# radio communication

March 1974

Dr J. A. Saxton, Immediate Past-President, installing Mr G. R. Jessop as President

## Presidential Installation 1974

Despite the travelling difficulties and weather conditions prevailing at the time, some 90 people gathered at the Bonnington Hotel, London on 4 January to see Mr G. R. Jessop, G6JP, installed as President of the RSGB for 1974.

Among the guests of the Society at this social occasion were Mr D. E. Baptiste of the MPT, Mr H. Barnard, former editor, and Mr T. Ivall, present editor, of *Wireless World*. All Past-Presidents and Honorary Members of the Society were also invited and several succeeded in being present.

Mr G. R. Jessop in conversation with Mr D. E. Baptiste

*Photos by Paul Fletcher*

journal of the Radio Society of Great Britain

# radio communication

Volume 50 No 3 **March 1974** Price 40p



## CONTENTS



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**Advertising, other than Members' Ads, should be sent to the above address marked for the attention of Mr C. C. Lindsay. Tel 01-837 8688 (or 01-686 5839, advertising only).**

# Western

# Yaesu Musen (U.K.) Main Distributor

**The NEW FT-101B** ex-stock. There are over two dozen various circuit changes in this new model of the famous "101", some of them very minor. The main differences are:—1, New plug-in noise blanker; 2, New 2nd mixer; 3, 3SK40M transistor on the RF board with different bias; 4, LED's to indicate VFO and RIT operations: 5, o/p socket for sidetone; 6, i/p socket for anti-trip from 2nd receiver; 7, New Crystal filter.

When you compare the superb value and craftsmanship built into this fine unit don't forget that you are buying a DC PSU and microphone all in one package plus our technical "know-how" and the finest after sales service in the country. If any Yaesu unit goes wrong (which is most unlikely) then all you have to do is write/telephone us and we will collect the unit from you AT NO COST TO YOURSELF by Securicor and deliver back to you free of charge on all warranty work. You just can't do better!


**YAESU PRICES (Carriage free by Securicor) including VAT. (All Ex-Stock)**

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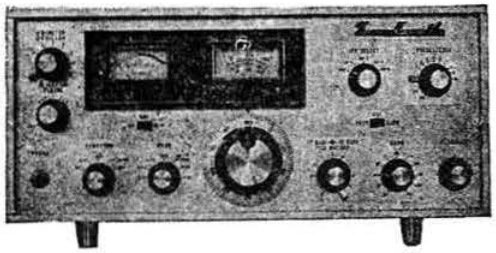
|---|---|
| **HF TRANSCEIVERS** | |
| FT-75 | £126.50 |
| FP-75 | £27.50 |
| DC-75 | £27.50 |
| FT-101 | £297.00 |
| FT-101B | £328.90 |
| FT/FP200 | £209.00 |
| FT-401 | £291.50 |
| FT-501 | £368.50 |
| **HF TRANSMITTERS** | |
| FL50 + VOX | £86.90 |
| FL400 | £181.50 |
| **VHF TRANSCEIVERS** | |
| FT-2FB | £107.80 |
| FP-2AC PSU | £29.70 |
| FP-ACB + Batts | £42.90 |
| FT2 AUTO | £172.70 |
| **HF RECEIVERS** | |
| FR50 + CAL | £73.70 |
| FR400DX | £148.50 |
| FR4005DX | £192.50 |
| **FREQUENCY COUNTERS** | |
| YC-355 30MHz AC PSU | £106.70 |
| YC-355D 220MHz AC/DC PSU | £132.00 |
| **REMOTE VFO** | |
| FV50 for FT75/FL50 | £30.80 |
| FV-101 | £46.20 |
| FV-401 | £46.20 |
| **SPEAKERS** | |
| SP101, 400, 401 | £12.10 |
| SP101P Phone Patch | £28.60 |
| **LINEAR AMPLIFIERS** | |
| FL2000B 1200w | £181.50 |
| FL2100 1200w | £181.50 |
| FL2500 2kW | £143.00 |

## SIGMASIZER 200.

This fine unit from Yaesu will enable you to dial up accurately any channel in the 2m band no matter where the band planners move you. You have full flexibility of operation via repeaters and a good specification:

Deviation: Wide ± 15kHz Narrow ± 5kHz.
Power output: 10w
Channels: 200 10kHz spacing
Spurii: —60dB
Sensitivity 20dB quieting: —40dB.
**Ex-stock at £198 (inc VAT/Carr.).**



**The FR400 SDX** (Super de luxe) receiver is made especially for us fitted with 4m, and covers 160, 80, 40, 20, 15, 11, 10, 4 and 2m. 4 filters are fitted for SSB (2·4kHz), AM (5kHz), CW (0·6kHz) and FM 24kHz. Dial readout to 1kHz from stable VFO. Rejection tuning to notch-out unwanted heterodynes. Clarified control permits adjustment of SSB/CW received signals when working transceive. VFO select for internal or 4 crystals frequencies. Monitor facility enables transmitted signal to be monitored at all times. Squelch circuitry silences receiver for noise-free AM/FM reception. FM discriminator fitted to SDX model, 25/100kHz calibrator. WWV band to check calibrated, 3 step AGC. Built-in noise limiter.

# Electronics (UK) ltd

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| Hallicrafters SX101 complete with auto tran. .. .. | £55.00 |
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| Heath SB300 very good .. | £79.00 |
| Heath SB300 .. .. .. | £80.00 |
| Heath SB400 .. .. .. | £80.00 |
| Heath SB303 new complete with CW Filter inc. VAT .. | £230.00 |
| Heath SB303 very good .. | £150.00 |
| Heath HM102 .. .. .. | £18.00 |
| Heath HP13 DC PSU .. | £29.00 |
| Heath HR10 .. .. .. | £32.00 |
| KW Viceroy 4 .. .. .. | £70.00 |
| KW107 as new 52 ohm .. | £42.00 |
| KW2000B .. .. .. | £165.00 |
| National NCX3 good 20, 40, 80 | £98.00 |
| Racal MA150 synthesizer for RA17/RA117 .. .. | £89.00 |
| Racal MA197 preselector, 1-30mc/s .. .. .. | £65.00 |
| Sommerkamp RF400DK .. | £105.00 |
| Star SR200 .. .. .. | £28.00 |
| Trio 9R59DS New .. .. | £49.50 |
| Trio JR310 as new .. .. | £65.00 |
| SSM 2m. AM TX and RX (incl. mic) .. .. .. | £45.00 |

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Why wait somewhere else when Western Electronics' ex-stock service can bring *you* the goods almost by return? All orders are normally dealt with the same day as received, and communications equipment too heavy for post is despatched by Securicor for delivery on the next working day. You can hardly do better. This is the quality of service which we initiated and of which we are still the leaders.

**We're doing our best, but due to manufacturers' price increases and the unfavourable rate o exchange, prices quoted in this advertisement may have to be increased in the near future.**

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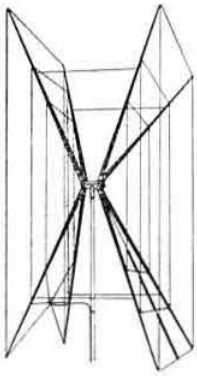
### get the most out of your aerial!

For the best possible T.V. or radio reception, your aerial should point towards the transmitter. Now, with just a flick of the wrist, the CDE AR30 Autorotor makes this possible. This easily installed device rotates any aerial through 360° and will bring new radio and television stations into the range of *your* receiver.

Fully guaranteed unit comprises a weatherproof, heavy-duty die-cast housing which will last a lifetime. The mast clamp type mounting ensures best distribution of antenna weight. Attractive console compliments any decor and incorporates on/off light. Send for details now:

## Antennas Antennas Antennas Antennas Antennas



**ANTENNAS (Carriage/VAT paid)**

### GEM-QUAD £81.95 (inc. VAT)

**for 10, 15 & 20m.**

- ★ Weighs only 21 lbs.
- ★ Withstands 100 mph winds.
- ★ Forward gain up to 8dB.
- ★ Balun included.
- ★ Converts to 3 or 4 element quad.
- ★ Fibreglass tri-dectic spreaders.
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- ★ Low angle radiation.

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HY-GAIN 18AVT/WB THE GREAT NEW WIDE BAND VERTICAL SELF-SUPPORTING FOR, 10–80m. (ex-stock) **£39.05**. Take the wide band, omni-directional peformance of Hy-Gain's famous 14AVQ-WB add 80m. plus extra heavy duty construction and you have the new 18AVT/WB ★ True ¼-wave resonance on all bands ★ 52Ω I/P ★ SWR of 2 : 1 or less at band edges ★ 1kW (AM) ★ Radiation pattern has an outstandingly low angle ★ Roof or ground mounting.

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| 12AVQ, 102-0m. vert. (self-sup.) | £18.15 | 203BA, 20m. 3 ele. beam .. | £79.20 |
| 14AVQ, 10-40m. vert. (self-sup.) | £26.95 | 153BA, 15m. 3 ele. beam .. .. | £40.15 |
| 18AVT, 10-80m. vert. (self-sup.) | £39.05 | 103BA, 10m. 3 ele. beam .. .. | £31.35 |
| LC80Q, 80m. coil for 14AVQ .. | £8.52 | LA1 Lightning arrestor .. .. | £15.95 |
| TH6DXX, 10-20m. 6 ele. beam .. | £106.00 | LA2 Lightning arrestor .. .. | £2.75 |
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| TH3 Jnr., 10-20m., 3 ele. 700w. .. | £56.65 | 262 ½p + magnetic mount .. | t.b.a. |
| Hy-Quad, 10-20m. 2 ele. .. | £81.95 | 263 ½p + book lip mount .. .. | t.b.a. |
| DB10-15, 10-15m. 3 ele. .. | £57.50 | 265 3dB gain + mag. mount .. | t.b.a. |
| DB24B .. .. .. .. | t.b.a. | | |

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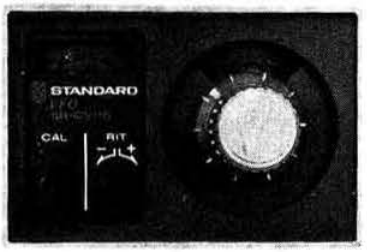
CABLES: 'AERIAL, SOUTHAMPTON'

**Hours of business:** *9-9.30; 9-12.30 (Saturdays)*

# Western Electronics (UK) Ltd

## Standard Radio Corporation

**144MHz CV110 VFO**




The CV110 is a remote VFO for the C140 Transceiver and has a centre tuning meter plus RIT(± 5kHz) and CAL position to accurately calibrate the VFO.

**C140 TRANSCEIVER**


The C140 is a 10w 12-channel transceiver+1 Memory Channel and measures only 3¼" wide × 2¼" high! The microphone has two switches, the normal PTT switch plus the MEMO switch. A flick of the switch and the transceiver overrides the channel selector and you can transmit or receive on another frequency. The C140 takes the CV110 Remote VFO or SY-200 Synthesizer and comes complete with microphone, line filter and mounting hardware.

**FT-2FB OWNERS!**

**CRYSTALS**

ex-stock for 145·5, ·525, ·55, ·575 and 145·6MHz at **£3.96**/pr. inc. VAT/ postage.

**C826M3 TRANSCEIVER**

**CV100 DUAL VFO**

C146A is a 2w5-Ch. Hand transceiver with tone burst and the capability of repeater operation. Ni-cad batteries and many accessories are available (but not fitted) making this superbly built unit the finest available. Complete with leather case and fitted crystals on 145·00 and 145·15.

The C826MB is a 12-channel 10w o/p unit. Tone burst and separate transmit and receive crystals permit repeater operation and are readily accessible via a hinged lid underneath. Receiver sensitivity is excellent being 0·4μV or less (20-dB quieting). Transmitter and receiver test sockets are fitted at the rear for servicing. The C826MB has provision for the CV100 dual VFO giving separate VFO's for transmitter and receiver operation. Each 826MB carries its own test certificates so you get guaranteed performance. Line filter and microphone are included. The CV100 has a centre signal meter and calibrate (CAL) position to zero the transmitter on to the receiver's frequency.

## 432 MHz

The C432 is a UHF 2W 5-channel hand receiver with a full range of accessories as the C146A. The C340 is a 10W 12-channel highly compact and efficient unit of the same size as the C140. This is the first professional 70cm transceiver available and will enable you to get going on 70cm with the advantage of smaller antennas and greater band space.

**PRICES (Carr./VAT Paid).**

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|---|---|
| CV100. VFO for C826MB | £33.50 |
| CV110. VFO for C140 | £45.50 |
| C140. 2m Transceiver | £119.90 |
| C146A. 2m Hand. T.cvr. 5ch | £89.90 |
| C 826MB 2m Transceiver | £135.00 |
| SY-200 Synthesizer | £96.00 |
| C 430 UHF Transceiver | £159.00 |
| C 432 UHF Hand T.cvr. 5ch. | £114.00 |

**ACCESSORIES (Carr./VAT Paid).**

| | |
|---|---|
| C—12/230-5AE AC PSU/SPKR for all models | £23.50 |
| C—12/230-6E AC CHARGER for C146C and C432 | £3.00 |
| N-cad Batteries, set of 10 | £12.00 |
| C—205K remote speaker for all models | £9.00 |
| C.A.D. external antenna coupler | £1.95 |
| CATO3E. Rubber flexible antenna | £2.75 |
| CMPO3 External microphone for C146A and C432 | £9.00 |
| CMPO2 Telepnone handset for all models | £25.25 |

The Standard Radio Corporation produce only VHF/UHF communications equipment and in this field they excel. All transceivers have automatic final protection circuits and are very well engineered. Because of the quality, the units are not cheap but nevertheless you will find their prices highly competitive and you have many advanced design features not found elsewhere. Delivery is ex-stock at the time of going to press but some callers at Totton have already "snapped-up" some of our initial stock! We regret the Standard accessories are only available to purchasers of Standard Transceivers.

**VHF EQUIPMENT (Prices carr/VAT paid)**

| | |
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| **BELCOM** Liner 2 145·25-·48 or 144-1 0·34, ex-stock | £132.00 |
| **BRAUN** SE600 Digital 2m AM/FM/SSB Transceiver | £780.00 |
| **FDK** Multi 2000 | £264.00 |

| | |
|---|---|
| **TEMPO** 6N2WE 2KW 144MHz SSB/FM amplifier | £385.00 |
| 12V DC amplifiers 502 (50w o/p) | £62.70 |
| 802 (80w o/p) | £107.80 |
| 1002-3 (100w o/p) | £130.90 |

**Western Electronics (UK) Ltd**

OSBORNE ROAD, TOTTON, SOUTHAMPTON SO44DN TELEPHONE: TOTTON (04216) 4930 or 2785

CABLES: 'AERIAL, SOUTHAMPTON'

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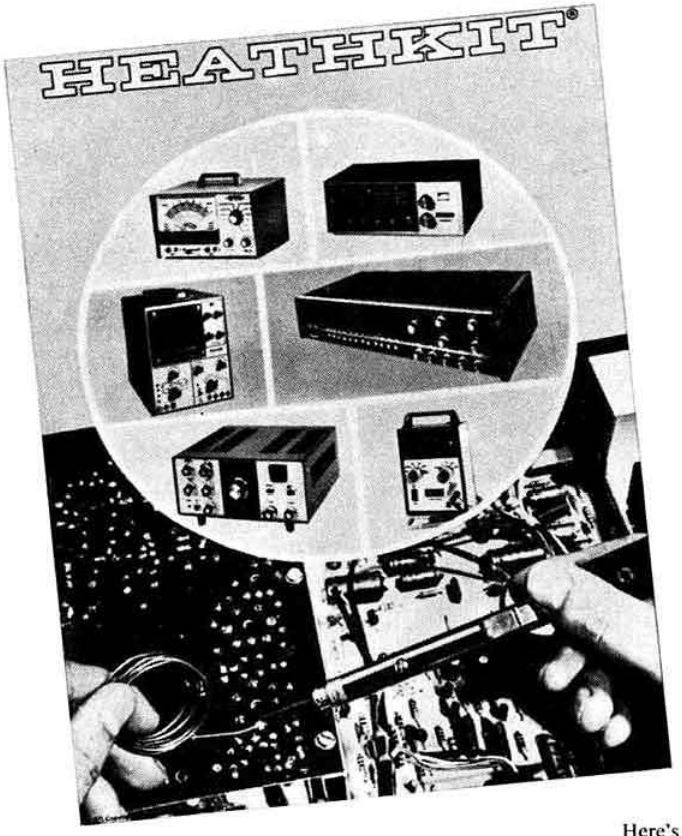


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| CDE TR44 | £45.75 |
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| TH3 Mk III 3 ele. beam | £75.00 |
| TH6 DXX 6 ele. beam | £97.00 |

| | |
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**Pye Cambridge AM10B,** sets only, no control gear complete but untested, High Band **£15.00**; Low Band **£13.00**, carriage **50p.**

**Pye Cambridge AM10D.** We have a few sets, complete but untested, with circuits at **£20.00**, carriage **50p**, and a few sets incomplete, suitable for spares or rebuild, with circuits at **£15.00.** Carriage **50p.**

**Circuits of Pye Cambridge AM10D,** showing TX, RX, Inverter, etc., **55p** post paid.

**Pye Vanguard AM25B,** 25kHz channel spacing, high or low band, complete but no control gear, with circuits **£8.00.** Carriage **75p.**

**Pye Vanguard AM25B**. We have a few sets incomplete, suitable for spares or rebuild, with circuits. High band **£4.75.** Carriage **75p.** Low band **£3.75.** Carriage **75p.**

**Pye Vanguard AM25T,** 25kHz channel spacing, transistor RX, valve TX, complete but no control gear, few only, Low band only **£12.00.** Carriage **75p.**

**Circuits of Pye Vanguard AM25B,** showing TX, RX, Inverter, control gear, etc., **65p** post paid.

**Pye Westminster W15AM,** High and Low Band, Boot mount or dash mount, good condition. Prices on application.

**Pye Westminster W25FM,** boot mount, low band only. Price on application.

**Pye F30AM Base Stations,** high or low band, 12½kHz channel spacing. Price on application.

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10·7MHz 2nd mixer, osc. **£1.70**

455kHz I.F. **£2.80**

AUDIO **£2.80**

SQUELCH **£0.50**

**P.C BOARDS, CAMBRIDGE FM10**

10·7MHz I.F. and 2nd Mixer **as above**

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AUDIO **£2.80**

SQUELCH **£1.70**

ANTENNA C/O RELAYS, Cambridge/Vanguard type 12V **£1.50**

CAMBRIDGE MOD TRANSFORMER **£1.00**

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CAMBRIDGE AUDIO OUTPUT TRANSFORMER **£0.50**

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VANGUARD INVERTER TRANSFORMER, 24V input to give 550V plus 300V at 150mA, as in Pye FM25B, with circuit **£1.20**

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(*Note: all xtals our selection*)

SILVER-PLATED PA COILS, mixed bag, **50p**

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10kΩ coil 2 pole make 8amp **25p**
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14kΩ coil 2 pole c.o. + 1 break **25p**
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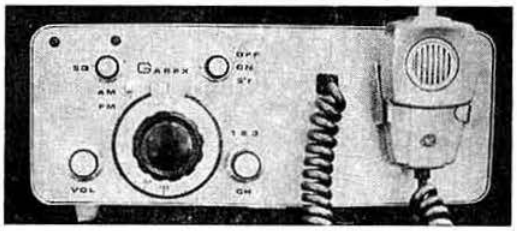


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**Membership rates: UK—£5.50 per year (Unlicensed members under 18 years of age—£2). Overseas—£5 (USA $12). Members are asked to notify changes of address without delay.**

# QTC AMATEUR RADIO NEWS

## GB2ITU

Two periods of operation are planned for GB2ITU in 1974, the first from 21 to 27 March, and the second from 9 to 19 May. It is hoped that this may give more opportunity for dx working, in addition to QSOs with European stations. A3J will be used on all bands from 3·5 to 28MHz. A new QSL card will be sent via the bureau, confirming all contacts. As usual, the station will be operated by members of Tonbridge School Radio Society, Tonbridge, Kent, under the supervision of Tim Hughes, G3GVV.

The International Telecommunication Union (ITU) through the co-operation of its 146 member states, is able to act as a planning, co-ordinating and regulating body, on a world-wide basis. Frequency allocation for all services, throughout the radio frequency spectrum, is one of its many responsibilities.

## Aberdeen Amateur Radio Society

The affiliation of this society temporarily lapsed after a fire which destroyed the society's premises some time ago and consequently it was omitted from the 1974 *RSGB Amateur Radio Call Book*. The society has since been reinstated and should be considered to have been affiliated without a break.

## Milton Keynes and District Radio Society

The former North Bucks ARS has changed its name to Milton Keynes & D RS and has continued in affiliation with the RSGB. The secretary is Mr R. King, G8CHK, 7 Brackley Road, Towcester, Northants.

## East Ham RSGB Group

This group has not been active for several years, and the group's equipment is being stored by a member who would like to hear from former members of the group regarding its disposal. Contact R. E. Wheeler, G3THY, 55 Rosedale Gardens, Gants Hill, Ilford, Essex.

## Facts and figures

The MPT advises that the following numbers of amateur licences were in force at 31 December 1973.

| | | | |
|---|---|---|---|
| Class A | 14,930 | Class B/M | 1,176 |
| Class B | 4,328 | Television | 254 |
| Class A/M | 3,081 | | |

The latest Callsign Record received from the MPT, dated 2 February, gives the latest callsigns issued in the G4 and G8 series as G4CTZ and G8IIG respectively.

At the end of January, RSGB membership totalled 16,456, made up of 13,847 UK corporate members, 1,057 UK associate members and 1,552 overseas members.

## New prefix

The ITU advise that the following callsign series has been allocated provisionally:

A8A-A8Z Liberia (Republic of).

## "Radio Communication" circulation

**The audited total average circulation of "Radio Communication" during 1973, as certified by the Audit Bureau of Circulations, was 17,513 copies per issue. This shows an increase of 200 over the 1972 figure, and an increase of 559 over the first ABC audited figure of 16,954 for 1970.**

## "SWL News"

Bob Treacher, contributor of this feature in alternate issues of *Radio Communication*, regrets that he has been unable to do so for this issue due to non-receipt of news and views from SWLs.

The next scheduled appearance of *SWL News* is in the May issue and all items for inclusion in it should reach Bob Treacher by 1 April.

## 144MHz band

IARU Region 1 advise that in France the hitherto exclusive amateur band of 144 to 146MHz is to be shared with military stations. This action by the French authorities is to be deplored as another phase in the erosion of amateur bands.

If interference from French military stations is experienced in the UK please send full information on the transmissions to the RSGB Intruder Watch organizer, G3PSM, QTHR. It is essential that the callsign (or other identification) and frequency of the interfering station be given in addition to other relevant information.

## Equipment stolen

On 28-29 December the car of Mr W. A. Rowlands-Lumb, G8FWJ, of 9 Cuthbert Harrowing House, Golden Lane, London EC1Y 0RB, was broken into and a Beltek W5400 2m 10W transceiver, serial number 030188, stolen. The set has a short-circuit burn on the top right of the front panel and a broken power socket, and the operating frequencies were 144·48, 144·60 and 145·00MHz. Any information would be welcomed by G8FWJ.

## Radio workshop course

A radio and electronics workshop class is being held at the Lansbury Institute, Lansbury Leisure Centre, The Highway, London E1, on Wednesdays at 7pm. The class is taught basic theory and given assistance with projects, test gear, etc.

Anyone wishing to enrol can do so at the Lansbury Leisure Centre or via the Lansbury Institute, Devas St, London E3, tel 01 987 4617.

## Delsonics Ltd, G8IDU and G8IDT

We have been advised by Delsonics Ltd (G8IDU at 47-51 Lind Road, Sutton, Surrey; and G8IDT at 176 Stanley Road, Carshalton on the Hill, Surrey) that they hold a licence for test and development purposes from 8am to 5pm daily, except weekends, for 145·5MHz ± 3kHz, A3, F3, A3H, A3A and A3J with bandwidths of 6kHz (A3), 16kHz(F3) and 3kHz(A3H, A3A, A3J). Maximum power 150W dc input and 400W p.e.p.

It will be noted that this frequency is that allocated to mobile calling in the new 2m band plan published in the December 1973 issue.

## Join AMSAT

The Radio Amateur Satellite Corporation (AMSAT) is a non-profit making organization founded in the Washington DC area 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.

Learn more about how you can participate with the exciting AMSAT-Oscar 6 communications satellite, and with Oscar 7 which promises to be even better, and receive the quarterly *AMSAT Newsletter* with the latest information on this new amateur radio frontier by joining AMSAT. For membership information, write to the Membership Committee, AMSAT, PO Box 27, Washington DC, 20044.

## Pirates prosecuted

The latest list of successful prosecutions of persons using wireless transmitting apparatus contrary to the provisions of Section 1 of the Wireless Telegraphy Act 1949, issued by the MPT and dated 5 February, contains 10 cases involving 20 persons during the period October 1973—January 1974. Fines totalled £545, of which two were for £100; costs totalled £455, of which the highest was £150; and equipment was forfeited in 15 instances.

## BARTG Convention

The third BARTG Convention will be held this year on Saturday 18 May at the Village Hall, Meopham, Kent, starting at 11am. Attractions will include a number of trade stands, live rtty hf station, and talks on various aspects of rtty. Full details will be published nearer the date.

## The Tartan Trophy

At the RSGB AGM in December 1973 Mr D. W. Dalrymple, GM3OLK, and Mr Andrew Givens, GM3YOR, on behalf of the East of Scotland VHF/UHF Group, presented to the Society a trophy to be awarded annually to the leading GM station in VHF/UHF NFD.

Where an entrant has stations working on more than one band, the aggregate of the scores on all bands is the deciding factor.

All operators of the station or stations comprising the entry must have been resident in Scotland for a period of six calendar months or more immediately prior to the date of the contest.

**The 1973 President receives the Tartan Trophy on behalf of the Society from Mr D. W. Dalrymple, GM3OLK**

**Mr W. Crossland**

## G5CI honoured with OBE

We congratulate Mr W. Crossland, G5CI, of Hythe, Kent, who received the OBE in the New Year Honours List. It is some time since Wally Crossland's callsign was heard but the explanation is simple—he is now an extremely busy businessman. He says "I would like to be able to find the time to once again call up people who remember me from some years back."

## Pen-pal wanted

A young Japanese boy, Noriyuki Amano, aged 15, would like to correspond with a boy or girl of about the same age. Amateur radio is one of his hobbies and his address is 2896 Niikura, Wako City, Saitama-ken, Japan 351.

## Television programme on amateur radio

Early in January, Thames Television visited Tonbridge School, Kent, to film some of the activities of its radio club. The first part of the morning was occupied in the preparation of the equipment—siting of cameras, lighting, microphones, and tape recorders. This done, a number of QSOs were made and filmed: 3·5MHz was used for inter-G working, and 21MHz for dx—9J2DT provided a first-rate signal, and gave an interesting account of television in Zambia. During the afternoon, Douglas Rae interviewed Kevin Woods, G8HAS, John Short, A8325, Timothy Trew (the club's QSL manager), and Tim Hughes, G3GVV. External shots of the school included a close-up of the three-element beam.

The film is scheduled for transmission in all regions of the IBA, in the *Magpie* series; this is rated as having an average audience of nine million viewers.

**Douglas Rae, with the programme assistant and sound engineer, talking to John Short, A8325, with Kevin Woods, G8HAS, and Timothy Trew, during the filming of the "Magpie" programme**

# The "Squeak Box"

## or

# Tone dip oscillator

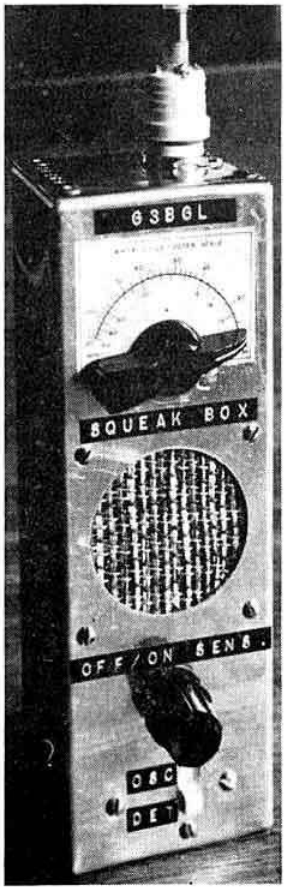
by Rev P. W. SOLLOM, OSB, BSc (Eng), PhD, G3BGL*

*This article describes the design of a transistorized grid dip oscillator which was developed as a joint project for the Newbury and District Amateur Radio Society and the Douai School Radio Society. The idea was to give RAE candidates and beginners an inexpensive and instructive practical exercise that would also contribute to the permanent equipment of the shack and help to satisfy the licence requirement concerning wavemeters. It is presumed that the reader is familiar with the general principles and uses of the gdo which are fully described in various handbooks, but data is included for a few lesser-known applications of great practical value.*

### General specification

**Range.** 1·2–150MHz is covered in four ranges for minimum cost of coils and greater operational convenience. The upper limit is actually about 170MHz, but the scale is too cramped at the extreme end to be useful.

**Scales.** The two scales cover more than a decade, 12–50 MHz and 36–150MHz. The insertion of a decimal point gives the scales for the low frequency decade. A neat and cheap scale can be contact-printed on photographic paper from a master negative.




**Coils.** Single untapped windings on 6mm slug-tuned formers, colour coded to indicate the relevant scale, require minimum effort in construction and calibration.

**Dimensions.** The earphone model (with a 1¾in square 0–1mA meter if really required!) fits into a box 6½ by 2 by 2in. The prototype fitted into a diecast box 4½ by 3½ by 2in, but this shape is less convenient to hold. The de-luxe version shown in the photos, which incorporates a 2½in speaker, measures 7 by 2¾ by 1⅞in.

**Special components.** The tuning capacitor is the only critical component for space and performance. A midget type of air-spaced 2-gang capacitor, 500 + 500pF, with ceramic stator insulation and ball-bearing rotor bearing, is necessary to obtain the wide tuning range and small size to fit in the box. The photo shows the preferred type.

**Power:** A 9V transistor battery (eg PP4). Total drain is about 5mA (15mA for the speaker model).

**Suppliers:** All the parts for the 25 kits for the club project were obtained from RS Components Ltd, G. W. Smith & Co, and Henry's Radio Ltd, at a total cost averaging £3 per kit (January 1973).

* Douai Abbey, Upper Woolhampton, Reading RG7 5TH

THE novel feature of this design is the use of an audio frequency tone to indicate the level of rf energy in the tuned circuit. The tone changes pitch if the rf level changes, so that absorption of energy from the oscillator makes the tone dip lower in frequency—hence the name "tone dip oscillator". As an absorption wavemeter, the presence of rf energy is indicated by a rise in the pitch of the tone, ie a "squeak" is heard as the tuning point is passed through.

The advantages of this feature are:

**Low cost.** A low-impedance earphone and jack socket replace a moving-coil meter, saving about 85 per cent of its cost, and the earphone can, of course, be used elsewhere.

**Convenience.** The operator's attention can be focussed continually on the *coupling* between the oscillator and circuit under test without the distraction of watching a meter.

**Sensitivity.** The ear can detect a change in pitch at least as easily as the eye can detect a needle flicker. No need to tap the meter in case it is sticky!

**Reaction time.** The inertia of a meter needle is such that a dip may be missed through quick tuning, but the audio tone responds instantly.

**Demonstration.** A simple amplifier makes the indication audible to a large audience at lectures. The de-luxe model illustrated in the photographs has a built-in speaker and amplifier stage for teaching purposes (still saving an estimated 66 per cent of the cost of a meter!).

An additional advantage is that the instrument could be used by blind operators, for whom an embossed calibration of the rf tuning scale would not be too difficult to arrange.

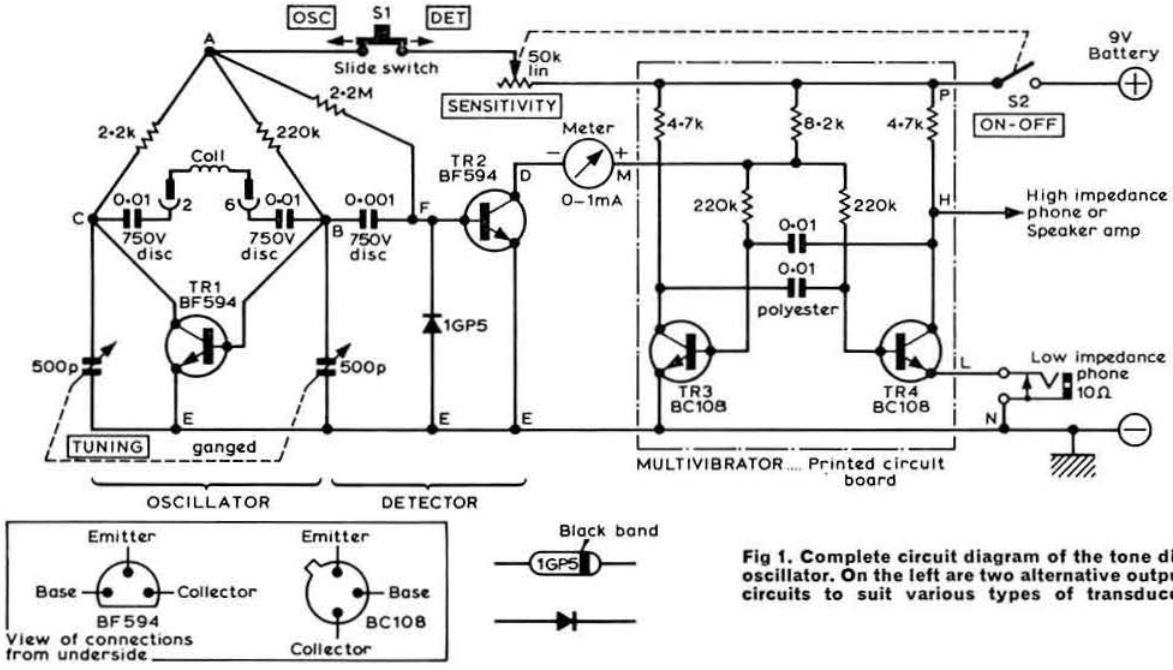
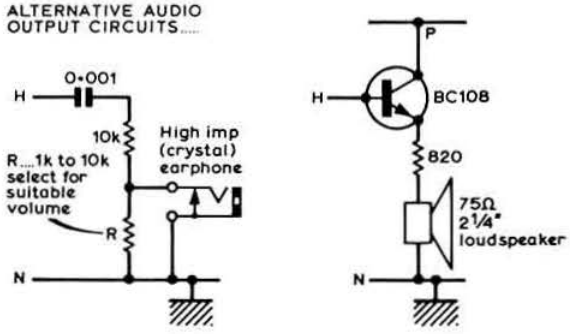



**Fig 1. Complete circuit diagram of the tone dip oscillator. On the left are two alternative output circuits to suit various types of transducer**




## Circuit operation

The complete circuit diagram is given in Fig 1. The heart of the design is a simple Colpitts oscillator using a BF594 transistor. The coil shown is the external plug-in coil; with a choice of four different coils the frequency range 1·2 to 170MHz can be covered. The coil itself is isolated for reasons of safety by two 0·01μF 750V capacitors.

Sensitivity is controlled by the 50kΩ linear potentiometer, which is fitted with a switch to perform the function of on/off switch for the complete equipment. The best adjustment is for a gentle oscillation, but in practice there is inevitably some variation in strength of oscillation over the whole range of the tuning capacitor, so some re-adjustment of the sensitivity control may be required.

The two-position slide switch S1 is used to switch off the rf oscillator altogether, so that the instrument can be used as an absorption wavemeter.

The output from the rf oscillator, basically a constant-amplitude waveform except at the resonant frequency of the circuit under test, is fed into a detector. Transistor BF594 acts as a current amplifier producing about 0·1mA depending on the amplitude of the rf oscillator signal. This current feeds into the 8·2kΩ resistor, and so changes the bias conditions of the multivibrator when there is a change in rf level, thus altering the (audio) frequency of oscillation.

The collector current from the detector transistor can also be passed through a 1mA meter if desired. The 2·2MΩ resistor feeding the base of this transistor provides a small base current to improve detector sensitivity at vhf.

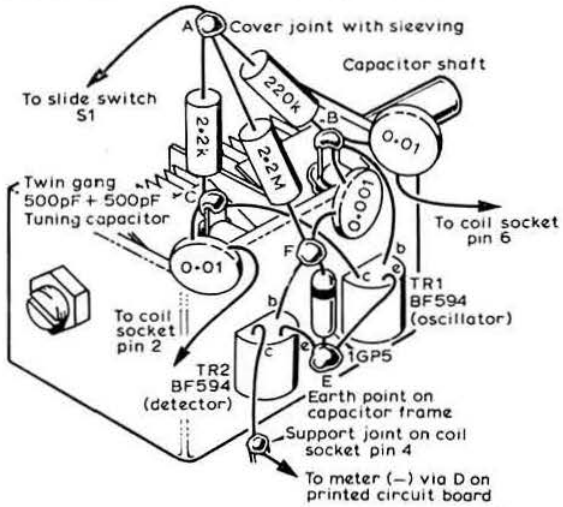



**Fig 2. Assembly of the rf oscillator directly upon the twin-gang tuning capacitor. Also see the photo, and description in the text**

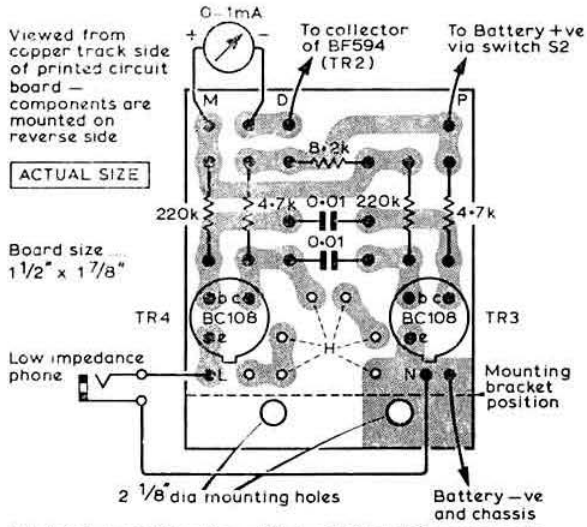



**Fig 3. Printed circuit layout for the multivibrator, viewed from the copper track side**

Audio output can be taken from the multivibrator, a conventional symmetrical circuit using BC108s, via an earphone connected to the emitter of one of the transistors. This will be suitable for a low-impedance earphone. Also shown in the circuit diagram are alternative output configurations suitable for driving a high-impedance (crystal) earphone or a 75Ω loudspeaker, but both these output devices would increase the total cost of the instrument.

