January 1978

radio communication

journal of the Radio Society of Great Britain

1977 ANNUAL GENERAL MEETING

(Report on page 59)

Lord Wallace, RSGB President, presenting awards at the AGM

Top, l to r: Bristol Trophy to representatives of Swansea ARS; Houston-Fergus Trophy awarded to G. J. Kellaway, G3RTE, and E. C. Hodson, G3XTJ, (one of the recipients was out of camera view on left).

Centre, l to r: 1930 Committee Cup to D. R. Vizard, G3UKS; Whitworth Trophy to D. J. Andrews, G3MXJ; Worthey-Talbot Trophy to J. W. Hardcastle, G3JIR.

Bottom, l to r: Gravesend Trophy to a representative of Glenrothes & D ARC; Metcalfe Trophy to R. Treacher, BRS32525; Edgware Trophy to representatives of Bracknell ARS.

Photographs by P. Jones G3YLV

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January 1978 Volume 54 No 1

CONTENTS

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A • •

ELECTRONICS

TELEX 897406

FAST MAIL ORDER SERVICE

FDK

FDK

Multi-2700 Mk II

DUAL VFO CONTROL

IN STOCK NOW

MULTI-2700—THE COMPLETE STATION

The FDK Multi-2700 is a front-line all-mode transceiver that incorporates every conceivable feature to ensure maximum enjoyment. In fact, apart from a mains plug and an aerial, there is little else we can sell the owner of a Multi-2700. All in all it is an unbeatable transceiver at an unbeatable price.

ALL MODES—ALL OCCASIONS

All modes are provided AM FM SSB and CW. For SSB operation VOX is included and for CW, fast break-in is provided with completely adjustable side tone. The 2700 can be used at home with its internal 230v AC PSU or taken out to the local high spot and run from 12v DC. This really has to be the QSO machine that you will never tire of.

BEAUTIFUL TO OPERATE—BEAUTIFUL TO HEAR

The transmitted audio quality of the 2700 is second to none. Its crisp, clear, quality effects the manufacturer's knowledge that a clean signal sells more products! The Optimised 16·9MHz 8-pole crystal filter gives clean SSB signals and good selectivity. On FM, direct modulation of the VCO gives smooth but penetrating audio. Typical power output is 16 watts but the flip of a switch and you have 1 watt on all modes. (An internal adjustment permits the power to be adjusted from approx 1 watt to 6 watts for driving linears or transverters.) The Multi-2700 has a built-in receiver RF pre-amp—no problems here with a deaf receiver.

DUAL VFO CONTROL

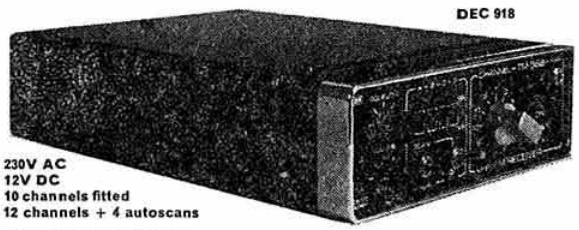
Until you have handled the Multi-2700 you cannot appreciate the advantages of dual vfo control. The conventional analogue VFO with its dual speed silky smooth feel, permits accurate tuning on all modes with 1kHz readout. It also covers a complete 1MHz segment at a time resulting in minimum band switching. The flip of a switch and you have full synthesized control of your transceiver. The bright LED display allows the transceiver to be immediately set to any 2 metre channel. A VXO control ensures the synthesizer can be used equally well on SSB, CW or FM. The versatility of dual vfo control is quite amazing. For example: use the analogue vfo at the SSB end of the band and the synthesizer on the FM channels; set the synthesizer to the "sked" frequency and continue normal operation on the analogue VFO; set analogue VFO to DX frequency whilst continuing normal tuning of the adjacent frequencies on the analogue VFO—the combinations are endless. Repeater shifts are completely taken care of. The Multi-2700 has +/− 600kHz shifts and 1·6MHz for 70cms operation.

ITS VERSATILITY IS ENDLESS

Inter-continental contacts are possible via OSCAR. Press the OSCAR button on the front panel and you bring in the 28MHz downlink receiver converter to enable true transceive operation through the satellite. An audio SPEECH PROCESSOR can be switched in to permit extra punch, the amount of compression being adjustable to suit the operator. RIT operates on all modes and both vfo's. A NOISE BLANKER is included for really excellent suppression of ignition pulses. The receiver section covers 143 to 149MHz (Tx covers 144-146MHz ± 1·6MHz shift only). Apart from the 2 existing repeater offsets one further shift may be programmed. AGC control is continuously variable, as is the VOX DELAY and ANT-VOX etc. All pre-set controls are easily reached through the top hatch of the transceiver. Separate centre zero and rx S-meters are provided. We could go on but if you have read this far perhaps it is time you sent off for the 4-page brochure giving full details of this beautiful transceiver at a really competitive price. **£489 inc VAT and Securicor delivery.**

TM56B AMATEUR VHF MONITOR RECEIVER

DEC 918



230V AC
12V DC
10 channels fitted
12 channels + 4 autoscans

A PLEASURE TO OWN

Tune into the exciting world of amateur radio with this advanced monitor receiver. Listen to your local amateur radio stations both fixed and mobile, direct or through the your local repeaters. From the comfort of your fireside chair, using the built-in 230 volt. AC power supply, this receiver will open up the whole new world of VHF Amateur Radio for you. Alternatively the necessary hardware supplied enables you to power the TM56B from your car radio battery for true mobile operation.

GREAT VALUE

Little wonder that the first two shipments of these beautifully engineered receivers were sold out within weeks of the advertisements appearing. We really are amazed at their superb performance at such a low price.

SOUND DESIGN

The design is well and truly tried and tested, and the circuitry is almost identical to the receiver section of the FDK mobile transceivers. Both sensitivity and selectivity leave nothing to be desired and the auto-scan enables the popular calling channels to be continually monitored for activity.

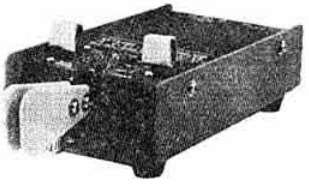
NO HIDDEN EXTRAS

The receiver is supplied complete with all leads, circuit diagram, crystals for channels S0, 20, 21, 22, 23, R3, 4, 5, 6, and 7 plus space for a further 6 channels, making 16 in all. An additional matching desk top aerial is also available at £2.50 extra.

£85 including delivery and VAT.

EK-121 DE-LUXE

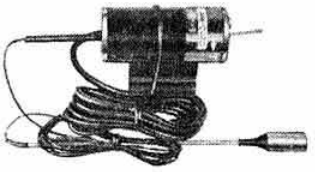
ECONOMIC ELECTRONIC KEYER



ONLY £29.95 INC. VAT

Beautifully built, featuring plug-in circuit board. At this price you have a real bargain.

MOBILE SAFETY MICROPHONE



Clips on lapel, sun vizor, safety belt etc. Weighs 5 grams and complete with gear lever Tx/Rx control box—keep both hands on the wheel in future! Matches most transceivers except IC240.

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Access

MONDAY TO SATURDAY 9 A.M. TO 5.30 P.M. EARLY CLOSING WEDNESDAY

1978—and here's THE BIG ONES!

MLA-2500, 160-10 metres, 2000 Watts PEP

DenTron
RADIO CO. USA

Send 25p for complete colour catalogue of all DENTRON products

Provisional price £695 inc. VAT.
Demonstration model in stock.
Orders now being accepted for Feb. delivery.

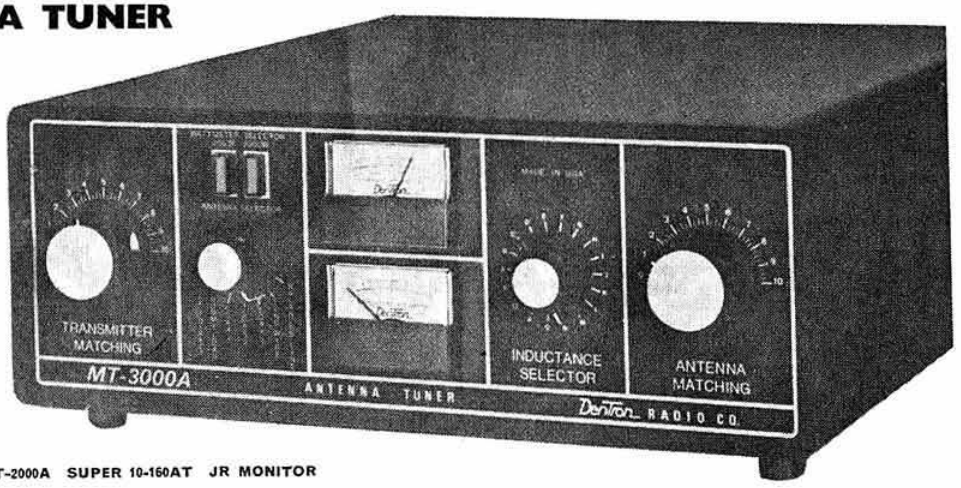
The new MLA-2500 is a linear amplifier beyond compromise. Dentron amateur radio products have always been strikingly individual. This is the result, not of a compulsion to be different, but of dedication to excellence in American craftsmanship. This dedication now extends to one of the world's finest high performance military amateur amplifiers. Luxury styling combined with rugged construction, however, would not be fully appreciated without an exceptional power source. The heart of the MLA-2500 is a heavy-duty, self contained power supply for 230 volt or 110 volt operation. Compare the MLA-2500. It has the lowest profile of any high performance amplifier in the world. Its modular construction makes it unique and no wonder it is outselling all its competitors in the USA. Two years ago we considered another manufacturer's 2KW amplifier but dismissed it because of its high cost, large size and lack of features. Having looked at the Dentron, MLA-2500 we now know we made the right decision then!

Features 160-10 metres ☐ 2000 + watts PEP/1000 watts D.C. continuous ☐ variable forced air cooling ☐ 2 × E1MAC 8875 tubes—built in true reading RF watts meter ☐ 40 watts drive for 1KW D.C. ☐ metering of plate volts/current and grid current ☐ size 5¼"H × 14"W × 14"D ☐ Weight 47lbs. ☐ 19" rack mounting kit available.

MT-3000A TUNER

3kW 160-10m

PROVISIONAL PRICE £235 inc. VAT



OTHER MODELS:—MT-2000A SUPER 10-160AT JR MONITOR

The MT-3000A is a capsulized solution to many aerial matching problems. It incorporates 4 unique features to give you the most versatile antenna tuner ever built. First as a rugged antenna tuner, the MT-3000A easily handles a full 3KW pep. It has continuous tuning from 1·8-30MHz without gaps. It matches anything and everything between 160 and 10 metres. Secondly, the MT-3000A has built-in dual watt metres—one to read forward power and the other to read reflected power. Thirdly, it has a built-in 50 ohm dummy load for proper exciter adjustment. Fourthly, it has a built-in antenna switch selecting: "tune or by-pass"—"coax 1, 2 or 3"—"long wire"—"balanced line". The compact size of the MT-3000A (5¼" × 14" × 14") matches it to the MLA 2500 and represents the most comprehensive and rugged tuner ever produced for the amateur market.

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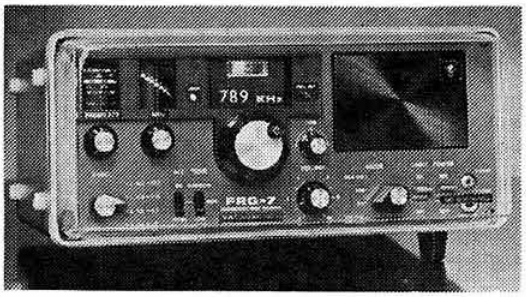

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stabilized	£50	MMV 1296, 23cm varactor	£33				

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All transceivers +12½%VAT		ALL MODELS IN STOCK		All + post 25p. + 12½% VAT.		All above items + VAT 12½%	

SPECIAL OFFER. Constant current Ni-Cad chargers. Adjustable charge rate for AA or C type Ni-Cads. Ideal for IC202/215, C146A, Trio, etc. Price £8.35 + 8% VAT. p & p 50p.

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Manufactured for us, and designed exclusively for use with the IC240. Note these star features ★ Scans 40 channels in 25Kc/s steps. ★ Locks out unwanted occupied channels ★ Adjustable scan rate ★ Adjustable phase period ★ Manual mode feature ★ Automatic ± 600 kHZ shift of TX frequency when repeater mode is selected ★ Large six digit display shows frequency to 5 k/cs ★ Display always shows frequency in use including TX frequency when PTT is operated. ★ Call for demonstration.

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The 2015 transceives across 144-146 (Rx to 149) MHz in 5 KHz steps tuned by coaxial switch stopped at 0 and 9.

A major feature is the 4 channel RAM memory (with an internal Ni Cad back up) which may be programmed direct from the front panel by simply dialling in a frequency, no screw drivers, no soldering irons, no fuss. Frequencies can be recalled from the memory instantly or they may be scanned in either of two modes: searching for a vacant or an occupied channel. 5 split (including + and — 600 KHz) for repeater or transverter (even triplevertor) use. Multipurpose tone burst, RIT (centre off with 'click'), modular constructions, centre zero meter, accessory socket, mounting bracket, microphone etc, are all provided. The sensitive receiver is varicap tuned by the DC level of the P.L.L. IF's of 16·9 MHz and 455KHz provide high image rejection and good shape factor 2 : 1 at 70dB (12KHz BW). In the transmitter, modulation is applied directly to the V.C.O. (for the ultimate in fidelity), auto power control and varicap tuning keeps power output constant at band edges and spurii way down.

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The Digital 11 offers complete 5kHz step coverage across 2 metres and now with the Scanner 33, 25kHz channels from 145MHz upwards covered in around 10 seconds. It offers full lock and lockout on all channels. The scanner stops on a required channel for 10 seconds, then unless locked moves on. The bright digital readout comes from 6 seven segment LEDs.

Selectable 10 or 1 watt output for simplex or duplex (up and down shifts), across 144-146 (rx to 149MHz) from a tiny 6½" × 2" × 7½". Easily underdash mounted with the supplied mounting bracket, or slipped in place of the broadcast wireless.

DIGITAL II, £235; CRYSTAL TB, £10; SCANNER, £49.50
ALL PRICES EXCLUDE VAT (12½%)

For strong handling, and low noise the R.F. mixer, first I.F. (16·9MHz) second mixer (and LO) are all FET's. The front end is tuned by varicaps by the DC output of the P.L.L. with superb selectivity provided by a 15 pole (±8kHz at —6dB ±15kHz at —70dB). Ceramic filter. LED lamps indicate if the P.L.L. is unlocked or the squelch open The V.C.O. is directly modulated (for exceedingly linear deviation). Unitary 6 circuit block construction (for serviceability and screening). Selective calling socket.

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10' telescope heavily galvanised steel mast supplied with guy rings etc. or c/w full rigging kit.
Carriage £2-£7 ex-stock VAT 8%
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Galvanised lattice 10' sections.
Free standing with climbing steps.
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42'	£121.00 (RK £28)	
57'	£174.00 (RK £28)	
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VERSATOWERS

(Illustrated right. Also see below.)

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Standard P60	£252.00
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Telescopic (20' sections) with full tilting facilities allows for easy antenna maintenance and alterations. The relatively low unit weight and superior design of ground post allows easy cheap installation often without resort to concrete. Full scale efficient production offers you a wide range of towers at a minimum cost. See far right for line drawing and above right for typical prices.

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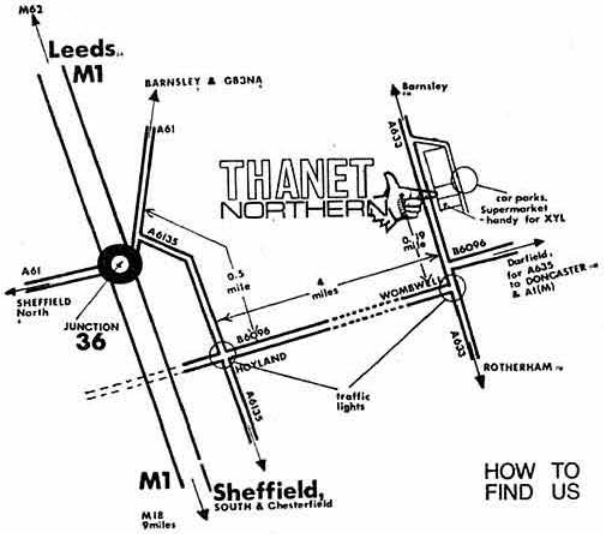
ICOM

64 HIGH STREET, WOMBWELL, BARNSLEY, SOUTH YORKS.



HOW TO FIND US

We are conveniently located close to the M1, and not far from the M18 and M62 Motorways. Ample free and unrestricted parking at rear of shop.

- ★ ICOM
- ★ AREA DISTRIBUTORS OF N.E.C. EQUIPMENT
- ★ YAESU MUSEN DEALERS
- ★ WESTERN ELECTRONICS PRODUCTS
- ★ S.B.E. DISTRIBUTORS
- ★ STOCKISTS OF:
  Microwave Modules Products
  S.E.M. Products
  QM70 Products
  Polar Electronic Developments
  Jaybeam, ASP, Revco and Hygain aerials.
- ★ PLUS WIDE RANGE OF COMPONENTS AND ACCESSORIES

A SELECTION OF OUR PRICES (Including VAT and Carriage)

Yaesu FRG7	£159.75	Osker SWR 200	£37.00	Icom IC240	£179.00
Yaesu FT101E	£453.66	Osker SWR 300	£41.50	Icom IC215(8 CHS.)	£149.00
Yaesu FT221R	£325.00	Osker SPC-2B	£14.50	Icom IC202	£162.00
N.E.C. CQ11OE	£682.08	Osker SPC-07a	£18.75	Icom IC245	£398.00
N.E.C. CQ301	£803.70	(all three for £71.00)		Icom IC211	£527.00
Western DX33	£76.00 (carriage extra on this)	Western PM2000	£44.00	Emoto 103LBX	£71.00

- ★ We will be pleased to quote for any item(s) against your enquiry.
- ★ We try to maintain adequate stocks of most advertised items, but reserve the right to supply to order if necessary.
- ★ We will open evenings and Sundays (by appointment) for sales.

