter with silence cover, in good working order. Also converter for same. Will buy separately. R. Looker, "Marcholme", New Rd, Lodge Lane, Chalfont St Giles, Bucks. Tel Little Chalfont 4685.

Manual for Collins tx and rx. Also power plugs and key jack. GW3TKG, QTHR.

Pye printed circuit boards transmitter rf driver, AT26838 (any version) transmitter af unit, AT26837 and 2nd oscillator unit, AT26836 also mod transformer for W15AM Westminster. Any reasonable price paid. Douglas McLay, 29 Cramond Ave, Edinburgh 4. Tel 031 336 4668.

Drake T4XB, TR4 Ezematch. G2UZ, QTHR. Tel Leeds 784074.

Good quality hand speed morse key. B. C. Complin, 5 Marsh Way, Pimperne, Blandford, Dorset. Tel Blandford 3695.

Microphone and NiCad battery box for a.m. Pye Bantam. Also wanted FT75. UHF Westminster, need not be complete. 4-el 4m J-beam. Bird 43W meter or similar. G3TTV, QTHR.

To borrow for cash; Westminster tape recorder circuit. Selling: Mains transformer 2,000V 500mA, £7. Notch filter tunable for receivers, £1.50. G3KH. Parker, 133 Station Rd, Cropston, Leicester LE7 7HH.

Handbook, circuit or info on valve voltmeter CT54, buy or borrow. Also mains psu for same. *For sale*: Collins atu 180L3A, £10. Pye Bantam high band complete, new, £35. GM3BQA, QTHR. Tel North Berwick 2519.

RSGB SLOW MORSE PRACTICE TRANSMISSIONS

These slow morse practice transmissions are sponsored by the RSGB. Alterations and additions to this list should be sen to the honorary organizer, Mr M. A. C. MacBrayne, G3KGU, 25 Purlieu Way, Theydon Bois, Essex.

Clock time	Callsign	MHz	Mode	Town
Sundays				
1000	G3HZL	144·160 to south-west	A1/A3J	Isleworth, Middlesex
1015	G3CGD	1·875	A1/A3	Cheltenham, Glos
1030	G3NPB	1·875	A1	St Ives, Cornwall
1030	G3LR ..	1·810	A1	Accrington, Lancs
1030	G3ZNW	144·520 to east	A2/A3	West Molesey, Surrey
1100	G2FXA	1·900	A1/A3	Stockton-on-Tees
1115	G3ZNW	144·520 to north	A2/A3	West Molesey, Surrey
1200	G3HVI	144·100 omni-directional	A2/A3	Stoke-on-Trent, Staffs
1330	G3FWW	1·880	A1	Burnham-on-Sea, Soms
1500	G8JD ..	3·600	A1/A3J	Durham
1815 †	G3VTY	1·915	A1/A3J	Leeds, Yorks
	G3YEE	1·910	A1/A3J	Bradford, Yorks
1830	G3NCZ	1·920	A1/A3	Blackburn, Lancs
Mondays				
1800	G3YEE	145·510	F2/F3	Bradford, Yorks
1800	G3SWR	1·980	..	Birmingham
1830	G3VBI	1·910	A1/A3	Goole, Yorks
1930	G3RAF	1·910, 3·590, 144·024	A1	Locking, Soms
2000	G3IBJ	1·910	A1/A3	Southampton, Hants
2000	G3XWZ	1·910	A1/A3J	Mansfield, Notts
2000 †	G3YJI	1·845	A1/A3	Walton-on-Thames, Surrey
	G3YZB	..		East Molesey, Surrey
2030	G3ASR/A	1·875	A2/A3	Harrow, Middlesex
2130	G3LQI	1·980	A1/A3J	Lancing, Sussex
2230	G3HZL	144·160 to south-west	A1/A3J	Isleworth, Middlesex
Tuesdays				
1100	G3EBU	1·952	A2/A3J	South Woodham, Essex
1800	G3SWR	1·940	..	Birmingham
1830	G4BNA	3·590	A1	Swindon, Wilts
1930	G3RAF	1·910, 3·590, 144·024	A1	Locking, Soms
2000	GM3UWX	145·890 omni-directional	F2	Bishopton, Renfrewshire
2045	GM3CRY	3·550	A1/A3J	St Andrews, Fife
2130	GM3UAG	145·800 to south	..	Ellon, Aberdeenshire
Wednesdays				
1930	G3RAF	1·910, 3·590, 144·024	A1	Locking, Soms
2000	G8QU	1·970	A1	London N22
2000	G3BPE	1·975	A1/A3	Bexley, Kent
2000	G3SWP	1·920	A2/A3J	Doncaster, Yorks
2015	G3WVJ	1·845	A1/A3	Staines, Middlesex
2030	G3KGU	1·915	A1/A3	Theydon Bois, Essex
2100	G3HVI	144·100 omni-directional	A2/A3	Stoke-on-Trent, Staffs
2230	G3HZL	144·160 to south-west	A1/A3J	Isleworth, Middlesex