## Construction

The rf oscillator and detector are both built as a sub-assembly on the tags of the tuning capacitor, and mounted close to the socket for the plug-in coils. It is most convenient to pre-assemble the oscillator and detector onto the tuning capacitor before it is fitted into the box. Care should be taken to keep component leads as short as possible, and a suggested layout is shown in Fig 2. The joint

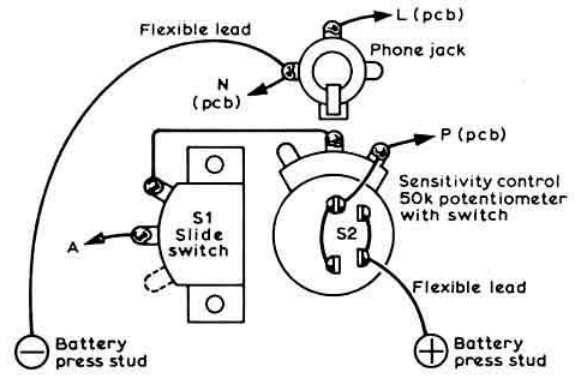



**Fig 4. Wiring details for the on/off/sensitivity switch, function switch, and output socket**

marked "F" in this figure is self-supporting, and the leads to the 0·001μF capacitor should be cut to ¼in long.

The multivibrator is built on a separate printed circuit board shown in Fig 3. If a meter is not to be included, copper strips M and D should be strapped together. There is scope on the board for either of the audio output devices, although it is shown with the low-impedance earpiece socket fitted.

Wiring of the on/off/sensitivity switch, the oscillator/detector switch, and the earpiece socket, is shown in Fig 4.

As mentioned in the specification, the instrument may be built with a phone socket and/or meter or speaker, and to some extent the choice of output device will decide the size and shape of box needed. The model illustrated in the photographs is fitted with a speaker only; the cutting details shown in Fig 5 are for an instrument with earpiece socket and meter.

There are one or two points to note when assembling the completed instrument, to ensure the best performance. The leads of the disc isolating capacitors should be as short as possible, and the discs themselves should not be allowed to touch the chassis. Leads to the valve base coil socket must be kept as short as possible.

In Fig 2, showing the construction details of the rf oscillator, some of the components have been drawn for clarity in positions which should not be followed exactly. The three resistors soldered together at point A should in practice be positioned so that they lie as close as possible to the tuning capacitor as shown in the photograph. TR1 should be positioned so that the leads are as short as possible in order to exploit the instrument's top frequency performance.

## Coil construction

The four coils necessary to cover the range 1·2-170MHz are shown in diagrammatic form in Fig 6. They are all constructed on plastic plug covers, with different colours used to avoid confusion. The three lower-frequency coils differ only in the winding details; the top frequency band (36-170MHz) coil consists of a single loop of 18swg wire.

Procedure is as follows for the three lower-frequency coils. Drill out a central hole in the plastic plug cover, using a 9/32in drill, and clean any burrs. The coil formers are inserted up through the plug covers and held in place with 8BA screws and nuts. To do this, it will be necessary to trim the mounting lugs of the coil formers quite severely until they can be inserted in the plug covers. Fresh holes must be drilled in both the mounting lugs and plug covers to take the 8BA bolts, and at the same time two 1/16in holes should

**COIL DETAILS**

| Coil | Freq (MHz) | Wire | Turns |
|---|---|---|---|
| a | 36–170 | 18swg tinned | exactly 3in, bent into loop and ¼in each end used for connection. |
| b | 12–50 | 26swg enam | 7 turns close-wound single layer |
| c | 3·6–15 | 36swg enam | 30 turns close-wound single layer |
| d | 1·2–5 | 36swg enam | 53 turns 1st layer close-wound<br>42 turns 2nd layer close-wound |

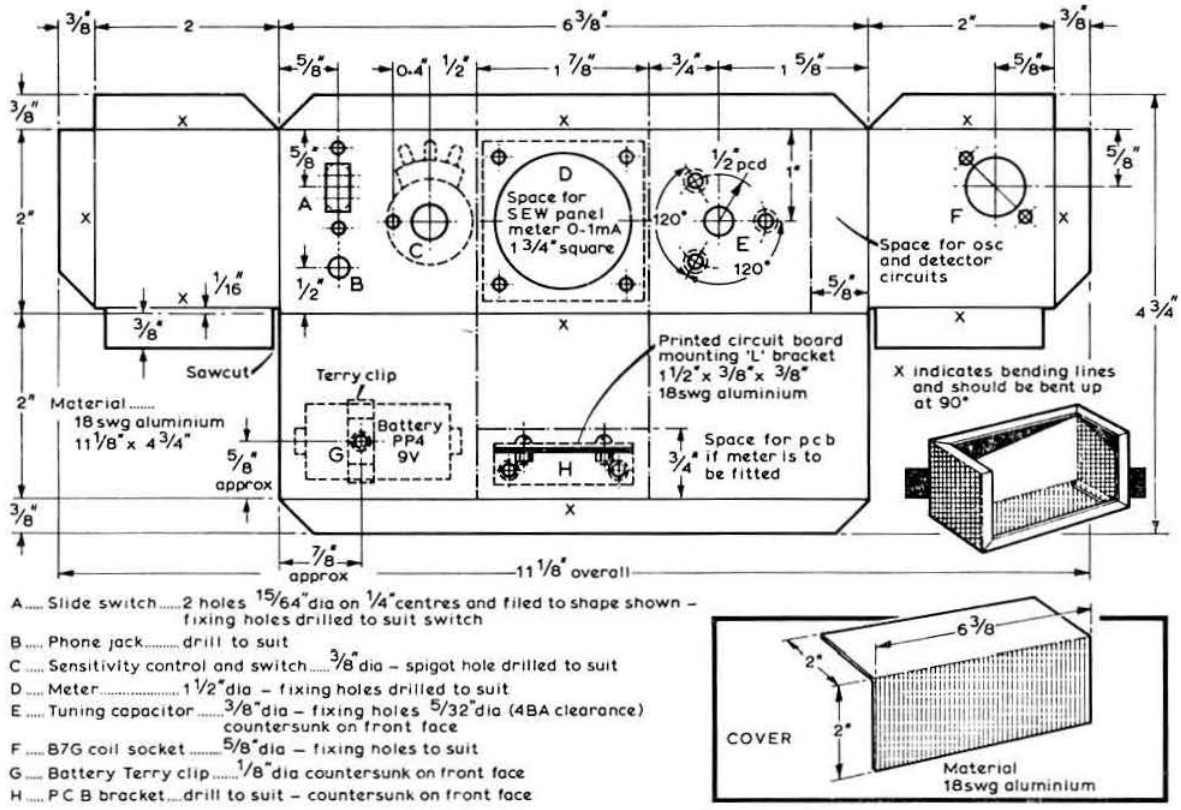



**Fig 5. Cutting instructions for the instrument case. Some alteration to these dimensions will be necessary if a loudspeaker is to be fitted**

be drilled to take the connecting wires. The best way to do this is probably to drill four $\frac{1}{16}$in holes and enlarge two of them to $\frac{3}{32}$in. The roundhead bolts should be inserted from the inside of the cover and trimmed off flush after the nuts have been tightened.

The coil connection wires are made from 18swg tinned copper wire cut initially to $1\frac{1}{2}$in. One is soldered to pins 1 and 2 of the plug, and the other to pins 6 and 7. Pin numbers are counted clockwise from the gap, viewed from the underside of the plug. The cover and coil former can then be fitted, feeding the two wires through the $\frac{1}{16}$in holes. Each end is then trimmed and bent into a hook to assist soldering and to prevent the cover from being pulled off the plug.

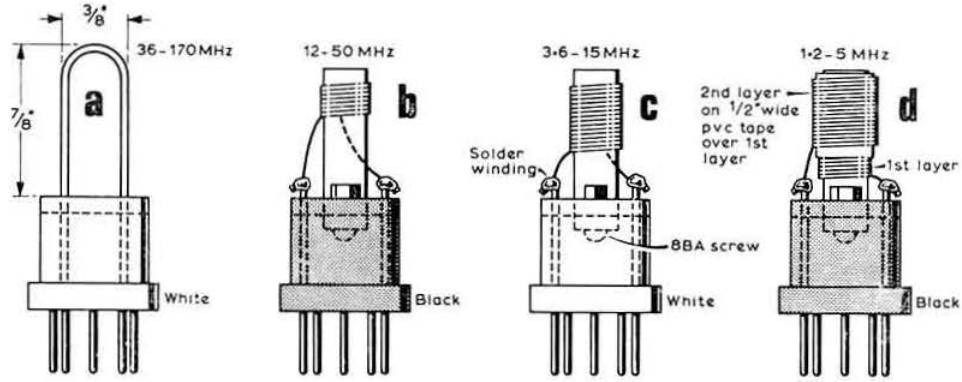
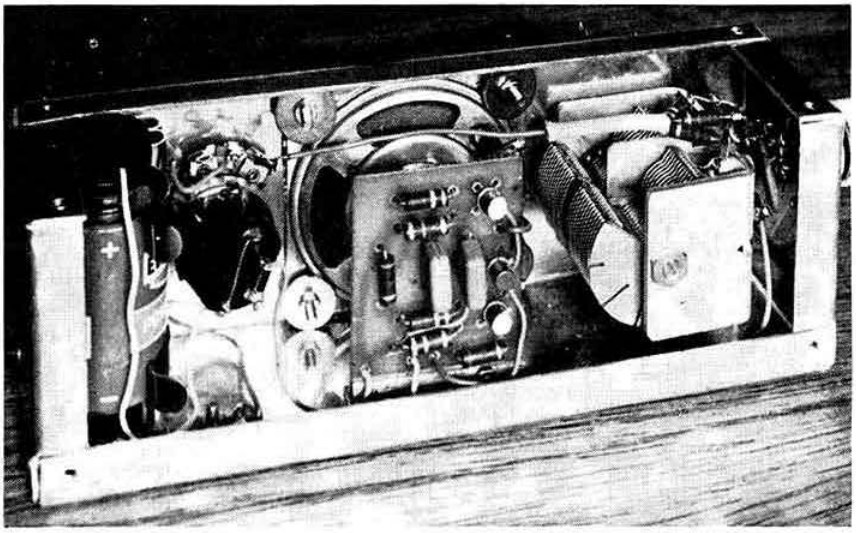



**Fig 6. The four plug-in coils. Full winding details are given in the text**



**Close-up of the interior of the instrument. Note the type of tuning capacitor used, and the way the rf oscillator is mounted directly onto it**

Winding the coils is straightforward and the number of turns means that it can quite easily be done by hand. One end of the wire is fastened to one of the connecting lugs and taken up to the top of the former, this length of wire being covered in a $\frac{3}{4}$in length of sleeving which is most conveniently fitted prior to soldering. The coil is then wound downwards along the former, gradually covering the sleeved wire. The finished winding should be held with Sellotape (temporarily only) while the wire is soldered to the second lug. The best way to strip the enamel off wire of this gauge is to use glasspaper.

The 1·2-5·0MHz coil is slightly different, in that the coil is started at the base end (so no sleeving is needed) and wound up to the top, when a piece of $\frac{1}{2}$in wide pvc insulating tape is wrapped round the turns, and the second layer wound back down towards the base.

Construction of the top frequency band coil is easier: the loop of 18swg wire is simply formed as shown in Fig 6, inserted in a pair of $\frac{1}{16}$in holes in the cover, and soldered to the pins.

## Component list

**Oscillator**
1 BF594 transistor
2 0·01$\mu$F 750V disc capacitors
1 220k$\Omega$ resistor $\frac{1}{2}$W
1 2·2k$\Omega$ resistor $\frac{1}{4}$W
1 tuning capacitor, 500 + 500pF
1 slide switch
1 50k$\Omega$ linear potentiometer with switch

**Detector**
1 BF594 transistor
1 1GP5 diode
1 0·001$\mu$F disc 750V capacitor
1 2·2M$\Omega$ $\frac{1}{4}$W resistor

**PC board**
2 BC108 transistors, or any similar audio frequency types
2 0·01$\mu$F polyester capacitors
2 4·7k$\Omega$ $\frac{1}{4}$W resistors
2 220k$\Omega$ $\frac{1}{4}$W resistors
1 8·2k$\Omega$ $\frac{1}{4}$W resistor

**Coils**
4 valve plugs, B7G*, two black and two white
3 coil formers with cores, 6mm dia polythene
1 low-loss B7G* valveholder
* B9A would be equally suitable (RS Components Ltd)

The finished windings of the three lower-frequency coils should be protected with a covering of Bostik No 1 or suitable alternative, and the cores locked in place with locking compound or a rubber band in the threads.

## Notes on components

The tuning capacitor for the rf oscillator should be chosen with care. A possible source of a suitable device is an old medium-wave receiver. What is wanted is a tuning capacitor that is free from spurious responses in the vhf region, and has a low enough minimum capacitance to provide the required frequency coverage. In practice a slow-motion drive does not seem to be necessary.

The actual tuning capacitor used in the prototype was listed in both the Henry's Radio and the G. W. Smith's catalogues as "type O", with dimensions of $1\frac{3}{4}$ by $1\frac{3}{8}$ by $2\frac{1}{2}$in overall (including shaft). Although the exact type is no longer included in the catalogues, a suitable tuning capacitor nominally labelled 420pF was found to be 500pF and therefore suitable.

The socket for the plug-in coils, a low-loss B7G valveholder, should be modified slightly to decrease the capacitance. This can be done by removing the central metal.

The components required for the assembly of the instrument, the nuts, bolts, rivets, switches etc. are not detailed in the component list as considerable flexibility of the basic design is permissible, and constructors will probably have most of the necessary bits and pieces available anyway, or will modify the design to suit the components that *are* to hand.

## Dial

Assuming that the component and constructional information given in this article is followed exactly, the only feature that can vary the calibration of various models of the tone dip oscillator is the tuning capacitor. If the constructor finds it necessary to use a tuning capacitor different from

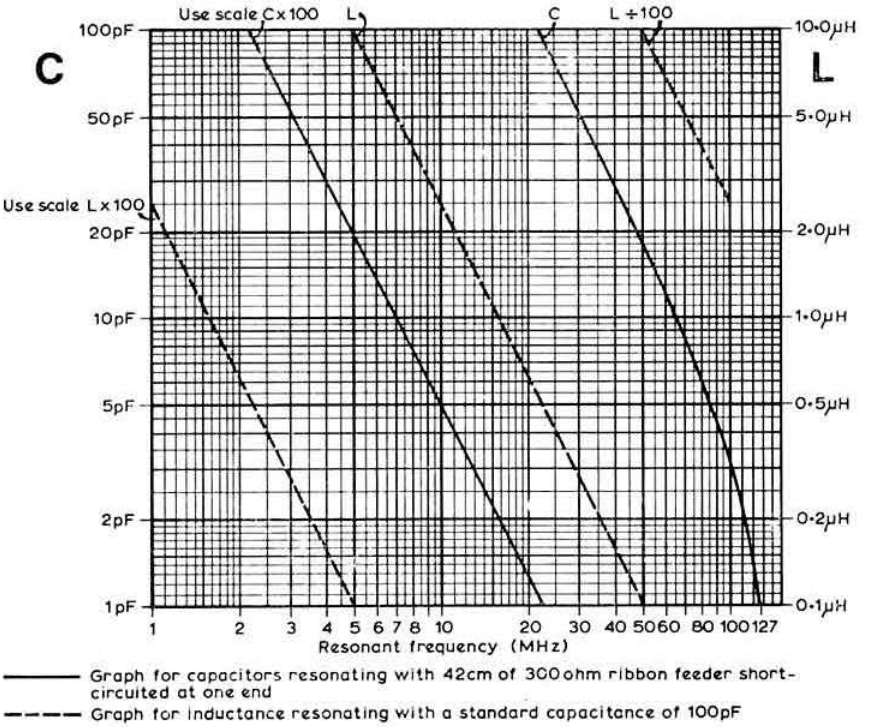



**Fig 7. If a gdo is used to measure the resonant frequency of an unknown capacitance and a known inductance (or vice versa) this graph enables the unknown quantity to be quickly determined**

the prototype, then the complete instrument will need to be calibrated from scratch. If, however, the specified type is used, the calibration will be the same as in the original model.

In this case the printed dial provided on this page can be used, by simply cutting it out and pasting it onto the instrument so that the tuning knob covers the scales. (Cutting out the dial from the magazine will not destroy any information as the reverse side has deliberately been left blank.)

## Calibration

A length of feeder exhibits multiple resonances which can be used to calibrate any gdo. For example, the "Twin Feed 300Ω" supplied by RS Components Ltd has a velocity factor of 0·84, so 4·20m of this feeder will resonate at half-wave multiples (when shorted at both ends) at 30, 60, 90, 120 and 150MHz and give calibration check points at these frequencies. The same length open circuited at one end resonates at 15, 45, 75, 105 and 135MHz. The ribbon should be stretched out fairly straight if these are to be accurate.

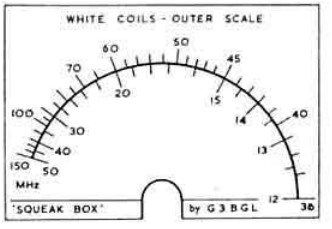
At lower frequencies a length of coaxial cable is more convenient as it can be wound on a drum without de-tuning. A length of 75Ω coaxial cable (known as Uniradio 202 and supplied by RS Components Ltd) 23·6m long, velocity factor 0·78, has resonances at 5, 10, 15, 20, 25MHz etc when shorted at both ends; when open at one end the frequencies are 2·5, 7·5, 10·5, 17·5MHz etc. For a club project it is worth setting up a few strategic lengths of feeder for calibration purposes.

## Measurement of inductance and capacitance

A silver mica one per cent tolerance capacitor of 100pF costs only a few pence. It may be soldered with *short* leads across any unknown inductance in the range 0·015-150μH, and the resonant frequency found with a gdo. From this information the value of the inductance can be read off from the graph in Fig 7.

A piece of the ribbon feeder 42cm long (RS Components "Twin Feed 300Ω"), shorted at one end and fitted with miniature croc clips at its open end is a standard inductance which can be hooked across any unknown capacitor in the range 1pF-0·01μF, and the resonant frequency found with the gdo. The graph in Fig 7 enables the value of capacitance to be read off. This length of feeder resonates as a quarter wavelength at 150MHz, but the capacitance of the croc clips will lower this somewhat. The graph curves where the length of feeder approaches resonance.

**Calibrated scale of original "Squeak Box"**



# A regulated inverter supply for portable use

by G. D. LEAN, BSc, ARCS, G3WJG*

THE unit to be described in this article was designed to run small klystrons from a car battery on portable excursions, but is easily adapted to supply small valve linear amplifiers requiring an anode supply of 250-350V.

## Circuit description

The circuit is quite straightforward and consists of a basic oscillator (TR1 and TR2) driving a transformer. The secondary outputs are rectified by D1 and D2 and smoothed by C1, C2, C3 and the 10H choke; the negative output is further stabilized by ZD1. The positive voltage is applied to a potential divider chain and fed to the base of TR5, the emitter of which is stabilized to 4·7V by ZD2. Any increase of voltage on the secondary output thus reduces the voltage on TR4 base which acts as a Darlington pair with TR3 and reduces the voltage on TR3 emitter. TR3 is the series regulator transistor which provides TR1 and TR2 with their emitter voltage, so negative feedback is applied to the oscillator and the system stabilizes at an output voltage controlled by RV1.

TR6, TR7 and TR8 form a conventional series regulator to supply 6·3V dc for valve heaters. As the inverter frequency is approximately 500Hz the smoothing required is much reduced compared with mains circuits, so with the values shown very low ripple voltages are achieved.

Other refinements added in the prototype include RLA1 which gives a choice of two outputs for transmit/receive.

The unit can be used with either a positive or negative earth, the connection being made at the input terminal only. The output voltage will be slightly reduced on the positive earth version as the supply volts are effectively added to the feedback loop.

## Construction

The unit can be constructed in a small box. The power transistors except for TR8 are mounted on the rear panel, and the transformers and the inverter board are mounted on a a chassis within the unit. The valve heater regulator is built as a separate unit and fitted inside the box towards the front.

Printed circuit layouts of the regulator board and the inverter board are given in Figs 2 and 3.

The exact layout of the transformer and choke on the chassis will depend on the size and shape of the transformer purchased. The transformer used in the prototype was an ex-equipment potted toroidal type, probably from a Pye Ranger, with a tapped secondary. It was purchased from B. Bamber of Littleport, Cambs, but Garex also offer apparently similar types. The requirement is for a transformer with 12V input and 400 and 250V outputs.

The other components are all readily available; in the prototype they were purchased from the same source as the transformer.

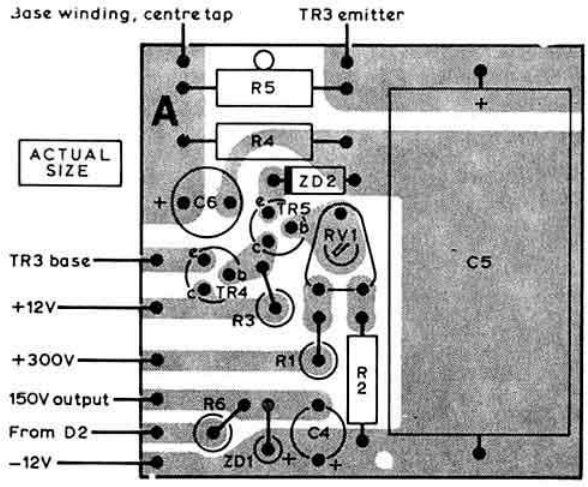
A 2,500μF 16V electrolytic capacitor across the input from the battery, and a 10A diode in one input lead, are useful additions to the basic inverter unit.

* 22 Woodrow Close, Perivale, Greenford, Middlesex.

### Parts list

| | | | |
|---|---|---|---|
| C1, C2 | 20 + 20μF 450V electrolytic | R1 | 200kΩ |
| C3 | 50μF 275V | R2 | 2·7kΩ |
| C4 | 2μF 150V | R3 | 1kΩ |
| C5 | 2,500μF 16V | R4 | 560Ω 1W |
| C6 | 125μF 16V | R5 | 10Ω 1W |
| C7 | 100μF 10V | R6 | 220kΩ* |
| C8 | 0·01μF | R7 | 680Ω |
| D1 | 1,000V piv | R8 | 470Ω |
| D2 | BY100 | R9 | 3·3kΩ |
| ZD1 | 150V 400mW zener | RV1 | 3·3kΩ |
| ZD2 | 4·7V 400mW zener | RV2 | 3·3kΩ |
| ZD3 | 3·3-3·9V 400mW zener | | |
| TR1, TR2 | NKT404 or 2G220 | | |
| TR3, TR8 | 2N3055 | | |
| TR4, TR7 | 2N3053 | | |
| TR5, TR6 | 2N3705 or BC109 | | |

* R6 is chosen to drop the output voltage to the zener; in the prototype R6 dropped 25V.




Printed circuit board viewed from component mounting side — copper track on reverse side

**Fig 2. Regulator pc board**

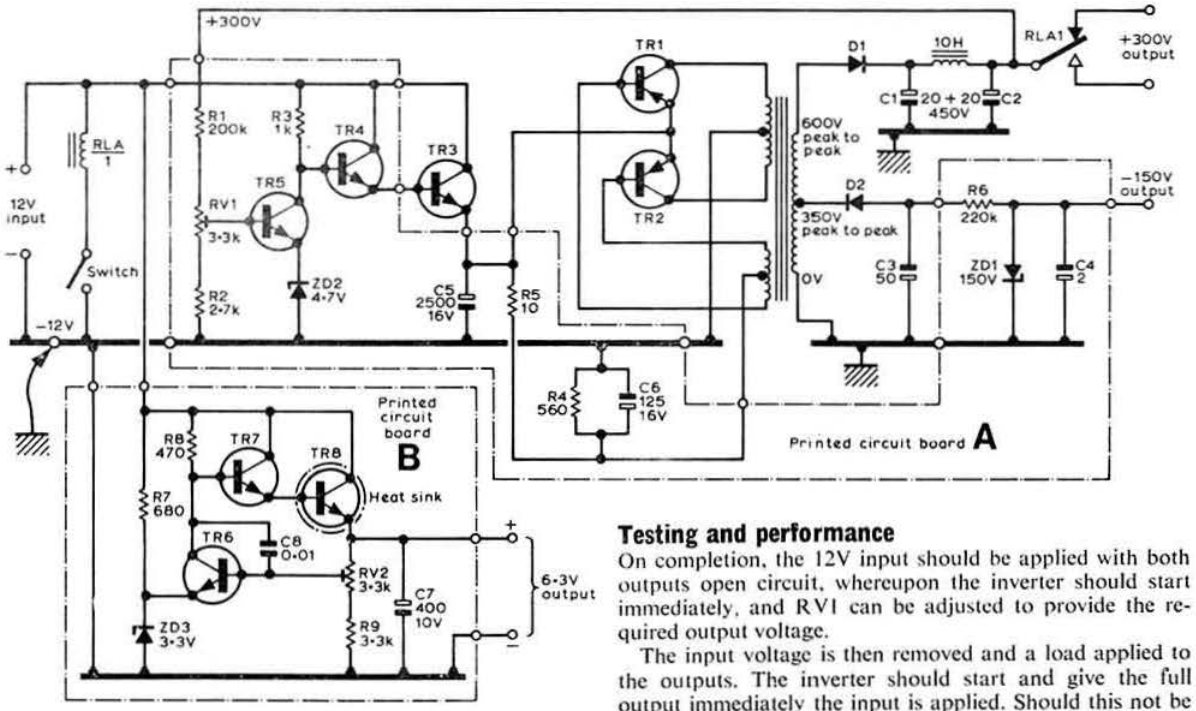
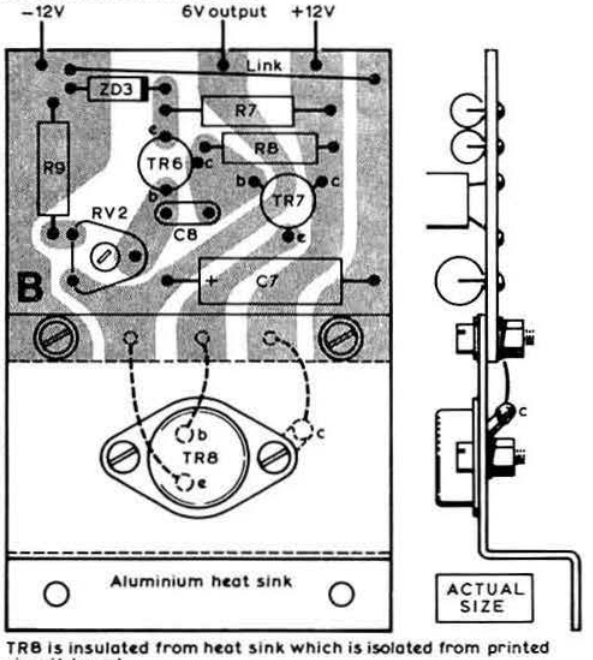



Fig 1. Circuit diagram

Printed circuit board viewed from component mounting side – copper track on reverse side




TR8 is insulated from heat sink which is isolated from printed circuit board

Fig 3. Inverter pc board

## Testing and performance

On completion, the 12V input should be applied with both outputs open circuit, whereupon the inverter should start immediately, and RV1 can be adjusted to provide the required output voltage.

The input voltage is then removed and a load applied to the outputs. The inverter should start and give the full output immediately the input is applied. Should this not be the case some adjustment of the ratio of R4:R5 will probably cure this, although in the two versions built by the author no such problems were encountered. RV2 is adjusted to give 6·3V from the output of the low voltage regulator.

The performance of the final prototype was as follows:

| | |
|---|---|
| **Input voltage (V)** | 13·5 |
| **Output voltage (V)** | 250-380 open circuit, depending on setting of RV1 |
| **Output noise (mV)** | 2 |
| **Output current (mA)** | 0 30 60 |
| **Output voltage (V)** | 300 295 285 |
| **Input current (A)** | 0·5 1·5 2·25 |
| **Noise (mV)** | 2 5 10 |

Although the output noise is very low, great care in construction and filtering must be taken if sensitive vhf converters are to be used from the same 12V source as the inverter while it is running. On the author's 6cm klystron receiver the low noise pre-amp picked up severe interference from the inverter until all inputs to and outputs from the unit were filtered and the unit was fully screened.

The above figures are typical of the performance when RV1 is set to its approximate mid-position. With an input of 12V, the maximum likely output is 380V when RV2 is adjusted to the limit. If the input falls to 10·4V, it is still possible to obtain 300V output by adjusting RV1, but in this case the regulation with varying loads will be poor.

With RV1 set to give an off-load output of 320V from a 12·8V input, the following figures show how the output voltage varies with fluctuations of input voltage.

| Input (V) | Output (V) |
|---|---|
| 11 | 280 |
| 12 | 305 |
| 12·8 | 320 |
| 14 | 340 |

# A collapsible vhf cubical quad

by J. R. HEY, Tech(CEI), MSERT, G3TDZ*

AS the author never runs more than 1W of rf on 2m, from the Mk4 portable set (see *Radio Communication*, January 1973), a substantial portion of the credit given to the signal must be shared by the 4-element cubical quad. On being informed that the aerial system is collapsible so it can be carried on public transport, many operators enquire how such an aerial can be made to fold up.

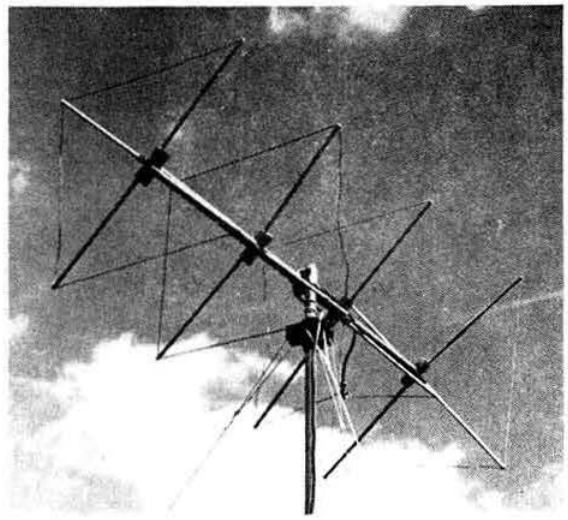
It was decided, therefore, to offer these notes so that others interested in the cubical quad as a portable aerial system might have a few guidelines to work from.

## Aerial details

The aerial consists of four square loops, made from medium thickness stranded pvc wire, held in position by wooden spreaders. The driven element is 20in on all sides, cut in the centre of the lower leg, where an insulating piece and coaxial socket is fitted. A reflector of 21in on all sides, closed circuit, (ie a continuous length of wire) is spaced 16in behind the driven element. The first director, 19in on all sides, is placed 16in in front of the driven element, along the 1in diameter aluminium boom, and the second director is 18½in on all sides, again spaced 16in. The overall length is thus 48in.

Spreaders are made from ¾in diameter dowel rod, which can be bought for approximately 1p/ft from the local do-it-yourself shop. At the end of each spreader, a notch or groove is cut, and the element wires then pressed into these and covered with a strong adhesive such as Araldite. The adhesive takes some time to solidify, so if the wires are folded down along the dowel rods and secured with Sellotape, movement of the carefully measured lengths is prevented while the adhesive is curing. When the adhesive is hard, the tape may be removed.

Hinging from the tubular boom, the spreaders are made to swing through just over 90°, when the element tension holds each element taut in the operating position. Roughly 14in in length, the exact spreader dimensions may be arrived at by Pythagoras' theorem—less the diameter of the boom.



*8 Armley Grange Crescent, Leeds LS12 3QL

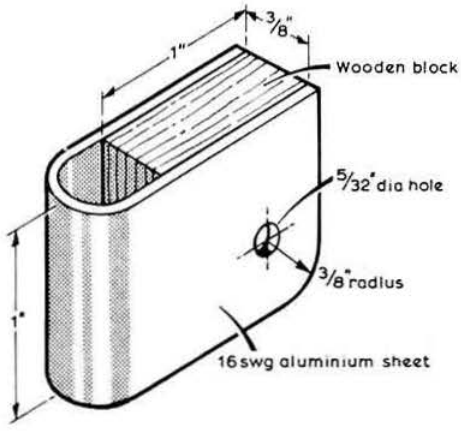



**Fig 1. Hinge block assembly**

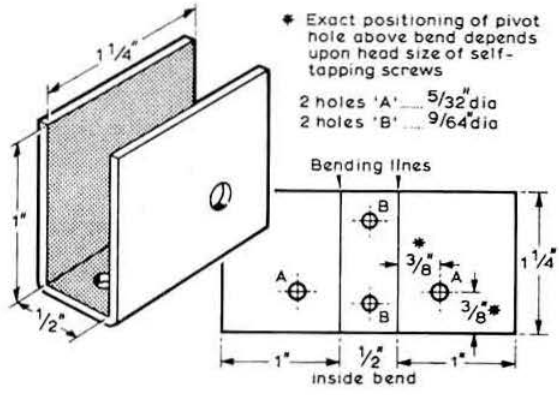



**Fig 2. U-channel**

## Construction

The hinges are made by wrapping a 2½in length of 16swg aluminium, 1in wide, round a dowel rod. A strong adhesive is applied, and a 1 by 1in wood block ¾in thick is fitted between the plates, allowing room for inserting the spreaders later. When dry, a $\frac{5}{32}$in hole is drilled through the assembly about ¾in from the edges at one corner; this corner is then ground or filed to a ¾in radius, allowing eventual turning clearance (see Fig 1).

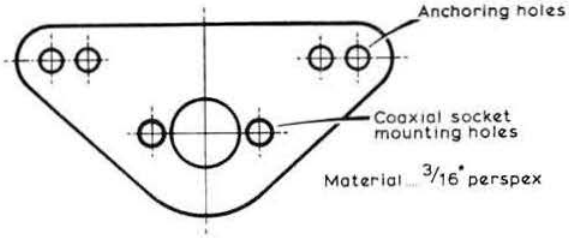



**Fig 3. Coaxial socket support**

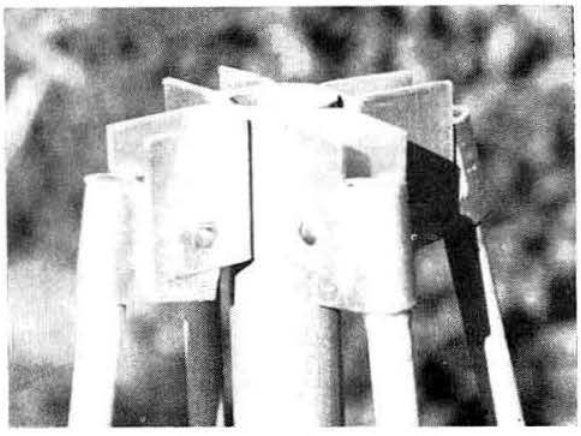
A U-section of 16swg aluminium sheet made from a strip 2½in by 1½in has two fixing holes of $\frac{3}{64}$in and $\frac{5}{32}$in for the pivot, drilled as shown in Fig 2.

Making sure that the inner block will rotate freely when inserted into the U-section when pivoted by a 4BA screw, all 16 hinges may be constructed similarly. It is desirable the spreaders rods form a snug fit into the hinge blocks. After trimming to correct length, that is providing reasonable tension when erected, the spreaders should be secured into the hinge blocks with strong adhesive.

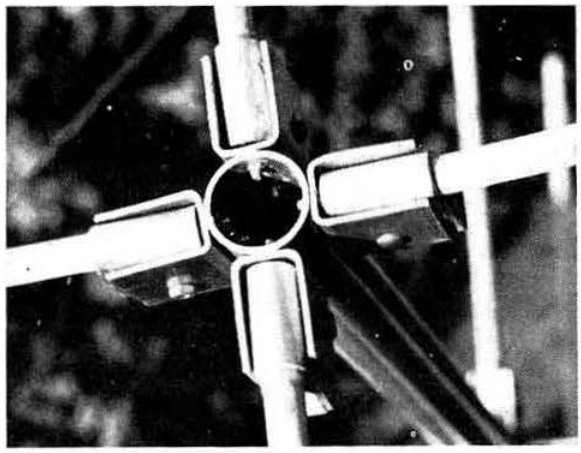
Estimating the position each element will attain when tensioned, the U-sections are fitted to the boom at 16in intervals, using self-tapping screws. A $\frac{3}{32}$in pilot hole should suffice. Make sure each group is in line with its neighbour.

The spreaders and hence the elements fold along the boom like an umbrella, two facing inwards from each end. When erected, the elements should spring into place, tensioned by the way their spreaders have turned through just over 90°. The coaxial entry is made by fitting a coaxial socket into a triangular piece of Perspex or paxolin, $\frac{1}{8}$in or $\frac{3}{16}$in thick. Two holes $\frac{3}{32}$in or less at each side anchor the driven element ends before soldering to the socket. Small Terry clips are fitted to the boom with self tappers to support the low-loss coaxial cable when fitted.

Although the reflector and the two directors must each inevitably have a joint, they can be camouflaged as follows. Stripping about $\frac{3}{4}$in of pvc from each end, twist tightly together and solder, so that the soldered joint now stands perpendicularly to the element wire. It may be hidden by arranging the elements so that the join fits into a small hole drilled into the end of one spreader. The adhesive now completely protects the joint, which has become invisible.



**Spreader hinges in the "collapsed" position**



**Spreader hinges in the operating position**

## Performance

When this array is used by the author for portable operation in conjunction with a J-Beam 16ft portable mast, it shows almost 3dB improvement over the home station 8-element Yagi. Considering the Yagi's length, compared with this 4-element quad's mere 48in length, advantages for portable operation, contests and field days become obvious.

Because of tooling and assembly costs, the cubical quad has never become a competitor to the "plumbers delight" Yagi with commercial manufacturers. The amateur, however, does not cost his own man-hours and thus may build this worthwhile array for 50p; much less if he scrounges the aluminium boom.

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# The RSGB News Bulletin Service

**The RSGB News Bulletin callsign GB2RS, is broadcast every Sunday morning. This bulletin can be received on either vhf or hf, which gives almost complete coverage of the British Isles. It keeps radio amateurs up-to-date about happenings in the world of amateur radio and gives information on coming events, supplementing and bridging the gap between successive issues of *Radio Communication*.**

**SCHEDULE**

| Time | Frequency (MHz) | Location and coverage (hf) or beam heading (vhf) of station |
|---|---|---|
| 0930 | 3.6 | Bromley, Kent (SE England) |
| 1000 | 3·6 | Cheltenham (SW England) |
| | 145·8 | Aberdeen (NNW) |
| | 145·095 | Croydon, Surrey (NE) |
| 1015 | 3·6 | Belfast (N. Ireland) |
| | 145·8 | Bangor, Co Down (N) |
| 1030 | 3·6 | Derby (N. Midlands) |
| | 144·337 | Weston-super-Mare (NW) |
| | 145·8 | Aberdeen (SW) |
| | 145·3 | Brierley Hill (NW) |
| 1045 | 145·89 | Middlesbrough (NW) |
| | 145·095 | Croydon, Surrey (SW) |
| 1100 | 3·6 | Bridlington (NE England) |
| | 144·3 | Brierley Hill (SW) |
| 1130 | 3·6 | Motherwell (S Central Scotland) |
| 1200 | 3·6 | Aberdeen (NE Scotland) |

# Batteries for electronic equipment

by R. F. STEVENS, G2BVN

THE introduction of transistors completely altered the power supply requirements for many items of communication equipment, and the change to smaller and readily portable units has since been taken a stage further by the use of integrated circuits. Batteries are now increasingly used as a power source because of their relatively low cost, portability and the simplification possible in the supply circuitry of the equipment using them; the choice of a suitable battery depending on a number of factors.