OTHERWISE OPEN DAILY MONDAY TO SATURDAY 10 a.m.–6 p.m.
(closed all day WEDNESDAY)

Tn

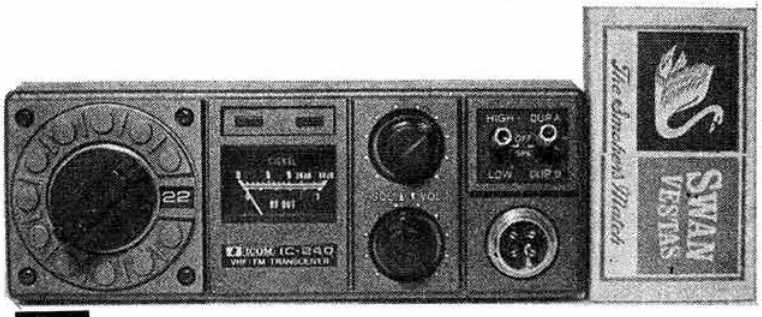
ICOM

TELEPHONE BARNSLEY 756229 TELEX 54151
24 Hour Ansaphone Service
Public Payphone Available

64 HIGH STREET, WOMBWELL, BARNSLEY, SOUTH YORKSHIRE

PAUL
G3VJF

ICOM



THE IC-240 IS NOW £179
INC. VAT*

*Prices marked thus have been reduced because of an extremely favourable rate of exchange at the time of purchase.

Sorry to have to bore you with even more comparison lists, but we have had so many phone calls that we felt that we should at least give you one more to compare with the rest! We still think, though, that the best way to choose a rig is to ask the owner of one for his opinion. Remember that ease of use and after sales service are probably the most important parameters.

Try this one:–

	FT-227R	TR-7500	IC-240
Mean number of clicks required to QSY	100*	10	6
Need to remember to press extra button for all odd channels	YES	NO	NO
Channel spacing (normal use requires 25kHz)	5kHz	25kHz	25kHz
Instant reverse repeat on all repeater channels without re-tuning	NO	YES	YES
Ability to remain on frequency last used when set is switched off then on again	?	YES	YES
Position of tone burst switch	REAR	FRONT	NONE (Automatic select)
Position of low power switch	REAR	FRONT	FRONT
Supplied with all those channels in the FM portion of the band which are used 98% of the time†	YES	YES	YES
Scanner available to cover all 40 FM channels plus electronic tuning outside this range	NO	NO	YES
Can be arranged to have the most frequently used channels next to one another	NO	NO	YES
Price (seems to vary a bit)	180/189	225	179

** or 50 if you confine yourself to the band*
† our guess, but it may be nearer to 99·5%

So there you are folks—the decision is up to you, but if you do buy ICOM from us we will guarantee you the best after sales service we can possibly give.
All data is correct to the best of our knowledge and is collected from adverts and other enquiries.

DON'T FORGET THE PORTABLE TWINS
IC-215 3w FM 8ch £149* IC-202 3w SSB £162*

Both provide the best in portables in their field, with crisp, clear modulation, a healthy 3 Watts of output, large sensible batteries and an excellent receiver. Both are used by many as base stations, with, or without, a linear. An economical way of getting a very good signal in the air!

◀ Introducing "SLIM JIM" SJ2

144-146MHz—High efficiency 2 metre omni-directional vertical

An omni-directional 2 metre aerial developed by T & T from a design by F. C. Judd (G2BCX). Derived from the "J" the SJ2 is a free space aerial with *better than 50% greater efficiency than conventional ground plane types due to the very low angle radiation field.* The aerial is slim and compact (58 inches long) and as there are no radials it is unobtrusive and has low wind resistance. Supplied complete with mast clamp. £15.50 inc. VAT (carriage 70p).

FOR DETAILS LEAVE YOUR NAME AND ADDRESS OR CALLSIGN ON OUR ANSAFONE (02273 63850) DURING THE EVENING WHEN CALLS ARE CHEAP

HP TERMS NOW AVAILABLE

YOUR SOLE AUTHORISED UK IMPORTER FOR ICOM

Access

THANET ELECTRONICS

143 Reculver Road, Beltinge, Herne Bay, Kent (02273 63859)

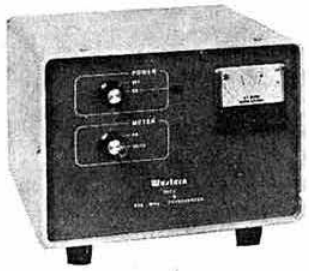
Access

Western

TRY "SEVENTY" in "SEVENTY EIGHT"

with the

Western 70TV 432MHz TRANSVERTER



this will be the new pacesetter!

We have designed and built the 70TV up to a high standard. Not down to a price! Don't buy a 70TV if you're looking for a cheap unit.

BUT if you want to hear signals that some others can't . . . the 70TV is the answer!

- ★ Fully stabilised AC and DC PSU
- ★ Full 10W. R.M.S. output
- ★ Double conversion to minimise spurious outputs
- ★ Noise figure 2·5dB typical
- ★ Built-in 28MHz attenuator 30:1
- ★ Built-in relays
- ★ Matches Yaesu styling
- ★ Withstands infinity mismatch
- ★ All units aligned on Hewlett-Packard Spectrum Analyser
- ★ Can be driven by most 28MHz Transceivers

Ex-Stock Now—ONLY £178.87 Inc. VAT

★ ALL MODES (YES—EVEN FM) on ALL HF BANDS and 70

WITH YOUR Western 70TV and the NEW

FT901DM from

YAESU

The **FT-901DM** provides unique features far ahead of any other transceiver of its kind on the market today.

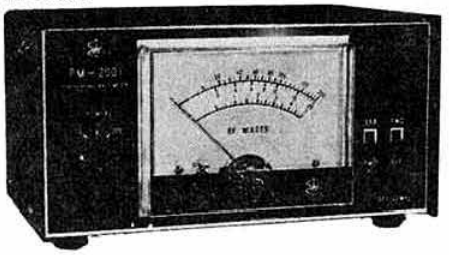
PRICE
£842.63 Inc. VAT

- ★ Variable-bandwidth IF passband tuning. Not "IF shift", this feature superimposes two filters upon each other, then tunes one to make the bandwidth as wide or narrow as desired.
- ★ Rejection tuning for elimination of particular interfering signal.
- ★ Audio Peak Frequency tuning provides a narrow audio peak with steep skirts for single-signal CW reception.
- ★ Built-in Curtis 8043 IC electronic keyer.
- ★ PLL frequency derivation. Digital plus analogue readout.
- ★ Unique memory circuitry allows storage of a frequency with recall for instant control of transmit, receive, or transceive frequency.
- ★ VOX, semi break-in CW with sidetone, 25KHz calibrator, advanced noise blanker, RF speech processor, receiver 20dB RF attenuator, and TX/RX clarifiers are built-in.
- ★ Rugged 6146B final tubes. Toroidal output circuitry and RF negative feedback for maximum reliability and purity of emissions.
- ★ Plug-in printed circuit boards for ease of maintenance.
- ★ TUNE button provides 10 seconds of "key down" condition, then automatic return to receive for protection of final tubes.
- ★ All band (160 through 10 meters plus WWV/JJY receive) and all mode (LSB, USB, CW, FSK, AM and FM) coverage.
- ★ Choice of supply voltages of 100/110/117/200/220/234 VAC or 13·8 VDC with no external power supply required.
- ★ Diecast front panel and heavy-duty steel case for maximum protection from shock or vibration damage while travelling.

Electronics (UK) Ltd

GET "PEP"ped UP on 2 METRES for the NEW YEAR with WESTERN's NEW PM2001!

WESTERN—the firm who gave you the PM2000—the first direct PEP reading HF wattmeter—now proudly present the PM2001 . . . the first direct PEP reading VHF wattmeter!



- ★ Direct measurement of SSB PEP output from 50 to 150MHz.
- ★ RMS power measurement for AM, FM or CW.
- ★ Forward or reflected power readings at the flick of a switch.
- ★ Full-scale ranges from 5 to 200 watts (RMS or PEP).
- ★ Accurate to within 7%.
- ★ No calibration dials to set.
- ★ Large, clear, easy-to-read meter scales.
- ★ Can be left "in-line" at all times.
- ★ Styled to match the WESTERN PM2000 HF PEP meter.

These superb instruments are now available ex-stock at £52.92 inc. VAT

CHRISTMAS PRESENT MONEY TO SPEND? TRY THESE . . .

OSKER SWR-200

All the facilities of the long-established and well-known Osker SWR-200, but now with optional add-on couplers for accurate (10%) power and SWR measurements in the 2 metre and 70 centimetre bands. Basic instrument for HF—add couplers for VHF and/or UHF. Couplers not useable without basic instrument.

	SWR-300	SPC-2B	SPC-07A
Freq. range (MHz)	3·5–30	144–148	420–450
Power ranges (W)	0–20; 0–200; 0–2000	0–20; 0–200	0–2; 0–20
Accuracy	±15% FS	±10% FS	±10% FS
Impedance (Ω)	50	50	50

PRICES (Inc. VAT, carriage free)

SWR300	£43.20
SPC-2B	£15.12
SPC-07A	£19.98

OR . . . ALL THREE FOR £75.00

OSKER SWR-300

Almost too well-known to need description. Power and SWR measurement 3·5 to 150MHz. Accuracy ±15% FS; 50 or 75 ohm; ranges to 2kW.

PRICE: £38.88 inc. VAT, carriage free.

ACCESSORY CORNER

Yaesu YH-55 phones	£9.00
Yaesu QTR-24 World clock	£14.62
Yaesu YD-846 hand microphone (50k)	£9.00
Shure 526T desk microphone	£33.69
Vibroplex "Original" Standard key	£38.81
Katsumi CW101 Audio CW filter	£15.75

PAYMENT: Cash or cheque, ACCESS (Mastercharge), VISA (Barclaycard), GIRO TRANSFER (A/c 288 6154), DINERS CLUB; HP and Credit Sale arranged

★ ★ ★ SEND SAE FOR CURRENT SECOND HAND/SPECIAL OFFER LISTS ★ ★ ★

Western Electronics (UK) Ltd

HEAD OFFICE (All Mail/Enquiries)

FAIRFIELD ESTATE
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Tel. Louth (0507) 4955/6

Our Agents
Southern: Alan Paxton, G4BIZ, Chandlers Ford, Hants (04215) 65015
Scotland: Alan Cameron, GM3OGJ, Alloa (0259) 214653
N. Ireland: Les Lyske, GI3CDF, Newtownards (0247) 812449

Opening hours:
LOUTH: 9-12; 1-5 pm Mon-Fri. By Appointment Sat 9-12.
LEICESTER: May's Hi-Fi, Churchgate (Tel: 0533-58662) Mon-Sat 9-6 pm; closed Thur.

YAESU
proudly announces
1980's RADIO TODAY:
The FT-901DM HF Transceiver

The Ham's dream—to have the best—is now reality.

Advanced receiver features include rejection tuning, dual-filter variable-bandwidth IF passband tuning, and audio peak frequency tuning for sharp CW reception. Unparalleled receiver selectivity is yours.

Built-in Curtis 8043 IC Keyer! Provides reliable operation and superb immunity from RF interference.

Famous Yaesu quality workmanship throughout. Toroidal output circuitry and RF negative feedback for maximum reliability and purity of emissions. Rugged GE 6146B final tubes.

Memory circuitry allows you to store a frequency, then recall it with the push of a button for control of transmit, receive, or transceive frequency. Digital plus analog frequency readout. PLL frequency derivation.

VOX, calibrator, noise blanker, RF speech processor, and 20dB attenuator are all built in, not expensive accessories.

Modern computer-type plug-in circuit boards for quick servicing and clean layout.

The FT-901DM will be available soon. See your dealer for a color brochure on the FT-901DM and other Yaesu products.

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

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

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

LOWE ELECTRONICS LTD

PRICE LIST JANUARY 1978

	Price inc. VAT £	Carriage £
TRIO EQUIPMENT		
TS820 160-10m HF transceiver 200W PEP	645.00	3.00
VF0820 External VFO	112.00	3.00
DG1 Digital readout to 100Hz	127.00	3.00
DS1A 12V DC inverter	40.00	0.86
YG88C CW filter 8 pole	36.00	0.28
SP520 Matching speaker 8 ohm	19.00	0.86
TV502 2m transverter all solid state	178.00	3.00
DK520 Conversion Kit—allows use of DG5 with TS520	12.00	0.40
TS520S 1·8-28MHz SSB transceiver 200W PEP	489.00	3.00
DS1A 12V DC inverter	40.00	0.86
VFO520S Remote VFO	94.00	3.00
SP520 Matching speaker	19.00	0.86
DG5 Digital display/40MHz frequency counter	132.00	3.00
YG3395C CW filter	36.00	0.40
R599D 160M10m all mode Rx, CW/USB/LSB/AM/FM	403.00	3.00
TS599S De luxe HF Tx-80-10m CW/USB/LSB/AM	383.00	3.00
S599 Matching speaker 8 ohm	18.00	0.86
CC29A 2m converter for R599 for internal fitting	20.00	0.28
TS700G 2m transceiver. CW/USB/LSB/FM/AM 240V AC/12 DC	426.00	3.00
VOX3 Matching VOX unit (free with TS700G)	19.00	1.06
SP70 Matching speaker	18.00	0.86
TS700S 2m all mode digital readout transceiver. Simply the best	542.00	3.00
VFO700S External VFO	83.00	3.00
SP70 Matching speaker	18.00	0.86
TR7010 2m SSB/CW mobile transceiver 10W output	189.00	3.00
PS5 Matching AC power unit/digital clock	58.00	3.00
Spare 2 pole power plug	0.25	0.15
TR7200G 10W FM mobile fitted 10 channels, auto toneburst, etc	189.00	3.00
VFO30G Matching VFO with repeater shift	92.00	3.00
PS5 Matching AC power unit/digital clock	58.00	3.00
*TR7400A 2m FM 30W mobile transceiver 800 channels	329.00	3.00
*TR7500 2m FM 10W transceiver. PLL with all FM channels, programmed 144-146MHz	225.00	3.00
TR2200GX 2m FM handy transceiver c/w battery charger, microphone, carrying case, fitted 3 channels	139.00	3.00
TR2200GX 2m FM handy transceiver c/w battery charger, microphone, carrying case, fitted 12 channels	169.00	3.00
RA1 Helical rubber antenna	6.30	0.15
MB1A Matching mobile mount (also fits TG2200/G)	9.70	0.67
Spare power lead	1.25	0.15
Pack of 10 ni-cad batteries	9.72	0.36
VB2200GX 10W mobile PA with SWR protection. All leads supplied	45.00	0.86
Spare whip for RT2200GX. (Also available for 2200/2200G)	1.90	0.15
TR8300 70cm FM mobile 10W transceiver fitted 4 channels	227.00	3.00
TR3200 70cm FM handy transceiver fitted 3 channels	182.00	3.00
MB1A Matching mobile mount	9.70	0.67
Spare power lead	1.25	0.15
Pack of 10 ni-cad batteries	9.72	0.36
VB3200 10W PA with RX pre-amp. Same case size as TR3200	95.62	3.00
R300 General coverage receiver 170kHz-30MHz. B/S for broadcast bands	184.50	3.00
HS5 Communications headphones, tailored response	22.00	0.67
Spare ac lead	1.25	0.15
*TL922 HF linear amplifier: 160-10m/2kW PEP input. 2x 3-500Z tubes	697.00	3.00
HC2 World time clock. 24 hour time zone clock. Invaluable aid	15.50	0.67
MC10 Hand microphone. 50k impedance (also available in 500 ohm)	9.00	0.28
MC50 De luxe desk microphone dual impedance. PTT locking bar	24.00	0.86
LF30A HF low pass filter 1kW. 90dB stop band rejection	17.00	0.67
BPF2A 2m band pass filter 144-146MHz 50W rms 100W PEP	27.75	0.67
HS5 Communications headphones, tailored response	22.00	0.67
PS6 Power supply. Matching PSU speaker for TR7500	57.00	3.00
*AT200 1·8 to 30MHz antenna tuner	86.00	3.00
TRIO OSCILLOSCOPES		
CS1570 Dual trace dc to 30MHz*	464.40	3.00
CS1560A Dual trace dc to 15MHz*	324.00	3.00
CS1562 Dual trace dc to 10MHz†	270.00	3.00
† The price includes two matching full bandwidth × 10 probes		
PF810 In line power meter. 3 power ranges. 1·8-200MHz. 2 way antenna switch	64.80	3.00
CO1303G Station monitor scope (as CO1303D but fitted in line RF monitor and 2 tone oscillator	129.60	3.00
CO1303D Single trace dc to 5MHz. Ideal small service scope	108.00	3.00
DM800 Dip resonance meter	48.60	0.86
JAPAN RADIO COMPANY		
NRD505 Professional communications receiver c/w matching speaker	1800.00	3.00
CRYSTALS		
We stock FM channels SO, S10 to S25, S32 (145.80) and all current repeater and reverse repeater channels for the equipment we sell.		
Price per single crystal	2.40	0.15
Price per pair	4.80	for any
Special offer on crystals for TR2200GX, TR7200, TR3200 and TR8300 ONLY. 3 pairs for £10.00	10.00	qty.
100kHz marker crystal	3.37	0.15
KF430		
70cm 10W transceiver, fitted 9 channels. Auto TB. The ultimate mighty midget	180.00	3.00
NIHON DENGYO		
Liner 430 70cm SSB transceiver—Get ready for OSCAR 8!	290.25	3.00
R115E Regulated psu for Liner 430	31.50	3.00
Belcom 70A 70cm 10W fixed/mobile transceiver. 430-440MHz. CW/USB/LSB/FM/AM	t.b.a.	
RTTY VIDEO DISPLAY		
*TD960 Send/receive RTTY & Computer Terminal display unit	351.00	3.00
*DM 170A RTTY terminal unit	129.60	3.00
VHF AMATEUR RECEIVERS		
NR56 Tunable/crystal 2m FM receiver. 144-146MHz	54.00	0.86
ASV1515 VHF FM monitor receiver less crystals. Mains/battery. Self-contained	39.60	0.86
AMR217B Scanner with 8 crystals. The best and most popular. Mains/battery	106.87	1.06
Seiwa MS2 Scanner less crystals. 4 channel pocket scanner	67.50	0.67
Seiwa MR2 Monitor less crystals. 12 channel pocket receiver	63.00	0.67
Crystals for the above—each	2.40	0.15
MICROWAVE MODULES EQUIPMENT		
MMC70 4m converte	20.25	
MMC144/28 LO 2m converter	22.50	
MMC432/28 70cm converter	27.00	
MMC432/144 70cm converter	27.00	All
MMC1296/28 23cm converter	31.50	micro-
MMC1296/144 23cm converter	31.50	wave
MMV1296 23cm tripler	33.75	modules
MMD050 50MHz counter	66.96	post
MMD500P 500MHz prescaler	27.00	paid
MMD050/5000 500MHz counter	85.32	
MMT342/28 70cm transverter	133.28	
MMT432/144 70cm transverter	169.88	
MMT144/28 2m transverter	88.87	
FILTERS		
Trio LF30A Low pass filter 1kW rating. 32MHz cut off. 90dB stop band	17.00	0.67
Trio BPF2A 2m band pass filter—144-146MHz. 50W. rms. 100W P.E.P.	27.00	0.67
Shinwa 1110 2m band pass filter—144-146MHz	13.72	0.67
Shinwa 1003 2m low pass filter—146MHz cut off	11.48	0.67
Shinwa 1140 28MHz transverter filter—28-30MHz band pass	13.72	0.67
Shinwa 1005 HF low pass filter—32MHz cut off	10.80	0.67
HF MOBILE ANTENNAS		
'G' whip tribander helical 20/15/10	19.68	1.06
G' whip multimobile 20/15/10	23.08	1.06
'LF coils for the above whips (Specify whether tribander or multimobile)	5.90	1.06
Telescopic whips for the above (Specify whether tribander or multimobile)	5.90	0.66
	5.90	0.66
	2.25	0.66
Base mounts for all 'G' whips	3.37	0.66
Extendarod 40in booster	9.56	1.06