† Alternately

Clock time	Callsign	MHz	Mode	Town
Thursdays				
1800	G3SWR	1·980	..	Birmingham
1830	G4BNA	3·590	A1	Swindon, Wilts
1830	G3NC	1·968	A1	Swindon, Wilts
1900	G3YEI	1·850	A1	Fleetwood, Lancs
1915	G3ZNW	144·520 to north	A2/A3	West Molesey, Surrey
1930	G3RAF	1·910, 3·590, 144·024	A1	Locking, Soms
2000	G3WGD	1·840	A1	Leicester
2130	GM4CAU	145·800 to north	..	Aberdeen
2130	G3LQI	1·980	A1/A3J	Lancing, Sussex
Fridays				
1800	G3SWR	1·940	..	Birmingham
1900	G3NPB	1·875	A1	St Ives, Cornwall
1930	G3PQF	144·360 to north-east	F2/F3	Farnborough, Hants
1930	G3RAF	1·910, 3·590, 144·024	A1	Locking, Soms
2015	G3SAZ	1·845	A1/A3	Ashford, Middlesex
Saturdays				
0930	G2FNK	1·930	A1/A3J	Staines, Middlesex
1000	G3HZL	144·160 to south-west	A1/A3J	Isleworth, Middlesex
1115	G3HZL	144·160 to north-west	A1/A3J	Isleworth, Middlesex

G3BZU morse proficiency transmissions at 20, 25, 30, 35 and 40wpm are made at 2000 clock time on the first Tuesday of each month on a frequency of 3·520 MHz. For 100 per cent copy at 20wpm a certificate is awarded, and endorsement stickers are available for 100 per cent copy at the higher speeds. A charge of 10p or two IRCs is made for the basic certificate, and 2½p or one IRC for each endorsement sticker claimed. All claims should be sent to—The QRQ Manager, RNARS, HMS *Mercury*, Leydene, Petersfield, Hants.

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.

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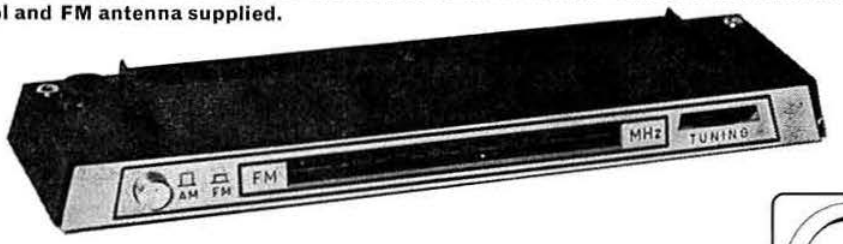
A separately tuned whip antenna is provided which enables an excellent level of sensitivity for a portable receiver to be obtained, especially at the higher frequencies where signals are usually weak. Logging facilities are provided by log cards in a flip-up holder on the set, on which can be logged identities, frequencies, time of day and time of year for instance, of stations which are of particular interest. On account of the high setting accuracy of the set, it will enable the listener to return to a previously heard transmission with the certainty of hearing it if the conditions are suitable.

These units extend the range of the XCR-30 to cover the FM Band 87·5-101 MHz. Fitting instructions, special tool and FM antenna supplied.



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