Primary batteries normally have a single life-span demanding periodic replacement, and many different types are now available. It is the author's belief that often the choice of a battery may be governed more by what is readily available rather than what is the most suitable type, and this can frequently lead to dissatisfaction with the subsequent performance. Alternatively, secondary batteries, which can be recharged, may be the best choice for certain applications.

The purpose of this article is to present some basic information concerning the various types of batteries now available. With this it is hoped that a user will more readily be able to select the correct battery for his purpose.

## Battery characteristics

In order to select a battery correctly, consideration must be given to the following factors:

**Voltage.** It is necessary to know both the initial and end point voltages. The lowest operating voltage of the equipment is an important factor in battery life.

**Type of service.** This could be intermittent communications use or constant current, and the operating cycle must be considered.

**Load.** The average current that the battery will be expected to deliver at the operating voltage.

**Size.** This will depend upon the size of the battery compartment in the equipment. To a lesser extent the weight may have some influence on the choice.

**Storage life.** This may or may not be a worthwhile consideration according to the usage of the equipment.

**Temperature.** Maximum performance is usually obtainable at about 20°C. Temperatures around freezing point will reduce the efficiency of certain battery types.

**Cost and availability.** Obviously economy will be a major factor but it is necessary to consider both the initial cost and the battery life. It may be more economical to use a larger and initially more expensive battery but one which will give longer service and a lower running cost. When choosing a primary battery this should be of a type that is obtainable without difficulty.

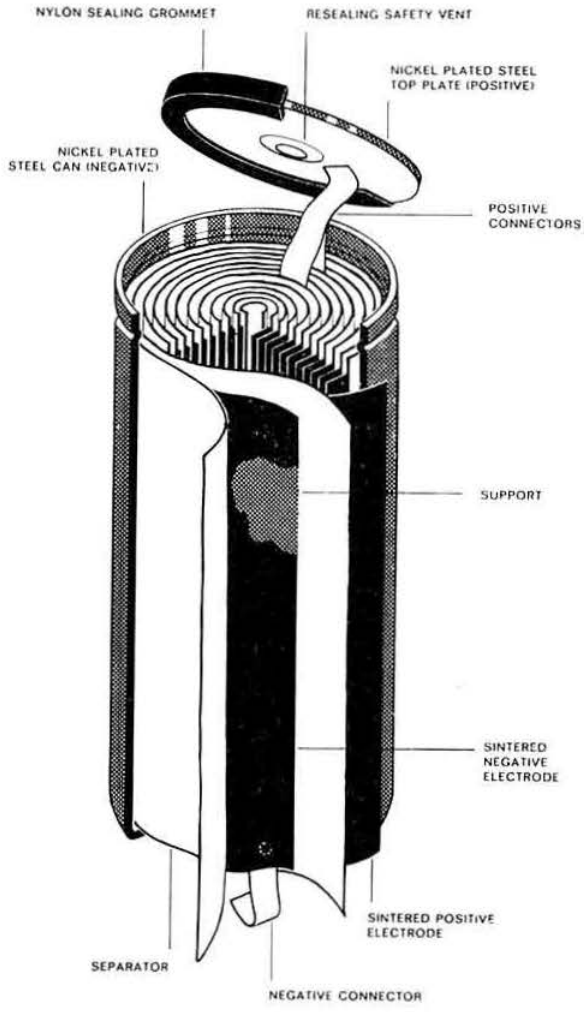



**Fig 1. Typical nicad cylindrical cell construction**

## Types available

### Primary cells

The **zinc carbon** or Leclanché battery is the most popular type available and is usually the least expensive. Among its characteristics are:

(*a*) It should not be discharged beyond the end of its useful life or left in equipment in a discharged state because of the possibility of leakage;

(*b*) a "rest" period is required. Continuous drain will materially reduce battery life;

(*c*) The "high power" (HP) type is suitable for heavy current drain with reasonable voltage stability. It is used in most motor powered devices;

(*d*) the "power pack" (PP) range of batteries has been designed for use with transistor operated equipment and they are fitted with non-reversible contacts.

No attempt should be made to recharge zinc carbon batteries owing to the very real danger of explosion.

The **mercury** cell was first produced in quantity during the second world war when military requirements hastened its development.

Its characteristics include:

(*a*) high cathode efficiency providing a stable voltage during current discharge;

(*b*) a "rest" period is not required for maximum performance;

(*c*) a greater capacity volume ratio than zinc carbon batteries;

(*d*) storage for long periods at temperatures around 20 C is possible without any appreciable loss of capacity. Typically 90 per cent of the capacity will be retained during a period of 30 months;

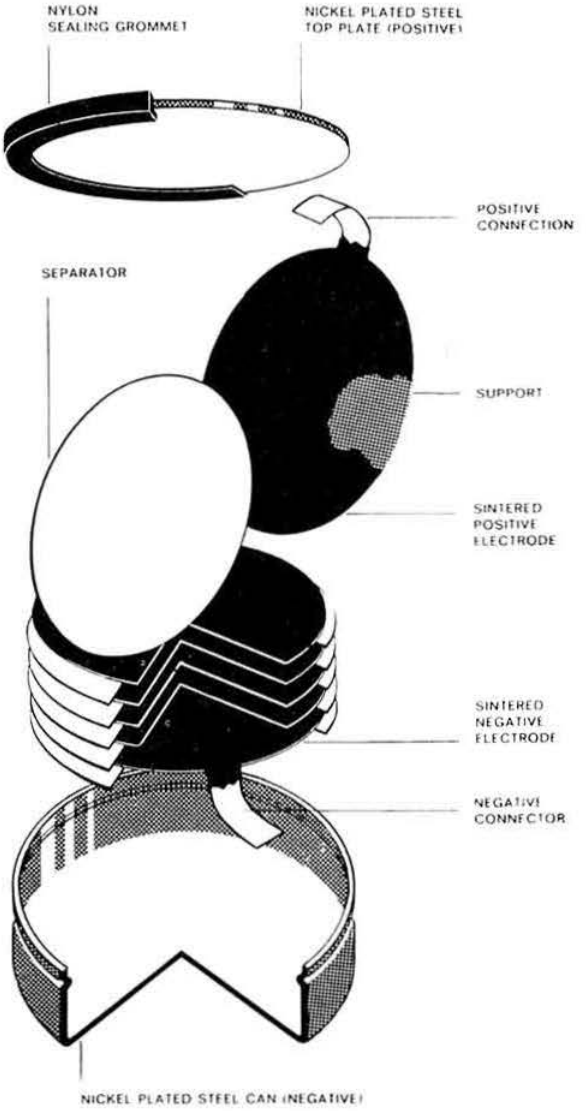



**Fig 2. Typical button cell construction**

## Primary cells

| Type | Nominal voltage | Weight (grammes) | Suggested current range (mA) | Typical use |
|---|---|---|---|---|
| RM675H (mercury) | 1·5 | 2·3 | 0–10 | Hearing aid |
| RM401 (mercury) | 1·5 | 11·3 | 0–80 | Hearing aid |
| ZM9 (mercury) | 1·5 | 29·8 | 0–200 | Hearing aid |
| HP7 | 1·5 | 16·5 | 0–75 | Radio |
| HP11 | 1·5 | 45·0 | 0–1,000 | Motor |
| HP2 | 1·5 | 90·0 | 0–2,000 | Motor |
| SP2 | 1·5 | 90·0 | 25–100 | Radio |
| SP11 | 1·5 | 45·0 | 20–60 | Radio |
| AD28 | 4·5 | 443·6 | 30–300 | Radio |
| PP1 | 6·0 | 283·0 | 5–50 | Radio |
| PP3 | 9·0 | 38·0 | 0–10 | Radio |
| PP6 | 9·0 | 142·0 | 2·5–15 | Radio |
| PP9 | 9·0 | 425·0 | 5–50 | Radio |
| PP10 | 9·0 | 1,250·0 | 15–150 | Radio |
| HP1 | 12·0 | 1,550·0 | 0–4,000 | General purpose |
| B106 | 45·0 | 255·0 | 1–10 | General purpose |
| B1702 | 60·0 | 2,720·0 | 5–50 | General purpose |
| B126 | 90·0 | 454·0 | 1–10 | Radio |

The above types are representative of the range manufactured by the Ever Ready Company (GB) Ltd.

(*e*) the cell containers are usually of nickel plated steel, not forming part of an active electrode and resistant to corrosion.

The **alkaline manganese** cell has undergone improvement comparatively recently and in its present form is suitable for continuous discharge applications. However, its voltage is not as stable as that of the mercury cell. Characteristics include:

(*a*) a good storage life. Typically 95 per cent of the capacity will be retained during a period of 20 months at 20°C;

(*b*) the case is not an active element and is usually of electroplated steel which is resistant to corrosion;

(*c*) saisfactory operation is possible over the temperature range $-20$ to $+70$ C;

Rechargeable alkaline manganese cells are obtainable but at the present time do not appear to be readily available from UK retail sources.

### Rechargeable cells

The **lead acid** battery is mentioned for completeness and its ready availability. Although it may have limited use for mobile applications its use in portable equipment is not recommended owing to the weight and corrosive liquid electrolyte.

The type of rechargeable cell generally associated with communication equipment is the **nickel cadmium** battery. This is manufactured in several forms, eg button cell, cylindrical cell and rectangular battery. Although the cell construction may differ between these forms the basic principles of operation are identical. Nickel cadmium (abbreviated to "nicad") cells are referred to by different manufacturers as cells, accumulators or batteries. It is here assumed that the descriptions are interchangeable, although strictly the term "cell" applies to the individual unit, ie a nicad battery can consist of several separate cells.

Characteristics of the nicad are:

(*a*) stable voltage during discharge cycle;

## Comparison of types

| Type | Nominal voltage | Energy/density (Watthrs/weight) | Low temperature performance | Shelf life | Initial cost | Order of merit in cost per 100 hours |
|---|---|---|---|---|---|---|
| Zinc carbon | 1·5 | 25 | Poor | Fair | Lowest | 2 |
| Alkaline manganese | 1·5 | 35 | Fair | Good | Moderate | 3 |
| Mercury | 1·4 | 45 | Special type available | Good | High | 4 |
| Nickel cadmium (rechargeable) | 1·25 | —(1) | Good | Very good | Expensive | 1 |

Note (1). Small size but moderate weight

(*b*) suited to a continuous high discharge rate, a "rest" period is not required;
(*c*) unlike most secondary cells, no maintenance is required;
(*d*) cells may be charged and discharged hundreds or thousands of times according to the conditions of use;
(*e*) cells will operate over a wide temperature range, for discharge typically −20 to +45°C. For storage a greater range is possible although the optimum figure for both charge and discharge is 20°C;
(*f*) nicads have a low self-discharge rate at normal temperatures. The curve for a typical cylindrical DEAC cell shows that 70 per cent of the nominal capacity will be retained after a storage period of three months;
(*g*) the cells are fully sealed and may be used or stored in any position and are shock and vibration resistant. There is no corrosion problem.

The correct choice of a nicad battery is dependent on service requirements. The following points must be taken into consideration:

(i) nominal voltage;
(ii) upper and lower voltage limits;
(iii) maximum current and duration;
(iv) type of operation;
(v) space and weight limitations.

The above points, with the possible exception of (iv), are self-explanatory. For communications use the type of operation will usually be a charge-discharge sequence, rather than trickle charging or float operation.

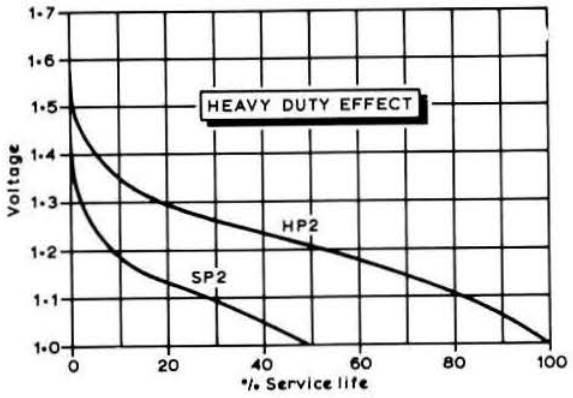



**Fig 3. The graph illustrates the difference in service life between the specially designed high power battery and the standard battery on a tape recorder test. The discharge is for two hours a day through 5Ω for Ever Ready HP2 and SP2 batteries**

## Charging nickel cadmium cells

It is important that attention should be given to the correct methods of charging nicads. There is no particular difficulty involved but the methods are different from those employed with the usual automotive battery. Nicads are expensive and this is a very good reason for devoting some care to this aspect of their use. It is essential that the charging current should be kept to a constant known value. The use of constant voltage charging systems is not recommended due to the very low internal resistance of nicads which could lead to the possibility of drawing high currents and consequent overheating.

The manufacturers of DEAC cells recommend that the charging current should be one tenth of the nominal capacity of the cell, ie a type 10/500DKZ with a capacity of 0·5Ah requires a charging current of 50mA. The charging factor of nicads is 1·4, ie in the case of a fully or partially discharged cell, 1·4 times the capacity taken out must be replaced. For normally discharged cells the charging time with the rated current is therefore 14h. This time can be reduced by fast charging, for details of which the manufacturer's literature should be consulted.

## Nickel cadmium rechargeable cells

| Ever Ready Cat No. | Nominal capacity (Ah) | Weight (grammes) | Type |
|---|---|---|---|
| NCB28 | 0·28 | 16·5 | Button cell 1·2V nominal |
| NCB55 | 0·55 | 28·5 | " " " " |
| NCB175 | 1·75 | 100·0 | " " " " |
| NCC60 | 0·60 | 30·0 | Cylindrical cell, equivalent size HP7 |
| NCC200 | 2·00 | 78·0 | Cylindrical cell, equivalent size U11 |
| NCC400 | 4·00 | 170·0 | Cylindrical cell, equivalent size U2 |
| NCB28/8 | 0·28 | 126·0 | Button cell battery. 10V nominal |
| NCB55/8 | 0·55 | 232·0 | Button cell battery. 10V nominal |
| **DEAC type** | | | |
| 10/225DK | 0·225 | 135·0 | Button cell battery. 12V nominal |
| 10/500DKZ | 0·500 | 280·0 | Button cell battery. 12V nominal |
| 10/1000DK | 1·000 | 610·0 | Button cell battery. 12V nominal |
| TR7/8 | 0·070 | 45·0 | Battery, equivalent to PP3. 9V nominal |
| 501RS | 0·500 | 30·0 | Cylindrical cell, equivalent size HP7 |
| RS1·8 | 1·800 | 65·0 | Cylindrical cell, equivalent size U11 |
| RS4 | 4·00 | 150·0 | Cylindrical cell, equivalent size U2 |

The above types are representative of the extensive range of rechargeable cells produced by these two manufacturers.

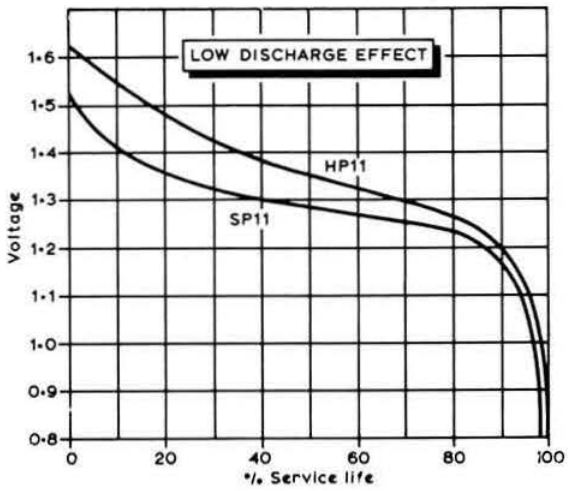



**Fig 4. This shows that where a light discharge is concerned the heavy discharge type HP11 does not show any advantage over the SP11 when discharged through 300Ω for two hours a day**

Charging of nicads can be carried out using automotive batteries, but usually it will be more convenient to use the ac mains supply. For this only a simple unit comprising a transformer, rectifier and current limiting resistance is required.

The circuits shown in Figs 5 and 6 have been suggested by the Ever Ready Co (GB) Ltd and are suitable for charging their range of nickel cadmium batteries. The appendix to this article outlines their practical use and how to determine values for these circuits.

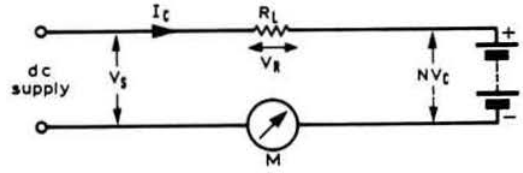



**Fig 5. Circuit for charging a nicad cell from an automotive battery or other dc source. A diode of suitable rating may be inserted in one supply lead to prevent damage from reverse polarity connection**

A number of commercial chargers are available, both DEAC (GB) Ltd and the Ever Ready Co (GB) Ltd manufacture constant current chargers intended for nicad charging. The more elaborate units provide a relatively high maximum current with metered output and a timer.

A range of transistorized constant current battery charging modules designed to charge nicads is obtainable from Electroplan Ltd. The transistorized circuit provides a constant charging current which is stabilized against normal mains and battery voltage variations. Each module includes a double-wound mains isolating transformer, bridge rectifier and current regulating circuit, and the unit is completely encapsulated in epoxy resin within a black polypropylene moulded case. These units are available in seven constant current outputs between 2 and 200mA.

## Suppliers

Normally the purchase of primary batteries presents little difficulty, with stockists in all large towns. A type not immediately available can usually be obtained with little delay. Further details of the complete range of primary batteries can be obtained from the Ever Ready Co (GB) Ltd, Technical Sales Department, 1255 High Road, Whetstone, N20 0EJ.

DEAC nickel cadmium accumulators are obtainable from Varta (GB) Ltd, Hermitage Street, Crewkerne, Somerset TA18 8EY. This includes small quantity orders on which there will be a charge for handling and packing. In addition certain model suppliers may also carry stocks of these cells.

The range of Ever Ready nickel cadmium rechargeable cells is handled by Electroplan Ltd, PO Box 19, Orchard Road, Royston, Herts SG8 5HH. They are able to supply small quantities by mail order. A data sheet and price list is available from this distributor who can also supply an automatic 750mA nicad charger and the range of charging modules mentioned above.

No mention has been made of the actual cost of the various types of batteries although a relative comparison is given. With the present fluctuation in the prices (usually upward) any current figures may be incorrect in the near future.

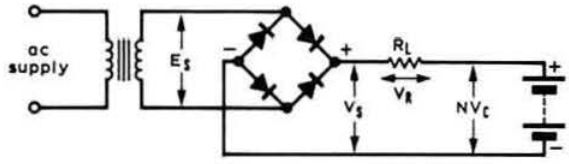



**Fig 6. Circuit for charging a nicad cell from the domestic ac mains supply**


## Acknowledgements

The Ever Ready Co (GB) Ltd has provided product information and suggested charging circuits, and Varta (GB) Ltd has supplied information on their range of DEAC cells. The author wishes to acknowledge their valued co-operation.


## Appendix
### Referring to Fig 5

Symbols

Vs = source voltage
Vc = on charge voltage of one nicad cell (approx 1·45V at 20°C)
Vr = voltage across resistor
N = number of nicad cells in battery
C = capacity of nicad cells in ampere hours
RL = resistor required to limit current
Ic = charging current required (C/8 for Ever Ready cylindrical cells)
Wr = watts to be dissipated by resistor

**Calculation of resistor RL**

Vs − NVc = RL × Ic (if this result is negative, Vs is too low). Assume charge rate of C/8, then Vs − NVc = RL × C/8.

Therefore $RL = \frac{8}{C}(Vs - NVc)\Omega$.

**(Continued on page 159)**

# MICROWAVES—1,000MHz and up

by DAIN EVANS, G3RPE*

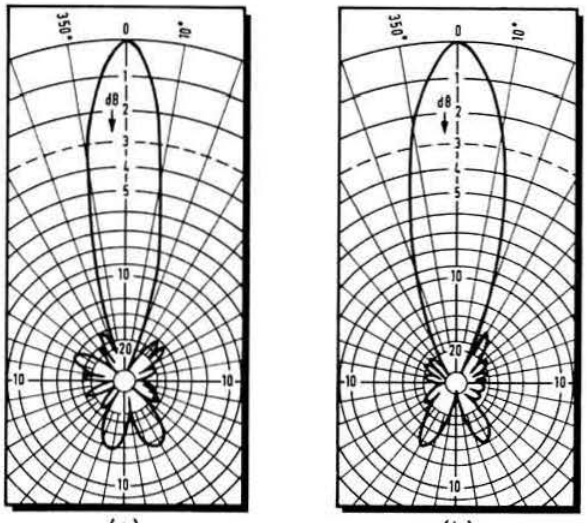
## VHF/UHF Convention

On the lecture programme for the convention next month is a first look at our new 24GHz band. G3HWR will talk about the design and construction of equipment for this band, and will also cover the unusual propagation characteristics found at this frequency.

There is already a fair amount of 24GHz equipment available. Can I ask people to bring as much as they can along; on the basis that one look is worth a thousand words.

## Yagi aerials on 1,296MHz

There is an increasing interest in the use of Yagi aerials on this band. Their relative ease of construction and of mounting, and their low windage are features which the alternative parabolic dishes certainly do not possess.




(a) (b)

**Polar diagram of G8AZM 1,296MHz long Yagi**
**(a) standard 34-el version (b) 27-el, shortened, version**

G2DD (Stanmore) has taken a closer look at the performance of the G8AZM 34-element design published in the August 1971 column. The aerial was made strictly to the dimensions as published, the only modifications being that the reflector and driven elements were made from single pieces of ⅛in diameter rod bent to shape and soldered midway along the bottom sections, and that the elements were clipped rather than soldered to the boom.

Initial "on-the-air" tests with G2FCA over a reliable one-mile path suggested that there was little loss in efficiency until 7 to 10 of the 32 directors had been removed. The aerial was then modified to a 27-element version with an optional 7-element extension, and both versions subjected to professional field tests by G4HQ.

Both aerials were found to have a centre frequency of 1,296MHz and a bandwidth of about 25MHz. Their polar diagrams are shown in the figure. Reducing the number of elements from 34 to 27 has little effect in practice: the measured gain of 18·8dB compared with a dipole was reduced by only 0·1dB (compared with about 1dB to be expected), the sidelobes were reduced from 15 to 14dB, and the front-to-back ratio changed from 24 to 35dB. The 3dB beamwidth of the 34-element version was 18° and was therefore slightly smaller than that of the 27-element version, 21°, although this difference was not reflected in the correspondingly greater gain to be expected. G2DD, rightly, is enthusiastic about the performance of this aerial: he suggests that the results obtained prove the tolerance and excellence of the original design.

Putting the performance of this size of Yagi aerial into perspective, a single one having a gain of 19dB is equivalent to a dish about 3ft in diameter. This assumes that the dish has an overall efficiency of 50 per cent, a figure which may not be reached in practice. If four such Yagi aerials are combined (a technique used by G3JVL as reported last month), then their gain is equivalent to a dish about 6ft dia.

## Reference books on microwaves

Several letters arrive each month requesting titles of books suitable for amateurs, and each time I have to say that I have yet to find one that can be recommended without qualification. The trouble is that most text books are intended to provide a broad foundation of knowledge in a particular area from which practical equipment can be derived. Most presume that the reader has professional qualifications, a laboratory full of test equipment of the highest standard and, these days, access to a computer.

What amateurs want, of course, is the reverse: the practical detailed design information with which to build equipment from which they can acquire the theoretical background if they so choose. It is, for example, difficult to find a text on waveguide which does not disguise the relevant information in a formal mathematical form, much of which is irrelevant at this time, when all that one needs to know initially can probably be given on a page or two.

Probably the most useful reference for amateurs is the famous M.I.T. Radiation Laboratory series (McGraw-Hill 1948). Due to the odd conditions under which they were written, there is an abundance of practical information well mixed up with high theory scattered throughout many of the 27 volumes (!) of this series. Specially recommended are Vol 7 (Klystrons and microwave triodes), Vol 8 (Principles of microwave circuits), Vol 9 (Microwave transmission circuits), Vol 11 (Techniques of microwave measurements), Vol 12 (Microwave antenna theory and design) and Vol 13 (Propagation of short radio waves).

The *Microwave Engineers Handbook* (Horizon House-Microsol Inc, 1972) is mainly a collection of nomograms,

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

many of which are useful, even if it is difficult to see in some cases how to use the data.

The writer has found three other books of value: *Reference Data for Radio Engineers*, Howard W. Sams and Co Inc, 1972; *Electronic and Radio Engineering*, F. E. Terman, McGraw-Hill; and *Antenna Engineering Handbook*, H. Jasik, McGraw-Hill. All contain information of much relevance at this time, and are written in a form which most amateurs should be able to digest. Being standard references, all the books referred to should be available via your local library.

If anyone has other texts which he has found usable and useful in an amateur context would he please pass on the information.

# Batteries for electronic equipment

**(Continued from p157)**

### Referring to Fig 6

**Symbols**

Es = transformer secondary voltage
Vs = voltage of rectified dc
remainder as Fig 5

**Calculation of resistor RL**—as above

**Rating of transformer**

The transformer secondary voltage Es should be at least twice NVc and its current rating should be at least equal to Ic (in rms value).

**Calculation of wattage of resistor RL**

$Vs = Vr + NVc$
$Vr = Vs - NVc = RL \times Ic$
$Wr = Vr \times Ic$
$Wr = RL \times Ic^2$ watts

### Practical example

To charge one Ever Ready NCC400 from (*a*) a 12V car battery, and (*b*) 240V ac mains supply. Charging rate to be C/8.

**(a)** $Vs = NVc = 1 \times 1{\cdot}45V$
$C = 4Ah$; $Ic = 6/8 = 500mA$
Value of $RL = \frac{8}{4}(12V - 1{\cdot}45V)$
$RL = 21{\cdot}10\Omega$
$Wr = 21{\cdot}10 \times 0{\cdot}5 \times 0{\cdot}5 = 5{\cdot}2W$
A resistor of about 22Ω 6W is required.

**(b)** For rating of transformer see above
Bridge rectifier: the piv should be greater than Es (3V) and have a forward current of at least Ic (500mA).
$Vs = 3V$; $NVc = 1 \times 1{\cdot}45$
$C = A4h$; $Ic = C/8 = 500mA$
Value of $RL = \frac{8}{4}(3V - 1{\cdot}45V)$
$RL = 3{\cdot}10\Omega$
$Wr = 3{\cdot}10 \times 0{\cdot}5 \times 0{\cdot}5 = 0{\cdot}77W$
A resistor of 3Ω 1W is required.

# TECHNICAL TOPICS

by PAT HAWKER, G3VA

NO matter how high or low the frequency we may be concerned with, it all comes from some form of power at zero frequency, our old friends the direct current supplies on which our systems depend. So this month we look first at the nitty-gritty—regulated power supplies so useful for transistor and integrated circuit equipment, before launching into radio frequencies ranging from the lower hf even unto 73GHz.

## Three-terminal ic voltage regulators

In *Ham Radio* (December 1973) J. E. Trulove, WB5EMI, draws attention to the recently introduced ranges of three-terminal voltage regulators now being offered by Fairchild ($\mu$A7800 series), Motorola (MC7800 series) and National (LM340T series). "They provide," he writes, "a lot of regulation for very little money."

One of these devices connected into an unregulated power supply will provide voltage regulation of the order of 0·01 per cent per volt. For example ±0·05 per cent for the 5V 7805 device. Devices providing regulated outputs up to 24V are available. There is built-in protection against excess output current, output short-circuits, and excess heat. Power capability is 15W, which means that you can draw 1A at 5V when the average unregulated input voltage is 20V or less provided that adequate heat sinking is used. Devices are made in TO-220 plastic power transistor packages and in metal TO-3 style (Fig 1).

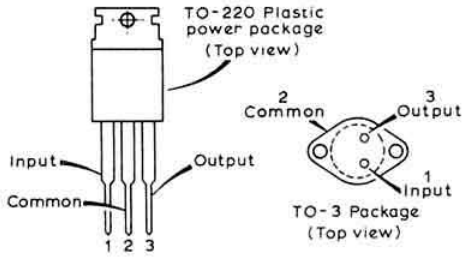



**Fig 1. Connections and outlines of the 7800-series of three-terminal ic voltage regulators**

One lead goes to the unregulated supply rail, one to the output and the third is the common earth connection. The key to the low cost (USA price for single units about $2.20) would seem to be that although the regulation is 0·01 per cent per volt, the output voltage may be within ±5 per cent of nominal; in other words a random 5V 7805 may give you an output anywhere between 4·75V and 5·25V, but regulation will keep the output to within ±0·05 per cent of this voltage.

Fig 2 shows a typical application, taken from another article in the same issue of *Ham Radio:* a 5V supply for a wide range rf signal generator built by Hank Olson, W6GXN, and using a standard 6·3V winding in conjunction with a full-wave bridge rectifier. He points out that the common terminal of the regulator is the case so that a good thermal connection to the chassis (for heat dissipation) also provides the electrical ground. The 0·22$\mu$F capacitor is important and should not be omitted; it should be placed between the input and common terminal of the regulator *immediately* adjacent to the ic to avoid any chance of instability.

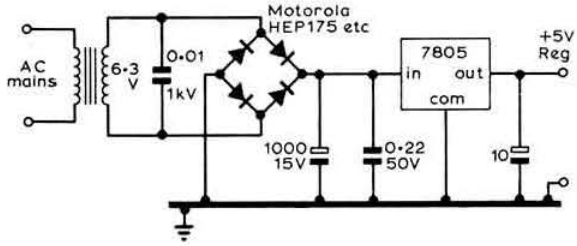



**Fig 2. The regulated 5V supply used by W6GXN for an rf signal generator making use of one of the three-terminal ic voltage regulators (*Ham Radio*)**

## High-current regulated supply

The ic regulators tend to require 10V or more input in order to bias their internal references etc, and this means that the device has to dissipate quite a lot of power when high output currents are required. An ingenious way of keeping the voltage of the high-current supply path low, while providing the necessary voltage for a regulator, was described in *Electronics*, 24 January 1974: Fig 3. This showed an arrangement capable of providing 5V at 10A, using a voltage tripler to bias the ic regulator's internal reference. The ic regulator drives a high-current power Darlington pair (Motorola MJ4033) which is biased by the high-current rectifier. The Darlington pair acts as a series-pass element increasing the low output

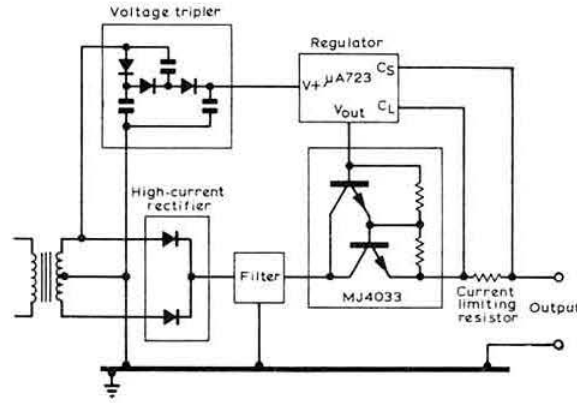



**Fig 3. High-efficiency high-current 5V regulated supply providing output currents up to 10A and using a voltage tripler to bias the ic regulator's internal reference (*Electronics*)**

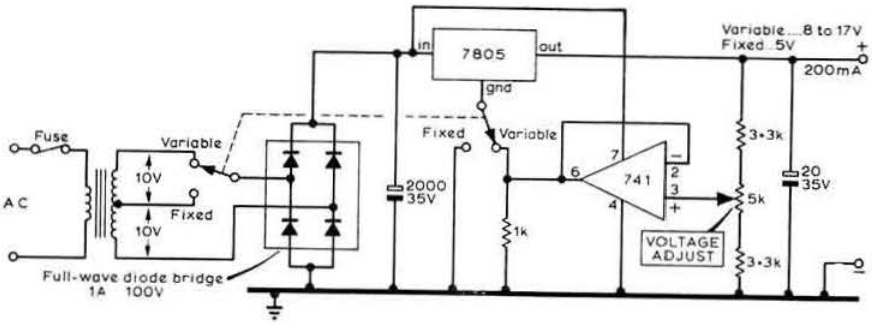



**Fig 4. Power supply providing either fixed (5V) or variable (8 to 17V) regulated output at up to 200mA. The variable output is achieved by using an op-amp in the regulator's output loop. Note that for 5V only half the transformer's secondary winding is used in order not to exceed the power rating of the ic voltage regulator (*Electronics*)**

current from the regulator to several amperes (a single power transistor instead of the Darlington pair can be used for lower output currents).

## Fixed and variable power supply

Another application of the 7805 voltage regulator ic to provide either a regulated 5V output or alternatively a regulated supply which can be adjusted anywhere between 8 and 17V appeared in *Electronics*, 27 September 1973, p107: Fig 4. Output current is 200mA and it is suggested that the 8 to 17V is suitable for many cmos devices.

A double-pole double-throw switch puts the same ic regulator and full-wave bridge into both applications, for 5V bypassing the 741 op-amp network and tapping down the mains transformer. Regulation is given as better than one per cent.

## Reducing ground losses with verticals

In *QST* (December 1973) J. Sevick, W2FMI, returns to the subject of high performance vertical aerials and describes the use of top-loaded elements of about $\frac{1}{4}\lambda$ in conjunction with an elaborate ground radial system (100 radials of No 15 aluminium wire each about 50ft long). For 3·5MHz he uses a 28ft vertical with top loading radials and base loading coil; for 14 and 7MHz a 16ft trap vertical with top and base loading. Both verticals are fed in parallel with a 4:1 matching transformer. From the illustrations it looks as though W2FMI has a site with reasonable ground conductivity and fairly open, although some trees are not far away. In his article W2FMI claims that similar good results could be achieved with a less complex ground system, but as with earlier articles on verticals by the same author it seems pretty evident that he owes a good deal to having achieved low earth losses.

Fine—but is there any practical way in which the ground losses of verticals can be reduced other than by extensive radials and favourable sites? Recent work at Fort Monmouth suggests that the answer may be "yes". The trick consists of using a number of driven verticals to form an array.

This approach is described in a paper by C. M. DeSantis, D. V. Campbell and F. Schwering in *IEEE Trans on Antennas and Propagation* Vol AP-21, No 6, November 1973, pp 769–773. This suggests that ground losses of hf aerials near ground are reduced if single aerials are replaced by arrays of, for example, two to four elements spaced by over $0{\cdot}1\lambda$ apart. In the lower hf range (eg 3·5MHz) it is claimed that the achievable improvement closely approaches the theoretical limit. That is to say the use of n verticals would reduce ground losses by the factor $1/n$ and transmission efficiency would be raised by $n^2$. In practical terms this means that by using two whips one should achieve a 3dB gain, and with four verticals 6dB. This gain, it should be noted, is not the result of possible *directional* gain that can be achieved with multiple elements but is due to the reduction of ground losses—and amateurs know how much better it is to heat up the ionosphere than the soil.

The authors recall that the use of aerial arrays to reduce ground losses was suggested as long ago as 1920 and that this factor is made use of in Beverage aerials; nevertheless the principle has never been given the same attention as the use of extensive ground radials.

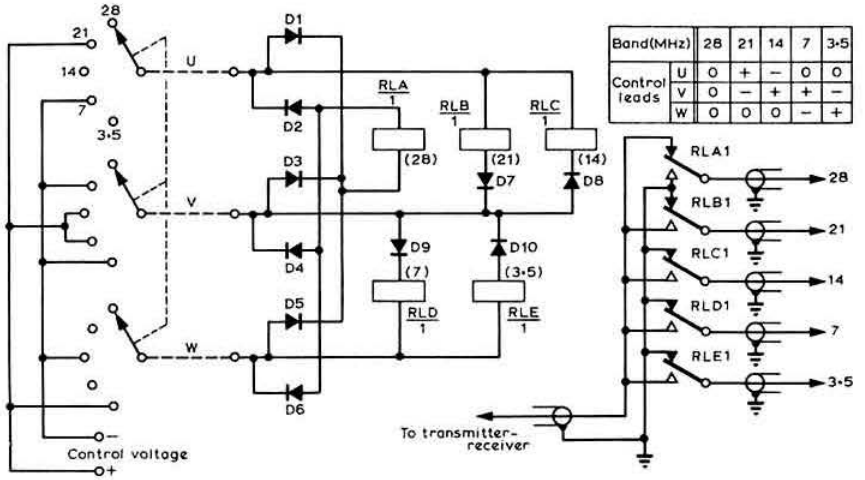
A number of computations at 3 and 6MHz and experimental results at 4·9MHz are presented and the idea looks decidedly promising. For the experiments the vertical radiators consisted of inductively loaded 4·9m whip aerials excited against a small 1·8 by 1·8m² wire mesh counterpoise (the whole assembly mounted on small wheels so that the radiators could easily be moved around). Special care was taken during the experiments to maintain currents of equal phase and amplitude in all array elements and to minimize undesired external feedline currents. Field strengths were measured at large distances from the array and compared to that generated by a single radiator fed with the same input as the array. Spacing of radiators was increased in steps of $0{\cdot}1\lambda$ (two-element arrays show increasing gain up to about $0{\cdot}4\lambda$, broadside four-element arrays up to about $0{\cdot}2\lambda$, but in each case quite substantial gain is achieved with $0{\cdot}1\lambda$ spacing).

The principle is that a substantial part of earth losses occurs in the immediate vicinity of the aerial. With an array, since ground losses are proportional to the electrical energy density in the earth, separation of the near fields results in a reduction of earth losses.

While at first sight it might appear that one is merely exchanging the need for a complex earth system for a more complex aerial array, there must be many situations in amateur operation where multiple verticals are more practical than big earth systems. So this concept seems to be an important one, and well worth following up.

## Remote aerial switching

The use of diodes to provide "trick" switching arrangements has been well known for many years—and today with the very low cost of general purpose silicon diodes some of the applications have become economically very attractive. Fig 5, which comes from an item by Franz Motyka, DL9EY, in *CQ-DL* (January 1974), shows a means of remote switching any one of five aerials over a three-core control cable




| Band(MHz) | | 28 | 21 | 14 | 7 | 3·5 |
|---|---|---|---|---|---|---|
| Control leads | U | 0 | + | − | 0 | 0 |
| | V | 0 | − | + | + | − |
| | W | 0 | 0 | 0 | − | + |

**Fig 5. Tricks with diodes. A remote aerial switching system by DL9EY using three-core cable to switch between five aerials (and those without three-core cable might be able to adapt the circuit to use the coaxial cable both for rf and for two of the dc control potentials)**

**Note: The negative control voltage on the "U" switch should go to "14" and not "7" and on the "W" switch to "7" and not "14"**

with the aid of five change-over relays, 10 diodes, a three-pole five-way switch and a dc control potential. The system could also be adapted for other applications.