*New items in stock

LOWE ELECTRONICS LTD

	Price inc. VAT £	Carriage £
VHF/UHF 'J' BEAMS		
5Y/2M 5 element yagi	7.70	3.00
8Y/2M 8 element yagi	10.00	3.00
10Y/2M 10 element yagi	21.31	3.00
PBM14/2M 14 element para beam	31.16	3.00
5XY/2M 5 element crossed yagi	15.97	3.00
8XY/2M 8 element crossed yagi	19.91	3.00
10XY/2M 10 element crossed yagi	26.32	3.00
Q4/2M 4 element quad	16.31	3.00
Q6/2M 6 element quad	21.71	3.00
D5/2M 5 over 5 slot fed yagi	13.61	3.00
D8/2M 8 over 8 slot fed yagi	18.22	3.00
UGP/2M Unipole ground plane	7.03	3.00
MBM48/70cm Multi beam	21.65	3.00
MBM88/70cm Multi beam	28.96	3.00
12XY/70cm 12 element crossed yagi	29.70	3.00
TAS¾in 2m whip	13.05	3.00
C5/2m Colinear	30.93	3.00*
C8/70cm Colinear	39.37	3.00*
D15/1296 23cm antenna	23.06	3.00
	* By BRS	
PHASING HARNESS		
PMH/2C For 2m circular polarisation	5.06	0.28
PMH2/70 For 70cm	5.90	0.28
PMH4/70 For 70cm	12.26	0.28
CDE ROTATORS		
AR40 (5 core cable required)	51.75	3.00
CD44 (8 core cable required)	106.87	3.00
Ham-2 (8 core cable required)	145.12	3.00
RAK ANTENNAS		
A-8XL 80m dipole 4kW rating	12.15	0.86
AL-48DXN 80/40m trap dipole. Length only 28m 2kW P.E.P.	25.43	1.06
Midy VN 80m to 10m trap dipole. Length 23m. 1·5kW P.E.P.	40.50	1.16
Listener III SWL antenna. Double dipole. 24m overall	25.43	0.86
Listener I SWL antenna. Loaded wire antenna. Only 5m long	9.54	0.66
HD-26A Extendable dipole. Tunable from approx 70cm to 4m	6.75	0.44
HY-GAIN ANTENNAS—HF beams		
TH2Mk3 2 element yagi for 70·15 and 10m. 1kW rating	117.56	3.00
TH3Jnr 3 element yagi for 20·15 and 10m. 600W P.E.P.	121.50	3.00
TH3Mk3 3 element yagi for 20·15 and 10m. 1kW	167.62	3.00
TH6DXX 6 element total 20·15 and 10m	201.37	3.00*
Hyquad 2 element quad. 8·5dB gain on 20·15·10m	182.25	3.00
	* By BRS	
HY-GAIN ANTENNAS—HF verticals		
12AVQ Trapped vertical self-support for 20·15.10m	39.93	3.00
14AVQ/WB Trapped vertical self-support for 40.20.15.10m	57.19	3.00
18AVT/WB Trapped vertical self-support for 80.40.20.15.10m	81.45	3.00
VHF MOBILE WHIPS		
Bantex B5/GF 2m ¼ whip c/w single hole base mount	8.16	3.00
Magnetic mount for all Bantex whips	10.40	0.66
Bantex UCL, 70cm colinear ½ over ½ wave whip with base	9.62	3.00
Bantex BUG, 2m colinear	29.53	3.00
'J' Beam TAS¾in 2m whip	13.05	3.00
Daiwa MA41, 2m ¼ wave gutter mounting with whip, clamp and cable	8.44	0.86
Gutter clamp. Accepts most whips	2.81	0.67
70cm UDL colinear whip ¼ over ¼ wave whip with base	16.28	0.67
Revco—base only fo ¾in whip	18.50	0.66
Revco—whip and coil only	5.00	0.44
*RAK ¾ 2m whip and mag mount, complete	13.50	3.00

CABLE (prices per metre)	Price £	Price inc. VAT £	Carriage £
5 core rotator cable for AR40	0.20		
8 core rotator cable for CD44, HAM 2, TR44, HAM-M	0.32		Up to
12 core rotator cable—heavy duty	0.25	Please	20m
UR43 50 ohm coaxial cable. 4·3dB/100ft at 100MHz	0.15	Add	add 80p
UR67/RG8U 59 ohm coaxial cable. 2dB/100ft at 100MHz	0.38	VAT at 8%	above 20m
Twin feeder 300 ohm	0.08		£1.00
Twin feeder 75 ohm	0.08		
Twin feeder 75 ohm—heavy duty	0.22		
VALVES			
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FROM THE WEST AND SOUTH/WEST. Follow M5 then M6 to Spaghetti Junction (see above). Alternatively, leave M5 at Junction 4 or 3 and proceed to inner ring road. Turn South on ring road and leave on A47 (East). We are located three miles from this point.

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

The national society representing all UK radio amateurs

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

GENERAL MANAGER AND SECRETARY
D. A. Evans, G3OUF

EDITOR
A. W. Hutchinson

A message from the Society's new President

In accepting the great honour of becoming the 44th President of the Society, I am very conscious of both the responsibility and the opportunity this office brings with it. Our previous President set a standard of service to the Society which on the one hand will be difficult to emulate but on the other hand by its success has made the task of his successor easier.

There still remains much to be done. The Society fundamentally is in good shape, and one would like to see continued Lord Wallace's philosophy of making it more responsive to the needs of the members who, we must never forget, *are* the Society. On the international side, much of our efforts will continue to be devoted to preparing for WARC 79. The IARU Region 1 conference in Hungary in April will add to the already extensive preparations made.

Amateurs are a privileged group. They themselves can recognize that they justify these privileges by their contributions to the art of radio and to a reduction in the barriers between nations. However, it is important that we continue our efforts to ensure that those outside the hobby who are less well qualified to judge these contributions can also fully appreciate the special training and experience of amateurs which sets them apart from other operators of communication equipment. Every amateur has a role to play in this direction.

To all members and staff of the Society, I extend my wishes for a happy and successful year.

Dain Evans, G3RPE

QTC
amateur radio news

Delays to "Radio Communication"

As a result of production problems at the printers, the November and December issues of the journal were delivered a week late and posted on 9 November and 8 December respectively. Unfortunately these production problems have become worse and this issue of the journal has also been seriously delayed.

However, from the March issue printing of the journal is being undertaken by another printer and a different process, and it is expected that these delays will then cease.

Another source of delay in *receipt* of the journal by members is that due to the vagaries of the postal service, but some members appear not to be aware that this is one over which the Society has no control. Under the Periodical Publishers Association contract with the Post Office, by which means the journal is despatched, *all copies are posted on the same day*. From then onwards delivery is entirely in the hands of the Post Office and, as the journal is posted as 2nd Class mail, it receives the low order of priority which that class has. This can result in delivery being spread over several days depending on the speed at which it is handled between the Post Offices of despatch and delivery.

In the majority of cases delivery is made on the third or fourth working day after posting, but there are usually a few members who get their copies later without any logical reason. Invariably among the latter are a number who miss out on Members' Ads bargains and consequently feel aggrieved. This is understandable, but it should also be understood that resulting complaints should be laid at the door of the Post Office, starting with the office of delivery, and not at the RSGB.

Membership cards

Members of the RSGB in the British Isles are reminded that a new membership card will be issued on receipt of their subscription. The membership card has two main functions: to act as a receipt for the subscription; and to provide proof of membership so that the member's discount on books may be claimed on purchases from RSGB HQ and RSGB bookstalls at rallies, etc.

On average, a membership card is sent within 10 days of receipt of a subscription, but as they are printed in batches of about 1,000 there may be a delay of up to three or four weeks in some cases. If a membership card is not received within four weeks, please enquire if the subscription has been received. However, if payment is made by banker's order, despatch of the membership card may be delayed by up to eight weeks because the Society has to wait for lists from the bank to check that payment has been received. Nevertheless, as a membership card is valid for the member's discount up to three months after the renewal date, these delays should cause no problems.

As a result of program modifications to the data processor, members having BFPO addresses will in future also have membership cards issued to them.

COUNCIL ELECTION RESULTS

The result of the ballot to fill the two vacancies on Council from 1 January 1978 was as follows:

E. J. Allaway, G3FKM	1,837 votes
R. Bellerby, G3ZYE	374 "
A. M. Cameron, GM3OGJ	363 "
T. P. Douglas, G3BA	1,272 "
R. W. Fisher, G3PWJ	191 "
G. I. Knight, GM8FFX	639 "
D. M. Manley, G3OWF	368 "
D. M. Pratt, G3KEP	592 "
D. S. Smith, G4DAX	414 "
Total number of votes accepted	2,976
Late votes not accepted	514

(Many of the late votes were post-marked 21 November but were not delivered until after the closing date of 23 November)

Spoilt votes 20

Messrs **E. J. Allaway, G3FKM,** and **T. P. Douglas, G3BA,** were accordingly elected to serve on Council for the three years 1978–80.

Special event stations

Authorization for special event stations will be re-introduced on 1 January 1978, and for a trial period of one year the Home Office will:

(a) accept requests that have been submitted through the Society; and

(b) authorize these stations by a formal notice of amendment that will be issued without charge.

Applications for a notice must reach the Home Office at least 14 days in advance of the effective date and therefore the information should be sent to the Society at least one month before the intended commencement of operation. A large number of requests have already been received following the announcement in the November issue of *Radio Communication*.

The RSGB expects to receive the co-operation of individuals and groups so that the new simplified procedure can be effective.

QSL Bureau

Mrs C. Pope, G4CMM, 136 Ridgeway Drive, Bromley, Kent BR1 5DD, has been appointed sub-manager for the callsign series G8PAA onwards. Mr and Mrs A. J. Mathews, G6QM, will continue to handle G8 calls up to G8OZZ.

4U1ITU

A room in the ITU headquarters building at Geneva, hitherto used for storage and as an office, is to be converted into a satellite ground terminal station. This will be used for demonstrations of the amateur satellite service to the many visitors to the ITU and to delegates attending international conferences. Items of equipment for the new station have been generously provided by Microwave Modules (of Liverpool) including a transverter, converter and counter. With the approach of WARC 79, stations such as 4U1ITU fulfil a valuable purpose, and the IARC is appreciative of the help of Microwave Modules in the person of its director, Richard Porter.

Switzerland

The callsign block HB9PAA – HB9PZZ is now being used for vhf licences in Switzerland.

Use of glassfibre

A timely warning is contained in a recent issue of the *LERC ARC Bulletin* (W6LS) by W6DDB. This points out that the catalyst added to glassfibre resin to accelerate hardening is usually mekp (methyl ethyl ketone peroxide) which can completely destroy eyesight. Once mekp commences to destroy eye tissue there is no known way to stop the process. When using glassfibre resin and its additives protective glasses should be worn. An adequate supply of clean water should be on hand with which to wash out the eyes within four seconds if an accident occurs. MEKP is also used in other products, such as some liquid casting plastics.

QRM

The latest figures from the Japan Amateur Radio League reveal that there are now 465,000 licensed radio amateurs in Japan.

More convictions

At Leicester Magistrates' Court on 28 November, the following were found guilty of committing offences in connection with offences under section 1 of the Wireless Telegraphy Act, 1949:
Graham Wale, who was fined £300 plus £25 costs;
Alexander Sagar, fined £250 plus £25 costs; and
Geoffrey Noon, fined £250 plus £25 costs.

Office of Fair Trading action

The Director-General of Fair Trading has started proceedings in the Brentford County Court, for alleged refusal to give satisfactory assurances, against Mr John William Pound, who was or purported to be a director of AVC (Advisory Services) Ltd, and Mr Barry George Harry Took, who until he resigned in 1976 was a director of the company. AVC (Advisory Services) Ltd, which went into liquidation in May 1976, was a mail order supplier and dealer in audio, hi-fi and radio equipment and traded as "City Audio".

Part 3 of the Fair Trading Act 1973 provides that where it appears that a company has persisted in a course of conduct detrimental to the interests of consumers and has disregarded its obligations under the criminal or civil law, the Director-General can seek written assurance that the course of conduct will cease. The Director-General may also seek personal assurances from directors and other company officers who appear to have consented to or connived at the company's conduct. Such assurances are binding on the directors and officers in relation to any other company in which they hold office and any other business carried on by them in the future.

If assurances are refused, the Director-General can seek from a court orders forbidding the continuation of such conduct. Breach of an order amounts to contempt of court and lays the offender open to a fine or, in the case of an individual, imprisonment.

In the present case the Director-General alleges that he has been unable to obtain satisfactory assurances from the companies or the officers named in the proceedings. The assurances were sought because complaints from consumers who did not receive the goods they ordered, or refunds of the deposits they had sent, appeared to the Director-General to constitute persistent breach of civil law obligations.

RSGB AMATEUR RADIO EXHIBITION

Alexandra Palace, London N22

5 and 6 May 1978

The Society will once again be organizing this, the amateur radio event of the year, to provide something of interest to all radio amateurs.

Full details will be published later, and all enquiries should be addressed to Les Hawkyard, G5HD, 100 Shirley High Street, Southampton, Hants; or via RSGB headquarters.

Rotarian net

The Rotarians of Amateur Radio net will, in future, commence at 9am every Sunday throughout the year, as this appears to be more convenient to the regular operators. Frequency: 3·692MHz ± QRM.

The transatlantic net at 1200gmt every Sunday is being transferred to 21·400MHz. owing to greater reliability with the increased sun-spot activity.

Liverpool University ARS dinner

Liverpool University ARS intends to hold a dinner in the spring this year to which all past-members are invited. The secretary, GW4FJH, would be grateful if all ex-G3OUL members would let him know if they will be able to attend, so that arrangements can be made and the address list revised. Write to him c/o Students' Union, 2 Bedford St North, Liverpool 7.

REGION 19 REPRESENTATIVE

Valid nominations for this appointment have been received in respect of:

Mr J. N. Bolton, G4DGK. Nominated by: S. A. Richards, G8LGX; A. G. Smith, G3WPD; P. R. Wilby, G3YRU; R. Macduff, G4AWB; K. P. Kearns, G8LYV.

Mr R. J. Broadbent, G3AAJ. Nominated by: W. E. F. Corsham, G2UV; R. J. Eckersley, G4FTJ; J. Hooper, G3PCA; H. Thompson, G3AMF; R. Glover, G8IUC.

Mr D. P. S. Wright, G4FBW. Nominated by: F. Taylor, G4DUO; S. G. Collyer, G3PZK; H. J. Stanley, G3YFF; R. A. McCowatt, G3WPK; I. T. Kirby, G4CVL.

Corporate members residing in Region 19 (Greater London north of the Thames, and Hertfordshire) are invited to vote for one of these candidates by sending a postcard in the following form addressed to: The General Manager, RSGB, 35 Doughty Street, London WC1N 2AE, to arrive not later than 14 February 1978.

I, ...

being a fully paid up corporate member of the RSGB resident in Region 19, wish to record my vote in favour of

Mr .....

as representative for Region 19

Signed .....

Callsign or BRS number.....

Address .....

An experimental self-tutor for morse code using the SN74S387 prom

by M. R. IRVING, G3ZHY*

Introduction

Despite numerous technological advances made in recent years, morse code still remains a popular method of communication with radio amateurs. This is probably due, in part, to the fact that the code can be used with relative success when other forms of communication fail due to poor band conditions. Morse code is of course a language, although it is not "spoken" in the true sense of the word. Nevertheless, being a language, a considerable amount of thoughtful and dedicated study is necessary if fluency is to be attained.

Learning morse code usually occurs in a series of discrete steps. Initially, it is necessary to become familiar with the sound of individual characters, and this is normally achieved by committing to memory, for example, the letter A as dit-dah etc. Once this first step has been mastered, short groups of characters or words may be attempted, albeit at relatively slow speed. As proficiency develops, speed is gradually increased with additional letters, numerals and punctuation characters included in the text.

Progress tends to be erratic; in a series of jumps rather than in a smooth progression. Furthermore it is necessary to attempt to read code at a slightly faster rate than one is currently able to, ie achieve less than 100 per cent correct copy, if progress at increased speed is to be made. This aspect of learning morse, if not appreciated, is most discouraging to the beginner and is, perhaps, one of the reasons why so many amateurs opt for Class B licences, or operate Class A telephony-only once the morse test has been passed.

With the assistance and encouragement of a good teacher, learning morse need not be a traumatic experience; indeed, it can be an enjoyable and rewarding one. In this respect the RSGB slow morse practice transmissions have, for many years, assisted many aspiring radio amateurs through their morse tests. Unfortunately no two individuals progress at the same rate, and the ideal teacher would need to provide tailor-made exercises for each student. This is of course not practical unless the ratio of students to teacher is low.

In the experimental unit to be described, an attempt has been made to simulate certain aspects of this "ideal" teacher. The unit is not designed to send plain language. However, by various combinations of switch settings on the control panel it is possible to select any specific letter, numeral, or punctuation character that is stored in the unit's

*22 Wheatley Way, Chalfont St Peter, Bucks. SL9 0JE.

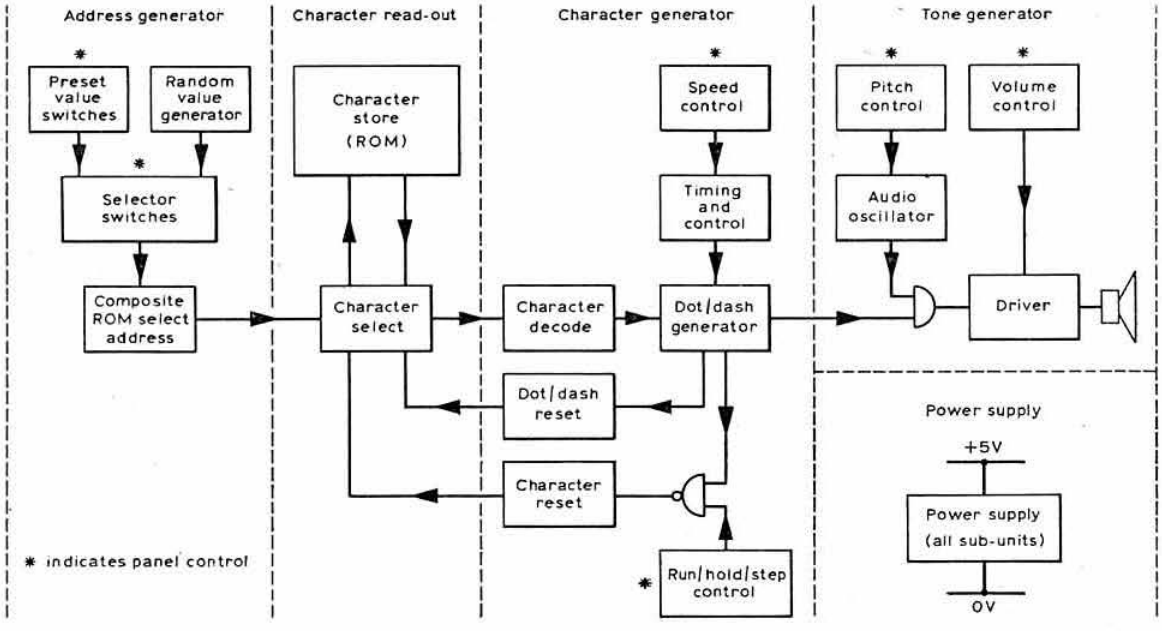


Fig 1. Functional block diagram

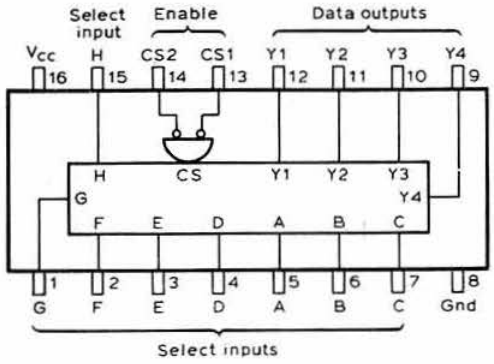


Fig 2. Type SN74S387 package (top view)

pre-programmed read only memory (prom). Groups of characters from the character repertoire may also be selected, eg letters only, numerals only, punctuation and numerals only, etc, and these characters may be sent in random sequence. Finally, the speed, pitch and loudness of the code can be varied by further panel controls, thereby allowing a "lesson" to be tailored to the exact requirements of the individual student.

General description

Fig 1 shows a functional block diagram for the complete unit. At first sight the circuitry may seem to be complicated. However, as with most electronic equipment, it can be broken down logically into a number of simpler sub-units. In this respect the self-tutor comprises five sub-units: address generator character read-out, character generator, tone generator and power supply. Each of these sub-units is discussed separately and will, in conjunction with the functional block diagram, provide an overall understanding of the unit's operation.

The SN74S387 prom

The SN74S387 integrated circuit is a 1,024-bit custom-programmable read only memory (rom). The memory is organized as 256 × 4-bit words, each word being accessed by specifying an appropriate 8-bit binary address. Full decoding and read-out of information is performed on the chip. Two over-riding chip select inputs are provided which, when either one or both are high, cause all outputs from the rom to be high.

At manufacture time all the 1,024 bit positions in the memory are set to a high level logic output (ie binary value 1). The customer supplies programming information in the form of a truth table showing the required logic levels at each of the 1,024 bit locations. Using this data the supplier will "burn in" the chip to the customer specification by open-circuiting metal links within the chip where a low logic-level output is required. Once a low-level output (0) is programmed into the rom it is irreversible; however, bit locations with a value of 1 can be changed to a 0 value by resubjecting the device to the programming process.

Fig 2 gives details of the SN74S387 rom package. Although the basic cost of the SN74S387 is relatively high (when the once-off programming charge is included), performing the same task using discrete components could not be achieved

Table 1. Layout of character store

Character	Character No	ROM address	ROM content +0	+1	+2	+3
0	0	0	0101	0101	0111	0000
1	1	4	1001	0101	0111	0000
2	2	8	1010	0101	0111	0000
3	3	12	1010	1001	0111	0000
4	4	16	1010	1010	0111	0000
5	5	20	1010	1010	1011	0000
6	6	24	0110	1010	1011	0000
7	7	28	0101	1010	1011	0000
8	8	32	0101	0110	1011	0000
9	9	36	0101	0101	1011	0000
—	10	40	1100	0000	0000	0000
—	11	44	1100	0000	0000	0000
—	12	48	1100	0000	0000	0000
—	13	52	1100	0000	0000	0000
—	14	56	1100	0000	0000	0000
—	15	60	1100	0000	0000	0000
.	16	64	1001	1001	1001	1100
,	17	68	0101	1010	0101	1100
?	18	72	1010	0101	1010	1100
/	19	76	0110	1001	1011	0000
CT	20	80	0110	0110	0111	0000
BK	21	84	0110	1010	0111	0000
AS	22	88	1001	1010	1011	0000
AR	23	92	1001	1001	1011	0000
VA	24	96	1010	1001	1001	1100
KN	25	100	0110	0101	1011	0000
K	26	104	0110	0111	0000	0000
R	27	108	1001	1011	0000	0000
Erase	28	112	1010	1010	1010	1010
—	29	116	1100	0000	0000	0000
—	30	120	1100	0000	0000	0000
—	31	124	1100	0000	0000	0000
—	32	128	1100	0000	0000	0000
A	33	132	1001	1100	0000	0000
B	34	136	0110	1010	1100	0000
C	35	140	0110	0110	1100	0000
D	36	144	0110	1011	0000	0000
E	37	148	1011	0000	0000	0000
F	38	152	1010	0110	1100	0000
G	39	156	0101	1011	0000	0000
H	40	160	1010	1010	1100	0000
I	41	164	1010	1100	0000	0000
J	42	168	1001	0101	1100	0000
K	43	172	0110	0111	0000	0000
L	44	176	1001	1010	1100	0000
M	45	180	0101	1100	0000	0000
N	46	184	0110	1100	0000	0000
O	47	188	0101	0111	0000	0000
P	48	192	1001	0110	1100	0000
Q	49	196	0101	1001	1100	0000
R	50	200	1001	1011	0000	0000
S	51	204	1010	1011	0000	0000
T	52	208	0111	0000	0000	0000
U	53	212	1010	0111	0000	0000
V	54	216	1010	1001	1100	0000
W	55	220	1001	0111	0000	0000
X	56	224	0110	1001	1100	0000
Y	57	228	0110	0101	1100	0000
Z	58	232	0101	1010	1100	0000
—	59	236	1100	0000	0000	0000
—	60	240	1100	0000	0000	0000
—	61	244	1100	0000	0000	0000
—	62	248	1100	0000	0000	0000
—	63	252	1100	0000	0000	0000

at the same cost, and certainly not in the same physical space. The basic cost is £5.33; the programming charge £2, and the burning-in charge 35p. This gives a total cost for one-off of £7.68 plus VAT, but if the device is ordered as programmed in the article from Texas Instruments, Manton Lane, Bedford, quoting Program No ZHY001, no programming charge would apply.

Character store

Although the basic organization of the rom is 256 × 4-bit words, each morse character is stored in four words or 16 bits. The rom is, therefore, artificially organized into a 64 × 16-bit array, each element of the array containing a single morse *character*; eg letter, numeral or punctuation symbol.

Each 16-bit character is further sub-divided into 8 × 2-bit *segments*. Segments are encoded with a binary value of "10" to represent a dot, and "01" to represent a dash. Additionally, a segment with a value of "11" is used to represent a pause or rest, while "00" represents a reset signal. These two latter values are used to provide inter-segment spacing and character termination respectively. Table 1 gives details of how each morse character has been encoded within the rom. Note that every character terminates with a rest and reset segment in that sequence.

The function of the individual sub-units is described in the following paragraphs: namely, to generate a rom access address, read out the appropriate character segment by segment, and produce the correctly sequenced audio tones for the given morse character.

Address generator

As previously mentioned, up to 64 characters may be stored in the rom and these are numbered 0-63 for reference purposes. To access a given character it is necessary to specify the appropriate "address". The function of the address generator is to build a 6-bit binary value (address) which can be used to access the required stored character in the rom. For example, the 6-bit binary address 110001 would access character number 49, or the letter Q.

In order to provide the facility to select specific characters or random characters from the rom, the make-up of the 6-bit binary address is governed by a combination of fixed and random logic. The control panel contains six pairs of switches, called selector and value switches; each pair of selector and value switches being associated with a corresponding bit in the 6-bit binary address.

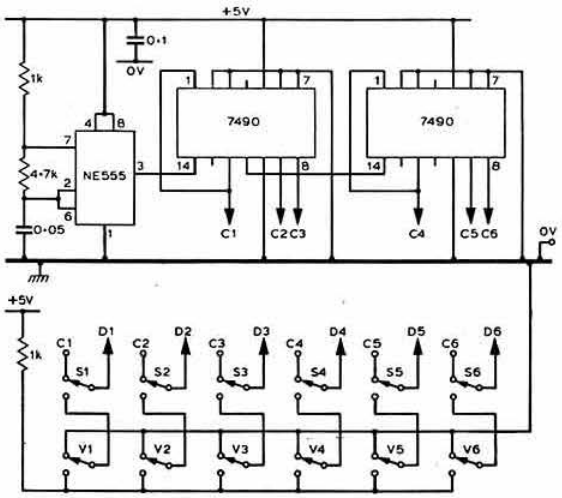


Fig 3. Address generator

When, for example, the first selector switch is in the *down* position the value (0 or 1) as specified by the first value switch is inserted into the first bit position of the 6-bit address being generated. Similarly, other bit positions in the address

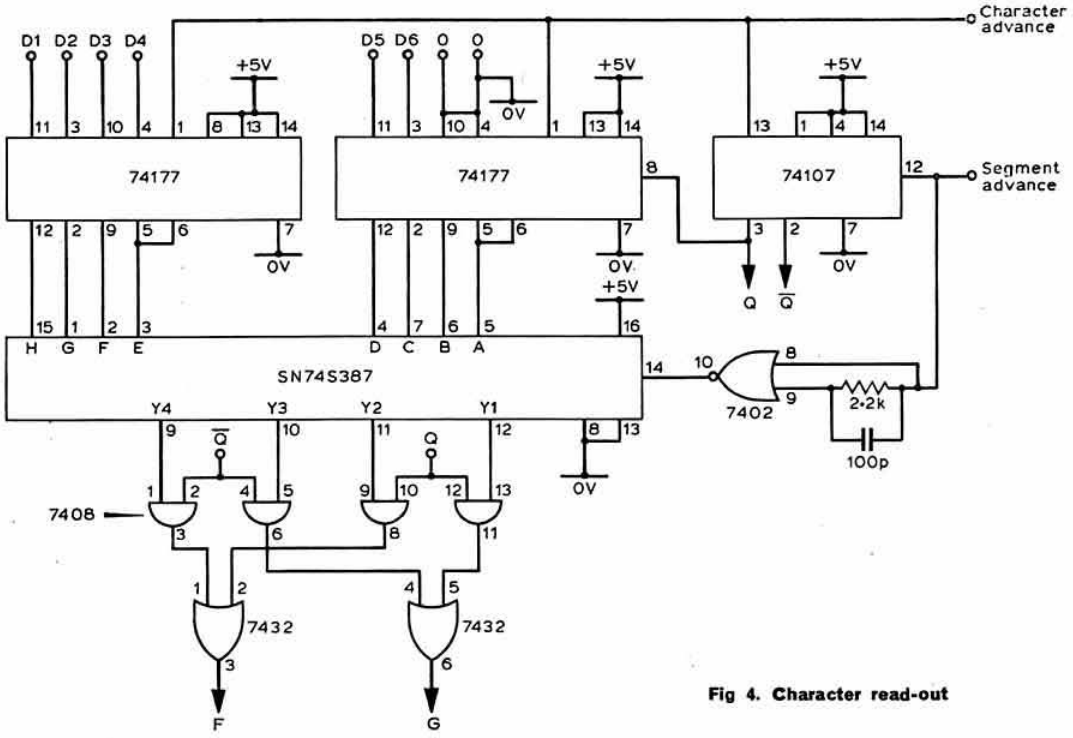


Fig 4. Character read-out

may be preset to a value of 0 or 1 as indicated on the corresponding value switches. When all six selector switches are in the down position, the access address is totally specified by the six value switches.

When a selector switch is in the *up* position, the corresponding value switch is ignored. Instead the bit value is taken from the corresponding bit position of a free-running 6-bit binary counter, and is therefore set to a value of 0 or 1 according to the content of the counter at that instant of time. In this way bit positions in the address may, in effect, be set randomly.

By varying the settings of the selector and value switches the select address may be composed of all preset values, all random values, or any combination of fixed and random values. It is therefore possible to select characters from the store by direct reference to their number, or in varying degrees of randomness through to completely random sequence.

Fig 3 shows the circuit diagram of the address generator. An NE555 timer integrated circuit provides a free-running oscillator, the output of which is fed into two SN7490 counters connected in cascade; this, in effect, provides an 8-bit binary counter. Only six bits from the counter are utilized for the purpose of random bit generation, and these are connected to the selector switches together with the fixed values read off the value switches. The composite 6-bit address appears at the poles of the selector switches. The frequency of the NE555 oscillator is approximately 3kHz, although this frequency is in no way critical. Provided the frequency is considerably higher than the frequency of the character generator timing and control oscillator (described later), random bit values will effectively be generated for inclusion in the address generation process.

Character read-out

Reference to Fig 4 will show that the character read-out sub-unit consists essentially of an 8-bit binary counter, the outputs of which are used as the data select inputs for the rom. The 8-bit counter is made up of two SN74177 presettable 4-bit counters connected in cascade. At the commencement of each character read-out cycle the content of the 8-bit counter is preset by loading the 6-bit value presented by the address generator into the six most significant positions, and by loading 0 values into the least significant bit positions of the address. In this manner an 8-bit rom select address is formed, the value of which is divisible by four. Remember, that although the intrinsic rom organization is 256 × 4-bit words, each morse character occupies four words in the rom, ie 16 bits.

The initial setting of the counter enables the first word (two segments) of a character to be accessed for decoding. Thereafter, pulses fed from the character generator cause the 8-bit counter to be incremented, thus indexing through the remaining segments of the character.

Since each 4-bit word of the rom contains two character segments, it is necessary to separate the segments and present them in turn to the character generator. This is accomplished by passing the rom outputs through an exclusive-OR gating

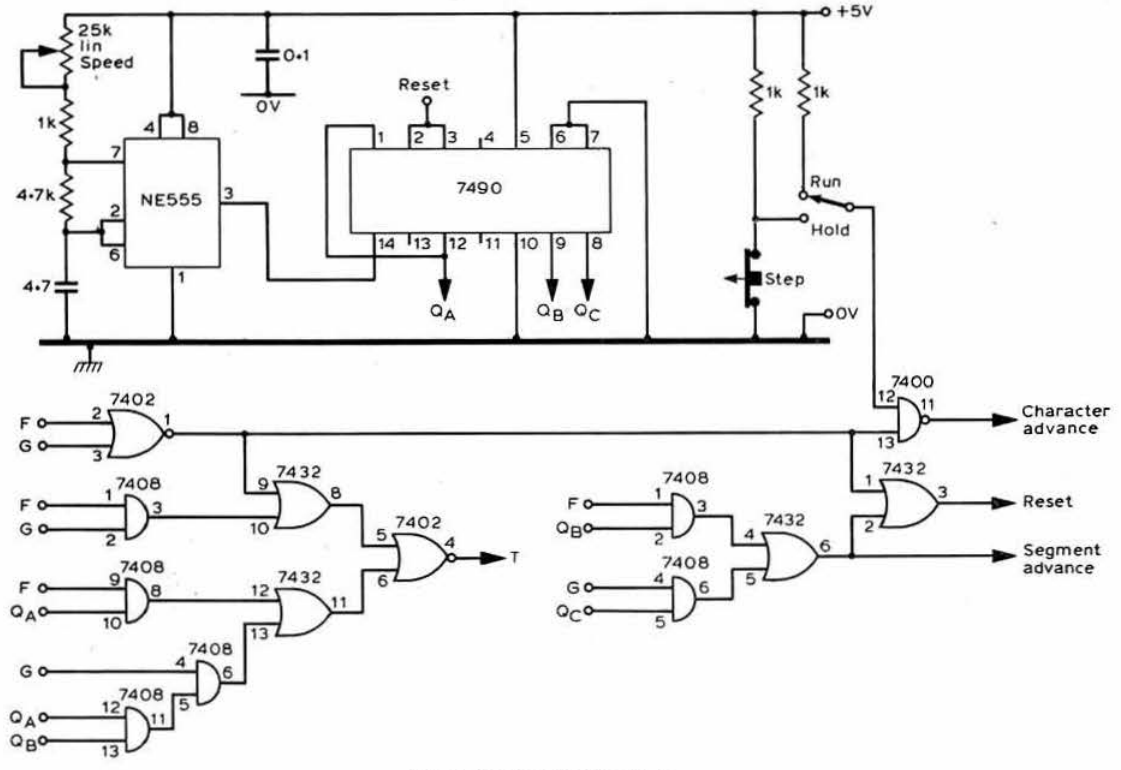


Fig 5. Character generator

system. The outputs, F and G, from the character read-out sub-unit are passed on to the character generator for decoding.