## Huff and puff vfo stabilization

The huff and puff system of vfo stabilization continues to arouse interest and this month we include some further comments on the PA0KSB system before describing an improved arrangement that stems from an undergraduate project carried out by A. K. Forrest at the Imperial College of Science and Technology.

J. R. Compton, G4COM, adds further to his earlier comments in *TT* (November 1973), when he was still BRS33886. He considers that the poor temperature characteristic of the internal timing resistors of the SN74121 is of no practical significance, and I feel it would now be generally agreed that there is no need to fit external resistors. He also notes GW3JNY/W9's suggestions (December *TT*) for avoiding forward conduction in the varicap diode by returning the cold end to the vfo power supply, adding: "This seems (now) an obvious alternative to my two-varicap arrangement. One or other of these approaches will certainly be needed if it is desired to use the full 0–4V swing, and putting a small capacitor in series will not be the whole answer. It will, however, be essential to return the cold end of the 1,000μF capacitor also to the vfo power supply, if the capacitance of the varicap is not to be a first-order function of any fluctuations in the power supply voltage and so requiring voltage stabilization within a millivolt or two."

He adds that the circuit as originally described is still in use, proving very successful for transmitting as well as receiving, and quite unnoticeable in use, yet proving a great comfort to know that when the other man comes back a bit off frequency "it's his drift and not mine".

J. H. Tait, BRS32041, in a long letter discusses a system which he has been developing on paper for a considerable time to provide stabilization in a manner not unlike that of the PA0KSB technique but based partly on ttl and partly on discrete devices. In his arrangement the output from the 7474 D-type flip-flop does not feed the RC integrator directly but instead feeds logic circuitry which gives an output pulse when the 7474 changes state after a sampling cycle. He believes that his arrangement will overcome the conflicting requirements of the RC time constant (short enough to follow fast changes in frequency yet long enough to prevent excessive cyclic swing). He writes: "Assuming that the vfo has settled and the output of the 7474 is changing 010101 etc (serially) at the end of each sampling period, each time a change is detected this pulse is fed into the 'up' input of a 74193 up/down counter. This counter controls four resistors by means of switching diodes and transistors in the integrator circuit. Since the 74193 counts to 16 (0 to 15) it is possible to obtain 16 discrete values of R (with one constantly in circuit). As the up input receives pulses from the logic circuits the value of R is increased with each pulse. The time constant of the integrator is further increased and cyclic frequency swing radically reduced."

He explains this in some detail since it is theoretically possible using this technique to stabilize the frequency of the vfo to very fine limits.

On the circuit arrangement given in *TT* (October) he notes that the 74121 provides both Q and $\bar{Q}$ outputs so that it is unnecessary to include the extra nand gate. He is also baffled why the $2^3$ output from the 74191 is shown connected to the No 1 pin of the 7474, as this is the "clear" input pin, and believes it should go to pin No 2, with pins 1 and 4 connected via 1kΩ resistors to the positive rail.

## A versatile huff and puff system

A. K. Forrest, BRS34402, provides details of a vfo stabilizer which was prompted by the PA0KSB arrangement but is capable of providing a maximum stability 16 times greater (or alternatively withstand a rate of drift of the uncontrolled oscillator 16 times greater; or four times the stability plus coping with four times the drift). He uses an integrator and his improved control comes about by using a four-bit circuit instead of the one-bit effectively provided by the flip-flop of PA0KSB's system. Additionally his design incorporates an op-amp integrator which improves linearity, reduces the settling time to under a second, and makes the circuit more easily adaptable to many different oscillators. Yet he believes his design (Fig 6) costs only slightly more than the original.

He writes: "Timing pulses are obtained from the SN7490

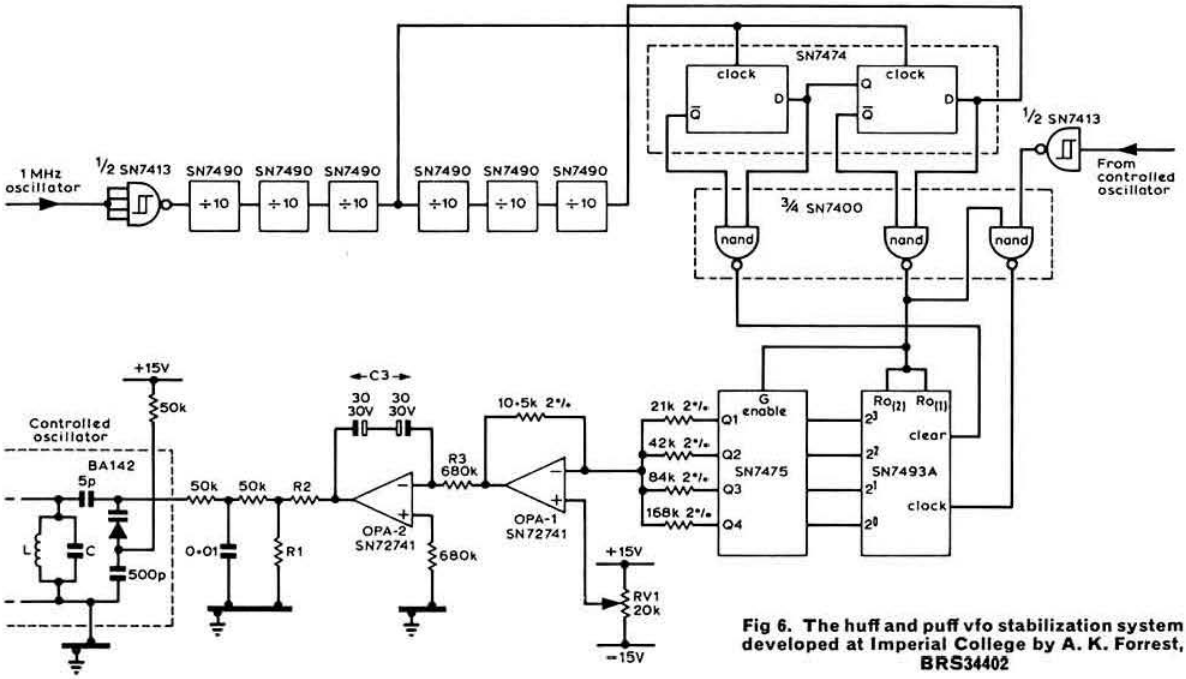



**Fig 6. The huff and puff vfo stabilization system developed at Imperial College by A. K. Forrest, BRS34402**

divider chain, the dual flip-flop and the nand gates. The pulses are 1ms long and one half-second apart. The pulses are in pairs: the first pulse stops the counter and puts the latch in the sample mode, high at pin 4 and 12; the second pulse starts immediately the first one ends and resets the counter to zero—and the counter then starts counting again. The latch now holds the number that was in the counter at the end of the timing period; this is converted to an analogue voltage which is zero for 8, positive for numbers less than 8 and negative for numbers greater than 8. This feeds the integrator which provides a ramp voltage across the varicap diode. The CR filter shown between integrator and oscillator may be necessary to prevent high frequencies from reaching the oscillator, although with good layout the filter should not be necessary.

"The control voltage and bias voltage on the varicap diode are kept separate: it is felt that this has several advantages, it keeps the $Q$ of the varicap high, thus increasing the intrinsic stability of the oscillator, and it reduces the change of capacitance versus voltage slope due to the swing of the control voltage; it also allows independent receiver tuning where the oscillator is part of a transceiver.

"To set up the system, the output of OPA-1 should be adjusted by means of RV1 so as to give 0V output with an "8" stored in the latch. The size of the correction is then adjusted by means of the ratio R1:R2, from the expression:

$$\frac{\delta f\ (\text{oscillator})}{\delta V\ (\text{varicap})} = \frac{R3C3\ (3{\cdot}2)}{T^2}\,\frac{R1}{R2}$$

"The input to the varicap from the integrator is changed to, say, between the 5V supply and earth and the difference of the oscillator frequency measured by means of a frequency meter or calibrated receiver to obtain the ratio.

"T represents the timing period, which in the prototype was 0·5s. R3 C3 is the integrator time constant, while 1/3·2 is the voltage of each step in the output of the digital to analogue converter.

"The maximum rate of drift that can be corrected by the circuit is given by $\Delta f$ T Hz sec and with a stability of 1 8T Hz sec. When averaged over long periods the stability of the system tends towards that of the timing crystal.

"The two op-amps can be either two 741 devices or one SN72747N. In the prototype the varicap diode was a BA142 but almost any varicap could have been used at the 6MHz frequency of the prototype. The resistors in the digital to analogue converter were made by combining 21kΩ 2 per cent resistors. The capacitors in the integrator were tantalum types, but normal electrolytics should work almost as well."

## Stacked crystal filters

Recent years have seen several innovations in bandpass crystal filters—for example, the raising of frequencies which can be achieved using the conventional approach of lattice arrangements with separate crystals; then more recently the coming of the monolithic crystal filter capable of providing very compact units at centre frequencies well up into the vhf range (a technique that has still to make its impact on amateur equipment). Also under development are various acoustic surface wave filters with very wide bandwidth (for example, for television i.f. filters).

Yet another new idea is reported in *Proc IEEE* (October 1973), pp 1495-96) by Arthur Ballato and Theodore Lukaszek again of US Army Electronics Command, Fort Monmouth. They have developed filters which they call "stacked-crystal filters", consisting of two or more AT-cut quartz plates bonded into a sandwich arrangement by a very thin layer of a beeswax composition or epoxy cement about 2$\mu$m thick. They have made several experimental filters using

2·16MHz crystals with bandwidths of 3·4 per cent and 4·2 per cent of centre frequency—considerably greater bandwidth than can normally be achieved by the other crystal filter techniques. Insertion losses are 8 to 10dB but it is suggested that these figures could be improved by better matching; the 10 to 50dB slope factor is about four but the filters have extremely few unwanted modes. Over the entire region 1 to 10MHz they provide complete suppression of all unwanted modes down to 60dB.

While such filters might make very useful i.f. filters for vhf receivers or roofing filters for hf receivers, it is suggested in *Proc IEEE* that specific applications would be as output filters and front-end filtering in proximity to transmitters operating in adjacent bands, where moderate power levels must be handled with a minimum of modulation and distortion effects. We have referred before to the concept of having a wide bandwidth crystal filter to provide pre-mixer selectivity, and this type of stacked filter might make such an approach more practicable.

It is claimed that the simplicity of construction and ruggedness of this type of filter, and its adaptability to modern crystal packaging procedures, compatible with integrated circuits, offers a wide area of application.

## Narrow-band reception with FM4 resonators - II

In *TT* (September 1973) a method of using the wideband FM4 ceramic resonators (Brush Clevite) for narrowband reception, due to G. Sinigaglia, I4BBE, and G. Tomassetti, I4BER, was described. Now from the same source comes an alternative and, in some respects, improved method of doing this: see Fig 7. This uses two FM4 resonators which

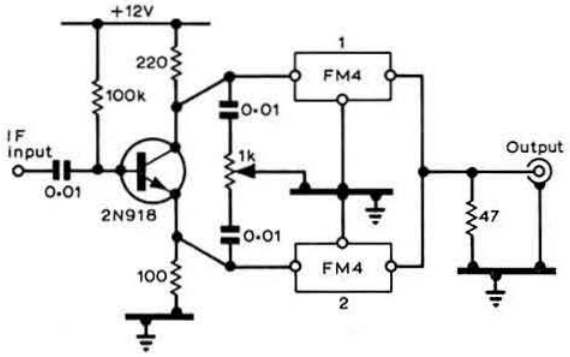



**Fig 7. Use of two FM4 ceramic resonators to provide narrow response curve by using phase-splitter**

are fed out of phase by means of a transistor phase-splitter. If the response curves of the two resonators were exactly equal, the output, when accurately balanced by means of the 1kΩ pre-set control, would be zero. But, in practice, resonators can be selected having suitably "different" responses, and this "difference" response is reflected in the output signals. The system thus has considerable resemblance to a balanced modulator. If the resonators are carefully picked, so that they are almost equal with respect to bandwidth, a residual bandwidth of say 20 to 30kHz can be achieved, compared with the normal FM4 bandwidth of about 230kHz, while the remainder of the FM4 passband

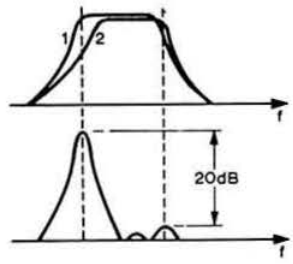



**Fig 8. Showing how narrow response curve is achieved by balancing two slightly different filters against each other**

will be attenuated by some 20dB: see Fig 8. The advantages over the previous technique are: (1) since there are no positive feedback loops there is no possibility of oscillation; and (2) the system provides greater dynamic range. The disadvantages are that it is necessary to pick the FM4 resonators and the reduced gain.

## Photodarlington microwave detectors

Most microwave receivers use a point-contact diode as detector or mixer, such as the 1N23C or 1N21D. A new approach is reported by G. A. Bowman and T. Koryu Ishii in *Proc IEEE* (November 1973, pp 1,651–2). Instead of a point-contact diode they use a type of opto-electronic device known as a photodarlington (eg 2N5778 or MRD14B). It is claimed that not only does this provide higher gain, linear input-output characteristics at large signal levels, uniformity in device characteristics, input-output isolation etc, but the photodarlingtons actually cost less than conventional microwave diode detectors. Something for less than nothing!

Experiments at 10GHz indicate the photodarlingtons provide about 10dB extra output, while at very low signal levels the output is put at about 25dB higher. Tests are also reported to have been carried out as high as 73GHz. So possibly this is an idea that has much to commend it to the microwavers.

## Iron powder toroids

Some months ago (*TT* July 1973) I drew attention to the availability in the UK of some of the Amidon iron powder toroidal cores, as often specified in the constructional articles in American journals. J. H. Jones, GW3TMP, tells me that his firm (TMP Electronic Supplies, 3 Bryn Clyd, Leeswood, Mold, Flintshire, CH7 4RU) has now a considerably larger selection of these cores, including most of those likely to be required for amateur equipment. The firm is also winding cores in "one-offs" and small batches, and supplying some of the hard-to-come-by American semiconductors.

The latest TMP data sheet on these cores includes a clear explanation of the difference between ferrite and iron powder core materials. Briefly, while ferrites have higher permeability they have less stability at higher frequencies and can be the cause of non-linear effects including cross modulation on strong signals, unless chosen with care. Iron powder toroid cores are often more suitable and convenient for oscillator circuits and rf amplifiers, including transmitters.

These cores are made of fine iron powder particles insulated from each other using a binder medium and then pressed

into the toroidal shape and baked at an extremely high temperature; this process means that there is an even distribution of the powder within the core and this contributes to the relatively constant effective permeability. Since they are not easily saturated they should not be used for applications which rely on core saturation.

Because all toroids are highly self-shielding it is seldom necessary to enclose them in shielding cans to protect them from inductive coupling; however, stray coupling can still arise from capacitive coupling effects. One method of providing adjustment of inductance is to use a toroid in series with an ordinary slug-tuned coil, combining the high Q of the toroid with the convenience of easy adjustment (in *ART* we note a technique for fixing slug cores directly to toroids using epoxy adhesives).

## D-mos field effect transistors

The appearance of whole new families of semiconductor devices seems to have slowed down a little since the heady 'sixties. But one interesting development still lurking in the wings but likely to move centre stage before very long is double-diffused mos technology, often known as D-mos. This particular fabrication technique appears to offer a useful means of producing field effect devices with low internal capacitances and effective up to the uhf and microwave region, and also for high-speed logic and switching applications. All sorts of intriguing devices are said to be under development: for example, linear amplifiers with 10dB gain at 1·5GHz, uhf power amplifiers providing 3W at 1GHz, and high-voltage devices offering minimum break down voltages from 70 to 300V.

One of the marketing problems of getting unusual semiconductors into wide use by equipment manufacturers is to avoid becoming a "sole-source"—that is to say, the only firm making them. As Ed Oxner recently put it: "In the USA there are precious few consumer-oriented companies that will even touch a device that isn't available from at least one other source. To be sole-source in a consumer industry is a luxury that few have ever enjoyed."

It is even said that semiconductor companies often try to persuade their rivals to manufacture similar devices to their own so that these can lose the sole-source stigma!

At present one of the few, if not the only, firm offering D-mos devices is Signetics (SD200 series) but there is every prospect that other firms will enter the field. The Signetics units include a device with diode-protected input for use up to 1·8GHz with a noise factor of 5dB and power gain of 6dB. At rather lower frequencies (up to 500MHz) there is a lower cost SD304 with a similar noise factor and gain of 16dB. The prices range from $1 to $5·25 in "100-up" quantities. Signetics in their advertisements claim these D-mos devices as "the only FETS ever produced to combine bipolar speed, noise figure and inter-electrode capacitance with mos linearity and input leakage." It all sounds very attractive, particularly for the uhf fraternity.

## Measuring af filter inductors

Graham Thorburn, G3WBT, has been building some low-pass af filters for use in direct conversion receivers but was initially rather surprised to find that the formulae for m-derived filters given in five different reputable sources produced five different sets of component values. It also became clear that the main factor in these calculations is the input and output impedances which should be known before the filter design can be started.

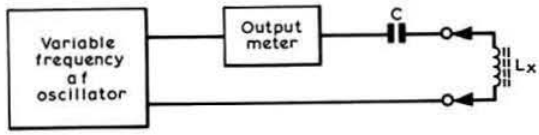



**Fig 9. Arrangement for measuring af filter inductors**

However, in the building of high-performance filters it is very useful if the values of the inductors can be determined with reasonable accuracy. G3WBT passes along the information that for inductances in the range of about 50 to 950mH this can be done using: (1) a variable frequency audio oscillator; (2) an output meter or low-range ac multimeter; and (3) the nomogram on page 504 of the third edition of the *RSGB Amateur Radio Handbook* (also to be found in the *Radio Data Reference Book*).

With the arrangements shown in Fig 9 vary the audio frequency until the output peaks up sharply. Note $f$ and C and connect these by a straight edge on the nomogram to ascertain $L_x$. The system was tried on various known inductances previously checked using an Avo LCR bridge from 1mH to 950mH and found to be as accurate as the limits to which the nomogram could be read, and remembering that for low-pass filter design for ssb reception $f$ is likely to be from 2,000 to 3,000Hz.

## Here and there

D. J. A. ("Sam") Noakes, BRS34009, provides a couple of quickies:

(1) No need to worry about those outside feeder connections and the like if they are bound with Denso Tape available from plumbing contractors; the only drawback, he says, is "it don't 'arf make yer 'ands sticky".

(2) Pieces of foam plastic draught excluder strip intended for doors and windows stick readily to the bottoms of aluminium boxes and so on; it stops them sliding about and saves scratches on furniture.

Belated acknowledgement: Vincent Evans, G4AUT, mentions that the use of toothpaste tube tops for cabinet feet and drawer knobs (*TT* December 1973) had previously been described by him in considerable detail in *Radio Constructor* (April 1972).

R. A. Whiting, 5B4WR, who is secretary of the Cyprus Amateur Radio Society, comments on the notes on D-layer whispering gallery (*TT* November). He reports that the society's beacon (5B4CY) was fairly recently moved to Zyyi on the southern coast of Cyprus about 27km west of Limassol, with a vertical 0·29λ high (height adjusted to match 72Ω coaxial) mounted at ground level with eight $\frac{1}{4}\lambda$ buried earth radials. The aerial is sited on a small rise in the ground some 500m from the sea. An interesting phenomenon has been observed in that signals from the beacon with its output of 16W are heard in Limassol with 27km land-sea path, in Akrotiri with 35km sea path, and at Cape Greco, 80km sea path. Is this normal ground-wave coverage or possibly some form of whispering gallery propagation? Incidentally some theoretical work reported recently suggests that waves are not completely entrapped in whispering gallery paths but show continuous leakage, even though the total path attenuation is so low.

# Detectors and dx

by B. PRIESTLEY, G3JGO*

AT times almost all amateurs want to try and work at maximum range with received signal levels that would not be acceptable professionally. The following notes are a brief review of the rather sparse information on this problem.

Except for radio stars and electrical interference, all radio systems are based on a cw source. This immediately gives the possibility of a twofold increase in signal to noise ratio through the detector, as shown in Fig 1. A signal is demodulated by a switching product detector. If the signal and local carrier are in phase then there is a dc output (*a*) but if they are 90° phased there is no average output. Noise voltages entering with the desired signal will add to it with a random phase angle. Noise components which add or subtract in phase will be demodulated and occur in the output, but those at 90° will average out. The net effect is that half the noise power is averaged out so that the product detector improves the signal to noise ratio by 2(3dB).

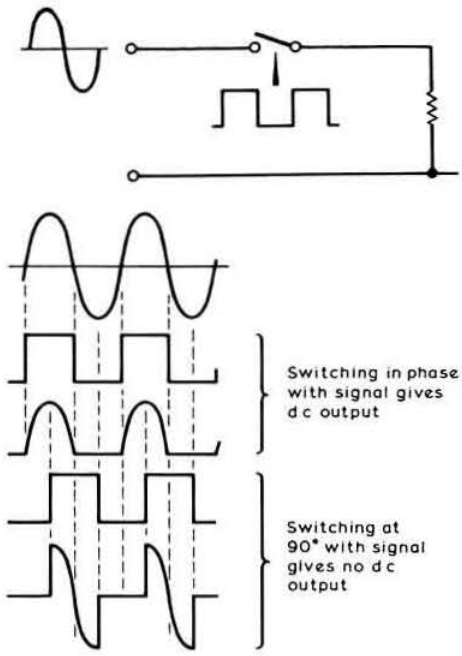



**Fig 1**

It should be noted that an envelope detector has exactly the same gain provided the received carrier is sufficiently far above the noise to completely control the time of switching off and on of the detector diode. As the input signal to noise ratio degrades, the carrier ceases to control the action exclusively and the output signal to noise ratio degrades rapidly, Fig 2. Note that an over-wide i.f. bandwidth can exaggerate this effect since the detector will be "captured" by the total noise voltage (proportional to the bandwidth) not simply that in the modulation bandwidth. This is one reason why there is little point in improving the front end of a wideband receiver; the noise figure may improve but the readability of weak signals will not do so. In many receivers this detector threshold is made worse as it coincides with the lower bend of the detector diode so that for all practical purposes the detector stops working.

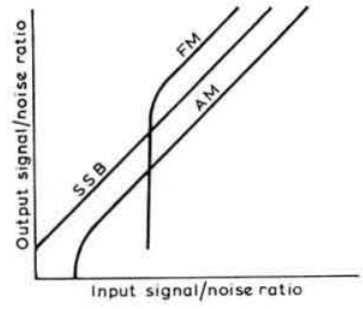



**Fig 2**

Exalted carrier reception, either in its simplest form of the stenode or more elaborate synchronous systems can improve matters, although a change of mode to ssb may be simpler.

How does fm perform? It is well known that the audio output is not directly dependent on the received signal power, so the straight line signal/noise relationship met with in ssb is unlikely to be duplicated. In fact there is an appreciable gain in signal to noise ratio through the detector and this increases with the deviation, but since the occupied bandwidth and hence also the noise increases with the deviation, the detector threshold also increases. The net result is that fm is very good (better than ssb) when the signal is strong, but under marginal conditions the detector can be captured by noise (or another signal) when ssb would continue to give a noisy but usable signal.

It is also clear that flutter will be somewhat less objectionable on fm than a.m. as long as the signal troughs do not fall below the detector threshold, but beyond that point fm will suffer.

Means have been found of lowering the threshold for very wide deviation fm where a large input signal to noise ratio is needed to get the expected gain. These take the form of frequency tracking receivers which effectively reduce the deviation to allow it to pass through a narrow i.f. strip. For amateur work this seems expensive and complicated and an exalted carrier detector for a.m. or fm on the lines of W8KFC's article in the September 1964 *QST* will be more useful to the weak signal enthusiast; probably the whole thing can now be done with a few ICs.

## Conclusions

More or less a case of "If you want to get ahead get a key (or a teleprinter)" with ssb a.m. and nbfm trailing behind in that order. On the other hand, if one is in a block of flats tortured by TVs and harrassed by HI-FIS and desperate to work someone, 500mW of 75kHz deviation on 1,296MHz could be the mode!

* 43 Raymond Road, Langley, Slough SL3 8LN

# RSGB SLOW MORSE PRACTICE TRANSMISSIONS

These slow morse practice transmissions are sponsored by the RSGB. Alterations and additions to this list should be sent 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 |
| 1130 | G3XVF | 1·974 | | Norwich, Norfolk |
| 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 |
| 1815 † | 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 |
| 1845 | G4AIV | 1·860 | | Kettering, Northants |
| 1900 | G3WGU | 1·880 | | Bispham, Lancs |
| 1930 | G3RAF | 1·910<br>3·590<br>144·024 | | 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 |
| 2000 † | G3YZB | | | East Molesey, Surrey |
| 2030 | G3ASR/A | 1·875 | A2/A3 | Harrow, Middlesex |
| 2130 | G3LQI | 1·980 | A1/A3J | Lancing, Sussex |
| 2230 | G3XVF | 1·974 | | Norwich, Norfolk |
| 2230 | G3HZL | 144·160 to south-west | A1/A3J | Isleworth, Middlesex |
| **Tuesdays** | | | | |
| 1100 | G3EBU | 1·952 | A2/A3J | South Woodham, Essex |
| 1830 | G4BNA | 3·590 | A1 | Swindon, Wilts |
| 1900 | G3XAM | 1·980 | | Wirral, Cheshire |
| 1930 | G3WGU | 433·500 to south-east | | Bispham, Lancs |
| 1930 | G3RAF | 1·910<br>3·590<br>144·024 | A1 | Locking, Soms |
| 2000 | GM3UWX | 145·890 omni-directional | F2 | Bishopton, Renfrewshire |
| 2000 | G3WGD | 1·860 | | Leicester |
| 2000 | GM3PIP | 3·590 | | Mintlaw, Aberdeenshire |
| 2045 | GM3CRY | 3·590 | | St Andrews, Fife |
| 2130 | GM3UAG | 145·800 to south | | Ellon, Aberdeenshire |

† Alternately

| Clock time | Callsign | MHz | Mode | Town |
|---|---|---|---|---|
| **Wednesdays** | | | | |
| 1930 | G3WGU | 433·500 to south-east | | Bispham, Lancs |
| 1930 | G3RAF | 1·910<br>3·590<br>144·024 | A1 | Locking, Soms |
| 2000 | G8QU | 1·970 | A1 | London N22 |
| 2000 | G4BEL | 145·020 to north-west | | Haddenham, Cambs |
| 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 | G3XVF | 1·974 | | Norwich, Norfolk |
| 2230 | G3HZL | 144·160 to south-west | A1/A3J | Isleworth, Middlesex |
| **Thursdays** | | | | |
| 1800 | G3SWR | 1·980 | | Birmingham |
| 1830 | G4BNA | 3·590 | A1 | Swindon, Wilts |
| 1830 | GW3VBP | 3·590 | | Barry, Glam |
| 1830 | G3NC | 1·968 | A1 | Swindon, Wilts |
| 1845 | G4AIV | 1·860 | | Kettering, Northants |
| 1900 † | G3ZBO | 1·850 | | Preston, Lancs |
| 1900 † | G3YEI | | | Fleetwood, Lancs |
| 1900 | G3WGU | 1·880 | | Bispham, Lancs |
| 1915 | G3ZNW | 144·520 to north | A2/A3 | West Molesey, Surrey |
| 1930 | G3RAF | 1·910<br>3·590<br>144·024 | A1 | Locking, Soms |
| 2100 | GW3XNI | 1·930 | | Crosskeys, Mon |
| 2130 | GM4CAU | 145·800 to north | | Aberdeen |
| 2130 | G3LQI | 1·980 | A1/A3J | Lancing, Sussex |
| **Fridays** | | | | |
| 1900 | G3NPB | 1·875 | A1 | St Ives, Cornwall |
| 1930 | G3PQF | 144·360 to north-east | F2/F3 | Farnborough, Hants |
| 1930 | G3RAF | 1·910<br>3·590<br>144·024 | A1 | Locking, Soms |
| 2000 | G3WGD | 1·860 | | Leicester |
| 2015 | G3SAZ | 1·845 | A1/A3 | Ashford, Middlesex |
| 2230 | G3XVF | 1·974 | | Norwich, Norfolk |
| **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 |
| 2000 | G3KPO | 1·980 | | Boston, Lincs |

† Alternately

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 sticke claimed. All claims should be sent to—The QRQ Manager, RNARS, HMS *Mercury* Leydene, Petersfield. Hants.

# FOUR METRES AND DOWN

by JACK HUM, G5UM*

## FOUR WEEKS TO CONVENTION '74

Two-day event with more room to move — and a dinner-dance on the Saturday night

First of all, the dates of the Twentieth Annual VHF/UHF Convention: Saturday and Sunday, 6 and 7 April: just four weeks from the time most members will receive this issue of *Radio Communication* (3-day week delays permitting).

Next, the innovations: each year members' ladies attend the Saturday night convention dinner in increasing numbers. Would they, thought the VHF Committee, enjoy the innovation of an after-dinner dance (to a live band) to keep the social side on the go until midnight? This has not been tried before. If it is a success it could become a feature of future vhf conventions.

Another thing: that urgent matter of increasing numbers filling a finite space at the Whitton venue has been solved (at least for 1974) by increasing the size of the finite space! The Whitton Secondary School, 150 yards from the "Winning Post", will be used for tech-sessions, thus freeing the hotel space for concourse, conversation and contemplation of the trade show.

Last year 535 attended, a tribute to the event's popularity (VHF Convention has become the Society's biggest annual social event, in parallel with VHF NFD as the biggest contest). This year the number present should top that record, for the proportion of members interested in the metre-wave scene grows at a dynamic rate each year (about 600 new Class B licences for vhf only were issued in 1973, and of last year's 500-plus Class A newcomers a fair proportion may be expected to be vhf-equipped: all these over and above the several thousand members already "427-orientated").

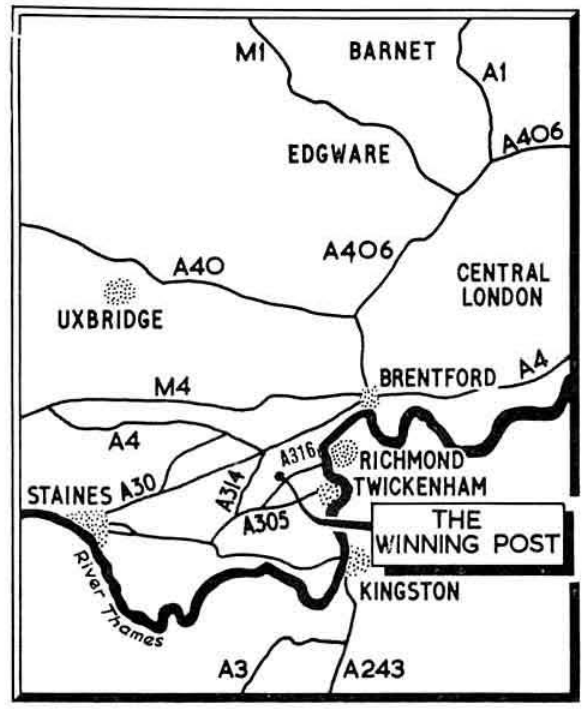
Convention facilities cost cash. Happily, the VHF Committee has been able to keep the ticket price at a reasonable level. Here are the charges:

| | |
|---|---|
| Convention (both days) and dinner | £2.75 |
| Dinner only (Saturday night) | £2.25 |
| Convention only (both days) | 75p |
| Convention only (both days) for persons under 18 years of age | 50p |

The convention ticket admits the holder to the Saturday session from 1000 hours and the Sunday session from 1100 to 1530 hours.

### Programme for Saturday

**1000:** "Winning Post" convention area opens. **Trade show** by exhibitors large and small. **RSGB bookstall** with the usual comprehensive stock. **Bring and Buy** stall where you are invited to deposit your saleable (repeat saleable) equipment, complete with price tag: 10 per cent of the marked price will be retained for convention funds, so if you want to sell that old "Quickstarter" converter for a fiver put a £5.55 tag on it.




**Routes to the "Winning Post"**

**Raffle** for lots of prizes: tickets on sale by all VHF Committee members or at the RSGB bookstall.

**Lecture Programme** (at the nearby Whitton Secondary School).

**1400:** session to be opened by G3FZL, RSGB VHF Manager.

**1415-1515:** *How to win contests: get your priorities right*, by G3LTF and G3VPK—and *they* should know: see "A miniaturized history of VHF NFD", December 1973.

**1515-1535:** Interval. Then the lecture session divides into Streams "A" and "B".

**Lecture Stream "A" (chairman G3USB)**

**1535-1620:** *Using the Plessey 600 series integrated circuits*, by G3ZVC of Plessey.

**1620-1705:** *Measuring your deviation*, by G3OOU of Burns Electronics.

**1705-1735:** *Vehicle ignition suppression*, by J. Leek of Lucas.

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

**Lecture Stream "B" (chairman G3JHM)**
**1535-1620:** *Monitoring the RSGB and other beacons, and their value in propagation studies*, by Ron Ham, BRS15744.
**1620-1705:** *The 24GHz band*, by G3HWR.
**1705-1735:** *Operating portable in Scotland*, by GM8FFX.
You may go from one lecture stream to another if you wish; please do so at lecture junction points to avoid disturbing listeners.

## Then back at the "Winning Post"

**1800: Draw** for the raffle prizes, after which the area will be prepared for the dinner.
**1930: Convention Dinner** (guest of honour G3HRH, chief engineer, transmitters, IBA). Presentation of the "Fraser Shepherd Prize" in recognition of pioneer work done on microwaves. Draw for the dinner ticket prize, which will be a J-Beam 18-element aerial for 70cm.
**2100** (approx) until midnight: **Dancing** to a live band, "The Phil Jennings Sound".

## Programme for Sunday

On Sunday the "Winning Post" only will be used. From 1100 to 1230 G8AGU will speak on *Single Sideband on 432MHz* followed by a discussion. After lunch, discussion groups will be in simultaneous and continuous session from 1400 to 1530, and visitors will be free to wander from one to another as their interest takes them, and preferably to contribute. Subjects will include microwaves, rtty, fm and repeaters. Then at 1530 Convention '74 will officially close.

## How to get tickets

Do not delay your application for tickets: the "House full" notice has never yet been put up, but it might be one of these years. Send cash with sae now to RSGB, 35 Doughty St, London WC1N 2AE, marking envelope "VHF Convention". If you are under 18 (admission only 50p) state date of birth.

For members who wish to stop over on the Saturday night, a list of hotels in the Whitton Twickenham area is available on request.

*See you at The Twentieth!*

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## Wide open to Europe

Many said that the sensational tropo opening of 19-21 January was the best ever, comparable with that of the historic sporadic-E of July 1965 (by those who remembered that one) if the actual distances covered were taken into account. It was commonplace to work from EA round through central Europe out to Poland on 2m, and the coincidence of the opening with the RSGB 432MHz ssb contest was a happy chance in many thousand.

But why did it behave as it did? Says G8DCA: "I was alerted to the lift by heavy Continental activity on broadcast Band 2, but for some reason signals that are normally rock steady became prone to sharp fades." In fact, Radio Bristol on 95·5MHz, normally a good signal at his Basingstoke site, faded out completely.

Says GW3ZTH: "My observations lead me to believe that the lift was caused by a network of ducts widespread over the whole of western Europe and some of the UK. It was noticeable that stations in Pembrokeshire and Cornwall running modest power on A3J, particularly those well elevated, achieved more consistent results than those farther to the east using larger erps." Joe Ludlow, in noting the many HB stations working low power British sidebanders, wondered if the Swiss rf could be getting into the ducts by knife-edge refraction off the Alps. And, he adds, the considerable variation in signals received suggested that ducts might have been drifting slowly across the Continent.

One of the things the big opening demonstrated was the art of the impossible, eg working Austria on 23cm. East Englanders seemed to be particularly favoured: G4BEL raised OE2OML on 21 January at 2230 gmt for what may have been the first G-to-OE on 23cm and a possible distance record of 640 miles for the band. Nearby G4BYV and G3LTF were among the other fortunates. But the pronounced directional characteristics of the whole lift, already touched on by 'ZTH above, are confirmed by G4BEL: says Roger Taylor: "Conditions during the 432MHz ssb contest were of course excellent, but not so good in eastern England until after the event. For example, G8AGU/P in Devon was working German stations and giving S7-8 reports when they were not audible here at all. But that's, of course, how it goes!"

To work Austrians on 70cm there was a big pile-up of British stations. Several members tell us they could get no response from any OE by calling on the key. Others say that in previous openings they could get no QSLs from them either. Better luck this time, let us hope, to swell the countries worked score and the prospect of an FMD Senior Award.

Apropos QSLs, plaudits to OZ9FR for obliging G4BEL and G4BYV with cards for their 23cm contacts in last October's great lift. Reading on this page that they were awaiting verifications he lost no time in sending them.

Back to January and the art of the impossible (well, impossible unless anaprop prevails): GD2HDZ raised DJ4VN on 70cm for his first German and another possible first (GD-to-DJ on 70cm: any earlier claims?). Yet another possible first: G3OXZ of Birmingham worked DK5TW by sstv on 2m at 550 miles. Pictures with the German station were also exchanged soon after by G3WW and copied by G3YQC.

As has happened in previous big lifts, the top end of 2m was full of German repeater output transmissions. Conversely, our own GB3PI was worked at great range by many.

Although after the event people were saying in a pejorative sense that ". . . vhf was becoming a rat race like the hf bands", this seems to be a minority view. Many indeed would share the G3XJS opinion that ". . . manners, operating procedures, signal quality and the willingness and ability for cross-mode contacts, by and large, seemed excellent; infinitely better in all respects than is usually found on 2m."

## Auroral bonus

Satiated after the anaprop excitements, few metre-wave men could believe their ears when 2m opened up again on 25 January as an aurora developed at 1840gmt—rather early for the usual run of 144MHz activists. Both GW3ZTH and G3IPV report it as lasting about an hour, with fleeting Scandinavian and GM signals growling up through the noise, several of them worked by G3LTF. No second-phase

Ar developed—and Joe Ludlow waited up until 0100gmt to see if it would.

## . . . and then back to normal

After the great openings, back to normal (which is what the metre waves are for most of the time). In tropo times, working the dx is a pushover: in normal times, a push hard. And two really hard pushers are G3HCW in Yorkshire and Devon's G4CG, whose 230-mile schedule on 2m telegraphy is still going strong after two and a half years. Over that period of time much has been learned about low signal 144MHz propagation from two quite ordinary sites both at only 120ft asl.

Success rate averages 60 per cent—and that means exchanging reports, sometimes within as little as one minute when the rest of the 20min schedule is silence. Conclusions are that five types of propagation have manifested themselves:

1. No signals—and that is 35 per cent of the time;
2. Aircraft reflection: very frequent, a quick build up, 2min of steady copy, and a quick fade down, plus Doppler;
3. Normal extended tropo: signals peak to S5 three or four times in a 20min schedule;
4. Constant S2 signal for the whole of the 20min schedule but quite unreadable on account of constant rapid flutter: no normal QSB;
5. Levels varying S2-6 to give good communication not attributable to any kind of "lift".

At G3HCW the power output is 50W of rf, and at G4CG 70W—a margin that seems to hold the Devon signal at readability when the Yorkshire one has gone. The aerials respectively are a 10-el and an 8-el, after much upping and downing of sundry designs.

A final comment from G3HCW: "If the BBC weather map shows a high pressure area west of Devon—south Irish Sea area—chances of success with the Devon sked are 80 per cent, almost predictably so. Once the high pressure has moved east of Devon the chances of success fall considerably."

Attempts have been made to develop the schedule into an A3J-cum-A1-haul: "The G4CG sideband has never yet been heard at my QTH, although his cw during the same sked has been copied," reports Ernest Ashby.

## July launch for Oscar 7

Because the ITOS-G space vehicle will not be called up for launch by NASA until July, several valuable extra months have become available to AMSAT for testing Oscar 7 which will accompany it. A good deal of work, mainly mechanical, still remains to be done on this amateur satellite, but progress has been rapid with the electronics, eg the 2m-to-10m transponder and the Canadian 435·1MHz beacon are completed and delivered, as is the DJ4ZC 70cm-to-2m transponder and the RCA Codestore device. By now the 2,304·1MHz beacon, built by the San Bernardino Microwave Society, should have been delivered to AMSAT from California.

Dr Perry Klein, K3JTE, president of AMSAT, reports that a good deal of work has been going on in respect of thermal design problems, and as a result of this ". . . we are now confident that the Oscar 6 overheating problem won't recur with Oscar 7".

Back to the old familiar friend Oscar 6: the countries-worked-via-satellite score now stands at 43 at G6RH, made up of 369 different stations, of which 84 were in W/VE. For a new continent Bob Holmes recommends looking for CN8BO, a good through-Oscar signal. Attempts to improve on the inverted dipole for the 29MHz receive link were directed towards the Zygi beam (*Radio Communication*, July 1973) scaled down for 10m, which exhibited high-angle radiation; in the end the dipole was retained.

## A repeater for 70cm?

It is proposed to form a repeater group in the South Northants/North Bucks area—but what is in mind is a repeater with a difference. Interest lies in establishing one that will be "70cm in" and "70cm out".

Before anything can be done it will be necessary to hold a meeting to look at the technical parameters and costs involved. This meeting could be held sometime in March, and members in the area who would like to go are invited to apply to M. D. Blake, G8FWV, 25 Churchcroft, Roade, Northants NN7 2PG, sending him an sae.

## Keyboard currencies

Metre-wave teleprinter activity is snowballing in the north-west. Every Sunday at 1500 and 2030gmt, Gordon Adams puts G3LEQ on to either 144·6 (the rtty dx channel) or 145·3MHz (the local rtty channel: see band-plan chart last December), using 170Hz shift. He says 144·3 is another channel to check: it suits Liner 2 operators on rtty.

All this in aid of the north-western rtty net in which G3MWI, G8DVR and G8GIW already participate, with another eight stations in process of preparing for the mode. Activity is not confined to 2m: G3LEQ is rtty-equipped for both 70MHz and 432MHz, using a Microwave Modules varactor tripler for the latter band.

Output on 2m is via a newly-acquired Europa transverter, which was well and truly run in during the vast Eu-opening of 20 January.

## Xtal exchange

Offered: 8,012 and 8,018kHz type HC6U (". . . easy pullers with small capacitance") and one 8,017kHz FT243, all bought new by G8LY, Constance Hall, 10 Clanwilliam Rd, Lee-on-the-Solent, Hants. She seeks any HC6U between 8,068·3 and 8,080·5kHz.

## Read the small print

Picking up last month's comment that cross-mode contacts were written into the rules for the first-ever 70cm ssb contest, G3BA says: "Full marks to whoever on the VHF Contests Committee thought that one out. But it will need to be stressed, for few amateurs taking part in the 432MHz sideband contest knew of the rule. Some a.m./fm types were sore that the ssb men were ignoring them, and conversely the ssb chaps did not know they could work any modes on any channel."

Which reinforces our advice never to use last year's rules for this year's contests. Many 70cm operators assumed that the present series of cumulatives run in two-hour takes: this year an extra half-hour's point gathering has been added (see p 38 for rules). Three more sessions this month.

## Expeditionaries

Four members of the Cambridge University Wireless Society will activate GC6UW/P on Guernsey in the Easter vacation from 28 March to 4 April on 144·125MHz telegraphy and 145·46 using a Liner 2 plus linear. They will also take 4m equipment that will warrant a special look on that band during out-of-tv hours. If you work them on 2m or 4m ask them if 70cm is "go": it may well be. Skedfixers write to M. Naylor, G4CDF, Christ's College, Cambridge, enclosing sae.

## Sked spot

**Schedules are offered by . . .**

**G5HD** on 432MHz telegraphy any evening. Les Hawkyard can provide rare Wiltshire on 70MHz as well, if you want it.

**F8OD** on 432MHz and 1,296MHz phone or key. Write Jacques Raimbault, 17 Rue de Bretagne, 44120 Basse Goulaine (which is in QTH Locator ZH63A).

**G8GQY/P** (71 Birchwood Drive, Ulverston, Lancs) who will be out on the Cumberland fells every Thursday from 2000, beginning next month, with A3J, and offers schedules on 144MHz with any stations beyond 200 miles.

**G8CXK,** temporarily domiciled at 15 Havelock Street, Bowerham, Lancaster, is on 145·915MHz most evenings from 2000 onwards, looking especially for contacts back home to the east Midlands.

G3XDY can offer 432MHz ssb skeds from his home QTH in Lincolnshire throughout April. The equipment in use received a good airing in the January ssb contest as GW8DAD P when the anaprop lifted its signals as far as DL6LM at 1,287km.

## ". . . and the next metre-wave meeting of . . ."

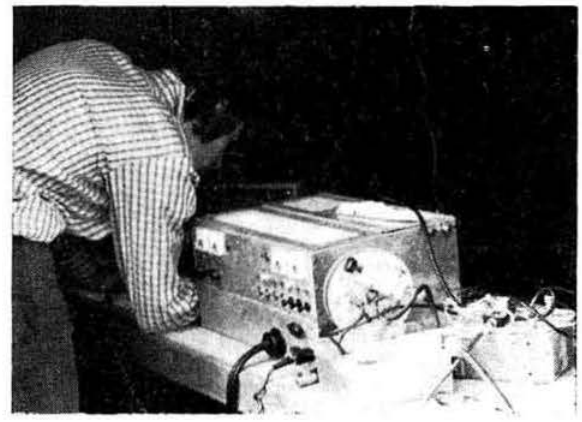
. . . the Mid-Midlands VHF Group is on 28 March at the Heart of England Social Centre, Berkeswell Rd, Meriden, at 8pm. Usual buffet. Subject: "Equipment for 23cm", a technical discussion to be opened by G8AVH and G3HAZ. All amateurs within motoring range welcomed. . . . the Leicestershire VHF Group is on 21 March at the Charles Keene College, Belgrave Rd, Leicester, 7pm for 7.30pm. Subject: "Microwave Modules converters and other products" by G8CMU. Again, all welcomed: no formal membership, just 10p admission.

## Here and there

His first-ever contact on 70cm brought G3BW a country and a county simultaneously. He worked GD2HDZ with his new 1W ssb sender. A linear is on the way at Whitehaven, and soon Bill Hodgson will be delighting many by giving them their "first-ever Cumberland" on 432·15.

Any takers in Yorkshire for 23cm activity? G3HCW would like to know. Write to him at Knottingley—or better still talk to him on 2m—to fix 1,296-skeds.

Three other items of 23cm news: G3FEX took for a car ride the famous 1,296MHz valve converter and CV90 tripler with which he established the 23cm record back in 1962 with G8AL, and as G3FEX M worked G8BDJ along the Sussex coast in aerial tests that proved the superiority of the corner reflector aerial (38dB above noise at 'BDJ). Secondly, G4BYV taped the Mirabel beacon on 23cm, sent it to F6APU, to the latter's great surprise and pleasure.



**For many years this entirely home-built equipment of G8ACE (in picture) has helped G3WGC/P to a good place in the 23cm stakes**

Thirdly, G8CPX tells us, the new GB3DD beacon on Dunstable Downs is testing on QRP on 1,296·05 with fsk, aerial NW.

Mistaken phonetics or a pirate? The callsign G8EDT is not valid. Its Shropshire owner is now G4AWY. Ignore it if you hear it on 2m.

Comment by G8GMU on the "What kind of people" correspondence:

*O God, what a gift to gie us*
*To HEAR ourselves as others HEAR us!*

## What they say

"The new 144MHz bandplan sounds better than the old one . . . anyway, I now have a transverter with FTDX500 so can go anywhere!"—G8LY.

"After six weeks on ssb (KW2000 into TW Phase 2 transverter, 180W p.e.p. and 8-el at 500ft asl), I have worked over 250 stations in 13 countries and 38 counties. This compares with 10 years a.m./cw of 400 stations in 11 countries and 50 counties. Something to be said in favour of 2m ssb, I feel"—G3OHC.

"One thing the GB3PI repeater has taught me is that an fm system is quite useless without clipping diodes to limit peak deviation. It works fine without, until one day you are in a noisy street and forget to keep your voice down. Apropos repeaters, please let future ones be on 70cm not 2m—and please no more dual-band contests for the same reasons"—G8CPX.

"Certain stations which go to Wales for contests should learn to keep the modulation down and avoid the terrible splatter which plagued the last contest—rigs which are in good order when modulated properly go hysterical when operators scream into the microphone"—G3BA.

**25 Years Back**

**"Withdrawal of Amateur Frequency Band. The Postmaster General announces that holders of Amateur Wireless Station licences will not be permitted to use frequencies within the band 58.5 to 60Mc/s after March 31st, 1949. Licences will be formally amended by a notice to be published in the London Gazette on April 1 1949".**
*RSGB Bulletin*, March 1949

# THE MONTH ON THE AIR

by JOHN ALLAWAY, G3FKM*

THE DX Century Club annual listing which appeared in December *QST* contained the callsigns of some 55 UK stations and 193 stations in West Germany. The interest in this particular aspect of amateur radio (admittedly a minority one) is therefore demonstrated to be very much less this side of the North Sea. The writer wonders why this should be so—is it that we are so much more inward looking and spend more time on the domestic bands? When it is realized that most of the West German stations listed have had to make the majority of their contacts in what is, to them, a foreign language the difference is even more remarkable.

Excellent work by the editorial staff and printers resulted in February *Radio Communication* being published on schedule but with problems mounting at the time of going to press later issues may be delayed. Closing dates for future *MOTAs* will be as follows—April (6 March), May (8 April), June (6 May) and July (5 June).

## News from overseas

The Society of Newfoundland Radio Amateurs has given notice that its VO QSL bureau has been taken over by Bill Coffen, VO1KM, (PO Box 6, St John's, Newfoundland A1C 5H5, Canada). This follows the death of Ern Ash, VO1AA, who had served as QSL manager for 25 years previously. Amateurs in the province have been authorized to change their prefixes to VX1 or VX2 during 1974 in recognition of the fact that it is 25 years since the separate country of Newfoundland joined Canada. The special call VX1XXV has been issued to the society—the XXV indicating 25 years.

Alan Foster, 3B8AX, wishes to send his greetings to all readers and says that he will be in Mauritius for at least another 18 months. He recently erected a quad for 21MHz and the results made him decide to add a 14MHz element as soon as possible. He is now active almost daily after 1200 and prefers the areas between 21,180 and 21,300kHz, and 14,180kHz and 14,215-14,220kHz. Alan appeals for more courtesy from European callers and says that he will try to contact them all but that he also enjoys ragchewing and will not reply to anyone trying to interfere on such occasions.

The latest *DXpedition of the Month Bulletin* points out that XE1IIJ is closing down. Currently active stations for whom QSLs should be sent to PO Box 7388, Newark, NJ, 07107, USA, include C21DC, C21DR, CN8HD, CX2CO, CR5SP, FM7WQ, HK0AI, HM1AJ, IIMOL, IIRB, IIRBJ, KV4FZ, OY7ML, PJ7VL, PJ8HS, PY2PA, PY2PE, VE8CV, VE9RCS, VK3BM, VK9JK (P29JK), VK9XI, VK9XK, VK9XW, VK9XX, VP7NY, VP8JV, VP9GR, VS6DO, VS6DR, ZS6IW, 6Y5RS and 9Y4VT. Stu, W2GHK, asks for QSL applicants to write the callsigns of the stations for whom cards are being claimed on the outside of their envelope in the bottom left corner.

Further news of G3VUI and his movements in the VP8 area is that he is travelling around most of the Antarctic bases on the RRS *Bransfield* until mid-March when he will arrive on Argentine Is. His callsign is VP8NO. At the time of writing, Mike was en route for Halley Bay and expecting to return to the Falklands at the end of February.

Jimmy Bruzon, ZB2BL, is in charge of the Gibraltar ARS QSL Bureau and is anxious to trace the present whereabouts of the following former Gibraltar licence holders: ZB2s AB, AD, AI, AJ, AS, AY, BA, BB, BC, BF, BJ, BO, BQ, BR, BS, BT, BV, BX, CD and CE. He has cards for all of them which he would like to forward if he could obtain their addresses. Would these gentlemen drop a line to Jimmy at PO Box 292, Gibraltar, please?

Geoffrey Smith, G4AJJ, will be in Mauritius from April to June, in Yemen from July to September, and in the Seychelles from October until December. He will have an FT200 and TA32Jr beam and will be active mostly on 14 and 21MHz.

Mike Taylor, G3UCT DA2XT, is now is Belize and has the callsign VP1MT. He will be there until mid-1975 and active on 14 and 21MHz ssb and rtty. He says that VP1JR will also be active on ssb until mid-1974.

## Top Band news

GI3YFY reports a contact with EP2BQ on 16 December 1973 and believes that this may be the first GI/EP contact on the band.

G3XAP completed his 160m WAC by exchanging reports with VK6HD. Phil says that the feat took him two years and was accomplished with 9W dc input to an aerial similar to that described by him in *Radio Communication*, December 1973. He is now trying to achieve another WAC—this time running only 5W—and needs only Africa and Australasia.

A plea from VK6HD (via GM3IAA) to those who have already had contacts with him to resist the temptation to call every time they hear him and to give those still trying a chance. On two recent occasions he heard up to a dozen stations calling as the band peaked but the regulars made the weaker stations impossible to copy. Mick also suggests spreading out *around* 1,828kHz. GM3IAA also reports a contact with VO1KE at 1914—a remarkably early time.

VK3CZ reports hearing OK1ATP and G3ZEM on 4 January, G3ZYY on the 13th and 14th, G3SZA on the 18th, G3RBP A on the 19th, 25th and 26th. G3SZA was contacted at RST 459 on the 25th. Arthur finds DHJ much weaker than formerly and wonders if this could be due to changes at that station.

## DX news

A circular received from DL1CU of *QRV Magazine* says that he has the original logs from the SV1DB/P expedition to Mt Athos, 21 April to 25 April 1973. He was a member of the crew and will QSL 100 per cent on receipt of sae, irc and QSO details at his address as given in *QTH Corner*. Listener reports will also be confirmed. DL1CU is also able

* 10 Knightlow Road, Birmingham B17 8QB

to obtain confirmation *for listeners only* from Vatican stations.

Ron Johns, now P29RJ (formerly VK9RY), points out that on 1 December 1973 self-government was proclaimed for Papua New Guinea as a combined state. He recommends that QSL hunters should try to obtain their P29 cards through accredited QSL managers as far as possible, as the relatively short-term contract of employment common in that part of the world and the lack of outward QSL bureau facilities means that cards sent direct or via the bureau may never reach their destination.

A6XB reports that communications with his QSL manager, K1DRN, appear to be unsatisfactory and he now asks for direct QSLs to the address in *QTH Corner*.

WS7MVM will be on the air from the Boeing Employees RS during the period of the Mariner/Mercury encounter period from 28 March to 3 April. WS6MVM operated from the Jet Propulsion Laboratories RC in Pasadena in early February during the Mariner Venus encounter. QRGs are given as 3,530, 3,805, 7,030, 14,030, 14,220, 14,330, 21,030, 21,130, 21,360, 28,030 and 28,530kHz. KK6WSL celebrated the opening of Foothill College Electronics Museum.

A notice in the *DXers Magazine* says that W1GEY has received permission from the Chinese authorities to operate an amateur radio station during the period 19 to 21 April. Operation will be limited to 14MHz ssb and he will transmit on 14,195kHz. Equipment will consist of a Drake TR4C with R4C receiver and L4B linear and a 204BA beam. Permission was granted on the basis of W1GEY's visit to demonstrate radio equipment and in appreciation the equipment will be donated to the University of Pekin. QSLs should be sent to Robert Stankus, 321 Eastfield Drive, Fairfield, Ct, 06604, USA. No contributions will be accepted.

## Dxpeditions

It seems that the French authorities have granted permission for a scientific expedition to visit Clipperton Is (FO8) to make medical and meteorological studies this autumn. The permit has been issued to the Universities of Freiburg (Germany) and Zurich. It is believed that four members of the scientific team are licensed amateurs—one Swiss and three German. Financing and transportation have still to be worked out but this seems to be the first genuine prospect of activity from Clipperton for many years.

Before the outbreak of fighting in the Paracel Is it had been announced that the expedition to Spratly Is, which had been scheduled for early summer, had been abandoned due to the likely poor propagation conditions. It now seems likely that any further visits to the area could be postponed for a considerable time.

JD1ACH will be very active during the period 24 to 30 March from Ogasawara Is. Other calls to be used will include JA3LWA/JD1 and JH3TKM/JD1, and all QSLs should go via JA3GZN. Frequencies to be used are given as: 3,505, 3,570, 7,005, 7,080, 14,045, 14,195, 21,045, 21,295, 28,045 and 28,595kHz.

WB2EXK may visit Palmyra Is (KP6) and Kingman Reef during March.

TI2WD, TI2CF and TI2BY are planning a visit to Cocos Is (TI9) which may take place between 30 March and 6 April. Callsigns will be TE9RC and TE9VHF—the latter will operate via Oscar. All bands 1·8 to 28MHz will be used.


**Paul Lethbridge, G3SXE/ZB2CV, operating from the station of Jimmy Bruzon, ZB2BL, during a recent visit**

## The Ex-G Radio Club

In the latest club elections, Don Rayner, W3CTR/G3BSY, was appointed president for 1974. Lawrie Kelsall, VK2AHV/G3PO, was elected vice-president, and Reg Cherrill, W3HQO/G3XNV, general secretary/treasurer. Will Schuman, WA6GLF, John Neville, WA6CEB, and Daniel Walsh, WA5ZXZ, have joined W3CTR, VK2AKV, W3HQO, and ZL3QA on the board. Club nets are held at 1900 on Sundays on 14,347kHz, at 0500 on Saturdays on 14,347kHz (primarily for Australasia), and at 0900 on Wednesdays on 3,650kHz for Australasian members. A world-wide cw net meets at 1900 on Saturdays on 14,065kHz. UK stations are especially invited to join in. The club is for those who were born or naturalized in the UK and who are now living abroad.

## Contests

### The CQ WW WPX Contest

0000 30 March to 2400 31 March.

All bands 1·8 to 28MHz—ssb only. Stations exchange reports and serial QSO number (from 001). Contacts with own continent count one point, with other continents three points. One's own country may only be worked for multiplier credit. Contacts on 7, 3·5 and 1·8MHz count double points. Final score is total QSO points multiplied by the number of different prefixes contacted—note that each counts once only. Categories are single- and multi-band single-operator, and multi-operator single- and multiple-transmitter (the latter may only radiate one signal at a time on any one band). Single operators must only operate for 30 hours and indicate their breaks (up to five) in their logs. Multi-transmitter stations must use separate serial numbers on each band. Separate log sheets must be used for each band and entries must be posted before 15 May to CQ WPX SSB Contest Committee, 14 Vanderventer Av, Port Washington, LI, NY, 11050, USA. Summary sheets (*but no log sheets*) are available from G3FKM.

### The 1974 Florida QSO Party

1500 to 2000 27 April, 0000 to 0500 and 1400 to 2359 28 April. Suggested frequencies: 7,080, 14,080, 14,318, 21,080, 21,380, 28,080 and 28,580kHz. Florida stations give RS/T and

## QTH Corner

| | |
|---|---|
| **A2CAB** | via WA2LOR, M. F. Mattes, Box 271, Sound Beach, NY, 11789, USA. |
| **A6XB** | W. S. Rees, PO Box 101, Ras-al-Kharimah, UAE. |
| **A6XG** | Box 1661, Dubai, UAE. |
| **CT2AZ/CT3** | via W0JHY, J. L. Ritzen, Box 3152-Glenstone Stn, Springfield, Mo, 65804, USA. |
| **DJ3DH/ET3** | via DL6ME, H. Gerls, Schillerstr.18, 3400 Goettingen, Germany. |
| **FK8BV** | BP 12, Noumea, New Caledonia. |
| **JD1ACH** | via JA3GZN, PO Box 29, Amagasaki, Hyogo 660-91, Japan. |
| **KK6WSL** | WB6WSL, Electronics Museum ARC, EMFCC, 12345 El Monte Rd, Los Altos Hills, Cal, 94022, USA. |
| **KW6HF** | WA6BBI, 1134 N. Orchard, Burbank, Cal, 91506, USA. |
| **KX6LA** | via K2BT, 75 Crestview Rd, Mountain Lakes, NJ, 07046, USA. |
| **M1C** | via I4EAT, Fausto Minardi, Box 94, Faenza, Italy. |
| **M1FOC** | via DL1RK, K. J. Doering, Hegeweise, 6381 Arnoldshain, Germany. |
| **OY1R** | via W2KF, 309 Cherry Hill Boulevard, Cherry Hill, NJ, 08034, USA. |
| **P29RJ** | via JH3HPX, Box 29, Amagasaki, Osaka, 660 Japan. |
| **PJ2MI** | Box 383, Curacao, Netherlands Antilles. |
| **SV1DB/P** | DL1CU, Box 585, D-7-Stuttgart-1, Germany. |
| **SV0WPP** | via WA1QBH or 29 Argous St, Nea Kifissa, Attica, Greece. |
| **VP2LI** | J. Rafferty, 555 West Middlefield, Apt H-103, Mount View, Cal, 94043, USA. |
| **VP2SV** | via K3GYD, 317 Harvey Av, Lawrence Park, Pa, 16511, USA. |
| **VP2VBW** | WB8LSD, E. B. Seeger Jr, Box 456, Beverly, Ohio, 45715, USA. |
| **WB6VGI/VQ9** | L. Minnis, 1826B Annapolis Rd, Ft. Meade, Md, 20755, USA. |
| **WS6MVM** | via W6VIO, J. Holladay, 4800 Oak Grove Drive, Pasadena, Cal, 91103, USA. |
| **WS7MVM** | via K7NWS, Boeing Employees ARC, Boeing Co Bldg 5-02, Renton, Wash, 98055, USA. |
| **ZF1RD** | via W3KT, J. Bieberman, RFD 1, Valley Hill Rd, Malvern, Pa, 19355, USA. |

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

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county, others RS/T state, province or country. Phone and cw are two separate contests. Each contact counts one point and total QSO points should be multiplied by the number of Florida counties worked (maximum 67). Trophies will be given to top non-Florida stations, and certificates to top entries in each country. Send logs to Florida Skip Contest Chairman, PO Box 501, Miami Springs, Fla, 33166, USA, before 30 May. Include summary sheet with the usual signed declaration. Untidy logs will be disqualified.

## Awards

### The Worked All Ireland Award

Sponsored by the Dundalk ARS from whom the required record/check book may be obtained (from awards manager GM3MTH, QTHR). Profits go to RAIBC and other charities. Nets are now being held daily on 3,710kHz (approx) at 1100–1400 and 1930 or 2200, and on 1·8MHz at 1900. CW nets, under the control of GI3OLJ, take place on Fridays on 3,550kHz, and on Saturdays and Sundays on 7,020kHz.

### The GI Award

GI3CDF has taken over administration of this certificate, and it now costs 40p, $1, or 10 IRCs. Conditions of application remain unaltered.

### The GI6YM Golden Jubilee & Marconi Kemp Award

Due to the difficulty many overseas stations are experiencing in contacting the 10 GIs required for this award, it has been decided to extend the period during which contacts will be valid by one year to 31 May 1975. The award can now be won on hf or vhf as follows: Contact GI6YM plus 10 Is, 10 Gs, and 10 GIs between 1 June 1973 and the new closing date. Those who contacted GB3MKB will receive a gold seal. Class B licensees need contacts with GI6YM or GI6YM/P plus five Gs and five GIs. The award is available to listeners on a heard basis. Claims, giving log details and enclosing 25p or eight IRCs should be sent to: Award Committee, GI6YM Radio Club, Wellington Place, Belfast, N Ireland.

A special GI6YM activity weekend will be held on 6-7 April—and all bands 3·5 to 28MHz, ssb and cw will be used. Schedules may be arranged (QTHR). GI6YM will also operate all day on 25 May to celebrate the centenary of Marconi's birth.

## Odds and ends

GB2ITU will be on the air from Tonbridge School from 21 to 27 March inclusive, and from 9 to 19 May inclusive. Operation will be on the hf bands and all contacts will be QSLd.

## Band reports

Conditions on the hf bands seem to have been very poor during the period under review. No reports of activity on 28MHz have been received and openings on 21MHz have been short.

Many thanks to the following for providing the information tabulated below: G2HKU, G3HB, G4RZ, G5JL, G6GH, G3s GVV, LPS, NKQ, UEG, GW4BLE, BRSs 17567, 17991, 25429, 31301 and 34507, and As 7511, 8431, 8538 and 8564.

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

**1·8MHz. 0000** *EP2BQ, KI's CPF, PBW, VP8KF, W1HGT, KV4FZ.* **0200** *K1KCV, W1BB, WB8APS, VP5GS.* **0400** *LU5HFI, W4IN, WA8IJI.* **0500** *K4IRQ, W4EX, WB8APH.* **0800** *KP4AST.* **2000** *VK3CZ.* **2100** *VK6HD.* **2200** *PY1RO.* **2300** *KP4AST, KV4FZ.*

**3·5MHz. 0000** CR4BS, EL1F, M1C, PJ2CW, TU2EN, WB2KEA/VP7. **0100** *UL7IH*, ZB2CF. **0600** CT2AK, XE1J. **0700** *CT2AZ/CT3*, HV3SJ, *K6QHC, PJ2VD*, WA5QIR. **0800** K6AHV, KV4BZ, WA5WR, W6NLZ, YV5EVO, ZL3PX, ZM3RJ, 6W8DY. **1500** EP2TW, 5W1AU. **1600** DU6AJ, DU7RLC, TA2KK/1. **1700** 5B4LR. **1800** AP2HP, XU1AA. **1900** JY3ZH, ZB2CH. **2000** HZ1AB, TJ1BF. **2100** CT2BG, KP4AN, MP4s BFR, BJS, OX3LW. **2200** CT3AB, *JA6AD*, JX6DS, PYs, TU2EN, W1,2,4,8,9. **2300** EA9ES, EY, UA9s, W0GNX, YV4TI, 9L1JT, 9M2CJ.

**7MHz. 0000** *CR7JO, TR8PB, W0DIA*, YN8JES, YVs. **0100** *CE8AA, CR5AJ, PJ2MI.* **0200** *PYs, TR8PB.* **0700** *CT2AZ/CT3*, ZL1BKX, *7X0WW.* **0800** CO2DC, JAs 1DJL, 7EA1, 7EOM, *8ZO.* PYs, TI2GI, *W6TSQ*, W7SFA, YVs, ZL4BO, 3A2s AH, CN. **0900** OJ0AM, *UA0KAH* (Wrangel Is), VKs, ZLs, 8P6AU. **1000** *KG6JAR, OY1R, W6PM.* **1500** *DU1POL, VK2BKM.* **1600** *K6OVJ, W7SFA* (3-el beam at 190ft), *VS5MC.* **1800** VE3AII/SU. **2200** CX4CR. **2300** *EL0U*, JY3ZH, PYs, *4K1D*, 9H1BB.

**14MHz. 0100** CR3KD, KC4AAB/MM. **0800** *FK8BU, VS6AW*, ZLs, 9G1GG, 9K2DT. **0900** *BV9KS* (?), *FK8BV, VK0AM*, YB5BD, YJ8UB, *9M2DP.* **1000** A4XFD, TY1UW, VKs. **1100** VKs, 9Y4RB. **1200** CP1QN, VKs. **1400** *VK6WT*, I5UA/VU. **1500** *FB8XA*, KL7MF, VE3AII/SU, VU2GBG, YB2AK, *ZB2CV.* **1600** FB8ZB, *FG7XE, FR7AX, TR8PB, YA1SS* (?), **1700** CR3AH, HS4AKF, TU2EN, *W6s*, ZS2MI, 8Q6AC. **1800** *FP8CT*, XT2AA, *DL1DH/YV6*, 9X5JC. **1900** A2CCY, *VP2VBU*, VQ9R, ZD3M, *4K1A.* **2000** VP8FL, ZD8MH, *ZD9GG*, ZS1ANT, 9Y4T. **2100** *HI3PC*, VP2KM. **2200** PYs, TR8SS, ZD7FT. **2300** *EA9EU*, K6OE, 9G1AR, 9M8JP.

**21MHz. 0900** *VS6BL*, ZLs, *4S7NG.* **1000** A2CAB, *HS4AGN*, 9J2DT. **1100** VS6BE, ZD7FT, 5N2ESH. **1200** *FL8CE*, VK6s, 3B8AX. **1300** ZSs, 3B8BX. **1400** WS3SKY,

ZSs, 3D6AW. **1500** CR6s, LU5HFI, ZSs, 3B8DG. **1600** PYs. **1700** EA8JJ.

Once again many thanks to all correspondents, and especially to the authors of the following publications for items obtained from them: **Ex-G Radio Club Bulletin** (*W3HQO*), **DX News Sheet** (*Geoff Watts*), the **29 DX Club Newsletter** (*George Allen*), **World Radio News**, the **DX'ers Magazine** (*W4BPD*), **Long Skip** (*Nick Sawchuk*), the **West Coast DX Bulletin** (*WA6AUD*), and **DX'press** (*PA0INA/PA0TO*).

Please send all items for **April** issue **to reach G3FKM no later than 6 March,** and for May issue by **8 April.**

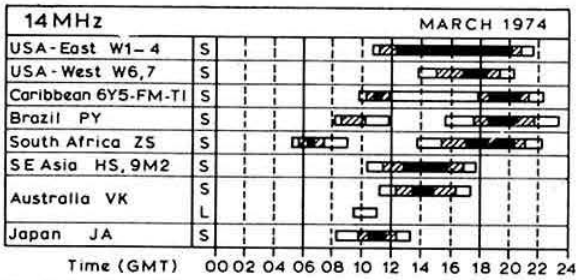
## Propagation Predictions

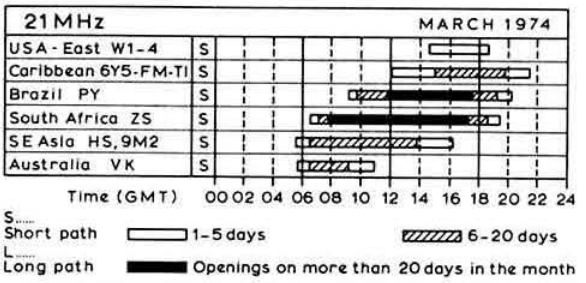
Propagation conditions will be equal in both the northern and southern hemispheres. The distribution of MUFs are symmetrical to the equator in March. Traffic conditions with the southern hemisphere will be much improved compared to the winter months. Solar activity has decreased considerably in the past few months.

**28MHz** will be useless for dx traffic and there will therefore be no more tables showing 28MHz propagation predictions for the coming sunspot minimum years. On days with extremely high F2 MUFs (in very exceptional cases) there will be a chance of contact with South America (1200-1700gmt) and with Africa (0800-1700gmt). Occasional short-skip contacts will liven up 28MHz in the coming summer months over distances of about 800-1800km.

On 21MHz the decline in F2 MUFs will be noticed as a deterioration of dx conditions; this deterioration will be noticed mainly in traffic with North America. The east coast of the USA will only be heard on days with above average F2 MUFs. These are unfortunately not very good predictions for the coming 2nd part of the ARRL DX Contest. Traffic with South America and South Africa will not be affected by the general deterioration.

Conditions will improve on **14MHz** compared to the previous months as the days lengthen, and the band will remain open for a few hours after sunset. All continents will be heard with certainty, but it will be almost impossible to work on the indirect path during the months of the equinox (March-April, September-October). Contact with Hawaii will be possible from about 1630 to 1830gmt, and contact with Alaska will be possible from about 0830 to 1200gmt and 1530 to 1830gmt.




**7MHz** will provide dx opportunities during March when most of the path lies in darkness. Traffic with South America, Australia and South Africa will show its seasonal improvement. Traffic with North America will be interrupted now and again by low MUFs. The F2 MUFs are for a large part below 7MHz, so local traffic will be interrupted now and again by the dead zone.

DX traffic will worsen this month on **3·5MHz** compared to the winter months as atmospherics will increase slowly and remain with us for the summer. During the second half of the night local traffic will be interrupted by the dead zone.

The provisional sunspot number for January 1974 from the Swiss Federal Observatory was 29·3 with the period of greatest solar activity occurring in the middle of the month. With the approach of the sunspot minimum the predicted numbers continue to fall and those for May, June and July are 21, 19 and 18 respectively.

# Committees of RSGB Council for 1974

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

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

**Finance & Staff:** J. O. Brown, G3DVV; D. A. Findlay, G3BZG; L. E. Newnham, G6NZ; B. O'Brien, G2AMV (corresponding); C. H. Parsons, GW8NP; C. G. Powell, G8BPK; R. F. Stevens, G2BVN; F. C. Ward, G2CVV.

**HF Contests:** J. C. Graham, G3TR; Dr E. J. Allaway, G3FKM; D. J. Andrews, G3MXJ; J. Bazley, G3HCT; A. V. H. Davis, G3MGL; R. L. Glaisher, G6LX; M. Harrington, BRS20249; S. V. Knowles, G3UFY; G. T. Peck, BRS15402 (corresponding); D. Thom, G3NKS.

**IARU Working Group;** R. F. Stevens, G2BVN; D. Andrews, G3MXJ; R. J. Baker, G3USB; D. A. Findlay, G3BZG; J. C. Graham, G3TR; R. Handley, G3GJQ; R. J. Hughes, G3GVV; E. G. Ingram, GM6IZ (corresponding); G. M. C. Stone, G3FZL.

**Interference:** J. W. Swinnerton, G2YS; J. W. Hill, G3JIP; A. M. B. Holloway, G3VUQ; I. Jackson, G3OHX; P. F. Jobson, G3HLF; D. G. Pinnock, G3HVA (corresponding); G. Slaughter, G3PAO; J. E. Swayne, G3BLE (corresponding); D. M. Thomas, GW3RWX; P. W. Waters, G3OJV; D. Byrne, G3KPO.

**Membership and Representation:** C. H. Parsons, GW8NP; D. Byrne, G3KPO; R. W. Fisher, G3PWJ; W. J. Green, G3FBA; W. F. McGonigle, GI3GXP; J. R. Petty, G4JW; W. A. Scarr, G2WS; A. W. Smith, GM3AEL; F. C. Ward, G2CVV.

**MPT Liaison:** R. F. Stevens, G2BVN; Dr E. J. Allaway, G3FKM; B. D. A. Armstrong, G3EDD; P. Balestrini, G3BPT; Dr D. Evans, G3RPE; D. A. Findlay, G3BZG; R. J. Hughes, G3GVV; L. E. Newnham, G6NZ; C. J. Thomas, G3PSM; F. C. Ward, G2CVV.

**Raynet:** P. Balestrini, G3BPT; E. R. L. Bassett, BRS16075; D. Beattie, G3OZF; Dr A. C. Gee, G2UK; S. W. Law, G3PAZ; T. I. Lundegard, G3GJW; S. J. Scarbrough, G3MBQ; E. W. Yeomanson, G3IIR.

**Scientific Studies:** G. M. C. Stone, G3FZL; R. G. Flavell, G3LTP; R. A. Ham, BRS15744 (corresponding); Prof M. Harrison, G3USF (corresponding); D. Hayter, G3JHM; R. J. Hughes, G3GVV; K. S. Hutchinson, G4ALN; A. Low, GM3GUI (corresponding); C. E. Newton, G2FKZ; A. J. Oliphant, GM3SFH (corresponding); J. Spurling, G4AQI/3B8DG (corresponding); A. Taylor, G3DME; T. Damboldt, DJ5DT (corresponding); Dr R. C. Whelan, G3PJT (corresponding).

**Technical and Publications:** R. F. Stevens, G2BVN; B. D. A. Armstrong, G3EDD; R. J. Baker, G3USB; J. P. Hawker, G3VA; R. S. Hewes, G3TDR; P. J. Horwood, G3FRB; A. W. Hutchinson; J. W. Mathews, G6LL; R. O. Phillips, G8CXJ; H. W. Rees, G3HWR; D. M. Thomas, GW3RWX (corresponding); M. McFadden, GI3VCI (corresponding).

**VHF:** G. M. C. Stone, G3FZL; P. Balestrini, G3BPT; A. H. Bower, G3COJ; J. Coffey, G3PSH; B. R. Coleman, G8AZU; Dr D. S. Evans, G3RPE; R. J. Baker, G3USB; D. Hayter, G3JHM; J. Hum, G5UM; A. L. Mynett, G3HBW (corresponding); M. J. Sparrow, G6KQJ/T; M. Wallace, G8AXA.

**VHF Contests:** C. Sharpe, G2HIF; R. G. Brade, G3VIR; M. T. Deacon, G3XHU; L. N. G. Hawkyard, G5HD; F. Matthews, G8ACJ; W. J. McClintock, G3VPK; G. M. C. Stone, G3FZL; L. V. G. Turner, G8CUT; I. F. White, G3SEK; P. Willcocks, G4BWY.