Character generator

The function of the character generator is to decode character segments, presented to it by the character read-out sub-unit, and produce the appropriate waveforms necessary to drive the tone generator. Fig 5 shows the circuit diagram of the character generator.

A master timing oscillator controls the cycle speed of the self-tutor. Because of the requirement to provide variable speed an NE555 timer ic has again been chosen; this being a very convenient method of generating a variable-frequency free-running oscillator with the minimum number of external discrete components. The output of the oscillator is fed into an SN7490 4-bit binary counter which is used to measure the duration of the dot, dash and pause intervals.

When a character segment with a binary value of 10 is presented to the character generator, the tone generator is turned off as soon as the counter contains a value of 1; ie after a duration of one unit of time. As soon as the counter increments to a value of 2 the counter is reset and a pulse sent to the character read-out module to fetch the next character segment. A waveform to generate a dot followed by one space interval is thus produced.

When a character segment with a binary value of 01 is encountered, the tone generator is turned off as soon as the counter contains a value of 3; ie after three units of time. One unit of time later, when the counter contains a value of 4, the counter is reset and the next segment is fetched from the character read-out module. A dash followed by one space interval is produced in this way.

A character segment of binary value 11 causes the tone generator to be switched off immediately and this state remains until the counter is reset when it contains a value of 2. Rest periods of two units of time can thus be obtained which, when added to the one unit of time space occurring after the last dot or dash of a character, gives an inter-character gap of three units of time.

The special character segment with a binary value of 00 is used to signal the end of a character. It immediately turns

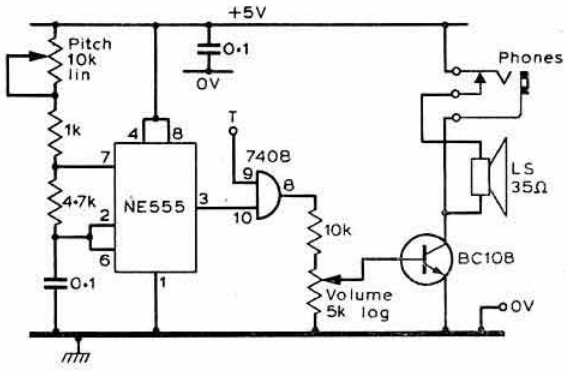


Fig 6. Tone generator

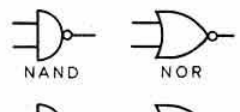
the tone generator off, resets the counter to zero, and sends a pulse to the character read-out module instructing it to load a new address for the next character.

The next character will only be initiated if the RUN/HOLD switch on the control panel is in the RUN position. If it is in the HOLD position the entire unit will cycle in a muted condition until either the RUN condition is reselected or the STEP push-button switch is momentarily depressed when the next single character will be accessed. Single characters may be selected in this way until normal free-running operation is desired.

Referring back to Fig 4 it will be seen that special precautions are necessary to ensure that the rom is disabled—ie its outputs F and G are held high—while a new segment is being fetched from the character read-out module. A short positive-going pulse is derived from the trailing edge of the segment advance signal and this is applied to one of the rom chip select inputs, thereby over-riding the normal rom outputs. The duration of the blanking pulse is timed to ensure that the switching of the rom outputs is completed before new F and G outputs are passed to the character generator.

Table 2. Integrated circuit pin connections

Type	Pin numbers 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Description
SN7400	1A	1B	1Y	2A	2B	2Y	Gnd	3Y	3A	3B	4Y	4A	4B	Vcc	—	—	4 × 2-input NAND
SN7402	1Y	1A	1B	2Y	2A	2B	Gnd	3A	3B	3Y	4A	4B	4Y	Vcc	—	—	4 × 2-input NOR
SN7408	1A	1B	1Y	2A	2B	2Y	Gnd	3Y	3A	3B	4Y	4A	4B	Vcc	—	—	4 × 2-input AND
SN7432	1A	1B	1Y	2A	2B	2Y	Gnd	3Y	3A	3B	4Y	4A	4B	Vcc	—	—	4 × 2-input OR
SN7490	B	R01	R02	—	Vcc	R91	R92	Qc	Qb	Gnd	Qd	Qa	—	A	—	—	Binary counter
SN74107	1J	$1\bar{Q}$	1Q	1K	2Q	$2\bar{Q}$	Gnd	2J	2CK	2CL	2K	1CK	1CL	Vcc	—	—	2 × JK flip flop
SN74177	Load	Qc	C	A	Qa	CK2	Gnd	CK1	Qb	B	D	Qd	CL	Vcc	—	—	Preset-table binary counter
SN74S387	G	F	E	D	A	B	C	Gnd	Y4	Y3	Y2	Y1	CS1	CS2	H	Vcc	1024-bit prom
NE555	Gnd	trig	O/p	reset	CV	Thr	Dis	Vcc	—	—	—	—	—	—	—	—	Timer
LM309K	I/p	O/p	Gnd														5V regulator



LM309K
Viewed
from underside

Tone generator

Fig 6 shows the circuit diagram of the tone generator. It consists of a free-running audio oscillator, the frequency of which may be varied by panel control over the range 1,000Hz ±300Hz. The output from the oscillator is fed to one input of a 2-input AND gate, and when the other input to the gate is supplied with the appropriate switching waveform from the character generator a dot or dash audio signal is passed to the loudspeaker driver circuitry.

The output from the AND gate is resistor-coupled to the volume control which in turn feeds the switching signal to the BC108 driver transistor. A 35Ω loudspeaker forms the normal collector load for the BC108; however, a facility is provided for external phones to be connected via a front-panel jack socket. When using phones the internally-mounted loudspeaker is automatically disconnected.

Power supply

The complete unit draws approximately 350mA of current, and this can be readily provided by the power supply shown in Fig 7. This basic power supply has been used in other equipment built by the author and has proved reliable in operation.

Provision is made for mains/battery operation, although circuit components may be excluded if only one option is required. It should be noted that under battery operation the supply is applied to the input of the bridge rectifier, and therefore incorrect battery polarity is impossible.

Mains input is fed via a dpdt switch to the primary winding of a low-cost filament transformer of suitable current rating. The output from the transformer, or the battery input, is switched via another dpdt switch to a full-wave bridge rectifier and then to a LM309K voltage regulator. A reservoir capacitor of 2200μF is used on the input side of the regulator, while final smoothing is effected by a 750μF capacitor on the output side of the regulator. Throughout the unit 0·1μF disc ceramic capacitors are fitted to decouple the power supply line to ground; this suppresses unwanted voltage transients which would otherwise cause unreliable circuit operation.

The LM309K will perform its regulation function with input voltages in the range 7-25V. It is, however, essential to use a low-impedance bridge rectifier with the filament transformer specified, in order to minimize the voltage drop across the rectifier which would otherwise cause the input voltage to the LM309K to fall below the minimum 7V required. If 12V battery operation is intended a suitable series dropping resistor may be included in the battery supply line to reduce the power dissipation within the regulator itself.

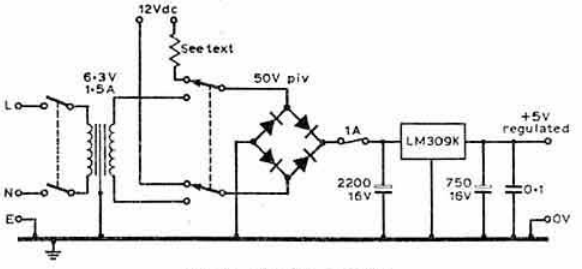


Fig 7. Power supply

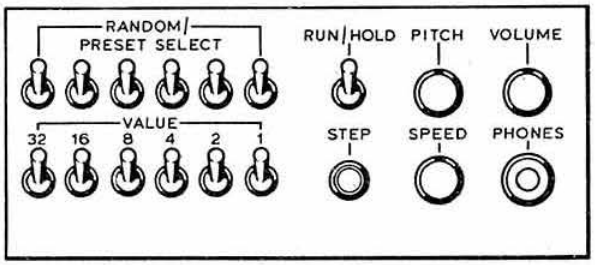


Fig 8. Front panel layout

Construction

The cabinet for the complete unit is constructed from two pieces of 16swg aluminium. The main chassis is U-shaped, with ⅜in flanges all round, and measures 10 by 10 by 3in. A slightly oversize U-shaped chassis, without flanges, forms the lid and this may be secured to the base flange of the main chassis by captive nuts or self-tapping screws. The front apron of the main chassis is bent backwards through some 15° to provide better visibility and operation of the panel controls. Fig 8 shows the layout of the front-panel controls.

The electronics of the unit, with the exception of the power supply components and front-panel controls, are all mounted on a single Vero dil breadboard with external wire strappings for component interconnection. A custom-built printed circuit board would have simplified construction and provided a neater finished project; however, the expense of a one-off pcb could not be justified. Table 2 gives details of the pin connections of all ICs used throughout the self-tutor.

To keep the front-panel dimensions to a minimum, the loudspeaker is mounted on the base of the main chassis. Groups of holes are drilled along each side of the lid to permit the egress of sound, and also to allow dissipation of heat generated within the unit.

Bibliography

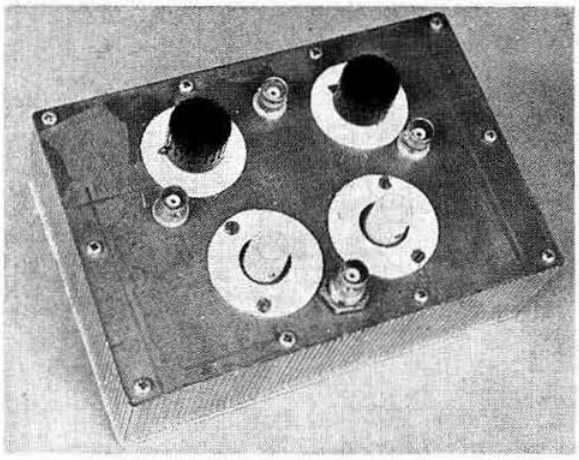
[1] *The TTL Data Book for Design Engineers*, Texas Instruments Ltd.

[2] *Supplement to The Data Book for Design Engineers*, Texas Instruments Ltd.

[3] *How to use Integrated Circuit Logic Elements*, Jack W. Streater, Foulsham-Sams. □

A simple rf admittance bridge

by G. GARSIDE, G3MYT/VE3*



External view of admittance bridge

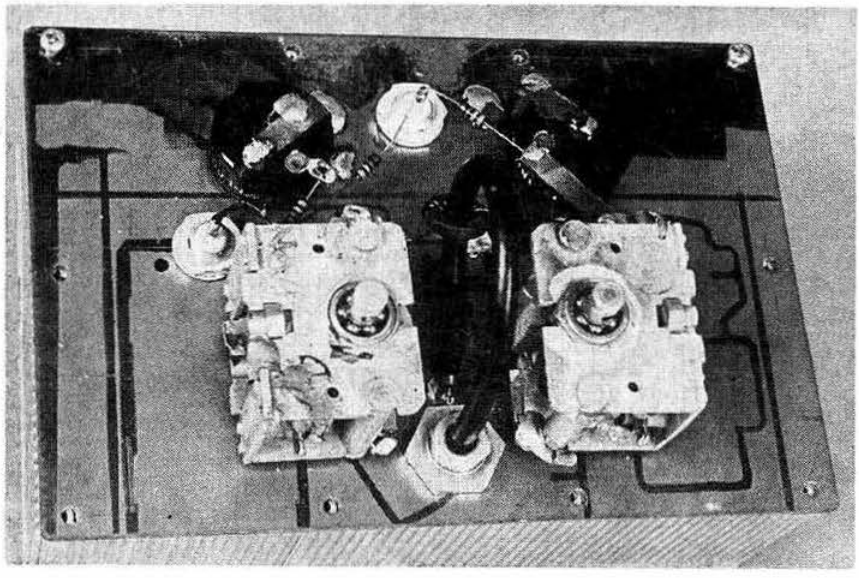
IN previous articles describing the use of the Smith Chart [1, 2], most of the examples assumed the existence of an initial "input" of measured data. It is the purpose of this article to describe an easily-constructed unit which is capable of making the necessary measurements, at least over the hf range. The author's prototype is reasonably accurate up to 30MHz (an opinion based on the degree of consistent agreement with other instruments) and is usable with care in interpretation up to 70MHz. Beyond 70MHz, residual stray capacitance associated mainly with the potentiometer casings makes it difficult to obtain reliable results.

The circuit, Fig 1, is simple in the extreme, and the results will largely depend on the quality of the components employed, and the degree of constructional care taken during assembly. It is essential that the layout be as symmetrical as possible, and that vhf wiring techniques are used. (Copper straps ¼in wide for ground connections, for example). Carbon potentiometers are mandatory; wirewound units are quite useless, of course.

The prototype uses relatively small variable capacitors, the range being extended either by the addition of fixed capacitors (wired inside coaxial plugs) or by external variables (the unit is far less sensitive to asymmetries occurring *outside* the screening box).

Fig 2 indicates the method of use; a convenient signal in the author's case is the low-level transverter drive output of the ssb transmitter, when the latter is fed from a two-tone test signal. A few volts maximum of the frequency of interest are then available to energize the bridge. The detector used is an Eddystone EC10, used with a low setting of the rf gain control and agc and bfo "off". (The convenience of a.m.-mode reception conferred by the use of the two-tone signal will be appreciated by owners of 28MHz, say, receivers of comparable drift characteristics.) Internal and external photographs of the bridge (before calibration) shown opposite, were supplied by Chris Brown, to whom thanks are due.

As an indication of constructional quality, it should be possible to achieve a balance with the bridge such that the detecting-receiver's rf gain may be advanced sufficiently for its front-end noise to be dominantly heard. (If an antenna is on test, for external signals to be copied via the bridge.) The bridge can be calibrated, and a feeling for its operation



Internal view of admittance bridge

*21 Albion Crescent, Bramalea' Ontario L6T 1L3, Canada.

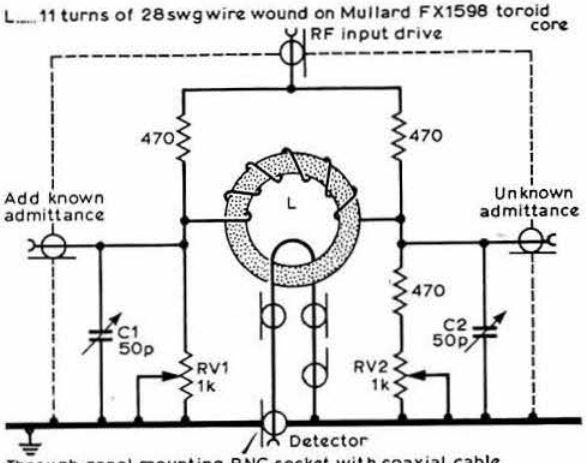


Fig 1. Circuit of admittance bridge

Operation

(i) Set C1 to mid-capacity; set RV1 to full resistance.
(ii) Use RV2 and C2 to balance bridge strays (minimum signal in detector).
(iii) Apply unknown admittance and re-balance using RV1, C1 and external additional admittance(s) if necessary.

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obtained, by measuring various known combinations of R, C and L. (The measurement of inductance is normally achieved by treating it as a negative capacitance—in practice, additional capacitance is used on the "unknown" side of the bridge to achieve balance; the reactance of such a capacitor at the frequency of interest is then numerically equal to the inductive reactance actually present.)

The instrument as described is inherently an admittance bridge, and generates data in the form of parallel combinations of R-C or R-L—the minor inconvenience of having to think in terms of conductance, susceptance, millimhos etc being, in the author's opinion, offset by the facility of having all bridge terminals available on coaxial connectors, with outers grounded.

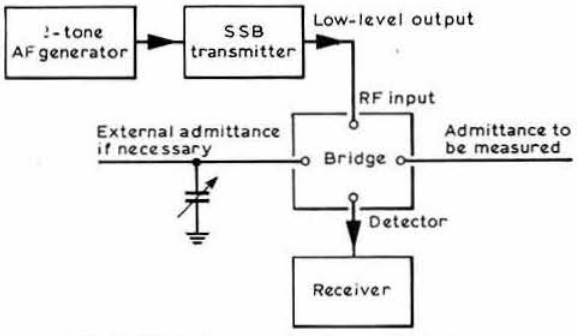


Fig 2. Block diagram showing method of use

Operation

Set frequency of rf source and detector receiver to that required for the measurement and adjust bridge for minimum receiver signal.

References

[1] "The Smith Chart", L. A. Moxon, BSc, CEng, MIEE, G6XN. *Radio Communication* January 1977, p22.
[2] "More on the Smith Chart", G. Garside, MSc, MA, CPhil, CEng, MIEE, MIERE, FRAS, G3MYT/VE3. *Radio Communication*. □

NEW PRODUCT

Usijet signal injector

Alcon Instruments announces the Chinaglia Usijet universal signal injector. This device is a small pocket-sized unit designed as a pen-shaped signal probe capable of providing a suitable test signal wherever it might be needed. Initially it is intended for use in fault-finding and alignment checking in the radio and television areas but it has application over a wide field, including audio and communications markets.

The Usijet incorporates a blocking oscillator as the main signal generator, giving a basic 500kHz signal which is modulated at 1kHz for identification and demodulation check purposes. Because of the waveform used the equipment produces harmonics detectable right up to 500MHz; very useful in many servicing applications. Power consumption is 25mA from an internal 1·5V battery to give a 20V peak-to-peak output at the probe tip.

In use the equipment case is merely connected via a fly-lead to the earth line of the item under test and the probe tip applied to the point at which the signal is required. The Usijet can be used in "live" test conditions and the probe can cope with circuit voltages of up to 500V dc.

The price, complete with earthing lead and instructions, is £11.55 inc VAT. Further information can be obtained from Alcon Instruments Ltd, 19 Mulberry Walk, London SW3. Tel 01-352 1897.

12V to 18V converter for the Pye Bantam

by A. BROWN, G3TXD*

THE author recently decided to use a Pye Bantam mobile with a view to adding an rf power stage at a later date. Although the Bantam uses internal dry cells (or nicads for those who can afford them) it was decided to run the equipment from the car battery. The Bantam requires an 18V positive earth supply at about 300mA depending on the output power obtained, most vehicles on the other hand are now 12V negative earth. Some form of isolating converter was obviously necessary and the following describes such a converter, capable of being used with both positive and negative earth 12V systems. The unit was designed to be fairly robust electrically as is necessary with a piece of mobile equipment likely to suffer some abuse.

Circuit description

The unit comprises a self-oscillating inverter, running at about 10kHz, followed by a series regulator. This particular type of inverter was chosen because of its simplicity and low component count; although relatively unsophisticated it is reliable and achieves good efficiency. The type of regulator used allows the minimum voltage drop across the series transistor which lowers the unit's power dissipation whilst allowing it to operate on a battery supply of 11V.

Inverter

At switch on, TR1 begins to conduct, being fed with base current initially via R1. As collector current begins to flow, base current is produced by the feedback voltage appearing across L3a, driving TR1 into saturation. TR2 base emitter is reverse biased by the voltage appearing across L3b. The collector current and the flux in the transformer core steadily increase until the core reaches saturation, when an increase in collector current produces proportionately less of an increase in flux.

In an attempt to maintain the original rate of flux change

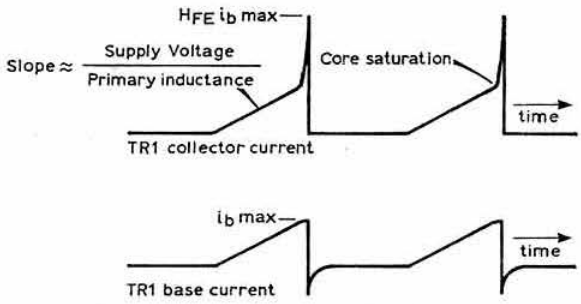


Fig 2. Diagrammatic waveforms (no load)

the collector current increases more rapidly until a point is reached where the base current can no longer support it and TR1 begins to come out of saturation. The transformer field begins to collapse, reversing the sense of the voltages on the windings, thereby reversing the feedback voltages on the bases of TR1 and TR2. TR1 is driven off and TR2 is driven into saturation. The cycle then begins again, this time with TR2 in the conducting state. The collector and base current waveforms are shown in Fig 2.

Regulator

After rectification and filtering the secondary voltage is applied to the regulator comprising TR3, TR4 and TR6. The voltage reference is D6 and this is compared with a sample of the output voltage at the base emitter of TR6.

Components list

C1, 4	330µF 25V, Al electrolytic	R1	1·5kΩ
		R2, 3	100Ω
C2, 3	2·2µF 100V, polycarbonate	R4	22kΩ
		R5	470Ω
D1	IN5400	R6, 9	1·2kΩ
D2, 3	IN4002	R7, 8	10kΩ
D4	IN4148	R10	330Ω
D5	BZY88C12	R11	2·2kΩ
D6	BZY88C6V2		
L1	44T + 44T bifilar	R12	10kΩ 0·5W, 2% metal oxide
L2	24T + 24T bifilar	R13	8·2kΩ 0·5W, 5%, carbon
L3	4T + 4T bifilar	RV1	5kΩ pcb mounting
TR1, 2, 3	2N3055	FS1	1A, 1¼in glass with in-line holder
TR4	BFX30	T1	35mm ferrite pot core Mullard FX2242
TR5, 6	BCY71		

0·5W, 5%, carbon

28swg

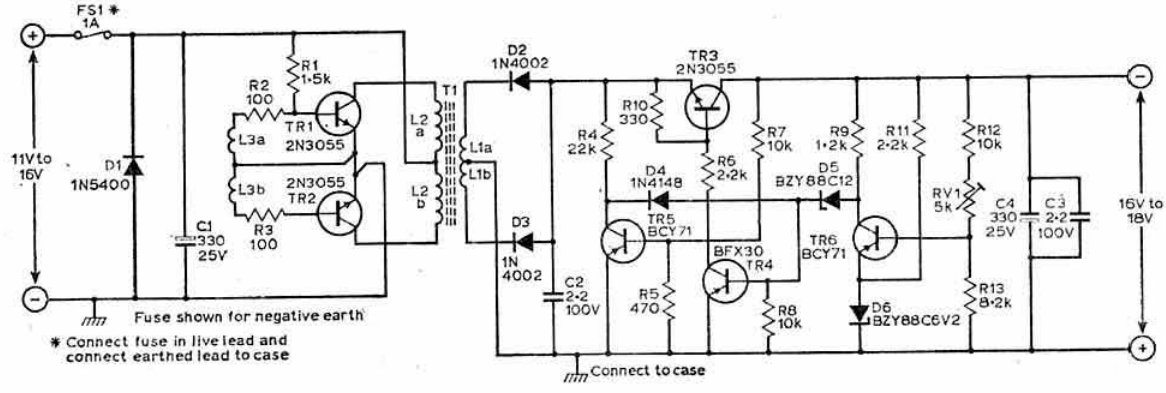


Fig 1. Circuit diagram 12V to 18V converter (R6 is 1·2k, not 2·2k as shown)

* 68 Lynton Avenue, Collier Row, Romford, Essex.

Table 1. Test results on prototype

Line and load regulation (for input change 11V to 15·6V, load change 0 to 350mA)	Better than 0·3%
Output ripple (Input 12·6V load 350mA)	Flat 1mV rms
Overall efficiency (Input 12·6V load 350mA)	65%
Maximum input current during overload (Fig 4)	1A
Short circuit input current (Fig 4)	380mA

Should, for example, the output voltage tend to increase, the base of TR6 would become more negative with respect to the reference voltage on the emitter. TR6 would tend to conduct more heavily and the current flowing through R9 into the base of TR4 would be diverted into the collector of TR6. Reducing the base current of TR4 reduces its collector current which in turn is the base current of TR3. TR3 collector current would therefore reduce, lowering the output voltage. Hence the system adjusts the output voltage so as to keep the base of TR6 at a constant potential.

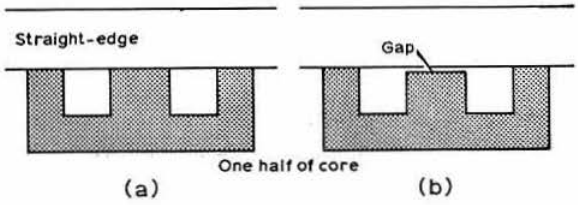


Fig 3. Distinguishing between an ungapped core (a) and a gapped core (b)

TR5 plays no part in the regulation process but is required at switch on. At this time the output voltage is zero and therefore no base current would flow into TR4, TR3 would remain off and the power supply would not start up. However, the output voltage is sensed by TR5 and, whenever it is below about 12V, TR5 turns off, allowing current to flow into TR4 base via R4. As the output rises above 12V TR5 conducts, reverse biasing D4, and the regulator functions normally. (This technique was described in *Technical Topics* some time ago.)

Transformer

The transformer is wound on a 35mm ferrite pot core. The type used was a Mullard FX2242 (choice was, to some extent, limited by availability at the time of building) but virtually any 35mm ungapped core will give satisfactory results as the power level is quite low. With this size of core there is also plenty of space available on the bobbin, an advantage for those not quite so adept at winding small transformers. Whether a core is gapped or not is easily ascertained by laying a straight edge across each core half-face as in Fig 3. The windings should be placed on the bobbin in the order: primary, feedback, secondary; and, although insulation between windings is not strictly necessary, it may be found helpful to tape each winding when winding the transformer.

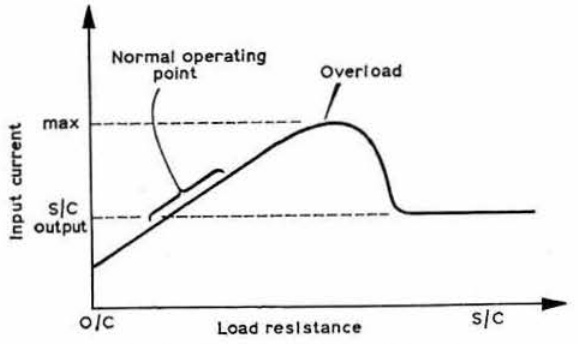


Fig. 4. Input current v load resistance

Power transistors

TR1, TR2 and TR3 are TO3 style 2N3055 transistors. They are very much under-run but allow the power supply to stand any amount of abuse even though, for several reasons, no current limit circuit exists on the regulator. TR1 and TR2 need not be mounted on a heatsink; TR3 should be mounted on a small heatsink (approximately 3in²) to take into account worst-case conditions, although it normally runs virtually cold. In the prototype all three transistors were mounted directly on to the circuit board.

Construction

The construction of the unit is not critical although the 18V regulated output terminals, together with the filter capacitors C3 and C4, should be mounted at the opposite end of the box to the inverter circuit—simply to avoid unnecessary coupling. A logical layout, following through from the input terminals at one end of the box to the output terminals at the other end, will ensure perfectly satisfactory noise performance. The prototype was constructed on a Paxolin wiring board, complete with transformer and power transistors, and secured as a unit inside a diecast box. The fuse was mounted externally in an in-line holder.

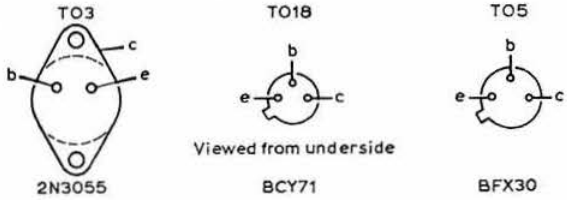


Fig 5. Transistor connections

When wiring in the transformer, there can be confusion (unless coloured markers are used) as to which end of a winding is the start and which is the finish. If the primary and secondary are connected up permanently, but the feedback winding start and finish are temporarily wired in, it is possible to reverse the feedback connections to determine the correct phase. The connection which allows oscillation can then be made permanent.

Output voltage is set by R13 and was designed to be adjustable over the range 16V to 18V. When installing the supply, either the positive or negative input (depending on vehicle polarity), and the positive output, must be connected to the power supply case to avoid coupling inverter noise into equipment via earth returns.

The results of a brief set of tests, made on the prototype, are given in Table 1.

The unit is currently in use and has withstood the usual overloads and short circuits that occur during mobile experimentation without any apparent damage. The circuit is straightforward and reliable and no difficulty should be experienced in getting the unit to perform satisfactorily, provided that reasonable care is taken in the construction. □

EQUIPMENT REVIEW

Yaesu Musen FT301

by T. G. GILES, BSc, AMIEE, G4CDY*

Introduction

The Yaesu Musen FT101 is probably the most popular amateur band transceiver ever built. It was one of the first complete stations in one package containing ac and 12V dc power supplies and its method of construction, using computor-type plug-in cards, has given it a good reputation for reliability and ease of servicing.

The all solid-state FT301 series is a natural development from the hybrid FT101 but, in addition to removing the driver and pa valves, many other features and improvements in performance have been included. The ac power supply is now in a separate unit and, because the pa is wide-band, the large tuning and loading capacitors have been removed. The FT301, therefore, weighs only half as much as the FT101 and is much smaller. This probably makes the unit easier to install in modern family cars where it can be powered directly by the car battery.

The transceiver is at present available in three forms—the FT301, which has a 100W output; the FT301S, which does not have the big pa and produces 10W; and the FT301D, which is a digital readout version of the 100W unit. The prices excluding VAT are £510, £355 and £599 respectively. The FT301 used for the review was a 100W unit, with an analogue readout, kindly loaned by Messrs Western Electronics (UK) Ltd, Fairfield Estate, Louth, Lincs LN11 0JH.

Description

The transceiver is built in a cabinet with a carrying handle on one side. The unit is of modular construction using printed circuit boards with edge connectors but with phono-type coaxial plugs for rf leads. The vfo is built in a separate screened box and is operated by the usual Yaesu Musen combination of a gear box and an epicyclic slow-motion drive. The tuning is very smooth and free from play or backlash and is calibrated in kilohertz steps using a combination of a rotating cylinder calibrated every 50kHz and a disc marked in kilohertz steps coaxial with the tuning knob.

The preselector is a permeability type operated through a slow motion drive with a small cursor to show the band selected. The other controls are well spaced and, despite the small size of the front panel, are easy to operate. The vox gain has been brought out to the front panel and in the fully counter clockwise position brings the transmitter on continuously for tuning or when the ptt or break-in cw is not in use. The clarifier, marker, noise blanker, rf processor and agc speed can be selected by means of a row of lever-type switches. There are two indicator lights to show transmit and clarifier operation.

A feature which is new on this equipment is a "reject control" which will tune a sharp notch across the receiver passband and is very useful for removing heterodyne or other interference. The filter also has a slight peak response, useful for reducing the bandwidth on cw signals (there was no cw filter fitted to the FT301 reviewed). The whole operation of the reject control is similar to that of the phasing control on the HRO, a very useful facility.

The noise blanker consists of a wide band amplifier fed directly from the receiver mixer, a detector, pulse amplifier and a noise gate in the main i.f. amplifier. The rf processor built in the transmitter i.f. comprises an amplifier and clipper followed by a second ssb filter to remove the distortion products generated by the clipper. The clarifier can be switched so that it is operative on transmit and receive thus making it easy to call a dx station a few kHz from his channel. An illuminated meter indicates receive signal strength and the collector current of the output transistors on transmit.

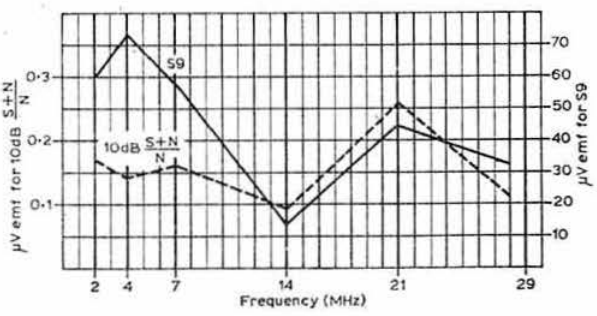


Fig 1. Receiver sensitivity and input for S9 on S-meter

* 54 The Mount, Coulsdon, Surrey.

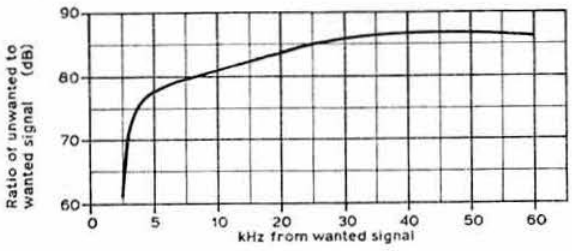


Fig. 2 Blocking response

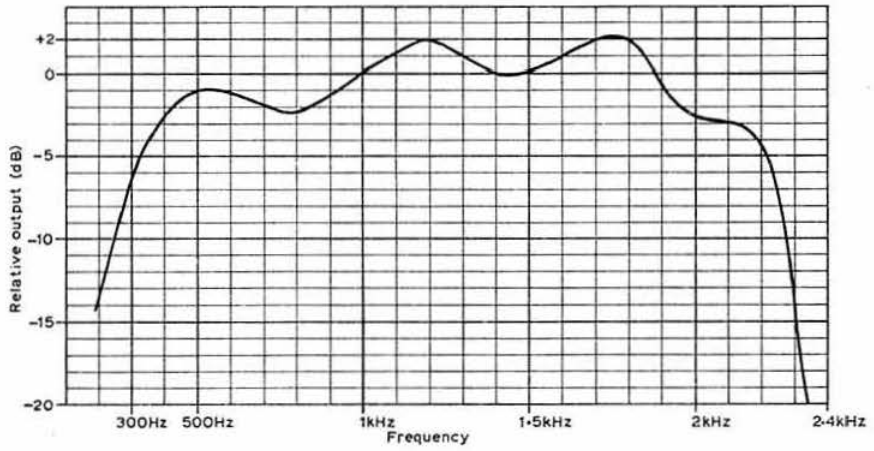
The FT301 is single conversion on transmit and receive and uses a 9MHz i.f. The 5-5·5MHz vfo is premixed with the relevant crystal to produce the conversion frequency for each band. This means that there is no crystal required for the 3·5MHz band. In the opinion of the reviewer the most important requirement for ensuring good signal handling in any receiver is to keep the gain before the i.f. selectivity as low as possible. Yaesu Musen engineers have done this by including a separate roofing filter directly after the dual gate mosfet mixer. The gain control rf amplifier is another dual-gate mosfet.

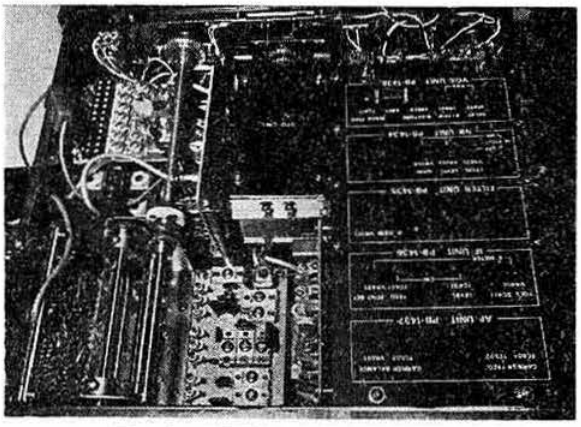
The transmitter mixer is a double-balanced type using an MC1496G integrated circuit. The basic transceiver produces 10W from a pair of S10-12 devices in push-pull. This is boosted to 100W by a separate amplifier which is bolted to the rear panel of the transceiver. This pa uses a pair of S2535s in push-pull, both amplifiers are wide band with 50Ω outputs. This type of amplifier is prone to generate harmonics and so there is a double section low-pass filter for each band. The pa transistors are protected against damage when connected to a badly matched antenna by means of an automatic vswr detection and shutdown circuit. This control circuit is progressive and will allow operation into a vswr of up to 3:1, but with reduced power input.