# PRESENTATIONS AT THE 1973 AGM

**Dr J. A. Saxton, 1973 President, and recipients of trophies which he presented to them at the 1973 AGM**

*Photographs by Paul Fletcher*

**A. B. Givens, GM3YOR, receives the Maitland Trophy awarded to the Scottish station with the highest aggregate number of points in two Top Band contests**

**L. Moxon, G6XN, with the Wortley-Talbot Trophy awarded for his article "Pocket-portable phone dx" published in "Radio Communication" November 1972**

**Representatives of the Westmorland VHF Group, G3FDW/P, receiving the VHF Managers Trophy as winners of the annual 70MHz Contest**

**The NFD Shield, awarded to the winner of National Field Day, being accepted by representatives of the Croydon RSGB Group and Surrey Radio Contest Club**

**P. D. Burgess, G4BCH, winner of the 80m Low Power Contest, receives the 1930 Committee Cup**

**The winner of the VHF Listeners' Championship, T. Cooper, BRS-28005, receives his trophy**

**D. I. Field, G3XTT, receiving the Victor Desmond Trophy for winning the 2nd Top Band Contest**

R. Treacher, BRS32525, receiving the Metcalfe Trophy as winner of the 21/28MHz Receiving Contest

For distinguished services to the Society, Council awarded the Founders Trophy to R. G. Flavell, G3LTP

D. W. Dalrymple, GM3OLK, and A. B. Givens, GM3YOR, of the Glenrothes & D ARC examine one of several trophies they received

The Courtney Price Trophy was awarded to the Pye Telecommunications ARG for outstanding technical development in the field of amateur radio in connection with the GB3PI repeater. The group also received the Surrey Trophy as winners of the VHF National Field Day

The Houston-Fergus trophy being presented to representatives of the Addiscombe ARC, G4ALE/P, winners of the 80m Low Power Field Day

P. Thornton, GM3PKV, receiving the Bevan Swift Memorial Prize awarded jointly to him and the late W. H. Allen, G2UJ, for the article "Aerial masts and rotation systems"

E. H. Trowell, G2HKU, was awarded the ROTAB Trophy by Council for outstanding and consistent dx work

The Ostermeyer Trophy was presented to J. R. Hey, G3TDZ, for his article "The G3TDZ portable 2m transmitter/receiver, Mk 4"

# OBITUARIES

*The Society records with regret the deaths of the following amateurs.*

**Mr W. Dorrell, G3HEC**
Bill Dorrell died in Rochdale in December. He had been off the air for a few years, after operating mainly on 20m cw for some time, but during the past year had been operating again on 20m ssb.

**Mr F. W. Garnett, BEM, G6XL**
Francis Woodhead Garnett, of Harrogate, died on 25 January at the age of 72. One of the top world-wide dxers, he is recorded in the DXCC Honor Roll with 334 countries.

**Mr P. G. Hester, G5HS**
Percival Giles Hester died on 31 December in his 80th year. Licensed in 1935, his main interest was cw dx on the hf bands from his home in Thame, Oxon. He was a member of FOC and RAOTA.

**Dr J. R. S. Innes, 9GIBF (Ex ZD4BF, VP3JR, 8R3A)**
Joe Innes died suddenly, aged 66, on 26 December at Nsuta-Wassaw, Ghana. He was medical officer for the African Manganese Company and had been in Ghana for 30 years, during which time he became well known over the air.

**Mr H. E. M. L. Lawson, GM5HL**
Hugh Lawson, of Edinburgh, has died following an illness which caused him to be inactive on the air in recent years. He was licensed in the '20s and soon became known as "Five Harry Lauder".

**Mr T. Bell**
Thomas Bell died in Leeds at the age of 81 on 18 January. He was one of the pioneers of amateur radio in Northern Ireland and held the call VXI in 1912. For business and other reasons he was unable to re-activate his station after the war but had always maintained an interest in amateur radio.

We have also been notified of the death of **Mr Malcolm G. Luker, G2ANG,** at Poole, Dorset.

## Mobile Rallies Calendar

**31 March**—White Rose MR, 1130am, Lawnswood High School, junction of A6120 and A660, Leeds. Organized by the White Rose RS; details from K. R. Robson, G3VTY, Flat 7, 34 St James Drive, Horsforth, Leeds.
**21 April**—North Midlands MR, 1130am to 5pm, Drayton Manor Park, on A4091, near Tamworth, Staffs. AA signposted one mile from A5 linking M1 and M6. Fifteen miles from M5, 12 miles from M6. Zoo, amusements, full catering. Details from A. Walton, G3ZKQ, QTHR; tel 021-427 3088.
**5 May**—Spalding Tulip-time Rally, Surfleet, 4 miles N of Spalding on A16. Organized by Spalding & D ARS; details from R. Harrison, G3VPR, QTHR.
**12 May**—South Leicestershire MR, 11am, Westfield Activity Centre, Westfield Road, Hinkley, Leics. Organized by Hinkley ARC; details from G4CAJ, QTHR.
**19 May**—Northern MR, Victoria Park Hall, Keighley. Organized by Otley RS; details from G8BZY, QTHR.
**19 May**—Amateur Radio Mobile Society's MR, RAF Cosford, Shropshire.
**26 May**—Hull MR, Bishops Burton.
**9 June**—Alveston Castle MR, Alveston Castle, Nr Derby.
**23 June**—Goole Humberside MR, Goole High School. Organized by Goole & D ARS. Talk-in 2m, 160m.
**30 June**—Upton MR. Organized by Worcester & D ARC; details from G8ASO, QTHR.
**8 July**—South Shields MR, Redwell School, Prince Edward Road, South Shields. Organized by SS & D ARC; details from G3SFL, QTHR.
**21 July**—Cornish Radio Amateur Club MR.
**11 August**—Torbay MR, Newton Abbott Rugby Club ground. Organized by Torbay ARS; details from L. H. Webber, G3GDW, QTHR.
**11 August**—Derby MR.

# RAYNET

## by S. W. LAW, G3PAZ*

A Raynet Committee meeting was held on 19 January, when the first item was the re-election of officers and members approved by RSGB Council for 1974. A lengthy discussion took place over the relationship with our image of the proliferation of certain other "services", and certain courses of action were agreed upon. These may take some time to mature, but members will be advised of the outcome in due course.

The registration forms which have served Raynet for so long have been redesigned in the light of present-day conditions and a new version will be put into use as soon as it can be produced. In particular, the new form will clear up the somewhat vexed question of Raynet insurance and the use of the registration card among other points. We feel sure that keen members will approve the change of format.

Regret was expressed that certain hard-working members had been unable to continue in their positions for various reasons, but others will undoubtedly come forward to fill the gaps, especially in those places where groups may be temporarily without leadership. Among the resignations we have A. G. Blackmore, GW3FKO, (SE Wales)—a new controller will be nominated shortly; B. Spencer of Mid-Thames, whose place is to be filled by S. E. C. Fryer, G3ERO, QTHR, as soon as ratified. Also, members are asked to note that Colin Shaw, G8FRA, (Warwickshire) is no longer QTHR but is to be found at 9 Ilfracombe Grove, Green Lane, Coventry CO3 6DX.

There are several prospective groups who would be glad to hear from interested parties. G8HRU of Chard, Somerset, (not yet listed in the callbook) would welcome some QSOs. Chris Haywood, the secretary of the proposed new group forming in Leicestershire, will write to confirm contacts with G4CUK, QTHR. A. Veitch, G8FRB, QTHR, will also welcome calls on their Nottingham frequency (145·8MHz) in order to enlarge their 12-strong group. For those in the Northampton area there is news also of a doughty dozen as the nucleus of a new group, but no full details to hand at the time of writing.

**Registered?**
Are there still disgruntled "members" who seem to feel in some way neglected? Perhaps you have not written to "Taff" about your registration? Try it and find out; there is quite a list in the spare filing box!

**General**
Membership still fluctuates, but a definite rise is shown by comparison with 1972 (1,025) as against the final 1973 figure of some 1,170 (registered, of course!). There have been enquiries from the Shetland Islands, and we are glad to report that the police in the Isle of Man have requested details of the service we offer.

Our equipment officer, Jane (QTHR see G3BPT), has sold 461 Raynet manuals as at January 1974 and has ample stocks at 16p incl postage; while headed Raynet notepaper is still available at 40p for 50 or 70p for 100 sheets pp.

**Harold Crane, G2AVC**
We record with regret the death on 8 February of Harold Crane, G2AVC, of the Surrey Raynet Group, and extend our sympathies to his widow Ann, G3GOX.

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

* 130 Alexandra Road, Croydon, Surrey CR0 6EW

# YOUR OPINION

The Editor
*Radio Communication*
Sir—As regular users and contest entrants on 4m, we object strongly to the remarks made about 4m in VHF NFD summary, similar miserable comments also having been noted in the 4m contest results in the September 1972 and 1973 issues of *Radio Communication*. These remarks coming from someone whom it seems is not active himself on the band, are hardly likely to inspire others. Indeed it is hard to believe that these remarks actually come from a responsible member of the VHF Contests Committee.

It may be seen from this year's VHF NFD results that the entries on 2m and 70cm were both down by 10 per cent and the 4m entry was only down by six per cent. Indeed, the overall picture of 4m contests has changed very little over the last five years or more but at that time the summary which accompanied each 4m contest result was both interesting and inspiring. VHF NFD is the only contest where the various factions of vhf/uhf meet on common ground with the resultant exchange of ideas etc. If there is any cause for gloom it is perhaps the 70cm results on a band where there are 30 per cent more UK licensees. A solution to the problem of the rigs that are only used for VHF NFD would be to make it necessary for a group to have entered one event on the band in question, ie 4m or 70cm, in order to qualify for entry into VHF NFD on those bands.

We also notice in the contests calendar published in December *Radio Communication* that there is to be no two-day open contest next year. This is the only event which allows sufficient time for participants to trek the many miles to the locations which, by virtue of their relative isolation, are always the winning ones in these contests, therefore we hope that this contest will be retained, possibly with a break between 0200 to 0600.

The cumulatives are found to be rather dull events and possibly would be better replaced with a short cw contest run between 0800 to 1300 on Sunday morning and a similar short phone event, and as there is ssb activity on 4m, a similar event could be included for this mode, which might bring into use some 4m ssb rigs that have not been fired up for some years.

K. F. Eastty, G3LVP; K. P. Jillings, G3OIT; T. E. Downing, G3MXH; C. Gove, G3WOS; G. C. Suggate, G3NPI

Letters in similar vein were also received from I. E. Davies, G3IZD; P. J. Lennard, G3VPS, and R. Reed, G3ZIG. All were sent to the chairman of the VHF Contests Committee who replied as follows:

The Editor
*Radio Communication*
Sir—As the chairman of a committee which sees its responsibilities extending beyond the routine of contest adjudication, I was pleased to learn that my recent comments regarding 4m activity have at last stimulated some reaction from groups regularly active on the band.

It has been obvious for some time that 4m is becoming increasingly out of step with the march of progress despite the committee's efforts to arrange a varied programme of events to suit all tastes.

The reasons for this are many and various; some controversial; but the fact remains even to the casual observer that the operational procedures and technical equipment in current use are much the same as they were 10 years ago. The band is, therefore, failing to capture the imagination and to inspire the competitive spirit from which new innovation springs.

Hard statistics in support of this argument are difficult to compute since the records of past 4m contests are incomplete. Moreover the rules, timing and duration of these events have changed appreciably over the years making direct comparisons subject to error. However, sufficient continuity has been maintained in three annual events to enable significant trends to be noted and conclusions drawn. These events are the 4m CW, the 4m Open and the 4m section of VHF NFD.

The one constant factor which emerges from an analysis of contest results since 1963 is the proportion of 4m groups taking part in VHF NFD. If this figure is accepted as being representative of the possible activity on the band at other times, any changing interest in 4m will be reflected by the entries in the 4m CW and the 4m events when expressed as a percentage of the 4m groups active during VHF NFD.

The following table sets out these figures for the period 1963 to 1972.

| Year | '63 | '64 | '65 | '66 | '67 | '68 | '69 | '70 | '70 | '72 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Percentage of groups on 4m in** | | | | | | | | | | |
| **VHF NFDs** | 68 | 79 | 70 | 87 | 73 | 69 | 65 | 68 | 68 | 65 |
| **4m Open Contest** | 95 | 110 | 120 | 105 | 93 | 69 | 59 | 32 | 36 | 37 |
| **4m CW Contest** | 73 | 50 | 36 | 52 | 47 | 25 | 27 | 19 | 10 | 12 |

The conclusion from these figures is inescapable. Despite a growing amateur population, the proportion of those gravitating towards 4m in its own right and not as a part of VHF NFD is decreasing. The VHF Contests Committee must, therefore, pose the question: "Are groups taking part in the 4m section of VHF NFD solely because the 4m score is necessary to a high position in the overall results table?" This argument is carried further by the lack of support for cumulative events which on other bands have proved highly successful in prompting the general level of activity.

The VHF Contests Committee has no plans for withdrawing 4m from VHF NFD at the moment, but if present trends continue, and the long term answer to the above question proves to be in the affirmative, then the committee would be foolish not to regard the 4m band as having only a minority interest, and to plan the vhf contest calendar accordingly.

It is appreciated that a few of the regular 4m band enthusiasts are not fully in accord with the foregoing, but it may be that they are too close to the subject to take in the overall picture. The true perspective must be maintained by seeking the views of all other vhf amateurs, especially the "once a year" 4m groups. Their attitude towards the band is just as important, but until they speak up for themselves the VHF Contests Committee must draw its conclusions from, and make its decisions on, the only statistical evidence available.

Cliff Sharpe, G2HIF,
Chairman, VHF Contests Committee

**PS.** The logs for the 1973-74 4m Cumulative Contests are coming in as this goes to press. The VHF Contests Committee is pleased to note that several stations are reporting that activity has improved and that at least two stations were heard using ssb. *C.S.*

The Editor
*Radio Communication*
Sir—So off we go again into another year of constant attacks on the amateur allocations, and nothing much we can do about it.

Aha, a strong national Society, the pundits say—but is it strong?

It may represent the interests of all amateurs—but only about half are members. An interesting anomaly—I doubt very much if impecunity is the main reason. Could disenchantment be creeping in—is there something fundamentally wrong? I feel there is. To my mind, the RSGB is just that—an overgrown school society, depending very much on the goodwill and energies of its organizers and how much charitable time they can devote in this world of increasing pressures for the good of their fellow amateurs. The QSL service, without which I suspect 30 per cent of the Society's membership would disappear overnight, depends solely on people giving up their own time to do this worthwhile task.

Surely it cannot exert much of an influence in a modern world where amateurism is despised, and only results really count for anything? My solution—proposed only as a discussion point—would be the dissolution of the RSGB as it stands today, 50 years old and equally out-of-date, and the setting-up of an Amateur Radio Institute, run on similar lines to the professional institutions. Membership would be graded, that is, Fellow, Member, Associate Member, Consociate.

Anybody who had an interest in amateur radio could become a Consociate, at the present subscription. People with CEI or equivalent status at the TEng (CEI) level could become Associate Members, but only on passing an examination of a standard considerably higher than that of the RAE; they would then be entitled to place the letters AMARI after their name. Similarly, Membership would be open to those possessing chartered engineer or equivalent status, but this time with a minimum of 10 years activity on the amateur bands and on passing an examination, set by the ARI of even higher standards than that for AM. Fellow would be reserved for members who have given long, valuable or exceptional service to amateur radio. It would also be open to ordinary Consociates of the institute who had given outstanding service. I would suggest that subscriptions be raised slightly for all those of order above Consociate.

I realize this would leave a large amount of the Society's present membership, including myself I hasten to add, somewhat out in the cold but under no different status from that which we are in at the

moment. It would have the inestimable advantage, however, of giving "amateur" radio a (dare I say it?) professional, responsible reputation, which I feel would add considerable weight to any arguments the movement could be involved in. Also I feel people would have a better outlook on their organization if being a member of it actually meant something. Perhaps we could avoid the disgusting situation where only 100 people turned up for the AGM—there must be far more than that in London alone. I think also that this could elevate BRITISH amateurs to a level unequalled in the world and produce a more positive attitude among the people who really count—if we could organize ourselves to this level, we *must* be something worth consideration.

Well I would like to see this argument torn to shreds, so I will place it in your hands.

P. G. Wood, G8EQA

The Editor
*Radio Communication*

Sir—The changes in county boundaries which will be brought about by the reorganization of local government during 1974 will, as has already been noted in *Radio Communication*, cause the disappearance of some counties and the birth of some new ones. As a resident of one of the counties so to disappear, I feel that perhaps some clarification of the position should be made by those who issue certificates and organize contests.

It was formerly generally accepted that the counties of Great Britain should be taken to be geographical counties rather than administrative counties. Thus, Yorkshire is one county and not three ridings, and the County of Bristol is divided between Somerset and Gloucestershire by the Avon. Similarly, when London's local government was reorganized, Middlesex did not disappear from the radio map, though there was no longer a county council.

Are we to assume that in future all certificates and contests will operate on a "local government county" basis, or will Hereford be allowed to remain distinct from Worcester, and Rutland from Leicestershire? Indeed, it is perhaps worth noting that Rutland will retain its identity as a second tier authority and will not disappear entirely. Perhaps before we hold a wake for the disappearing counties we should be sure that they are truly dead.

Revd J. L. Marshall, G3RKH

The Editor
*Radio Communication*

**VHF and UHF band plans**

Sir—So the organizers, do-gooders, regimenters, meddlers—call them what you like—are at it again! Words are beyond me; I dare not express my full thoughts in writing.

In over 40 years of almost exclusive vhf and uhf operation (not contests only) and the coming and going of various band plans, I have not seen a more half-baked scheme than this one. It appears to me that it has been concocted solely to meet the requirements of commercial interests producing push-button black boxes, and to promote the "clique" operation of the various transmitting modes still more.

Why not leave well alone and let things take their own course depending on local area activity and propagation conditions. It is no well-kept secret when the bands are open for dx that band-planning is ignored anyway.

William James, G6XM (Life member)

The Editor
*Radio Communication*

Sir—Recently I attempted to have two QSOs on 80m with great difficulty, due to the very bad operating habits of certain stations taking part in a contest who did not listen to the frequency but were only interested in getting as many contacts as possible with a disregard for anyone else.

Looking through the Contests Calendar and listening on the bands it would appear that amateur radio is turning into a number passing hobby which I am sure is doing more harm than good to our hobby.

I appreciate that there are those who will say that I am wrong, but I would ask that, at least, the contests be restricted to half of the cw or phone part of the bands; this would allow the normal QSO to continue. At a recent meeting of our local club, I had full support of the 40 members for my views.

Can the contest committees do anything to make operating an amateur radio station a pleasure and not a life or death rat race, number passing hobby.

T. Sorbie, GM3MXN

The Editor
*Radio Communication*

Sir— Much as I regret adding to the series of comments (many of which have been trivial and irrelevant) made in *Radio Communication* during the past few months concerning vhf operating procedure, I feel compelled to reply to the suggestion of G3VMB (*FMD*, February) that "—a move towards the operating standards set on 80m might improve vhf."

During the past 18 months I have spent much time operating on 2m, and a considerable amount of time listening on the lower bands, especially 80m. During one 15min listening period on 80m I had the dubious privilege of hearing the following: one station shouting "go away" at an apparently unwanted breaker; two more stations involved in a "slanging match" concerning tuning-up methods, and a fourth station using phonetics which many people would have considered highly objectionable, and which almost certainly contravened licence regulations. None of these, nor anything like them, have I ever encountered on 2m.

Now it may be that I was unlucky to hear all this in such a short period, but the fact that I have heard similar displays of bad manners on 80m several times since then leads me to assume that this may be a regular occurence.

I might add that much of the operating procedure heard on 80m has been excellent, but if we must generalize (as G3VMB does) then in my opinion, the move he suggests could only be a retrograde step.

R. M. Crossley, G8GPR

The Editor
*Radio Communication*

Sir—May I please put forward several matters relating to callsigns which, I think, seem to require some rationalization. The object of a callsign, it seems to me, is to identify the sender of a signal and to give some indication of his general whereabouts. To this end it has been the custom to allocate a separate prefix where a territory is largely self-governed, sufficiently remote or has some other marked ethnic, political or even postal identity; hence the G, GC, GD, GI, GM and GW prefixes. I know that the MPT has been reluctant to extend this system for fear of a flood of requests from other small but isolated parts of the UK. I sympathize with this attitude, to some extent, although it is a fact that the Official List takes no cognizance of prefix.

There is, however, one unanswerable case for consideration—the States of Jersey and the Bailiwick of Guernsey. These two are completely separate in government, laws, jurisdiction and postal service. They are recognized as two separate countries by DXCC and by amateurs throughout the entire world. I cannot see any justification for witholding separate prefixes. The amateurs in both territories want the change and I am given to understand that Guernsey would be willing to carry on with GC or would accept GG, whereas Jersey would be happy to use GJ. The matter is entirely within the competence of the MPT who have these prefixes within their ITU allocation. It would not be creating any sort of precedent but would extend a principle already in use.

It would also enable me to devolve the QSL Bureaux and overcome the present difficulties due to UK stamps not being valid in the two countries. It would tell the world immediately which territory a station is in. Surely just a matter of common sense.

At present, a lot of unnecessary work is caused by the activities of amateurs with one prefix operating within another prefix zone. For example GM2MI/A appears on the air; the callsign does not indicate whether this is G2MI now permanently resident in Scotland operating /A or whether he is still a G away from home. If he signed G2MI/GM there would be no doubt and the QSL card would go to the correct sub-manager. This practice is now common all over the world. When I was in Bermuda, I signed G2MI/VP9. G2MI/A would show that the station is G2MI operating at an alternative address in England. GM2MI/A would show that he is now permanently resident in Scotland and operating /A, G2MI/GM that he is still a G operating on a temporary basis in Scotland.

This would save the work of scanning through the callbook in every /A case to find where the card should be sent. The suffix /P has little relevance nowadays except on field days and then it is unusual for anyone to operate outside his own call area.The /A suffix is peculiar to the UK and often has to be explained to foreign stations. I would prefer it to be dropped but perhaps because of the special significance of /P it should be retained.

I would like to know what possible objection there can be to these simple reforms and hope to see that the MPT Liaison Committee has been able to obtain the consent of the MPT at an early date.

One further small point, much confusion arises, and also some disappointment, by the way in which GB calls are issued. It is natural for, say, the Derby Flower Show, the Durham Flower Show and the Didcot Flower Show all to want DFS. One gets GB2DFS, another GB3DFS and then, by some quite inexplicable working of the regulations, the third has to have some other call because the MPT will not issue GB4DFS. Why? The MPT collects the same fee for a licence valid for only one day as one valid for a year, surely some concession in this respect is not beyond the administrative ability of this efficient and eminently reasonable organization.

I may add that they keep me advised of the issue of GB calls together with the callsign of the licensee, a service which is very much appreciated. The suggestion I have made would avoid the issue of the same callsign to different groups within a comparatively short time and the consequent confusion when it comes to delivering the QSL cards. It would cost the MPT nothing and would avoid much heartache and disappointment as well as relieve the hard-worked QSL Bureau of a bit of unnecessary work.

A. O. Milne, G2MI, RSGB QSL Manager

## Contests calendar

| | |
|---|---|
| **9-10 March** | —BERU (Rules in November 1973 issue) |
| **10 March** | —Clifton ARC Top Band |
| **16-17 March** | —ARRL DX CW |
| **23-25 March** | —BARTG Spring RTTY Contest (Rules in December issue) |
| **30-31 March** | —CQ WW WPX SSB |
| **30-31 March** | —432MHz Open (Rules in March issue) |
| **7 April** | —80m Low Power |
| **20-21 April** | —Bermuda Contest (phone) |
| **21 April** | —70MHz Open (Rules in March issue) |
| **27-28 April** | —National Amateur Television (Rules in February issue) |
| **27-28 April** | —Florida QSO Party |
| **28 April** | —Chelmsford DF Qualifying |
| **4-5 May** | —144MHz Open & SWL |
| **4-5 May** | —Bermuda Contest (CW) |
| **12 May** | —Mid-Severn Valley Teleprinter (Rules in February issue) |
| **19 May** | —South Manchester DF Qualifying |
| **25 May** | —1,296MHz Open |
| **26 May** | —432MHz Open |
| **8-9 June** | —NFD (Rules in February issue) |
| **9 June** | —70MHz Portable |
| **15-16 June** | —Microwave Field Day (Rules in February issue) |
| **15-16 June** | —All Asian DX (phone) |
| **16 June** | —Slade DF Qualifying |
| **22-23 June** | —Summer 1·8MHz |
| **25 June** | —Start of 432MHz Summer Cumulative |
| **30 June** | —Derby DF Qualifying |
| **6-7 July** | —"Jubilee" VHF/UHF & SWL |
| **13-14 July** | —SSB Field Day (Rules in March issue) |
| **21 July** | —432MHz Open |
| **21 July** | —Stratford-on-Avon DF Qualifying |
| **28 July** | —70MHz Open |
| **4 August** | —Oxford DF Qualifying |
| **18 August** | —144MHz QRP |
| **24-25 August** | —All Asian DX (CW) |
| **1 September** | —Dartford Heath DF Qualifying |
| **7-8 September** | —VHF NFD & SWL (Rules in March issue) |
| **15 September** | —80m Field Day |
| **22 September** | —DF Final—Coventry and Rugby |
| **5-6 October** | —UHF NFD & SWL |
| **5-6 October** | —VK/ZL/Oceania (phone) |
| **12-13 October** | —VK/ZL/Oceania (CW) |
| **October** | —Start of 70MHz Cumulative |
| **October** | —Start of 432MHz Cumulative |
| **19-20 October** | —7MHz CW |
| **2-3 November** | —7MHz Phone |
| **2-3 November** | —144MHz CW |
| **9-10 November** | —Second 1·8MHz |
| **8 December** | —144MHz Fixed |

For **432MHz Spring Cumulative Contest** rules, see January issue.

**NOTE: The date of NFD is 8-9 June, not 1-2 June as previously shown in the calendar.**

# CONTEST NEWS

## Rules for VHF NFD 1974

The rules for this year's VHF NFD are almost unchanged from those of the 1973 event. Minor revisions have been made to bring them into line with the General Rules for VHF/UHF Contests. In recent years the normally pleasant atmosphere of VHF NFD has been marred by a handful of disputes over access to sites, and the last sentence of Rule 7 has been introduced to deal with such cases. However, it is not necessary to register proposed sites before the event.

Fixed stations wishing to have their 144MHz scores checked and entered for the IARU Contest please see Rules 19 and 20.

Contestants are requested to observe the provisions of the Code of Practice for vhf/uhf contest operation, published on page 36 of the January 1974 issue of *Radio Communication*.

1. **Duration**
   From 1600gmt 7 September to 1600gmt 8 September.
2. **Bands**
   The 70MHz, 144MHz, 432MHz and 1,296MHz bands only will be used.
3. **Eligible entrants**
   Any RSGB member or group of members operating within the British Isles may take part.
4. **Operators**
   (*a*) Operators of stations taking part in the contest must each hold a current British Isles amateur (sound) licence and must be fully paid up corporate members of the RSGB at the time of the contest.
   (*b*) Points may not be claimed for contacts with stations operated by, or using the callsigns of, operators of the competing station or group of stations.
5. **Power supplies**
   Stations may not use public supply mains. Power for all equipment must be derived from an on-site portable generator or battery.
6. **Stations**
   Each competing group will be permitted a maximum of four stations, each using a different callsign. Only one station may score points on a given band. There is no restriction on the way in which the bands are divided between the stations (eg 70MHz and 432MHz on one station, 144MHz on another, to form a two station entry). Special event callsigns (eg GB) may not be used.
7. **Sites**
   All the stations forming one entry must operate from within a circle of 1km radius centred on the operating position of any of the stations. *Proof of permission to use a site may be required.*
8. **Groups**
   Any two groups may combine their score to form one entry, subject to the requirements of Rules 6 and 7.
9. **Setting-up time**
   All equipment, including aerials, must be installed on the site (as defined in Rule 7) during the 24 hours preceding the contest or during the contest. The site may not be used for any transmitting activities by the group or member during the five days before this time.
10. **Concurrent working**
    A station may not engage in more than one contact concurrently.
11. **Scoring**
    (*a*) On the 70, 144 and 432MHz bands, contacts will be scored as follows:

| km | points | km | points |
|---|---|---|---|
| 0–50 | 1 | 200–250 | 9 |
| 50–100 | 3 | 250–300 | 11 |
| 100–150 | 5 | 300–350 | 13 |
| 150–200 | 7 | and pro rata | |

    Contacts on boundaries between scoring rings score low.
    (*b*) Band multipliers will be as follows: 70MHz–2, 144MHz–1, 432MHz–6.
    (*c*) On 1,296MHz scoring will be one point per kilometre.
12. **Contest exchanges**
    (*a*) Contestants must exchange RS or RST reports followed by a serial number. Serial numbers start at 001 on each band and advance by one for each contact.
    (*b*) Contestants must send and log both QTH and QTH Locator. The QTH must be a point which is identifiable on the Ordnance Survey 10-mile map, or a distance in kilometres and a bearing from such a point. The distance must not exceed 25km and should be given to the nearest kilometre. The QTH Locator is the standard location fixing system.
    (*c*) The QTH given on 1,296MHz must differ in form from that given on the other bands, eg a location given as "10km north of Marlborough" on 432MHz could be given as "8km south-east of Swindon" on 1,296MHz.
13. **Contacts**
    (*a*) Only one contact may be made with a given station (ie callsigns that are fixed, /P, /A or /M, or the same set of equipment used under a different callsign, all count as one station). If a station that has moved location is contacted a second time, only the higher scoring contact may be claimed.
    (*b*) Repeat contacts must be clearly marked as such and the points column left blank.
    (*c*) The 1,296MHz station may operate on any other band for the purposes of arranging a contact, but the exchange of contest information must take place on 1,296MHz only and may not be interrupted by recourse to another band.
    (*d*) Contacts made by eme reflection, man-made satellites (active or passive) or any relaying device will not count for points.
    (*e*) Contacts made with unlicensed stations will not count for points.
14. **Calling CQ**
    Contestants are asked to indicate on which band they are calling CQ and are strongly urged to state their tuning intentions, and to call CQ in the correct frequency zone. 1,296MHz stations operating on another band (Rule 13c) should call "CQ for 23cm only".
15. **CW segments**
    Any station operating on modes other than A1 or F1 in the segments 70·025–70·1, 144–144·15, 432–432·15 or 1,296–1,296·15 MHz, or transmitting on beacon frequencies, is liable to be disqualified.
16. **Defective signals**
    Stations that persistently overmodulate, radiate key clicks or poor quality signals, or transmit excessive harmonics, are liable to disqualification or loss of points. Monitoring stations will be in operation.
17. **Proof of contacts**
    Proof of contacts may be required.
18. **Disputes**
    The decision of the Council of the RSGB is final in any cases of dispute.
19. **Logs**
    (*a*) Logs must be submitted on RSGB VHF/UHF Contest Log Sheets. Separate logs must be submitted for each band. Groups wishing to have their 144MHz logs forwarded to the IARU Region 1 VHF Contest should enter the distance in kilometres in the points column and the score as Rule 11 on the rear of the sheet.
    (*b*) Entrants must keep their own log records in accordance with the licence requirements.
20. **Entries**
    (*a*) Entries must be postmarked not later than 23 September 1974.
    (*b*) Entries must be marked VHF NFD in the top left-hand corner of the envelope and addressed to: The Chairman, VHF Contests Committee, 20 Harcourt Road, Wantage, Berks.
    (*c*) A cover sheet (Form 427) must be made out for each band and must show the callsigns of all operators.
    (*d*) *In addition to Form 427, a special summary sheet must be forwarded, even by single-band entries.* The declaration must be signed by one member of the group, who will be considered responsible for the entry.
21. **Awards**
    The Surrey Trophy will be awarded to the overall winners, and Certificates of Merit will be awarded to the overall runner-up, the leading entry from each country and the highest scoring station on each band.

## VHF NFD 1973 results

The Southgate Radio Club was omitted from the overall results table for VHF NFD 1973. A photostat copy of their missing summary sheet has now established their claim to 17th position overall with a score of 4,800 points.

## VHF NFD Listeners' Contest rules

**Dates:** 7-8 September.
**Times:** 1600–1600gmt.
The General Rules for VHF/UHF Listeners' contests, published in the January 1974 issue of *Radio Communication*, will apply. Entries should be prepared as described in rules 19a and 20 of the transmitting contest.

## 1974 Direction Finding Contests

The complete programme is included in "Contests calendar" in this issue. These dates must, of course, be subject to any shortage of petrol or restrictions in force at the time. If in doubt, intending competitors should telephone Mr G. T. Peck, High Wycombe 0494-881517.

## 432MHz Open Contest rules

**Dates:** 30-31 March.
**Times:** 1600–1600gmt.
All entries and checklogs to: VHF Contests Committee, c/o G5HD, 100 Shirley High Street, Southampton, Hants.
The following General Rules, published in the January 1974 issue of *Radio Communication*, will apply: 1, 2, 3, 4a, 5a, 6a, 7a, 8a, 9a, 10a, 11–26. The Council Cup will be awarded to the station with the highest score.

## 70MHz Open Contest rules

**Date:** 21 April.
**Times:** 0900–1700gmt.
All entries and checklogs to: VHF Contests Committee, c/o G4BWY, 27 Manor Road, Barnet, Herts EN5 2LE.
The following General Rules, published in the January 1974 issue of *Radio Communication*, will apply: 1, 2, 3, 4a, 5a, 6a, 7a, 8a, 9a, 10a, 11–26.

## SSB Field Day 1974 rules

**1.** The General Rules for RSGB HF Contests, published in the January 1974 issue of *Radio Communication*, will apply.
**2. When.** From 1700gmt on Saturday 13 July to 1700gmt on Sunday 14 July 1974.
**3. Eligible entrants.** Any group of RSGB members resident in the British Isles, or any affiliated society in the British Isles or overseas. This is a multi-operator contest as provided for in General Rule 5b.
**4. Stations.** Each group may operate one portable station, as defined in General Rule 4b, on any or all of the 3 5, 7, 14, 21 and 28MHz bands. Simultaneous operation on two or more bands is not permitted.
**5. Power.** The rf peak envelope power output must not exceed 400W.
**6. Contacts.** SSB (A3A or A3J) only.
**7. Scoring.** Three points for each completed contact with a fixed station, and six points for each completed contact with a portable or mobile station. In addition, a bonus of 30 points may be claimed for the first contact with each prefix* worked on each band. Column 5 of the log should be headed—**Bonus points claimed.**
**8. Awards.** Certificates of merit will be awarded to the three leading groups, and to the fixed station whose check log shows that it gave the highest number of contacts to entrants.
**9. Entries.** Entries must be addressed to The HF Contests Committee, c/o S. V. Knowles, G3UFY, 32 Nursery Road, Thornton Heath, Surrey CR4 8RF.

* A large proportion of entrants in last year's event were in some doubt as to the definition of a prefix. For the purposes of scoring this contest, a prefix is defined as that group of letters and/or figures up to and including the final figure in the callsign, eg *5Y3*ABC, *C31*ZZ, *GW4*BBB etc. It should be obvious, therefore, that DL2, DL3, DJ3 and DK2 are all different prefixes, although they come from the same country.

## Chiltern ARC Top Band Contest rules

**Date and time.** 10 March 1974, 0900 to 1300 clock time.
**Where.** Top Band.
**How.** Any mode the operator's licence allows.
**Who.** Any single-operator station.
**Scoring.** One point for each station worked, multiplied by number of different counties or non-G prefixes worked.
**Entries.** To reach M. Connell, G8HDL, 38 White Close, High Wycombe, Bucks HP13 5NG, by Friday 22 March.

Copy of normal log required, including date, time, frequency, station worked and county, and serial number (commencing at 001) given and number received if in contest, and claimed score.
**Concurrently** a listening competition for SWLs and G8s will be run with same general details as above.

## 432MHz Cumulative Contest results

The results table for the Autumn 1973 432MHz Cumulative Contest is as usual a poor reflection of the activity generated by these popular events. Most stations experienced good conditions during one or more sessions, and Continental contacts were not uncommon. Results are tabulated by RSGB zones, and certificates will be awarded to the zonal leaders and to the runner-up in Zone D, from which more than 10 entries were received.

It is interesting occasionally to take stock of the type of equipment currently in use on 70cm, though not too often, since apart from changing fashions in rf amplifier transistors there have been few variations in the last year or two. The average station still consists of a QQVO3-20A transmitter running 20–30W input to a Multibeam aerial, with a BF180 or the like as the first rf amplifier in the converter. However, G3ZYC's log records 11 ssb stations, himself included, and he praises the willingness of the 70cm fraternity to make crossmode contacts.

*G3SEK*

**ZONE A NORTHERN ENGLAND**

| Posn | Callsign | Score | TX final | Power | RF amp | Aerial |
|---|---|---|---|---|---|---|
| 1 | G3NHE | 508 | 3-20A | 6* | AF239 | 46mb |
| 2 | G3KMS | 369 | 4CX250R | 150† | BF180 | 4 s/r |
| 3 | GD2HDZ | 145 | 6-40A | 40 | BFY90 | 18pb |
| 4 | G8EOP | 115 | 6-40A | 10*† | AF239 | 46mb |
| 5 | G8HBQ | 78 | — | 60 | AF239 | 46mb |

**ZONE B MIDLANDS**

| Posn | Callsign | Score | TX final | Power | RF amp | Aerial |
|---|---|---|---|---|---|---|
| 1 | G3ZYC | 323 | 3-20A | 45*† | BFY90 | 46mb |
| 2 | G5UM | 204 | 3-20A | 15 | AF186 | 14 |
| 3 | G8AVX | 162 | 6-40A | 60 | 2N5397 | 46mb |

**ZONE C EAST AND LONDON**

| Posn | Callsign | Score | TX final | Power | RF amp | Aerial |
|---|---|---|---|---|---|---|
| 1 | G8ATD/P | 328 | 3-20A | 24 | BF180 | 46mb |
| 2 | G8CTT | 245 | 3-20A | 30 | BF180 | 46mb |
| 3 | G4BMM | 219 | 3-20A | 25 | BFY90 | 46mb |
| 4 | G8ERW | 188 | 3-20A | 26 | BF180 | 18pb |
| 5 | G3VPS/P | 84 | BAY96 | 3* | 2N3819 | 46mb |
| 6 | G3FIJ | 74 | BAY96 | — | BF180 | 18pb |

Late entry G8BDJ claimed score 76.

**ZONE D SOUTH AND WEST**

| Posn | Callsign | Score | TX final | Power | RF amp | Aerial |
|---|---|---|---|---|---|---|
| 1 | G6GN | 408 | 3-20A | 30 | — | 46mb |
| 2 | G5DF | 362 | ACT22 | 60 | BFY90 | 46mb |
| 3 | G3SDS/P | 256 | 6-40 | 35 | AF186 | 46mb |
| 4 | G8CXH | 254 | 3-20A | 12* | BF180 | 14 |
| 5 | G8AAY | 207 | 3-20A | 28 | 2N5245 | 18pb |
| 6 | G3RZG/P | 196 | 6-40 | 35 | AF186 | 46mb |
| 7 | G8FMK | 117 | 2-6 | 6 | BF180 | 10 |
| 8 | G5HD | 74 | module | 6* | BF180 | 14 |
| 9 | G8AFA | 55 | 2-2C39A | 100 | AFY42 | 46mb |
| 10 | G8BKR | 43 | 3-20A | 25 | BF180 | 46mb |
| 11 | G3XFW | 21 | 6-40A | 22 | GM0290 | 8/8 |

**ZONE E WALES**

| Posn | Callsign | Score | TX final | Power | RF amp | Aerial |
|---|---|---|---|---|---|---|
| 1 | GW8ACG/P | 420 | DET24 | 25 | BF180 | 6/6 |

* Power output. † = SSB. mb = Multibeam. pb = Parabeam. s/r = Slots & reflectors.

# Looking ahead

**6-7 April 1974**—VHF Convention. "Winning Post", Whitton, Twickenham, Middlesex.
**16 May**—Radio Amateurs' Examination.
**17 May**—RAOTA reunion, Bonnington Hotel, Southampton Row, London WC1.
**14-15 September**—North-West Amateur Radio Convention, University of Lancaster, Bailrigg, Lancaster.
**31 October-2 November**—Midland National Amateur Radio Exhibition, Leicester.
**25 November**—RSGB lecture at the IEE.

# CLUB NEWS

**RSGB Affiliated Societies are invited to submit items for inclusion in this section to their Regional Representatives (not direct to the editor), whose addresses appear on page 141 of this issue, for inclusion in the appropriate regional section.**

**Items of news and dates of forthcoming events should reach RRs by the following date:**

**29 March for May issue.**

## REGION 1 — RR B. O'Brien, G2AMV

**Ainsdale ARC**—Contact N. Horrocks, G2CUZ, for details of meetings.

**Blackburn (ELARC)**—First Thursday of each month, 7.30pm. Edinburgh House, Shearbank Road, Blackburn. Sec—W. E. Baxendale, G8FDG, "Juverna", Westland Avenue, Darwen, Lancs.

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

**Bolton (B & DARS)**—Third Tuesday of each month, 8pm. "Clarence Hotel", Bradshawgate, Bolton. 2m net Tuesday nights at 1900gmt on 145·73MHz. Sec—S. Macdonald, G4AQB, 8 Archer Avenue, Bolton.

**Bury (B & RRS)**—Second Tuesday of each month, 8pm. Civic Hall, Bury. RAE and morse classes 7pm every Tuesday except the second Tuesday. Sec—Chris Kirby, G8HQW, 2 St Peter's Place, Haslingden, Rossendale. Tel Rossendale 4915.

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

**Cheshire (M-C ARC)**—Wednesdays, 7pm. Technical Activities Centre, Winsford Verdin Comprehensive School, Grange Lane, Winsford. Nets on 160m 7pm Mondays; 2m 7pm Tuesdays; 10m 7.30pm Thursdays. On Tuesdays RAE classes and slow morse transmissions are available. Please see sec G3SIQ for details. Chairman is G3JWK.

**Chester (C & DARS)**—Tuesdays, 8pm. YMCA, Chester. Except 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)**—Sec 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 11am Sundays on 145·65MHz. All visitors and prospective members welcome. Sec—G4AEQ, QTHR.

**Lancaster University (UoLARS)**—Every Wednesday, 7pm. Furness College. RAE and morse classes; active on hf bands and 2m using G3ZBY and G8DOU; gear also operational on these bands. Skeds and visits welcomed. Enquiries please to Colin Pegrum, Department of Physics.

**Leyland Hundred (ARG)**—Second Monday of each month, 7.30pm. Rose & 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. Sec—G3WCS.

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

**Liverpool University (UoLARS)**—Every lunch-time in the radio shack in the Students' Union. Formal meetings Mondays, 7.30pm. Active on all bands up to 70cm. Visitors always welcome. Annual dinner will be held in the Shaftesbury Hotel on Saturday 9 March, at 7.30pm. All friends and past members of the society are most welcome and full details and tickets are available from sec Mike Harbach, G8GMC, at 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. Sec—G3IOA.

**Manchester (SMRC)**—Fridays, 8pm. Sale Moor Community Centre, Norris Road, Sale, Cheshire. The vhf activity night is Monday, with operation of G3UHF on 2m from the club shack at "Greeba", Shady Lane, Manchester 23, from about 8pm. Visitors are welcome on either night. Morse lessons precede lectures on Friday nights.

8 March (Radio theory, parts 7 and 8), 15 March (Technical discussion, questions and answers), 22 March ("Digital frequency meters" by Alan Buxton, G8CZW), 29 March (Evening on 2m), 5 April (Visit of B. O'Brien, G2AMV, RSGB Region 1 Representative, and a mystery lecturer), 12 April (Radio theory—Questions and answers), 19 April ("RF spectroscopy" by M. Ware, G4BJT), 26 April (Home-built equipment contest), 17 May (AGM 8pm prompt).

The club also runs df practice contests; would anyone interested please contact G3WFT, QTHR.

**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 sec G. T. Phelan, G8EPS, at the University Union, Oxford Road, Manchester M13 0PL or G3AOS, QTHR.

**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)**—Second and fourth Thursdays of each month, 7.30pm. "Windsor Castle" (private room), St Paul's Square, Preston. Morse practice 7.30pm, main feature 8pm.

**Stockport (SRS)**—Second and fourth Wednesdays of each month, 8pm. Blossoms Hotel, Buxton Road, Stockport. 10 April (Receivers), 24 April (Electronic organs). Sec—G. R. Phillips, G3FYE, 6 Ross Avenue, Davenport, Stockport.

**Thornton Cleveleys (ARS)**—First and third Wednesdays, 8pm. St John Ambulance Brigade HQ, off Fleetwood Road North (behind Police Station), Thornton, Lancs. Project group meets on Fridays 7.15-9pm at the Project Laboratory, Rossall School, Fleetwood. Work in hand includes 160 and 2m transmitters and receivers. Please note acting sec is J. Duddington, G4BFH, The Grove, Thornton Cleveleys, Blackpool.

**Warrington (W & DARS)**—Every Tuesday, 8pm. Thames Board Mills Social Club, Alford Hall, Manchester Road, Warrington. Sec—G. H. Read, 2 Princess Avenue, Great Sankey.

**Wirral (WARS)**—First and third Wednesdays of each month, 7.45pm. Sports & Recreation Centre, Grange Road West, Claughton, Birkenhead. Sec—G3YGL.

**Wirral DX Association**—Last Thursday of each month at members' homes. Visitors are welcome—please inform sec beforehand. Sec—T. O'Neill, G4AHC, 41 Willoughby Road, Wallasey.

**Merseyside** members meet for lunch on the first Monday of every month. It is essential to book beforehand and obtain details of the venue from either G3VQT or G2AMV.

## REGION 2 — RR J. E. Agar, G8AZA

**Barnsley (B & DARC)**—Meets at King George Hotel, Peel St, Barnsley. Details from PRO P. Ackley, G3LRP, QTHR, or hon sec—P. Garbutt, G2AFV, QTHR.

**Bradford (BRS)**—Meets at 10 Southbrook Ter, Bradford 7 (Nr Chestor St bus station) at 7.30pm. Details from PRO B. Ackroyd, G8GOV, QTHR.

**Doncaster (DCTARS)**—Mondays, 7pm (during term time). Doncaster College of Technology (Refectory). Club callsign G3UER. Details from hon sec—G4AWT, QTHR.

**Durham (County) (Durham Contests Club)**—c/o R. Henderson, 5 Laxton Close, High Grance, Wolviston, Teeside. Club callsign G4ANR.

**Durham (City) (DCRS)**—c/o G3LIV, 5 Lancashire Drive, Mow Park Estate, Belmont, Durham.

**Easington (EAR & EC)**—Tuesdays and Thursdays, 7.30pm. Easington Workingmen's Club, Easington, Peterlee. Nightly net on 28·750MHz at 1930z. G3VSS, QTHR.

**GDX Club (GDXC)**—c/o B. J. Stork, G3VUU, 20 Oakdale Ave, Bradford 6, Yorks.

**Goole (G & DARS)**—Fridays, 7.30pm. Goole Grammar School. Visitors welcome. Hon sec—G4CIS, QTHR.

**Halifax (NHARS)**—6 March (Committee meeting), 13 March ("A.M. transmitters" by Mr L. M. Dougherty, MSc, FRSE), 20 March (Ragchew), 27 March ("VHF/P working" by Mr J. Hey, G3TDZ), 3 April (Committee meeting), 10 April (AGM), 17 April (Meeting the new committee), 24 April (Junk sale), 7.45pm. Peat Pitts Inn, Ogden, Nr Halifax. *G3MDW*, QTHR.

**Harrogate (H & KRS)**—Mondays, 7.30pm. Further Education Annexe, 64 Chain Lane, Knaresborough. Hon sec—G4AZJ, QTHR. Tel Knaresborough 3494.

**Hartlepool (HARC)**—11 March ("PSU for valves" by G3NWU), 18 March (Quarterly junk sale), 25 March ("Practical introduction

to cw" by G3AWL). Mondays, 7.30pm. Grange Road Methodist Church (side entrance). Hon sec—J. W. Thompson, G3NWU, QTHR.

**Hull (H & DARS)**—Fridays, 7.45pm. 592 Hessle Road, Hull. Details from G8GDD, QTHR.

**Hull (HUR & ES)**—Department of Engineering, The University, Hull.

**Leeds (WRRS)**—Wednesdays. 83 Town St, Armley, Leeds. Details from G3VTY, QTHR.

**Mexborough (M & DARS)**—Meets at Free Christian Church Hall, College Rd, Mexborough. Details from G8FUV, QTHR.

**Middlesbrough (POARC)**—Thursdays, 7.30pm. 200 Marton Rd, Middlesbrough. Callsigns G4BAY and G8GPO. Details from G8CDP, QTHR. Tel Midd 38237.

**Morpeth (NRC)**—Thursdays, 7pm. 3 Wheatsheaf Yard, Morpeth. Details from G4AVO, QTHR.

**Otley (ORS)**—Tuesdays, 7.30pm. Details from G8BZY, QTHR.

**Scarborough (SARS)**—Fridays, 7.30pm. Technical College, Scalby Rd, Scarborough. Details from G3VAN, QTHR, or G8KU, QTHR.

**Sheffield (SARC)**—18 March ("7Q7 Land" by G3JCJ), 22 April ("Microwaves" by G4JW Shield winner G8AGN). 7.30pm. Sheffield University. Details from G3PHO, QTHR. Tel Sheffield 306956.

**South Shields (SS & DARC)**—Fridays, 8pm. Trinity House Social Centre, Laygate, South Shields. Details from G3SFL, QTHR.

**Spen Valley (SVARS)**—Meets at Grammar School, High St, Heckmondwike. Details from G8DSB, QTHR.

**Sunderland (SARS)**—Meets at Sunderland Polytechnic. Details from G3XID, QTHR.

**Tyneside (TARS)**—Mondays, 7.30pm. Community Centre, Vine St, Wallsend-on-Tyne. Details from G. Lowden, 21 Winefred Gdns, Wallsend. Tel 627878.

**UK FM Group (Northern)**—First Sunday of each month, 7.30pm. Bush Hotel, Kineston, Barnsley. Nightly net on 144·48MHz at 2230 to 2300gmt. Hon sec—G3WQA, QTHR.

**Wakefield (W & DRS)**—Alternate Tuesdays, 7.30pm. Youth Centre, Ings Road, Wakefield. Details from G3XVU, QTHR.

**York (YARS)**—Thursdays, 7.30pm. RAE class in progress. 61 Micklegate, York. Details from G3WVO, QTHR.

## REGION 3 — RR B. Kennedy, G3ZUL

**Birmingham (MARS)**—19 March ("An historical survey of the measurement of time and frequency", by G2RQ). 7.45pm. Birmingham and Midland Institute, Margaret St. *G3ZKO.*

**(Slade)**—No information. Alternate Fridays, 8pm. Committee room, Church House, Erdington. *G4BRT.*

**(South)**—6 March ("Raynet", by Mr. A. Dennis). 8pm. Hampstead House, Fairfax Rd, Birmingham 31. *G8GDZ.*

**Coventry (CARS)**—Friday, 8pm. Baden Powell House, St Nicholas St, Radford Rd, Coventry. *G3TFA.*

**Dudley (DARC)**—5, 19 March, 2, 30 April. 8pm. Central Library, St James's St, Dudley. *G3PWJ.*

**Hereford (HARS)**—First and third Fridays of each month. Civil Defence HQ, Gaol St, Hereford. *G4CNY.*

**Lichfield (LARS)**—First Monday and third Tuesday of each month. Swan Hotel, Bird St, Lichfield. *G3NLY.*

**Mid-Warwickshire (MWARS)**—4 March ("Slow scan tv", by G3YQC and G8DLX). Each Monday, 8pm. 28 Hamilton Terrace, Leamington Spa. *G8GDY.*

**Rugby (RDAR & EC)**—Informal meetings on first Tuesday of each month. Lawrence Sherriff Arms, town centre. *G3YQC.*

**Solihull (SARS)**—19 March (RSGB tape lecture on dx aerials and station working for contests), 16 March (Open day—club will man two stations, Top Band and 2m using the club call G3GEI). Manor House, High Street, Solihull. *G4AEJ.*

**Staffs (North)**—Every Monday, 8pm. Harold Clowes Community Centre, Ubberley Rd, Bucknall, Stoke-on-Trent.

**Stourbridge (STARS)**—5 March (Informal), 18 March (AGM), 2 April (Informal), 15 April ("Civil communications", by G6GR). Third Monday of each month. Longlands School, Brook St, Stourbridge. Informals at "Shrubbery Cottage", Heath Lane, Stourbridge. *G8HUQ, 17 Mill Rd, Cradley Heath, Warley, Worcs.*

**Willenhall (WDARC)**—13 March (AGM), 27 March ("Short wave listening", by J. E. Churms), 10 April ("Piped tv", by G4CFP), 24 April (Natternite). Morse classes at end of each meeting. "The Three Crowns", Stafford St, Willenhall. *G4CFR.*

**Wolverhampton (WARS)**—Neachell's Cottage, Stockwell End, Tettenhall, Wolverhampton. *G3UBX.*

**Worcester (WARS)**—"Old Pheasant", New St, Worcester, *G8ASO, Tel Worcester 29208.*

**Wrekin (WARS)**—6 March (Films), 13 March (To be announced), 20 March (Part 1—Construct club project), 29 March (AGM). Wednesdays, 8pm. Ketley Bank Youth Centre, Nr Oakengates. (Except first Wednesday in month when at Walker Technical College, Nr Wellington). *G3UKV.*

**Would club secs please be sure information for the next "Club News" reaches me by 29 March as I shall be on holiday for three weeks after this date . . . G3ZUL.**

## REGION 4 — RR T. Darn, G3FGY

**Derby (DADARS)**—6 March (Surplus sale by auction), 13 March ("Tape editing", by John Stiles of BBC Radio Derby), 20 March (AGM), 27 March (Technical film show), 3 April (Surplus sale by auction), 10 April (Club visit, details later), 17 April (Direction finding practice), 24 April (Film night). Club Room, 119 Green Lane, Derby. Visitors are always welcome. A summer dinner will be held at Ilkeston on Saturday 29 June followed by the RSGB DF Qualifying Event on Sunday 30 June. Derby Rally, Sunday 11 August.

**Derby (NHCAARG)**—3 March (First DF run of 1974. Callsign G3EEO/P), 8 March (Call my bluff, quiz by G3VKH and G8GBU), 15 March (Open forum about the rally), 22 March (Home-brew (or kit) night, bring all your home-brew equipment), 29 March (Preparation for CQ WWPX Contest), 5 April ("The amateur and the car", by D. Barker, G8GBU), 7 April (2nd 1974 DF run), 12 April (Technical film show), 19 April (Junk sale by auction), 26 April ("Low voltage power supply units", by S. L. Norman, G8DBO). 7.30pm. Nunsfield House Community Centre, Boulton Lane, Alvaston, Derby. *G8GBV.*

**Grimsby (GARS)**—14 March (RSGB tape slide lecture), 28 March (Members talk; awards and contests), 11 April (DF hunt), 25 April (VHF evening). Alternate Thursdays. Community Centre, Dunmore St, Grimsby. *G8HAE.*

**Kettering (KADARS)**—Heard nothing from Kettering for a while but presume that meetings are still being held on the second Wednesday of each month, 8pm. Youth Centre, School Lane, Kettering.

**Mansfield (MARS)**—First Friday in each month. New Inn, Westgate, Mansfield. Club sec—G3XWZ.

**Hinckley (HARAES)**—Alternate Wednesdays, 7.30pm. Hinckley College of Further Education. A programme has been arranged to cover amateur radio topics and the use of club vhf equipment. They are again organizing a mobile rally to take place on 12 May. Further information from hon sec—G4CAJ.

**Lincoln (LSWC)**—6 March (Project night—2m converter), 13 March (Films), 20 March (Talk, to be arranged), 27 March (G3IXH "on the air"), 3 April (Project night—2m converter), 10 April (Films), 17 April (Open night), 24 April (Treasure hunt). Every Wednesday. Lincoln Astronomical Society, off Burton Rd, Lincoln. Gordon Coggin has now taken over as hon sec from Fred Day, G4BXL, and all radio enthusiasts in the Lincoln area wish me to thank Fred on their behalf for his past services to the club.

**Melton Mowbray (MMARS)**—15 March (Tape lecture by G6JQ on his recent trip to America), 19 April (Junk sale and open discussion evening). 7.30pm. St John Ambulance Hall, Asfordby Hill, Melton Mowbray. *G3NVK.*

**Nottingham (ARCON)**—Thursdays, 7.30pm. Sherwood Community Centre, Mansfield Rd, Sherwood, Nottingham. At recent meetings there has been an interesting talk on low definition tv by some local chaps who are investigating the Baird system and seeing if it can be modernized. A Raynet group has also been formed and this meets on the second Wednesday of each month at 7.30pm Member Mike Harris, G3VUI, is now in Antarctica with the callsign VP8NO and it is hoped to contact him over the air from the club. *G4AFJ.*

## REGION 5 — RR P. J. Simpson, G3GGK

**Cambridge (C & DARC)**—5 April (Slow scan tv demonstration by G3VKP). 7.30pm. Civil Service Sports Club, Brooklands Avenue, Cambridge. Every other Friday is informal at club HQ. Hon sec—Sam Stimson, G5BBP, 2 Burns Way, St Ives, Huntingdon.

**Dunstable Downs (DDRC)**—8 March (Between week), 15 March ("VHF/UHF radio for aircraft and airfield control" by K. R. A. Cepa), 22 March (Between week), 29 March (Film, *How to hand solder electronic equipment*—Multicare Solders), 5 April (Between week), 12 April (No meeting), 19 April (Between week), 26 April ("History of vhf mobile radio" by G3GGK), 3 May (Between week). 8pm. Chews House, 77 High Street South, Dunstable, Beds. Hon sec—C. G. Powell, G8BPK, 1 Wenwell Close, Aston Clinton, Aylesbury, Bucks.

**Peterborough (PR & ES)**—15 March (Alignment of 2m transmitters), 19 April (Junk sale and social). 7.30pm. Scout Hut, Lincoln Road, Peterborough. ASR—Peter Chilcott, G4BBA, 258 Coneygree Road, Stanground, Peterborough PE2 8LR.
**Stevenage (S & DARS)**—7 March (Between week), 21 March (AGM), 5 April (Between week), 18 April (Tape lecture and slides —Andorra 73 dxpedition). 8pm. Hawker Siddeley Dynamics Ltd, Gunnels Wood Road, Stevenage, Herts. Hon sec—Cliff Barber, G4BGP, 473 Canterbury Way, Stevenage, Herts SG1 4EQ.

**REGION 6** **RR L. W. Lewis, G8ML**

**Cheltenham RSGB Group**—First Thursday in each month, 8pm. Royal Crescent Hotel, Clarence Street, Cheltenham.
**Cheltenham (CARS)**—Every Wednesday, 8pm. St Marks And Hesters Way Community Centre, Brooklyn Road, Cheltenham. *G8DVA.*
**Banbury (BARS)**—Fridays at 43 North Bar, Banbury. Details from G3LTN. Tel Banbury 710623.
**Gloucester (ARS)**—First Thursday in each month, 7.45pm. The Oddfellows Club, Eastgate Street, Gloucester. Each remaining Thursday, 7pm. Leisure Centre, The Old Drill Hall, Painswick Road, Gloucester. *G3MA.*
**Milton Keynes (MK & DRS)—(Formerly North Bucks ARS)**—Second Monday of each month. Wolverton Youth Club. 11 March (Talk on "Test equipment" by representative of Techtronics), 11 April (Tape/slide lecture. "Dxpedition to Andorra" by G8CHK).
**South Bucks VHF Club**—First Tuesday in each month. Bassetbury Manor, High Wycombe. 5 March (Annual surplus sale). *G8DDM.*

**REGION 7** **RR R. S. Hewes, G3TDR**

**Acton, Brentford & Chiswick (ABCRC)**—19 March (Film from VK2FU), 16 April (2m ssb transceiver—stage one by G3CCD). 7.30pm. Chiswick Trades and Social Club, 66 High Road, Chiswick W4. Hon sec—W. G. Dyer, G3GEH.
**Addiscombe (AARC)**—Tuesdays, 9pm. "Prince George", High Street, Thornton Heath. Hon sec—S. F. Knowles, G3UFY, QTHR.
**Ashford, Middlesex (Echelford ARS)**—11 March (To be announced), 28 March (AGM), 25 April (To be announced). 7.30 for 8pm. St Martin's Court, Kingston Crescent, Ashford, Middlesex. Hon sec—Vic Higgs, G3WVJ, QTHR.
**Barking (BR & ES)**—Mondays (Morse class), Tuesdays (RAE class), Wednesdays (OP's night), Thursdays (General), 7.45pm. Visitors welcome any Thursday. Westbury Adult Centre, Westbury School, Ripple Road, Barking, Essex. Hon sec—R. Clark, G8BXC, QTHR.
**Burnham Beeches (BBARC)**—First and third Thursdays in each month, 8pm. Hedgerley Scout Hut, Hedgerley, Nr Slough, Bucks. Hon sec—Margaret McCabe, G8HCO, QTHR.
**Cheshunt (CDRC)**—First Friday in each month, 8pm. Methodist Church Hall, opposite Theobalds Station. Hon sec—Richard Ludwell, G3ZZQ, QTHR.
**Chingford (Silverthorn RC)**—Fridays, 7.30pm. Friday Hill House, Simmonds Lane, Chingford E4. Hon sec—M. Higgins, G8BUF, QTHR.
**Cray Valley (CVRS)**—7 March ("Linear amplifiers" by Peter Chadwick, G3RZP, of KW Communications), 21 March (Natter nite), 4 April (AGM), 18 April (Natter nite), 2 May (Talk by R. J. Hughes, G3GVV). Hon sec—P. F. Vella, G3WVP, QTHR.
**Croydon (Surrey Radio Contact Club)**—Third Tuesday in each month, 8pm. "The Ship", 47 High Street, Croydon. Hon sec—Sid Morley, G3FWR, QTHR.
**Crystal Palace (CP & DRC)**—16 March ("Digital circuitry part two—counters", by Bob Fairburn, G8HAX), 20 April (To be announced). 8pm. Emmanuel Church Hall, Barry Road, SE22. Hon sec—Geoff Stone, G3FZL, QTHR. (01-699 6940).
**Dartford Heath DF Club**—Fridays, 8pm. The Scout Hut, Broomhill Road, Dartford. Hon sec: Maureen Worby, G3XXC, QTHR.
**East London RSGB Group**—17 March ("FAX for all", by G8GGU), 21 April (Business meeting), 19 May (Jermyn Industries: talk, slides on radio hardware and devices). 3pm. Wanstead House, The Green, Wanstead E11. (Buses: 66, 10, 20, 101, 167. Underground: Wanstead Central Line Station.) All SWLs, transmitting amateurs and friends very welcome.
**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.
**Edgware (E & DRS)**—14 March ("TVI, prevention or cure", by G3OHX and G3VUQ), 28 March (Film show), 11 April (Constructors

**Mr E. Godfrey, G3GC, chairman of Edgware & DRS, (centre) with the winners of the club trophies, J. Bluff, G3SJE (left), Constructor's Cup; and A. Ling, A7521 (right), DF shield, at the society's AGM on 10 January**

contest), 25 April (Informal G8ERS on the air), 8pm. Watling Community Assn, 145 Orange Hill Road, Edgware. Hon sec—Alan Masson, G3PSP, QTHR. (01-950 6827).
**Farnborough (Bromley RC)**—Third Monday in each month, 8pm. 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 (H & DRS)**—Tuesdays, 8pm. Mark Hall Barn, First Avenue, Harlow, Essex. Hon sec—Vic Heard, 106 Vicarage Wood, Harlow.
**Harrow (RSH)**—Fridays, 8pm. Harrow Sea Scouts HQ, Woodlands Road, Harrow, Middlesex. Refreshments available during evening. Hon sec—Les Light, G3KDL, QTHR.
**Havering (H & DARC)**—13 March (Members slide evening—the Thames, a talk by D. Garity), 27 March (Rutland Business meeting final arrangements for GB3RUT/GB2RUT), 10 April (Beam rotation indication, magslips, delsyns, talk by G3KFW), 24 April (RSGB films selection from RSGB library). Members please note alternate Wednesdays are informal natter nights, 8pm. British Legion House, Western Road, Romford. Hon sec—K. S. Hutchinson, G4ALN.
**Holloway (Grafton RS)**—Fridays, 7.30pm. Archway School Annexe, Whiltington School, Highgate Hill N19. Hon sec—H. D. Ashcroft, G8AYU, QTHR.
**Ilford RSGB Group**—Thursday, 8pm. Mortlake Road (off Ilford Lane), Ilford, Essex. Hon sec—Derek Sapsworth, G3YMW, QTHR.
**Kingston (K & DARS)**—13 March ("Amateur television", by Mike Bues, G8AAI/G6OPB/T, with a practical demonstration), 10 April ("Digital frequency counters and clocks", by Don Shepherd, G3YNP), 8pm. The Berrylands Scout Troop, Stirling Walk, off Grand Avenue (behind Surbiton Lagoon), Berrylands, Surrey. Hon sec—Dick Babbs, G3GVU, QTHR.
**Loughton (L & DRS)**—Second and fourth Fridays in each month, 8pm. Loughton Hall, nr Debden Station. Hon sec—David Bowers, 12 Theydon Park Road, Theydon Bois, Epping, Essex.
**New Cross (Clifton ARS)**—Every Friday. March 8 ("Varicaps", by Robin Hewes, G3TDR), 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, 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)**—15 March (Subject to confirmation meeting to be held at TAVR centre, Marlpitt Lane), 5 April (Natter nite), 19 April (To be announced), 8pm. Lansdowne Hall, Lansdowne Road, Purley, Surrey. Hon sec—M. H. Roach, G3TWJ, QTHR.

**Reigate (RATS)**—19 March ("VHF", by G3DAH), 16 April (AGM), 8pm. St Mark's Church Hall, Alma Road, Reigate, Surrey. 5 March, 2 April (Natter night), 8.30pm. "Marquis of Granby", Hooley Lane, Redhill, Surrey. Hon sec—F. H. Mundy, G3XSZ, QTHR. Tel Reigate 43130. All visitors welcome.

**St Albans (Veralum ARC)**—20 March, 24 April, 8pm. Market Hall, St Albans, Herts. All visitors welcome. Hon sec—Hugh Young, G3YHY, QTHR.

**Southall (UK FM Group, London)**—Second Tuesday in each month, (March meeting, junk sale), 8pm. The Scout Hut, Hayes Road, Southall, Middlesex. PRO—Roger Wilkins, G3XFA, QTHR. Tel Heathfield 2189.

**Southgate (SRC)**—14 March ("Electrical activity of the heart", by Bob Williamson), 11 April (Junk sale/film show). 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)**—26 March (Dx-pedition to Andorra, tapes and slides), 16 April (AGM), 7.30pm. The Library, Cheam. Hon sec—Alan Keech, G4BOX, QTHR.

**Welwyn (Mid-Herts ARS)**—Second Thursday in each month. 14 March (Annual constructors contest and films of radio/electronic interest), 11 April (Quiz challenge on radio amateur topics—teams from other clubs invited), 8pm. Welwyn Civic Centre, Prospect Place, Old Welwyn. PRO—Maurice A. Pyle, G2BLA, QTHR. Tel Welwyn 4685.

**Wimbledon (W & DRS)**—Second and last Thursday 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)**—Meetings now held on the first Thursday of each month, 7.30pm. "Westgate Hall', Room 2. Details of future events from G3XDV, QTHR.

**Maidstone (MYMCAARS)**—1 March ("160m Tapes", by G3ORP), 8 March (RAE), 15 March ("A second look at binary", by G8HLE), 22 March (RAE), 29 March ("Testing semiconductors").

**University of Kent (UKC)**—Details of club meetings from K. Beesley, G3UXE, Eliot College, University of Kent, Canterbury.

**Worthing (W & DARC)**—Tuesdays, mainly RAE/morse and constructional classes; second and fourth Thursdays, talks and lectures, 8pm. Rose Wilmot Youth Centre, Littlehampton Road, Worthing.

**Medway (MARTS)**—Fridays. Aurora Hotel, Gillingham, Kent. Further information from hon sec H. E. Willis, 111 Laburnum Road, Rochester.

**Crawley (CARC)**—Fourth Wednesday in each month. United Reform Church Hall, Ifield, Crawley. Details from G3MGL, QTHR.

**Eastbourne (SARS)**—First Monday in each month. Victoria Hotel, Latimer Road, Eastbourne. PRO: G3JFM.

**Horsham (HARC)**—Formal meetings, Guide HQ, Denne Road, Horsham. Informal meetings at "Star", Roffey. Details from T. Wadsworth, G3NPF, QTHR.

**Mid Sussex (M-SARS)**—Meetings held at Marle Place, Leylands Road, Burgess Hill. Details from G3RXJ, QTHR.

## REGION 9 — RR H. W. Leonard, G4UZ

**Bath (B & DRG)**—Every Monday, 8.30pm. The Crypt, Church of the Ascension, Oldfield Park, Bath. Full details from G8DRK. Tel Bath 23465.

**Bristol City & County RSGB Group**—25 March "(World War 2 airborne radar equipment", by Dr Winbolt), 29 April ("VHF", by Geoff Stone, G3FZL). New officers: chairman, G3XOD; vice-chairman, G8CKJ; treasurer, G3YLJ. 7pm. Becket Hall, St Thomas Street, Bristol 1. *G3ULJ.*

**Bristol (BARC)**—Every Tuesday, 7.45pm. 24 Bright Street, Barton Hill, Bristol 5. *G4BZZ.*

**Bristol (Shirehampton ARC)**—Membership rapidly approaching 50. Every Friday, 7.30pm. Twyford House, Shirehampton, Bristol. RAE class each Friday and the RAE may now be taken at Twyford House. Prospective new members cordially invited. *G4BOL.*

**Bristol (University ARS)**—Most Saturdays during term time, 2.30pm. Dept of Physics, Royal Fort, Tyndall Ave, Bristol BS8 1TL. All details from G3WDG.

**Cornish (CRAC)**—First Thursday in month. 7 March ("Ship to shore communication", by Mr D. Smith of Lands End Radio GLD), 4 April (AGM followed by "DBs and all that", by G3OCB), 2 May ("Slow scan TV", by G3LPB. 7.30pm. SWEB Club Room, Pool, Camborne.

**West Cornwall (CRAC)**—Alternate Wednesdays. 28 March ("Colour tv reception", by Keith Watkins), 7.30pm. The Guildhall, Penzance. Full details of Cornish and West Cornwall clubs from G3NKE, QTHR. Tel Camborne 2419.

**Exeter (EARS)**—Second Monday of each month. 11 March (Proposed visit to STC at Paignton), 7.30pm. ATC Hut, Colleton Hill, The Quay, Exeter. RAE class *every* Wednesday at 7.30pm. Hon sec: Jack Bawden, 232 Exwick Road, Exeter EX4 2BA.

**Newquay (N & DARS)**—Welcome to a new society. Meetings *pro tem* at 41 Crantock Street, Newquay TR7 1JJ. Alternate Wednesdays, 7.30pm. Full details from G3THT.

**North Devon (NDRC)**—Second and fourth Wednesdays. 13 March (Talk), 27 March (Ragchew), 10 April (Talk), 24 April (Ragchew), 8.30pm. "Crinnis", High Wall, Barnstaple EX31 2DP. *G4CG.*

**Plymouth (PRC)**—First and third Tuesdays. 5 March (Film show), 19 March ("Radio df techniques"), 2 and 16 April (To be arranged), 7.30pm. Virginia House, Bretonside, Plymouth. Visitors always welcome. *G3UVS.*

**Saltash (S & DARC)**—First and third Fridays, 7.30pm. Burraton Toc H Hall, Warraton Road, Saltash. *G3XWA.*

**South Dorset (SDRS)**—First *Monday* each month. 7.30pm. For meeting place contact G8BCH.

**Taunton (T & DARS)**—Every Friday, 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 of month. 9 March (Annual dinner at Templestowe Hotel), 30 March ("VHF equipment", by G3ABU), 27 April (AGM), 7.30pm. Rear of 94 Belgrave Road, Torquay. Visitors most welcome. *G3UIQ.*

**West Dorset VHF Group**—Welcome to another new group. First Wednesday each month. 7.30pm. Victoria Hotel, Dagmar Road, Dorchester. Chairman, G8HVP; treasurer, G8HVY; hon sec, Mrs V. March, 27 Great Western Road, Dorchester.

**Weston-super-Mare (WsMRS)**—Second Friday each month, 7.30pm. Room Lewis M2, Worle School, New Bristol Road, Worle. *G3PQE.*

**Yeovil (YARS)**—Every Thursday. 7 March ("Metal work and home construction," by G8FCF), 21 March ("Brains Trust" chaired by G8AFA). RAE coaching by G3FXW every meeting. 7.30pm. The Youth Centre, 31 The Park, Yeovil. *G3NOF.*

## REGION 10 — RR D. M. Thomas, GW3RWX

**Material for Club News entries should in future be sent to Mr. R. G. Barrett, GW8HEZ, QTHR, Deputy RR.**

**Blackwood ARC**—Fridays, 7pm. Oakdale College of Further Education, Oakdale, Mon. Ambitious plans are being made for a convention in September, details of which will be announced later. *GW3KYA.*

**Barry College of Further Education ARS**—Thursdays, 8pm. Barry Rugby Club. First and third Thursday of each month, film show; second and fourth Thursdays, talks. 14 March ("Use of electronics in film", by Mr R. G. Barrett, GW8HEZ). Sec, GW3VPB.

**Cardiff RSGB Group**—11 March ("Introduction to meteor scatter", by GW3NJW. 7.30pm. BBC Social Club, Newport Road, Cardiff. The annual mobile picnic will be held at Porthkerry Park, Glam, in May; details to be notified later. *GW3GHC.*

**Hoover ARC**—Mondays, 7.30pm. Hoover Social Club, Hoover Works, Pentrebach, Nr Merthyr, Glam. *GW3RNC.*

**Mid-Glamorgan VHF Group**—Third Tuesday in each month. NCB staff members club, Tondu, Nr Bridgend, Glam. *GW3ZTH.*

**Pembroke RSGB Group**—Last Friday of each month, 7.30pm. Defensible Barracks, Pembroke Dock. *GW4AKO.*

**Pontypool RSGB Group**—Tuesdays, 7pm. Educational Settlement, Rockhill Road, Pontypool, Mon. *GW3JBH.*

**Port Talbot ARC**—Second Tuesday of each month, 7.30pm. Rail & Transport Club, Station Road, Port Talbot. Annual social on 9 April. A cordial invitation is extended to all South Wales amateurs and their ladies. Will all intending to be present please notify the secretary of their intentions not later than one week in advance of the event. G. Watson, 19 Kelvin Road, Clydach, Swansea, Glam.

**Rhondda ARS**—Rhondda Transport Employees Club & Institute, Porth, Rhondda. Details from GW3PHH.

**Sully & D Short-wave Club**—Tuesdays, 7pm. Sully Bowls and Social Club Annexe, 59 Port Road, Sully, Glam. Sec, GW4CJC.

**Swansea RS**—12, 26 March and 23 April. 7.30pm. Commercial Inn Killay, Swansea. *GW4BIQ.*

**University College of Wales, Aberystwyth R & ES**—Details from the secretary, c/o Students Union, University College of Wales, Aberystwyth.

**University College of Wales, Cardiff**—Details from the secretary, Students Union, Dumfries Place, Cardiff.

## REGION 11 — RR P. Hudson GW31EQ

**Rhyl & District ARC (R & DARC)**—12 March ("Electroptical communications" by Mike Theaker), 9 April (Quiz — RAE), joint meeting Conway Valley, Flint and Rhyl. Please note all meetings are cancelled during the period of the present fuel emergency.
**Bangor (UCNWARS)**—4 March (Presidential address by Prof. I. M. Stephenson).
**Conway Valley (CVARC)**—14 March ("Top Band operation," by GW3GCZ), 9 April (Joint meeting at Rhyl — RAE quiz).

## REGION 12 — RR A. J. Oliphant, GM3SFH

**Aberdeen ARS**—Every Friday, 7.30pm. Hall behind 91 Crown Street, Aberdeen. 8 March (Demonstration of a direct conversion receiver by D. Kelman, GM4BVC), 15 March (Discussion on technical topics), 29 March (Talk on digital frequency measurement by D. Young). Further details from hon sec—Mr. S. Sutherland, GM4BKV, 67 Greenfern Road, Mastrich, Aberdeen.
**Caithness ARS**—Every second Tuesday in the month. Details from GM4BKO, QTHR. Thurso 3704.

## 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. 14 March (Contest techniques), 28 March (Outside visit), 11 April (Quiz), 25 April (Talk by GM4AOR). 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.

The club held an open evening and combined it with a Fife district meeting of radio amateurs in the Dunnikier House Hotel, Kirkcaldy, on 21 November 1973. The club's committee was very pleased with the turnout of over 80 amateurs and SWLs. Visitors travelled from Perth, Lanark, Edinburgh and from Berwick-on-Tweed. On display were several items of club members' equipment and stations set up on 80 and 2m, the latter being used for talk-in purposes.

The meeting was opened by the club chairman, Stan Smith, GM8IEH, and after formally welcoming the visitors he introduced the guest speakers, Sandy Smith, GM3AEL, and Harry Cook, GM8FXZ, who talked on "The advantages of being a member of the national radio society and local radio club" and "Modulation", respectively.

After question time light refreshments were served as everyone got together to meet old and new friends. A most enjoyable time was had by all and it is hoped that this venture by the club will not be the last.

**St Andrews (UStAARS)**—Details from R. Marchant, GM3ZCQ, Dept of Physics, North Haugh, St. Andrews.

## REGION 15 — Deputy RR H. J. Campbell, GI8FOK

**Bangor (B & DARS)**—First Friday in each month, 8pm. Redcliff Hotel, Seacliff Road, Bangor. Hon sec—J. T. Barnes, GI3USS, QTHR.
**Belfast RSGB Group**—Third Wednesday in each month, 8pm. 90 Belmont Road, Belfast. New members and visitors always made welcome. Information from H. J. Campbell, GI8FOK, QTHR.
**Mid-Ulster RSGB Group**—First Sunday in each month, 3pm at GI4BAC, QTHR. Interesting programme arranged. All welcome. Hon sec: R. F. S. Sinton, GI3ONF, QTHR.