Measurements

Receiver sensitivity was measured by connecting a signal generator to the antenna input and adjusting its level until a 10dB signal plus noise-to-noise ratio was obtained on a wide band af voltmeter connected to the phones socket. Fig 1 shows the sensitivity on each band and also the input required to produce an S9 reading on the S-meter. The test showed that, like most modern receivers, the FT301 is extremely sensitive and that its performance would be limited by noise picked up by the antenna.

Fig 3. Overall af response of transmitter





Top view of FT301 with cover removed

Early transistor receivers had a very bad reputation for blocking and cross modulation, but tests made on the FT301 showed that it has extremely good signal handling characteristics and is certainly the best amateur receiver ever measured by the reviewer. This may seem a strange compliment, but the performance of this receiver is as good if not better than many valve receivers. Blocking performance (shown in Fig 2) was tested by putting a signal in on 7·1MHz adjusted to give a signal plus noise-to-noise ratio of 20dB, and introducing an interfering signal at a level which degrades this ratio by 6dB. A simple intermodulation test was also carried out, by putting two signals into the receiver spaced at 10kHz and 20kHz from the frequency to which the receiver is tuned. The level of these interfering signals was increased until the product appearing in the receiver passband had a signal plus noise-to-noise ratio of 20dB, when it was found that the interfering signal needed to be 70dB above a single on tune signal, a very good figure.

Tests were made of image, i.f. rejection and frequency

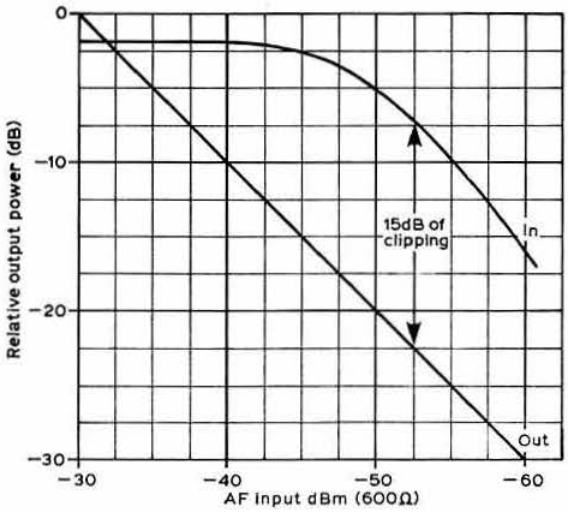


Fig 4. Transmitter processor performance

stability, and they were all found to be better than the manufacturer's specifications, shown in Table 1. No measurements were made of i.f. selectivity because the only practical way of doing this test is with the filter removed from circuit. However, the figures given in Table 1 would appear to be realistic. On testing, the rejection filter produced a rejection of 27dB and a peak of 6dB, both measured on a signal at the centre of the passband.

Transmitter power input and output were measured into

Table 1. Technical details

Frequency range:	1·8MHz to 28MHz (WWV/JJY—receive only)
Emission:	lsb, usb, cw, a.m., fsk
Power input:	ssb 200W p.e.p. cw 200W a.m., fsk 50W (Slightly lower on 28 and 1·8MHz bands)
Carrier suppression:	better than 40dB
Sideband suppression:	better than 50dB
Transmitter frequency response:	300Hz — 2,700Hz −6dB
Spurius radiation:	less than −40dB
Distortion products:	better than −31dB
Frequency stability:	less than 100Hz drift in any 30min
Antenna output impedance:	50Ω unbalanced
Sensitivity:	0·25μV at s:n 10dB
Image ratio:	1·9—21·0MHz, better than 60dB 28MHz, better than 50dB
I.F. interference:	better than − 70dB
Selectivity:	ssb 2·4kHz at −6dB 4·0kHz at −60dB cw, fsk 0·6 kHz at −6dB 1·2kHz at −60dB a.m. 6kHz at −6dB 12kHz at −60dB
Audio output:	3W at 10 per cent thd
Output impedance:	4Ω
Power requirement:	dc 13·5V negative earth
Power consumption:	transmitter (max) 280W (21A) receiver 12W (1·1A)
Size:	280(w) by 125(h) by 370(d) mm
Weight:	9kg approximately

Table 2. Output power and spurii measured into 50Ω load

Test frequency	Input power (W)	Output power (W)	Efficiency (%)	Spurii (approximate frequency and level relative to output)
1·9MHz	156	65	41·6	3·8MHz −55dB
3·6MHz	189	81	42·8	7·2MHz −58dB
7·2MHz	176	97	54·9	12·5MHz −50dB, 14·4MHz −50dB
14·2MHz	239	100	41·8	5·6MHz −38dB, 18MHz −51dB, 28MHz −48dB
21·2MHz	189	82	43	14MHz −40dB, 28MHz −35dB
28·7MHz	214	92	46·7	19MHz −44dB

a 50Ω load, and a check of any significant spurious outputs was made with a spectrum analyser. The results are shown in Table 2. The power figures are slightly lower than the specification because they were made with a 12·6V supply (typical car battery not under charge), but they are 10-20 per cent higher when the FP301 mains supply is used. The carrier and other sideband were −35dB and −50dB relative to the wanted sideband.

A two-tone audio signal was applied to the microphone socket and a spectrum analyser was used to check the distortion products. At 10W they were −32dB and at 80W they were −25dB relative to each tone. These are both excellent figures for a transistor pa particularly as the test shows up distortion in the microphone amplifier and transmitter modulator. It was impractical to do any tests with mismatched loads because of the powers involved. However, the pa survived with the antenna connector both open and short circuit when operating at 13·5V and maximum drive.

The automatic vswr shut-down circuit made tuning an external atu rather confusing because as the vswr improved the output power started to rise. Consequently the reflected power shown on an external reflectometer remained substantially constant until the perfect match was obtained. It is recommended, therefore, that both forward and reverse powers are monitored simultaneously so that the confusion does not arise.

Audio response with the rf processor switch out is shown in Fig 3. Fig 4 shows the performance of the rf processor, which would appear to give a 15dB improvement in mean output power.

Conclusions

The FT301 was air tested over a period of several months, including contest conditions, and all reports received and comments by operators were entirely complimentary. The reviewer has found that a simple test of the signal handling of a receiver is to see if it will pick out any amateur signals on the 7MHz band after dark. The FT301 passed this test easily with no problems of signal handling experienced, thus bearing out the measurement results.

The transceiver is very compact and, because it has no pa tuning or loading controls, would make an excellent mobile rig. When used with the FT301 power supply, the new features, like the rejection filter and rf processor, would make it an excellent home station. On the other hand, the FT301S, the 10W version, would probably appeal to many vhf/uhf enthusiasts, when used with suitable transverters, or somebody who fancied building their own pa. □

swl news

Bob Treacher, BRS32525 *

A happy New Year!

Following the announcement in December's *SWL News* that as a result of the increased size of *Radio Communication* more space had been allocated to SWLs, we have pleasure in unveiling the first of a regular **monthly** feature for the swl fraternity. It will retain its past format, including yearly and all-time heard tables, plus news, views and comments from listeners up and down the country, and news from abroad as and when it is received. Black and white photographs of listeners' shacks are always welcome. Let us hope that this feature continues to prosper—and remember . . . it is your column, so keep your news and views flowing.

1978 countries table

Here we are again at the beginning of a new year. With it comes the customary start of the 1978 hf countries heard table. Over the past few years this has proved a very popular facet of *SWL News*, with many listeners taking part to see if they can be unofficial top listener of the year. The rules for the 1978 table are exactly the same as in previous years, but for those who are new to the RSGB, I will take this opportunity of setting out the very basic rules. The table relates to the total number of countries (not prefixes) heard on each band from 1 January to 31 December 1978. Simply keep a list by your rig and when a new country is heard add it to the list. Use the RSGB countries list only. Starting total is 100. Let your scribe have the totals for each band, a grand total and an indication of the mode. Initially, a list of equipment in use will be given but this will be omitted after a while as it eats up valuable space. There, in a nutshell, are the rules. The all-time list will also appear at intervals and the starting total for this list is 500.

Noel Phelps is studying for the RAE in May, and if he is successful he cannot foresee working 1·8MHz as his location does not provide enough space for an effective transmitting antenna system. Now that 28MHz is showing signs of remaining open for an indefinite period, it is suggested that a list of 28MHz beacons and their QRGs be published. Noel offers 3B8MS (28,190), 5B4CY (28,220), A9XC (28,242·5), VP9BA (28,235) and N4RD (28,207·5), and he remarks that the last time he heard N4RD, in Florida, it was flashing the recommendation "Use 28 now"! The sector between 28,100 and 28,200MHz is well worth monitoring for cw signals, as Central and South American stations appear to use this portion of the band, particularly to avoid the QRM from the USA in the bottom 100kHz of the band. Best dx this time for Noel—KX6LA on 7,003kHz at 0650.

Dave Brooks, BRS38356, signed on for the RAE course at a college in Loughborough but, apparently because of the lack of interest shown, the course has now been cancelled, much to Dave's annoyance. However, he is now going to try and enter a big score in the next all-time countries list. Dave Lloyd, BRS37790, has just started an RAE course in Bath; his listening activities have been thwarted by a few receiver problems but he hopes to have things back to normal fairly soon.

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

1978 crystal ball

With the smoothed sunspot numbers for the early part of 1978 around 40, we can hope that as the year proceeds the numbers will rise much higher to give good dx propagation from northern Europe. Conditions during the closing months of 1977 certainly tended to suggest that much better conditions are not far away.

The success of the Jubilee Contest in 1977 has prompted the HF Contests Committee to include a new contest in 1978. It will occupy the period selected for last year's event. Hopefully, a suitable trophy will be requisitioned to give the SWLs even more incentive to enter their section.

News and comment

At the time of writing this piece, dxpeditions were the main talking point around the bands. George, VE3FXT, was involved in a mini-African expedition visiting TZ, 7P8 and S8 on his way to being the first to activate a new DXCC country, H5. Several American amateurs had been activating Juan Fernandez Is (CE0Z) and a group of PYs had Fernando de Noronha activated.

The 1977 table is not published in this issue but comments have been received as follows. John Holmes, BRS38934, reports hearing his first W6 and his first Eu dx on 1·8MHz in the shape of several DLs. However, 7MHz bc QRM restricts serious listening on that band. John is currently experimenting with G3XAP's sloping antenna.

Finally: please send all comments and news to your scribe at his home QTH to reach him by 26 January for the March issue and by 2 March for the April issue.

obituaries

The Society records with regret the deaths of:

Mr C. Crisp, G3ELJ
Charlie Crisp, who died on 28 October 1977 aged 77, was an ex-Marconi operator 1st Class, and a very keen cw man with friends world-wide.

Mr S. W. Rowden, GM6SR
Sid Rowden died on 27 October 1977 at the age of 89. He was first licensed in 1925 and did much pioneer work on the 5m band before the last war. He was a well-known phone operator on the vhf bands in the Edinburgh area.

Mr T. H. Streeter, G5CM
Tom Streeter died on 22 October 1977 aged 67. He had held a transmitting licence since 1929, and for many years pre-war worked QRP cw dx using a hand generator. He was also active on the 5m band before the war and, although hampered by illness, he latterly enjoyed the 2m band. He was an honorary member of the Chichester Radio Club.

Mr J. Wadman, G2GK
Frank Wadman, who died on 14 November 1977, was one of the Society's oldest members. He was a founder-member of Torbay ARS in 1946, and in pre-war days of the Thames Valley ARS. He was also a member of RS ARS and RAOTA.

We have also been advised of the deaths of:
Mr T. Almond, G2FST;
Mr L. Fox, G2BDR, on 3 October 1977;
Mr P. F. Hughes, G3IZH;
Mr N. L. Stephens, GW8NQ;
Mr R. Taylor, W1QCO, of Boston, England, on 21 November 1977.

Starting on Oscar—some common problems

by P. J. A. GOWEN, G3IOR*

OF the many hundreds of queries that AMSAT-UK has received in the past three years, the majority fall into a number of specific categories, particularly those from operators seeking advice on operational problems when attempting to hear their signals through the satellite's transponders. When the basic necessities relating to the standards required of the uplink transmitters, the downlink receiver, the nature of the antennas and the tracking of the spacecraft have been dealt with, a few other problems become evident in attempting to maintain effective communications through the satellites over the entirety of those sections of the orbits within range.

Assume that one is in possession of a set of orbits [1] and has the means of converting these to the position and times that Oscar is within range [2], [3], [4], [5], which will be a section of every orbit between equator crossings of 120°W (around 0430 ut) and 38°W (around 2300 ut) for all parts of the UK. Also assume that one possesses the basic equipment necessary, eg a 10W transmitter covering 145·850 to 146·000 MHz, a 29MHz receiver with coverage from 29·400 to 29·550MHz for Oscar 6 and Oscar 7 Mode A operation, and/or a transmitter of some 10W covering 432·125 to 432·175MHz with a receiver in the 145·925 to 145·975MHz spectrum for Mode B operation [6]. Ideally, one also has beam antennas at all frequency ranges, with both azimuth and elevation command, although this is not necessary for most of the time. However, the chances are that the amateur is either an hf operator with good antennas for 29MHz but a simple array on 145MHz, or a vhf enthusiast with excellent antennas on the 145MHz and 432MHz bands, but with a hastily erected dipole for 28MHz coverage of the downlink. Whatever the case, one is still in a position to make good use of the satellites, on the proviso that the basic needs are observed and the fundamental requirements put together.

Over 70 per cent of the problems that have been encountered by beginners on the Oscar 7 "A" or Oscar 6 "2 to 10" modes can be attributed to deficiencies in the receiving system. Users should realize that while they are putting several watts from a high-gain antenna to a good receiver in the satellite, in a relatively noise-free environment, Oscar is putting very few watts from a simple dipole back to them through attenuating ionospheric layers to a receiving system which also captures lots of man-made electrical noise. On Mode B this is not really a problem as the average user will have a high-gain receiving antenna, many wavelengths high, with many decibels of gain in the direction of the satellite and considerable attenuation to the surrounding noise off the main lobe, all going into a high-gain and low-noise converter. This is not the case on the "2 to 10" modes, as not only is the antenna much lower in gain, and lower in its effective height above ground in terms of wavelengths, but the signal is also being captured by an inferior receiver. The average 28MHz receiver has a poor signal: noise ratio, and even good receivers are rarely successful in the 29·5MHz portion.

Peaking and tuning the mixer and rf stages of a receiver at 29·5MHz will help to a large degree but, ideally, a converter or preamplifier is necessary for effective reception [7], [8]. A gain of some 25dB with a noise factor below 2·5dB should be aimed at, and a simple mosfet will improve reception beyond belief! Many people have reported a radical improvement resulting from this simple step—to quote one recent letter: "Until I added a preamp I had heard only five stations on Oscar in three months but tonight I heard 27 in 15 minutes, including my own for the first time!"

A further problem with the true beginner is the 29MHz antenna, limiting the downlink observation. The average vhf user probably has a long Yagi, possibly without elevation, for the 145MHz uplink, and has a very effective path to the satellite at low angles, eg when the spacecraft is at the horizon and up to some 15° elevation. When the path to the Oscar is above this the lobes are minimized and the input signal will reduce with elevation. If a station is merely employing a low simple dipole for downlink reception, the downlink on 29·5MHz will not be heard until the spacecraft is at an elevation of some 20-25°, due to the low-angle limitations of the receiving antenna.

Thus, neither the station's nor other signals will be heard from Oscar when accessing it. However Oscar will be heard when the station is not providing sufficient uplink power to

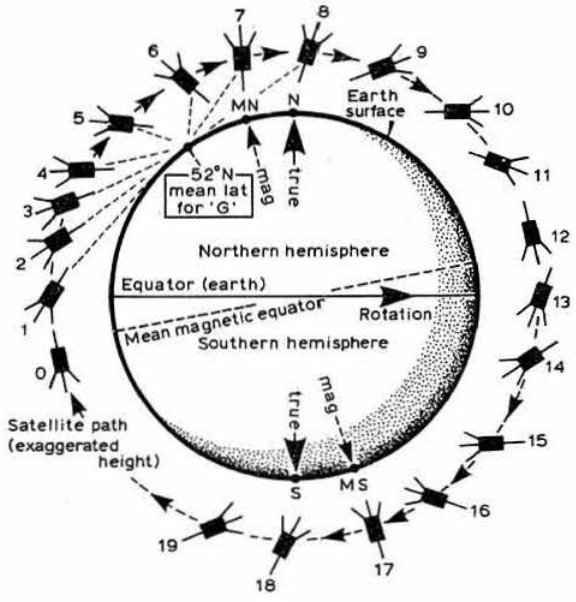


Fig 1. Representation of Oscar orbit showing position of antennas relative to earth

*17 Heath Crescent, Hellesdon, Norwich, Norfolk.

activate it, giving the erroneous impression of insufficient uplink power. This is obviously not the case, as many QSOs have been made using less than 100mW erp, and signals of 10W erp (1W of power to a beam of 10dB gain) are quite easy to copy when the satellite is not overloaded by stations who are attempting to use higher powers to overcome their receiving limitations!

There are two ways out of this apparent dilemma. If one is restricted to a high-angle receiving antenna such as a low dipole or turnstile, the answer is to utilize a similar uplink antenna, such as a turnstile for 144MHz mounted above a wire netting mesh, to give an optimum signal into Oscar which can be heard at the same time by the receiving system when the satellite is at high angles. Such a system, limited to the higher elevations, will inhibit the maximum dx potential of Oscar, but will give adequate QSOs up to a range of over 3,000 miles ground-range distance. The second method is to erect a receiving antenna that will couple with the satellite when it is close to the horizon at maximum range, and try to effect some gain at the same time. HF stations may already be equipped with beams or quads to effect this, but vhf stations may need to put effort into this area. If large beams are not possible, even ground planes and sloping dipoles will be of considerable value and enable the user to access the low-angle lobes.

Ideally, an Oscar station will have steerable beams in azimuth and elevation, for both uplinks and downlinks, with cross-polarization as well. But this is something to work towards and not vital to run-of-the-mill Oscar communication. Suitable references to further reading on the important matter of antennas can be found under [9], [10] and [11].