The City of Belfast YMCA Radio Club was founded in December 1923 and to complete their Golden Jubilee year of celebrations a reunion was held in the clubroom at which over 30 members and former members attended. To mark the occasion it was decided to present something right up to date in the amateur radio field and so a lecture and demonstration on sstv was arranged and given by Mervyn Anderson, G3WWY, and Bob Sinton, GI3ONF, both from Tandragee, Co Armagh.

## REGION 16 — RR E. T. Jacobs, BRS32513

**Ipswich (IRC)**—13 March (Lecture), 27 March (No details), 10 April (AGM), 24 April (no details). Handford House, Ranelagh Road, Ipswich. Details from hon sec—P. Hubert, G3YNM.
**Great Yarmouth (GYRC)**—Last Thursday in each month. 67 Southdown Road, Gt Yarmouth. Details from hon sec—A. D. Besford, G3NHU.
**Lowestoft (L & DARC)**—Twice weekly, 7.30pm. YMCA, Park Road, Lowestoft. Details from hon sec—R. P. Finch, G4AJO.
**Vange (VARC)**—Every Thursday, 8pm. Youth Hall, Barstable Community Centre, South Riding, Basildon. Details from Mrs D. Thompson, 10 Feering Row, Basildon.
**Chelmsford (CARC)**—First Tuesday in each month, 7.30pm. Marconi College, Arbor Lane, Chelmsford. Details from hon sec—W. L. Pechey, G4CUE, Berkeley, Tye Green, Good Easter, Chelmsford.
**Colchester (CRA)**—Most Wednesdays, 7.30pm. Garrison Amenity Centre, Reed Hall, Colchester. Details from hon sec—E. T. Jacobs, 26 Pondfield Road, Colchester.
**Stowmarket (G & DARC)**—Details from hon sec—A. P. Ashton, G3XAP.
**Colchester (UEARS)**—Details from hon sec—A. E. Green, G4ABB.
**Norwich (UEAR & EC)**—Room 029, U E A Village. Details from hon sec—P. Gowen, G3IOR.

## REGION 17 — RR L. Hawkyard, G5HD

**Reading (RARC)**—Alternate Tuesdays, 8pm. The "White Horse", Emmer Green. *G4BLT*.
**Bracknell (BARC)**—Mondays, 8pm. Coopers Hill Community Centre. Morse sessions, etc. *G3YMC*.
**Portsmouth (P & DARC)**—Every Wednesday, 7.30pm. Portsmouth Community Centre, Malins Road, Buckland, Portsmouth. Visitors and new members welcome. *G3CNO*.
**Winchester (WARC)**—Meetings every Friday. Antrim House basement, St Cross Road. *G4BKE*. Tel Win 61133.
**Basingstoke (BARC)**—1st and 3rd Saturday in each month. Chineham House, Popley, Basingstoke. *G3CBU*.
**Swindon (SDARC)**—Meetings on Wednesdays. Penhill Junior School, Swindon. *G3YKC*.


**Bill McGonigle, GI3GXP, zonal manager for RSGB, presenting certificate No 1 of the GI6YM Golden Jubilee and Marconi Kemp Award to Bob Barr, GI5UR. Other winners are Steven Ruff (third from left) GI8EWM; Hugh Carmichael, GI6VU; Hugh Irvine, (third from right) GI3TLT; SWL Jonathan Ruff, and John Ruff, GI3ZJR. The gentleman with beard is Howard Campbell, GI8FOK, assistant area representative for RSGB** (*Photo: GI3GTR*)

**Oldest member and vice-president of the YMCA Radio Club, Eddie Beat, GI3AV, cutting the cake at the club's reunion. Also in the picture, from left, Frank Campbell, chairman; Bob Barr, GI5UR, vice-president; Joe Beattie, GI3NQH; Bob Boal, GI3AXI, president; John Ruff, GI3ZJR, and Cedric Rourke, GI3IVJ. Eddie was the original licensee when the club obtained its call GI6YM in 1926**
*(Photo: GI3GTR)*

**Harwell (AERE RC)**—Meetings on the third Tuesday of each month, also informal meetings on every Friday lunch time. The Social Club, AERE, Harwell, Berks. *G3NNG.*
**Southampton RSGB Group**—Saturday 9 March and 20 April. Lanchester Building, Southampton University. All welcome. Also at the Clubroom, Kent Road. *G4AEU.*

**UK FM Group (Southern)**—First Wednesday in each month, 8pm. Chineham House, Popley, Basingstoke. *G8BIH.*
**Farnborough (F & DRS)**—Second and fourth Wednesdays of each month. 8th Farnborough Air Scouts Hut, Rectory Road, Recreation Ground. *G8FWE.* Tel Camberley 22887.

# 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

**KW2000A** plus ac psu, new pa valves, Shure mic, vgc, £140. Eddystone 940 g/c rx vgc, £80. 2m a.m./cw tx, vfo and crystal psu, £22. HY-Gain 14AVQ vert aerial, £12. Top Band mobile a.m. tx dc psu, £10. Top Band whip, Tavusu, £5. G3YOU, QTHR. Tel Tonbridge 61656.

**Cossor double beam scope**, model 1035 Mk2, with trolley and handbook, £10 or offer. Buyer collects. G8ML, QTHR. Tel Cheltenham 56094.

**"Radio Communication"** and "RSGB Bulletin" vols 42-49, "SWM" vols 24-31, "Radio Constructor" vols 22-26, "Practical Wireless" vols 42-48, "Everyday Electronics" vols 1-2. All at £1.50 per vol or offers. R. K. Woodman, 2 Gladstone Cottages, Wimborne Avenue, Norwood Green, Southall, Middx.

**Trio JR310**, £60. EC10 Mk1 with internal battery psu, £35. Sentinel 4-6MHz 2m converter, £8. *Wanted*: FR400SDX, also 2m fm rig, multichannel or vfo. G8HAC, QTHR.

**HW-202** 2m fm tx/rx, 3 months old, including HW-202A toneburst generator and xtals for 145·0 tx/rx and repeater input 145·15 tx/rx output 145·75 rx. Complete as per current advertisement, £75 carriage paid. G3PLL, QTHR. Tel Cottesmore 513.

**Linear L45A** amplifier 5W mono, mains, good cond, £5. No 10 xtal calibration requires attention, £2. Hallicrafter vhf tx, requires xtal, 110V, £5. CR100 rx working, requires slight attention, £8. Watford 24752 after 6pm.

**Garex 2m a.m.** tx QQVO3-20a final with mains psu, £80. IC2F with a.m. rx mod and mains psu, £85. BC221 with charts and spare valves, £20. Carriage extra, deliver 50 miles. G8DPL, QTHR. Tel (week-days) Kidlington 4321 ext ops.

**B40/C** with extension spkr, perfect working order and cond, £29 ono. Buyer to collect. All Cambridge boards, plus other Pye spares, sae with enquiries please. B and O stereo decoder, new unused, £6. Mains transformer 250V at 250mA, 6·3 at 4A x 2, 5V at 3A, new, £1.50. P. I. Martin, 41 Ottoline Drive, Troon, Ayrshire KA10 7AN.

**Europa** transverter with valves, £50. XF9A filter with usb xtal, £8.50. New Eddystone 898 dial, £7.50. 131MHz vhf xtal, £3. Please write, I will ring you. G8DCQ, QTHR.

**4-section** 40ft steel lattice tower dismantled, £25. 3-band Labgear quad, £15. Radio and tv servicing manuals vol 67-72 inc, gen on most makes, £16.50. Latest Labgear colour-bar generator CM-6028-CB, £65. G3KLM, QTHR. Tel Chobham 8483.

**FR50B rx** c/w handbook calib less 100kHz xtal. Few hours use only, £50. G3SJF, QTHR. Tel 04-252 72612.

**Strumech tower** sections offers 4 x 150As, £1 each. G8AWM, QTHR. Tel 01-458 7974.

**TIL 209** red leds 10 for £1. BB113 V-caps 3 x 10pF per component, 30p. RCA 16561 silicon power npn 20p. BC141 100V 3·7W, 15p. BF256A fets, 10p. BC107/30 for £1. BF240, 8p, post extra. G3WZT, QTHR. Tel 0403 710565.

**Trio 9R-59 DS**, fitted stabilizer, perfect working order, over 200 countries heard, £45. Prefer buyer collect, reason for selling, FT401. L. H. T. Large, Broadhill Farm, Keymer, Hassocks, Sussex. Tel Burgess Hill 2303.

**TR44 rotator**, £30. Heath vtvm, £10. 2·5kV psu, £8. Drake R4B, £160. Bennett, 58 Evesham Road, Headless Cross, Redditch, Worcs.

**Paros hf triband** tx/rx new cond 80W input ssb a.m. cw 80/40/20, exch 2m tx/rx. G3LRO, QTHR. Tel 01-472 8479.

**2m transverter**—320 pa vy fb 28-30MHz input, £25. B40C rx prod det, bandspread as new, £20. Command Q5er, £3. TW2 tx, £20. Would consider rx or why? in part exchange. G2BUC, QTHR. Tel 061-430 3933.

**KW202 rx, KW204 tx** with vox 1972 mint, £115 each, £220 pair. GEC RC410, offers. G4AET, QTHR. Tel Rustington (09062) 4262 (work), Worthing (0903) 42268 (home).

**FT2FB** little used, in original packing, £70. Xtals for FT2FB for use on American repeater channels, write for details. Shure 201 mic hardly used, £4. G3ZSS, QTHR. Tel 05432-22614.

**Minimitter 150W** cw/a.m. tx, built-in psu, circuits, suit beginner or cw op. Owner gone QRP. Buyer collect, £8. G3THU, QTHR.

**KW Vespa** Mk2 with ac psu, PTT mic, handbook and circuits, practically unused since new, £70 ono. KW (E-Zee) match unit, £8. G3RLA, QTHR. Tel 051-342 6515.

**Codar AT5** 160/80m a.m./cw transmitter 12W with Codar ac psu, with leads, little used, vgc, £25 ono. Post included. *Wanted*: G2DAF or similar all band ssb rig. P. I. Martin, 41 Ottoline Drive, Troon, Ayrshire.

**Unwanted precision** screened audio compressor filter modules, perfect performance, brand new, 9V dc, narrow passband 300Hz-3·2kHz, 5in x 2in, improve rx s/n, increase mod any tx x10 thus power x10, only £5, cwo please. C. Hogg, 12 Oaklands, Argyle Road, Ealing, London W13 0HC.

**BC221** modulated model brand new, £28. Original manuals all new: 51J3, £4. 75S3, £4.50; RA17L, £5; 6-40A brand new boxed, £6. All postage extra. *Wanted*: High quality db scope, Avo 8 Mk5. G3GUU, QTHR.

**Cup-winning G2DAF rx** Mk1 hardly used, £26. G2DAF tx Mk1, ac supply, £25. AR88LF rx, £27. Class D wavemeter ac, £6. 70cm 18-el Parabeam new, £5. All ono. G2BLA, QTHR. Tel Welwyn 4685.

**HRO** full general coverage 50kHz to 30MHz with 80, 40, 20, bandspread coils complete with psu and spkr, also 100kHz crystal calibrator, noise lim, product detector, spare valves, £25. P. Webster, 7 Berkley Cl, Hellesdon, Norwich. Tel Norwich 44602.

**Heath HW-101** with HP23A psu excellent cond, £130. Homebuilt double conversion amateur band rx based on Qoilpax QP166, £12. Parmeko transformer 1,000V-0-1,000V 250mA, £3. G3RFO, QTHR. Tel 0934-24675.

**Four-bedroom QTH**, central heating gas-fired, detached with garage, excellent vhf results, £12,650. QRA Kidderminster, Worcs. G3MWQ, 3 Albert Road, Wellington, Salop. Tel 55735.

**FT101** swr bridge mobile aerial 80-20-15-10 purchased Nov 1971 little used, £200 complete ono. Tel Blandford 2581 ext 490 9am-5pm weekdays, callers after 6pm. G3WED, 18 Keynston Down Road, Blandford Camp, Dorset.

**144MHz tx** 100W mod 1kW linear 10-80m 2,000V supply. Eddystone 640. Codar T28 1·8, 35, 144MHz 10W tx with mobile psu, 30ft tower, VFOs, pre-amps, etc. The lot, £150 oro any item. G2HOP, QTHR. Tel Stamford 3125.

**Exchange FT101** with Top Band for FT401, will consider smaller rig with linear, cash adjustment. G4BHM, QTHR. Tel Leeds 664833.

**Free, large desk** 4½ ft by 2½ft to buyer of 2m rig. H/B a.m. tx 18W, tatty wkg CR100 plus convtr, £25. 30ft erected mast plus 6 + 6 and turnstile aerials, £20. Buyer collects. G8BFU, QTHR. Tel High Wycombe 26200 ext 2129.

**Bantam fm 2m** with new nicads, offers. LM14 as new with stab psu, £18 ono, buyer collects. Manual for SP600JX rx, £2. TY2-125 valves £2.50 each, buyer collects. G3RNV, QTHR.

**Labgear transmitters** 10W Top Band, £10. LG300 150W cw requires power pack, good condition, will deliver up to 30 miles, would consider exchange for 2m tx plus cash. G3KRT, QTHR. Tel Ruislip 38287.

**EC10** Mk2 12 months old, fab cond, with mains psu, £70. G3XPD, QTHR.

**R1475 clean 6SH7** rf neat hb psu, £11. Hiband Ranger, £5. Collect. G3AGF, QTHR. Tel Cheltenham 54773.

**KW107 Supermatch** new cond, £38. CT52 miniature scope with manual, £12. Canon Motor Zoom 8EEE standard 8mm auto exposure with case and w/a converter lens, offers or swop for electronic gear. Why? G3XHX, QTHR. Tel Liskeard 43749.

**Liner-2** complete with fitted SSM pre-amp new, impeccable condition, unrepeatable bargain at £97.50. G3BD, QTHR.

**Heathkit HW32A** 20m single-bander tx/rx in perfect cond, half price at £39. Write or call G3HHZ, QTHR.

**Trio JR500s**, extremely stable, speaker, manual, all mint cond, £45. Solatron scopes; Pye Ranger, masses of components, meters, crts, etc. Sae for list. *Wanted*: 1st class KW2000A/B plus ac/dc psu (neg earth). G3ZDO, QTHR.

**Eddystone 840A** rx, good cond recent overhaul, ideal beginner, £17 ono. R. C. Ebder, 2 Rolleston Close, Petts Wood, Kent. Tel 467-5908.

**Minimitter** tx, 150W a.m./cw, all bands 3·5MHz to 28MHz, £15; delivery by arrangement. Mullard hi-fi amplifier and pre-amp, £12. Other gear, components, valves, transistors, etc; sae for details. G3KAG, QTHR. Tel Ellastone 393.

**Heathkit** wide-band general purpose scope 10-18U, brand new never used, assembled by professional, £50 ono. G8CZY, QTHR. Tel Medowfield 780 465.

**Murphy B40c** communications rx, good cond with full manuals, £22. P. M. Cleaver, 86 Main Road, Dovercourt, Essex. Tel Harwich 2195.

**Scope CTR103** with cathode follower probe 68 and psu 675, auto sync fitted, complete, £11 ono for quick sale. G3JNM, QTHR. Tel 0204-43999.

**Inoue 1C-700R** rx exc cond, £60 ono. BC221 with charts good cond, £15 ono. *Wanted*: scope tube type ICP1. G8ABP, QTHR. Tel 0803 55488.

**One industrial strobe kit** 1-80 fps spare tube new, £17, p & p 50p. Command rx CBY 46104 freq 1·5 to 3MHz mod to 3Ω output, transistor inverter 12V bfo. Rack mounted all in working order, £14 + p & p £1 or ono. GI3RNY, QTHR. Tel B'mena 41468.

**Compact tx** Starflight phone-cw xtal control or external vfo 90W. RA1 needs rectifier otherwise ok. Both with manuals. Offers. Can deliver reasonable distance Manchester. G2DCF, QTHR.

**99% complete hb rx**—BRS25769 design ref Jan 67 *Bull*—QP166 front end Kokusai MF455 with both xtals—989 dial stab psu—all valves and components in position on good quality chassis and cabinet, £25. G3RLA, QTHR. Tel 051-342 6515.

**2m Cambridge dash**, £14. 3XQQVO6/40A sh, good, £1 each. Valves, transformers, relays, chassis, boxes, variable caps, etc. £7. All ono. Prefer buyer collect. Phone after 6pm. G3JDN, QTHR. Tel Reigate 40646.

**2m ssb.** Exchange my transverter and/or cash for Liner 2. Transverts 14MHz to either ssb section, 120W input, with cables for FT200/FT101. Works well, but need a/M rig. G3SEK, 15 Holmbush Rd, London, SW15. Tel 01-789 1465 evgs.

**HF amateur bands** rx, triple conversion, rf tuning, variable sel, notch filter, product/a.m. dets, is KW77, £64 ono. G8ERQ, QTHR. Tel Harrogate 69801.

**Moving QTH** have for sale at low prices, Redifon Twinplex TUs 7b and 85R machines, Airmec CT212 sig gen, current *Rad Comm Handbook*, new edition of *Teleprinter Handbook*, other books and gear in excellent to mint condition, sae list only. R. A. Hounslow, 445 Wellingborough Road, Northampton NN1 4EZ.

**R1155 rx** with psu in good clean working order. £10 plus carriage. Sae with enquiries. Hayward, "Sunnyfields", Lighthouse Road, St Margarets Bay, Nr Dover, Kent.

**Pye Cambridge spares** 1st i.f., 2nd i.f., 2nd mixer boards, 25kHz filters, relays. Transistor Vanguard spares as above plus squelch rx audio, tx audio boards, QQVO320s, inverter transformer, all vg used cond. Sae with enquiries please. P. I. Martin, 41 Ottoline Drive, Troon, Ayrshire, KA10 7AN.

**Mobile dc psu** for KW2000 A/B, £25. Fet 70cm converter, £10. KW traps, £2. *Wanted*: 2m ssb transverter. G3XVF, QTHR. Tel Norwich 56782.

**Trio JR500SE** fitted with Burns discriminator and crystal calibrator. SP-5D spkr, £50. Heathkit GR-125 Q-multiplier, £5. All in original packing with handbooks, prefer buyer collects. G. W. Black, 18 Lattimore Road, Wheathampstead, Herts. Tel 3307.

**160m/M a.m.** station complete, £15. G-whip 160m/m aerial, £5. 160m a.m. tx (807 pa) + mod, £2. Heathkit Q-multiplier, with manual, £5. Padded headphones, 25p. Sinclair stereo amplifier complete in case, £10 ono. *RSGB Handbook* (ed 3) £1. G3TRH, QTHR. Tel Rayleigh 73778.

**Ex-commercial tv** installation 35ft self-supporting lattice tower. Top section drilled and with clamps for 2-2¼in pole, sensible offers around £60 please, buyer to collect. G3WZD, QTHR. Tel Hassocks 4549.

**Clearance sale.** Transformers, valves, xtal filters, etc. Send sae for list. Also including IC2F 144·48, 144·60, 145·0, £50. B40 rx + manual, £18. BC221 complete with mains psu, £15. Callers welcome to see rest of junk not worthy of list. G3WXG, QTHR. Tel Brighton 553150.

**Marine vhf/fm** 12W base station (Standard Electrik-Denmark) 6-ch 156·162MHz 230V ac remote control box, cables, instruction manual, etc., carriage paid, £16. G3JMJ, QTHR. Tel 073-271 3467.

**Trio JR500SE** rx, very good cond, £45. 2m convertor 28 to 30MHz suit above, £8. Please write: M. Richards, Bradford Hall, Univ of Bradford, Bradford, Yorks.

**160m miniature homodyne** tx/rx, only 6 x 4 x 3in, tx-2W, break-in, i.r.t. Rx drives phones. Reasonable offers? Sae for further details. G3XZK, QTHR.

**160m receiver** based on BC453 with 85kHz i.f., needs psu, also has hf converted which needs attention, £6. Ic keyer *Radio Communication* August 1969 design, needs paddle, £4.50. G3XZK, QTHR.

**Cambridge rx boards** with information, 50p. Vanguard spares also 12ft of 2in aluminium pole, £2. Indicator ex WD with 5in tube, £3. Azimuth indicator with selsyn and circuit, £3. Buyer collects. G8FBL, QTHR. Tel Lichfield 23919.

**Sentinel mf converter**, £13. Desk mic, £1. *Amateur Radio Handbook* 3rd ed, *Radio Constructor* 1964-67, *RSGB Bull* 1965, *Practical Electronics* 1964-66, all bound, offers. Many other mags—sae. G3ZNW, QTHR. Tel 01-432 2343.

**Eddystone 870A** gc rx 150kHz-22MHz 5B bfo ac-dc, £10. Heath RF-1U 100kHz-200MHz fitted stab tube vg cond, £14. Cambridge AM10D, £22. Speech compressor h/b, 9V, £4. Collect or postage extra. Nock, 4 Park Crescent, West Bromwich.

**J-beam** 10-el Skybeam 75Ω used but good cond, £5. SE406 swr meter, £2. Mod tfmr EL84s into QQVO3-20, £1. Burns 1pf 75Ω 144-146MHz, £4. Garex Twomobile a.m./fm 2m tx/rx, £85. Ex cond. G8ESK, QTHR. Tel Bradford 45611.

**Pye vhf** rx, 4m psu, £6. Prop-pitch motor, remote indicator, unused, £8. BC625A tx unmodified 100-156MHz, £5. 52-set rx, psu, manual, £3. R1155, £2. RF24 converter as new, £5. Various junk free. R. J. Hart, 23 Harvey Road, Guildford, Surrey. Tel Guildford 4982.

**19in rack** 5ft high with master power switch, £2. Douglas MT2AT, £1.50. 100W auto transformer, £2. 4m base rx BCC £3. Collins noise blanker 136B-2 offers. Solatron oscillator 25Hz to 500kHz, £20. G8DDM, QTHR. Tel Penn 4483.

**Swan 350** tx/rx with additional separate vfo rated 400W + p.e.p. psu, vox unit, £145. BC221 with charts and stab supply, £12. G2BUW, QTHR. Tel Romford 43122.

**4 x 150As** good used cond, £1 each + p & p or exchange for similar QQVO640/A, QQVO750. *Wanted*: Mains transformers 1,250-0-1,250 at ½A, also 10V at 10A centre-tapped. Any information on Cossor CC3-AA/B3 tx/rx—circuits, layout, etc? Neville, 27 Newbury Close, Great Wyrley, Walsall, Staffs. Tel Cheslyn Hay 415374.

**KW2000** (fb 6146 pa), £110 ono. Passive grid linear 600W, G-line cabinet but old 6HF5s need replacing, £30 ono. Marconi CR150/3, £30 ono. Will deliver in London or within 50 miles. G4ABQ, QTHR. Tel 023-08 587.

**Vibron electrometer** 33B, £25. Solatron delayed triggered plug-in timebase CX1444, £8. 5A scope, £15. Oscillators rf 2·5-7·5MHz, £4. Af 50Hz-20kHz, £7. Microwave 3·5-4·2GHz, £8. Video 7kHz-8MHz, £15. Or reasonable offers considered. G4BXI, QTHR.

**Hammarlund** HQ170A vgc recent overhaul, prefer buyer collects, £65 ono, week-ends preferred. G3ORH, QTHR. Tel Maid 44021.

**Heathkit** SB401 6146Bs SB301 cw-filter sell for £200 or swop for transistor electronic organ, cash adjustment if necessary. G3JLB, QTHR. Tel 0474 4694.

**Trio 9R59D** general coverage rx fitted voltage stab, 500kHz calibrator, converter psu, 12V, £25. G8GME, 16 Latrigg Road, Liverpool, L17 0DD. Tel 051-727 3812.

**Heathkit 10-18U** oscilloscope, £40. Securicor delivery extra. R. K. Adatia, 43 Netherlands Road, New Barnet, Herts EN5 1BP. Tel 01-449 0022.

**Double beam** Cossor scope model 1035 good cond, £30 ono; call any time after 6.30 pm. G8HJK, QTHR.

**FT401** FV401 as new mic etc, £280. Heathkit OS2 scope, £20. Lucas AC11 alternator and control unit, £20. As new. G3GHS, QTHR.

**PR 866A, PR GXU1**, £1.50. E180F 417A, 4 for £1. A1834, 2 for £1. 8mF 600V oil filled, 2 for £1. 5B255M, £1. A1834, 12E1 regulators, 2 for £1.25. Dual crystal oven 6·3V, £1.50. 72·95MHz HC18U, £1. All postage included. G3LTF, QTHR. Tel Chelmsford 58439.

**Trio JR500S** with SP5D excellent, £42. Telford TC7 Mk2 as new, £35. G8AEV converter, £5. G8AEV tx and pa in Eddystone box less modulator, including 48MHz xtal, £7. *Wanted*: Liner 2, full details. T. N. Price, Sherwood House, Brimpsfield, Gloucester.

**HRO MX mint**, psu, 8 coils, 14·4MHz, £15. AR20 100yds cable, £14. 2m 6/6 80ft 11 cable, £4. 2m m/m conv, mint, 2·4MHz o/p, £12. 2m vxo fm 24MHz o/p, £5. BC221 psu, £15. G3JDN, QTHR. Tel Reigate 40646.

**Hudson FM208** for 2m 10W rf o/p 0·5μV/rx for readable signal, mint cond, dash mounting, all trans, rx with leads less xtals, £20 ono. Please enclose sae. M. R. Kember, 3 Kent Road, Gravesend, Kent.

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**Heath rx SB303** matching spkr, £150. Heath wattmeter-bridge HM-102, £11. KW E-Zee match, £12. J-Beam 2m, 8-el Yagi, £2. All above as new cond. AR22/R rotator, used but in good order. Shepherd, Woodfield, Priory Close, Chislehurst. Tel 01-467 2023.

**38 set afv** 12V dc vibrator psu, 7·3-9MHz ATP4 pa, control box, good cond, £8. PCR3 rx, internal psu, spkr, vgc, £8. R11555 rx, internal mains psu, S-meter, £6. Watford 24752 after 6pm.

**Trio 9R59D**, recently overhauled, with speaker, buyer to collect, £28. G4ALG, QTHR. Tel Twyford 345046.

**HW17A, fm adaptor**, 2m tx/rx, £30 ono. A. Jones, 121 Upper Tennyson Road, Newport, Mon.

**Heathkit GR78** rx, 16 months old, as new, £55 ono. G8FUB, QTHR. Tel 051-226 4571.

**KW 52Ω** dummy load as new, £7 plus post. G3BDS, QTHR. Tel Worcester 424722.

## WANTED

**Base station** tx Pye or similar high band for 2m use, a.m. or fm. Must be good working order. G8ERX, QTHR.

**KW2000** tx/rx and psu. *For sale*: homebrew 80m tx/rx 50W ssb, £30 ono. GM4BDJ, QTHR. Tel Peebles 21219.

**AKG** C12, C412, D202C or D224 mic, or similar, Neumanns, Senwheiser, etc. Dolby "B" noise reduction unit, also 4, 6 or 8 channel mixer. Please give any details and price required. G8HMF, QTHR.

**"National" Velvet** vernier slow motion drive, scale and knob as used for pa tuning on USA surplus tuning units type TU5B, etc. G3XHX, QTHR. Tel Liskeard 43749.

**Buy or borrow** manuals for Marconi vtvm TF958 and US Army signal gen type AN/URM26B. *For sale*: Pye Bantam fm 2m with new nicads and handbook, working. Offers. G3RNV, QTHR.

**VHF swr bridge**, 4m beam, 4m converter. Also assorted 48MHz xtals. G4CGL, QTHR. Tel W/ton 732404.

**AR22R rotator** and control in good cond, state price required. G3YJI, QTHR. Tel Walton-on-Thames 23228.

**Rotator AR22**, TR44 or HAM M. G3MGW, QTHR. Brightlingsea, Essex. Tel 2382.

**Sphinx tx** Mk2 or similar tx, or ssb cw tx/rx suitable 80 and 20, wideband absorption wave meter, must be in good cond. G2DRA, QTHR.

**Battery eliminator** for Heathkit Mohican receiver. C. E. Fuller, 76 Heathfield Road, Croydon, Surrey.

**Can you help, please.** Circuit, alignment info, copy of instn book for "Signal Corps Panoramic Adaptor BC 1031A". Any info—will send cheque for copies. Thank you. J. Coles-MacGregor, 166 Ellenborough Road, Sidcup, Kent.

**Collins 516F-2** mains psu any condition or alternately circuit diagram. Also required Heath SB600 speaker or cabinet for same, and SB640 remote vfo for SB101. GM3MQO, QTHR. Tel Prestwick 79245

**Schoolboy** requires manual for high power Pye Ranger type 2207. To borrow, to photocopy or buy. B. Keal, 18 Sefton Gardens, Aughton Green, Aughton, Lancs. L39 6RZ. Tel 0695 423062.

**Wanted for wireless museum**—Spyset or miniature B2, very old valves, components, txs, rxs and meters. Old radio mags, cats, books. Voight or Hartley/Turner spkr. Spark gear particularly wanted. G3KPO, QTHR. Tel 077 584-485.

**Pye multi-channel** HC6U crystal sockets. Ex Cambridge Vanguard etc., your price considered. P. I. Martin, 41 Ottoline Drive, Troon, Ayrshire, KA10 7AN.

**For army cadet force.** Technical information (EMERS) for WS No 12ATP35 valve or suggested mod to replace modern control harness JO9 (24V) E box, I box or M box. Offers. Capt M. J. Buckley, 62 Ballards Way, South Croydon, Surrey. Tel 657 4778.

**Sphinx, G2DAF**, Cornishman or similar ssb tx. Must cover 160. Condition and price required please. *For sale*: Minimitter top-7 rebuilt and working with matching inverter and control box, £15 the lot ono. P. Russell, 13 New Road, Bolter End, High Wycombe, Bucks HP14 3NA.

**AR88D rx**, unmodified and working order, state price and condition. D. Craig, 2 Blakehall Road, Carshalton, Surrey. Tel 01-387 0859 (day).

**Receiver type** R209 12V version must be in good condition and complete with power plug. Loan of *RSGB Bulletin* March 1961. Manual or circuit for B40C receiver. C. A. Cooper, 45 Nightingale Crescent, Bracknell, Berks. Tel Bracknell 4168.

**KW2000B or Atlanta** mint or vgc, state price with or without separate vfo, collection and delivery by Securicor arranged by purchaser. All replies acknowledged. N. T. Gwynn, La Besnardiere, Monnaie Road, St Andrews, Guernsey, C.I. Tel 0481 36806.

**Portable transistor** radio having fm and hf short wavebands or hambands only, must be vgc. No homebrew stuff. Parker, 133 Station Road, Cropston, Leicester, LE7 7HH.

**HRO bandspread** coils dearly wanted for HRO used by long-stay hospital patients. State freq and price. R. Beauchamp, B Ward, Romsley Hill Hospital, Farley Lane, Halesowen, Worcs B62 0LL.

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**Hallicrafter S27B** 36·165MHz, good cond. E. A. Bovey, 1 Chapel Lane, Dartmouth, Devon TQ6 9BL.

**Eddystone EC10** with mains psu, or will consider Eddystone valve rx. Must be clean and in good working cond. G3PFM, QTHR.

**Circuit** of Minimitter table top tx 150W circa 1956. Purchase or loan. G4BRE, QTHR.

**"Wireless Valve Transmitters"** by W. J. James, published by Wireless Press about 1924. Handbook "Marine Radio Telegraphists" about 1940. G6RF, QTHR. Tel Perranporth 2149.

**KW Vanguard** Heathkit Dx100, KW107 atu, only sound items considered. Price and details to G8LD, 75 Conaglen Road, Leicester LE2 8LE. Tel 0533 832969.

**Working** instructions and/or circuit Admiralty pattern W2508 wavemeter G73 fitted with xtal calibrator G42 made by Pye. Purchase or loan to photocopy. All postage paid. GM3BRF, QTHR. Tel Leven 2136.

**Handbook** operating instructions for Advance Components Ltd signal generator type B3-C. Also transformers OV-75V 1·33A STC AS46148-6 or equivalent, and OV-350/495/510/530V 270mA STC U46149-4 or equivalent. G3LHN, QTHR.

**Marine channels** vhf tx/rx mobiles and base station. HW32A or similar tx/rx with cw facilities. Hf marine equipment and echosounder. Disposing of a.m. tx and other gear at giveaway prices. G3DVF, QTHR. Tel Alnwick 2487.

**Late model LG300** rf section only, Tiger/Olympic cw only tx 60/100W model, HW12, HW16, tx/rxs DX40, DX60, AR77E, SX24/28, SP200 (BC779) with psu CR300 outdoor Joystick 4RF atu. Replies answd. Pitt, 25 Park Road, Freemantle, Southampton. Tel 21711.

**Required** for rx type B40/C the following valves. CU287, CU327, CU302; the equivalent commercial numbers are EZ22 or 724, EF52, and ECH22. Prices to E. Parker, 50 Sherbourne Close, Hove, Sussex. Tel 0273 414244 ext 37.

**HW12 80m** tx/rx and ac psu. D. Coutts, 1 Stevenson Avenue, Glenrothes, Fife.

**"Ham Radio"** issues prior to 1973. Absorption wavemeter 400MHz upwards. BC221 dials and drives. Double beam scope dc—10MHz. G8FPT, QTHR. Tel 01-504 4942.

**Codar PR40** preselector in working order. Buy or borrow handbk for Geloso G209 rx. Large coaxial plug to fit aerial socket on Geloso G209. J. Keeler, Church Farm, Banningham, Aylsham, Norfolk. Tel 3146 (evenings).

**BC221 230V** ac with charts. G3XXJ, QTHR. Tel 021-351 2370.

**Pye Cambridge** or Westminster high band fm unmodded dash or boot multi channel. G3IRQ, QTHR. Tel Manningtree 2957.

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2638 2854 2868 2875 2876 2889 2910 2931 2938 2945 2952 2954 2966 2980 2987 3008 3081 3023 3102 3105 3250 3255 3270 3285 3298 3302 3404 3411 3425 3432 3446 3453 3460 3467 3481 3496 3800 3805 3950 3985 3993 3995 3997 4031 4195 4220 4516 4570 4575 4595 4654 4668 4675 4689 4703 4745 4781 4808 5010 5060 5105 5420 5480 5491 5499 5506 5514 5521 5548 5551 5566 5581 5584 5589 5604 5611 5619 5621 5625 5626 5630 5641 5642 5644 5649 5650 5659 5671 5680 5687 5690 5691 5692 5695 5697 5701 5710 5711 5714 5730 6210 6270 6337 6440 6500 6510 6537 6540 6552 6557 6563 6567 6577 6580 6582 6590 6597 6612 6627 6634 6637 6640 6642 6647 6649 6650 6652 6657 6659 6662 6667 6672 6677 6679 6720 6753 6810 7585 7770 7992 8160 8280 8364 8820 8837 8839 8841 8845 8854 8862 8864 8871 8879 8885 8888 8896 8913 8930 8947 8953 8956 8961 8967 8971 8973 8983 322 324 329 338 339 342 kHz 2184 2638 2844 2854 4868 2875 2889 2910 2924 2931 2938 2945 2950 2952 2966 2968 2980 2987 3008 3023 3072 3081 3102 3142 3278 3403 3411 3432 3446 3460 3467 3474 3881 3495 3841 3921 4140 4182 4257 4399 4410 4415 4417 4418 4420 4422 4427 4431 4435 4444 4465 4469 4473 4478 4654 4689 4703 4710 4724 4808 4860 4889 4966 5010 5491 5499 5506 5514 5521 5551 5566 5589 5599 5604 5611 6619 5626 5630 5641 5642 5649 5654 5659 5671 5680 5687 5692 5695 5697 6337 7537 6540 6552 6557 6559 6567 5682 6590 6597 6612 6627 6634 6637 6640 6642 6647 6649 6652 6657 6659 6662 6664 6667 6672 6677 6791 8364 8439 8837 8839 8854 8862 8864 8871 8888 8913 8953 8956 8967 8971 8983

12237 12250 12262 12287 12312 12337 12357 12362 12387 12412 12437 12462 12487 12512 12357 12652 12587 12612 12637 12662 12687 12712 12737 12762 12787 12837 13062 13087 13112 13137 13162 13187 13212 13237 13262 13272 13312 13337 13387 13412 13437 13462 13487 13540 13590 13640 13690 13740 13790 13840 13890 13940 13990 14848 14898 14948 14998 15048 15098 15148 15198 15248 15298 18347 18372 18497 18662 18747 18872 18997 19122 19247 19372 19497 19662 19747 19872 7533 7550 7566 7583 7600 7616 7633 7650 7666 7683 7700 7716 7733 7750 7766 7866 7875 7883 7900 7916 7933 7950 7966 7983 8118 8150 8166 8183 8216 8250 8266 8283 8300 8316 8333 8350 8366 8416 8433

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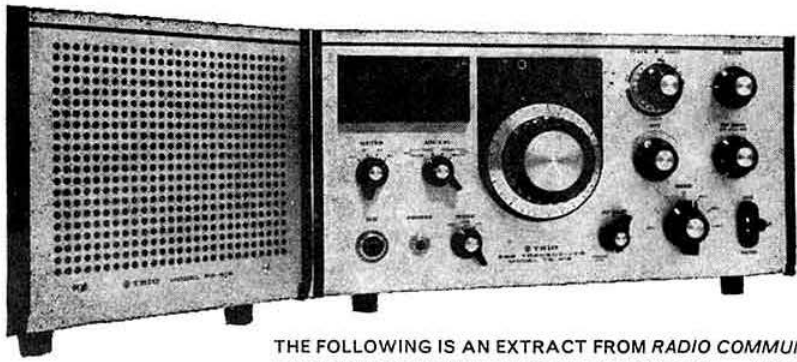

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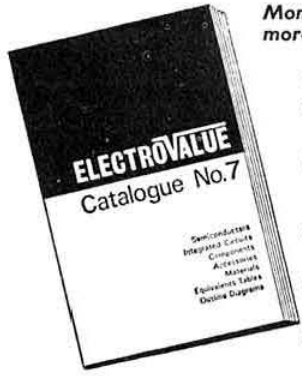


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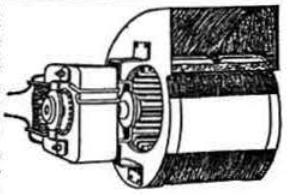

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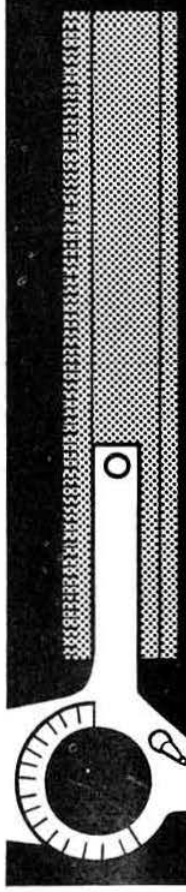

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