When the first step has been overcome, the next problem usually encountered is the difficulty of access when heavy loading from the many high-powered European users depresses the satellite's alc system. Then the only passes to be used with any degree of success are those either during quiet daytime orbits, when the satellite is out of range of the high-powered users, or when an unexpected mode switch has occurred without their knowledge. There is no answer to this other than constant and repetitive education of those who create the high power which extinguishes the signal. It has been said so many times before that if everyone ran 10W erp, let alone the 80-100W erp maximum, everybody would have perfect communication—but a single station running 10kW erp (and many can be back-calculated as exceeding even this ridiculous power) takes more power from a fixed alc-controlled power budget than a thousand of the QRP stations, and leaves them with virtually nothing.

Following the stabilization of Oscar 7, soon after launch, another communication problem became evident. This was termed "the weak in the south phenomenon" ("Weak in the north" for Australasia). Early work by AMSAT-UK members showed that the problem was due to the permalloy magnets in Oscar 7 being in line on the long-axis with the 29MHz downlink dipole, thus, apparently, giving an "end-on" effect when Oscar 7 was coming up from the south-west on near overhead orbits, producing minimum coupling to the receiving antenna on 29·5MHz regardless of its polarization [12]. Later work confirmed this effect, which was also affecting other areas under similar relative pole positions [13], [14]. Oscar 6 did not suffer from this, as its 29MHz downlink dipole was at 90° to its permalloy magnets—although deep fades occur for short periods during a pass, they are not sustained and related to the near overhead passes on one complete half of the orbit as they are on Oscar 7.

Fig 1 shows the relative positioning of the satellite to the earth during the course of a complete orbit. The magnets, hence the 29MHz dipole, will always point to the earth's magnetic poles and, with the dip angle of earth's magnetic field taken into account, will produce an end-on dipole effect to stations in line with the satellite path and the pole at latitudes of 40° to 55° north and south, producing a weak-in-the-south or weak-in-the-north effect respectively.

Although the 145MHz uplink is accessing the satellite perfectly, neither the associated downlink nor the beacon, nor indeed any other station, can be heard satisfactorily until the satellite has passed from overhead to the north (or to the south in the case of southern hemisphere stations). Stations to the south of the spacecraft can hear both themselves and the European stations with ease and, often, initially think that there must be a dire shortage of good receivers, antennas or ears in the northern latitudes. At the same time, stations to the east and west of the path can hear the satellite quite well, as the 28MHz dipole is side-on to them. To the affected stations, once Oscar has passed the overhead point, the antenna is progressively seen more on the flat, and the signal continues to improve until it disappears below the user's horizon. Remember that Oscar tends to be pointing vertically down at the far NNW horizon over the magnetic pole zone and, hence, horizontally-polarized beams will be at a disadvantage to vertically-polarized antennas, but a simple vertical dipole, reserved for working the Ws, VEs, KL7s and others at the far horizons on evening orbits, will produce a considerable advantage.

As shown in Fig 1, the satellite comes "into view" at (1), but its dipole antenna is "end-on" to the observer at 50-55°N (England). As the satellite rises, the dip angle of the field ensures that this position relative to the UK stations is maintained, through (2), (3), (4) and (5). Once overhead (6) the dipole is beginning to be seen more off the side and signal strengths will improve through (7) and (8) until los occurs at the far horizon. A similar effect is to be found on orbits coming up from the north in Australia where (13), (14) and (15) are end-on couplings, and signals rise as the satellite passes overhead to the south at (16).

The only conditions under which this can change will be if a severe magnetic disturbance occurs, when both the dip-angle of the earth's field will change and the stability of the

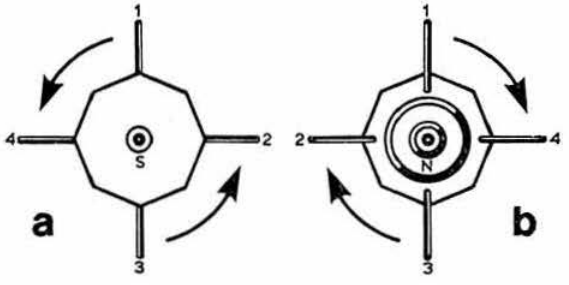


Fig 2. Oscar 7 as seen from axis, with canted turnstile, and with 28MHz downlink linear dipole end on (minimum coupling). End view, arriving and leaving with observer in line. (a) As seen for upcoming overhead orbits in northern hemisphere at 45-55° N. (b) As seen in southern hemisphere on descending overhead orbits at aos up to tca at 45-55° S

satellite is disturbed, producing a change in the gyroscope rotation of Oscar 7 as well [15]. The effect, of signals markedly stronger in the south from the UK coupled with scintillation at the auroral zone, will indicate the likelihood of an imminent Dellinger fade-out followed by an aurora [16].

One further problem is likely to be encountered, that of cross-polarization fade-out. The earlier Oscars, and Oscar 6, employed monopole or dipole antennas. With a plane-polarized antenna for the downlink, regular roll-pattern fade-outs could be expected [17], and even if the plane of the user's antenna was parallel to that of the Oscar antenna, this would still occur due to Faraday rotation caused by the passage of the signal through the E and F layers of the ionosphere. Users were encouraged to employ crossed-polarized or circularly-polarized antennas if possible, where all but end-on antenna couplings could produce a signal path [12], [13], [14].

Oscar 7, on the other hand, although still using a dipole for the 29MHz downlink, employs a canted turnstile for both uplink and downlink on Mode B (432:145MHz) and for the 145MHz Mode A uplink and the 435·1MHz beacon. By this means much of the loss of signal during rotation and changes of attitude to the user has been overcome, and even stations with plane-polarized antennas experience considerable freedom from the QSB periods compared with Oscar 6.

Prior to the launch of Oscar 7 AMSAT published a table of recommendations for the aspect of circular polarization for the satellite, in order to make maximum use of the new facility and to ensure that users with circular polarizations were not using the incorrect thread, eg lhcp when the requirement was rhcp, and vice-versa. (This can cause a loss of up to −35dB.) The recommendations are as follows:

System	Polarization in N hemisphere	Polarization in S hemisphere
2-10 uplink	Left-hand circular	Right-hand circular
2-10 downlink	Linear	Linear
70-2 uplink	Right-hand circular	Left-hand circular
70-2 downlink	Right-hand circular	Left-hand circular
435·1MHz beacon	Left-hand circular	Right-hand circular
2,304·1MHz beacon	Right-hand circular	Antenna shielded from earth

The last system gives the clue as to the actual orientation of the satellite within the earth's field, as the quadrofiliar antenna for the 2,304MHz beacon is on the "top" of the satellite, eg the opposite end from the turnstile sloped toward the "lower" λ/4 of the 28MHz dipole. Thus, when Oscar 7 approaches from the SSE, the canted turnstile is sloping away and pure axial left-hand circular polarization is obtained. Fig 1 shows that this will be maintained up to the highest point of the orbit, after which the turnstile is seen progressively more side-on, approaching north. Unfortunately, as already pointed out, the part of the orbit best suited for circular polarization is also the worst part for downlink audibility, hence the user will not be aware that he is effecting good input on Mode A "2-10".

With orbits to the west and east, the satellite is oriented with the side of the turnstile facing the user's antenna and, with the 29MHz dipole side-on, giving the best signal downlink, mainly horizontal, until it approaches vertical as the satellite nears the auroral zone in the north. The uplink path now has either a plane vertical or horizontal preference, dictated partly by Faraday rotation produced by the signal

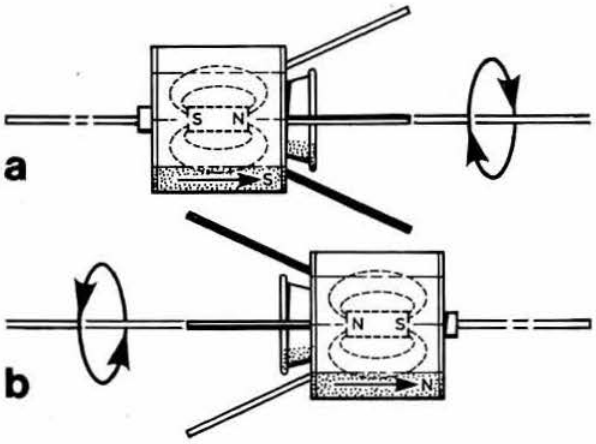


Fig 3. Oscar 7, showing opposite aspects of internal permalloy magnets positions relative to the antenna positions and direction of rotation and field

passing through the ionospheric layers, and by the preference of the particular attitude of the canted turnstile toward the user's antenna.

Past evidence has shown that there is invariably a plane polarization optimum for Oscar 7 [18], [19], although not as marked as Oscar 6 with its single monopole antenna [17].

As the four tape-antennas forming the canted turnstile are black on one side and bright on the other, the spacecraft rotates about its long axis due to the pressure of light, normally at a rate of about one complete revolution every few minutes, although this will slow down in times of severe geo-magnetic storms to spin up again to the former rate once the disturbance is over [15]. This roll pattern, coupled with the attitude of the satellite to the observer and the Faraday rotation, adds up to polarization preferences, and the user is recommended to be prepared to switch to alternatives according to the format dictated. With the helix, dual circular polarization is impossible but, with a pair wound in opposite directions, alternatives may be switched in. With cross-polarized Yagis, such as the nX/Y range, a simple switching is possible to give horizontal or vertical, rhcp or lhcp, or, with a slightly more complex arrangement, all four forms [20].

On Mode B the canted turnstile is used for both uplink and downlink, both having the same polarization preference in phase. As with the Mode A uplink, on overhead ascending orbits the canted turnstile will be seen at the axis, giving rhcp until the satellite is overhead and then changing to a linear preference on a roll pattern, to become slightly more inclined to lhcp just before los. Descending orbits, although not seen quite on axis as the magnetic pole is not now in line, will be seen on high-angle pass aos as with a marginal linear preference, subtending to a marginal rhcp when the satellite has passed overhead towards SSW. Most passes to the side of the station at maximum elevations of up to 30° will invariably show a display roll of vertical to horizontal maxima.

Conclusion

Although circularly-polarized antennas will produce an enhanced degree of freedom from the worst fade-outs, they are sharing their power over all vectors, and can be −3dB down

on the optimum plane polarization at any one time, according to the preference dictated by the position, attitude and roll of the satellite. However, a reversal of circular polarization can produce far greater loss. An ideal station should possess fine tracking, with sufficient elements to give 80-100W erp, polarization selection of vertical, horizontal, rhcp, and lhcp, and antenna elevation capability. With this, it should be possible theoretically to access the satellite for an orbit's entirety, except for those periods when a needed linear element on the spacecraft is end-on. (For this one would need an antenna that can see round corners, and this has yet to be developed!) On the other hand, one can do pretty well with simple fixed turnstiles most of the time [11].

The Phase 3 satellite will probably be equipped with a pair of elements acting as a two-element beam on each corner of the tri-star configuration, eg three two-element beams, each at 120°, giving over 10dB of gain, plus a quadrofiliar. Both these antennas will give strategic advantages for circular polarization and should be seen at the axis for virtually all the orbit time. The quadrofiliar will give a gain of some 5dB smooth out off-axis to 0dB while maintaining its circular polarization. So, it looks as if circular polarization is here to stay for some time yet!

References and bibliography

[1] Orbits for the spacecraft are available from GB2RS bulletins, the BARTG rtty bulletin, Ceefax, Oracle, Viewdata, and the AMSAT-UK nets on 3·780MHz at 1015am and 144·280MHz 7.30pm on Sundays, and on 14·280MHz at 1000ut on Saturdays and 1730ut on Sundays. The AMSAT Orbital Calendar is available from W6PAJ or via G3AAJ for $5 or £3 with large foolscap sase, or at a reduced rate of $2.50 or £1.50 for AMSAT members (free to life members).

[2] "Keeping Track of Oscar" by Bill Browning, G2AOX. A booklet of articles from *Radio Communication*, available from the editor on receipt of an sase, size 7½ by 10in minimum.

[3] "Oscar look-up table for the UK" by A. L. Bailey, G3WPO, *Radio Communication* March 1973. Available as an AMSAT-UK photocopy from the librarian, G8KME, for 6p plus sase.

[4] A satellite plotter designed specifically for your location, giving real time positioning, azimuth and elevation angle, accurate aos and los times and range limits, is available for $6 (plus $1 for overlay) from W2GFF, QTHR. This comes ready for use with complete instructions, and is highly recommended.

[5] An "Oscarlator" is available to UK enthusiasts from ARRL for $2. It gives sufficient accuracy for all but the most detailed work.

[6] The Oscar 7 satellite normally operates on a daily changing basis of 145-29MHz and 432-145MHz operation. Note that future satellites will employ the 435-438MHz section of the band to conform to the space allocated to the amateur satellite service.

[7] The circuit of a suitable preamplifier for 29·5MHz using a single mosfet, by G3HAZ, is shown in *Radio Communication*, October 1977.

[8] A commercially made model using a vhf fet followed by two bipolars is available as a board construction for £6.30 inc p&p, or £8.80 boxed and switched (less 15 per cent discount to AMSAT members), from Hamgear Electronics, 2 Cromwell Road, Norwich NR7 8XH.

[9] *Oscar News* No 11, p16. Az-el system at G3IOR, photograph.

[10] *Oscar News* No 3, pp4-6. Oscar elevation graph, az-el system, and sloping dipoles.

[11] *Oscar News* No 1, p3. Crossed dipoles for uplink and downlink, and coaxial vertical for the 144-28MHz downlink.

[12] *Oscar News* No 12, pp15,16,17. The Oscar 7 weak-in-the-south phenomenon.

[13] *AMSAT Newsletter* Vol 7 No. 1, June 1976. Letter from VK5ZAD.

[14] *AMSAT Newsletter* Vol 7 No 2, September 1976. Letter from G3IOR.

[15] *CQ-DL* No 2, 1976. "Oscar 7—Auswertung der Teletype-Telemetrie", pp36-39. DL3SK.

[16] *Oscar News* No 12, p6; No 15, p3; also *AMSAT Newsletter* Vol 8 No 1, March 1976, part of G3IOR letter.

[17] *Oscar News* No 8, December 1974, pp6,7. Graphed roll-patterns by G3IOR and G3PEJ.

[18] *Oscar News* No 11, June 1975, p15. Graphed roll-patterns by G3IOR.

[19] *Oscar News* No 12, September 1975, p18. Polarization roll graph by G3IOR.

[20] *Oscar News* No 5, July 1974, pp8,9,10,11. "Antennas for Oscar" by G3IOR.

Photocopies of past issues of *Oscar News* can be obtained for 3p per page (three pages for one IRC) from the AMSAT-UK librarian, G8KME, QTHR. □

The presentation of the COMSAT ground terminal station to Scouts at Washington. Left to right: Irving J. Feist, chairman, World Scout Committee; Len Jarrett, HB9AMS, director of administration, World Scout Bureau; F. Battle, vice-president, COMSAT; standing behind is Perry Klein, W3PK, president of AMSAT. The operator is Joe Kasser, G3ZCZ/W3, of the COMSAT technical staff and editor of the *AMSAT Newsletter*

technical topics

Pat Hawker, G3VA

AN article which came my way recently argued plausibly that modern research engineers cannot usefully refer to the events of the past because they are working in successively new worlds and are faced with decisions that have no worthwhile equivalents in history. Uumph, personally I could not disagree more. I believe that anyone interested in developing new equipment can and does benefit enormously by studying ideas that surfaced originally 30, 40, 50, 60 or more years ago—but looking at them afresh in the light of current materials, semiconductors, etc. Really original discoveries are few and far between; but many promising ideas come before their time and stay buried and frustrated in the pages of old journals, until at last suddenly everything clicks into place. Transistor-like amplification was reported more than 20 years before Shockley *et al*; magnetic recording was outlined by Poulsen in the 1890s; ssb used by Carson in 1915; stereo records made by Blumlein in the late 'twenties; synchronous space satellites proposed for communications by Arthur Clarke in 1945; digital pcm patented by Alec Reeves in the 'thirties . . . and so on, and so on. Of course this is not to belittle, in any way, those engineers who finally produced the hardware for these "historic" ideas, but to remind us that much that is worthwhile may still await final development. It is no coincidence that this *TT* includes items on ideas that date from 1922, from 1927, from 1945 and from 1959 and yet (I hope) cannot be described as "old hat".

Sweepers, creepers and sporadic-E

Professor Martin Harrison, G3USF, recently set me on the track of a strange propagation phenomenon that was first reported some 20 years ago, yet has apparently remained virtually uninvestigated until some recent study at the University of Calcutta (aided by a number of amateur observers including VU2KX and VU2SA). There is already some reason to believe that this phenomenon is almost certainly connected with the sun, may be associated with the beginning of the still little understood sporadic-E openings, and could thus be of practical use as well as scientific interest in predicting such openings.

The phenomenon consists of a form of "atmospherics" that sweep rapidly (or sometimes much more slowly) through a band of frequencies. They are heard most often between 23 and 28MHz but on occasions as low as 2MHz and as high as 150MHz. They were given the name "sweepers" by two Americans in 1958: see, for example, N. C. Gerson and W. H. Gossard, *J Atmos Terr Phys*, 17, 1959, pp 82-4. They had discovered that many "atmospherics"of a form categorized by listeners as "clicks, tweeks, hisses and swishes" are not just a single "crash" but sweep through a finite frequency band, mostly shifting from high to low frequency, although exceptionally from low to high. This discovery was made at Palo Alto, California, and the sweepers were studied by using a combination of 60 rf comb filters, each having a bandwidth of about 8kHz, allowing a receiver to look simultaneously, but separately, at about 0·5MHz bandwidth. They noted a considerable variation in the rates at which the "signals" sweep through the spectrum. Their 1959 paper speculated that the sun was in some way connected with these sweepers and noted that "many give the impression of being Type I or Type III solar bursts".

But this strange discovery, comparable in some ways to the vlf phenomenon of "whistlers", seems to have attracted little attention. The only other published report appears to be of observations made in Calcutta and New Delhi from December 1974 to February 1975 and described in: "Sweeper activity in the hf and vhf bands in relation to magnetospheric phenomena" by A. K. Sen and S. K. Trehan (*J Inst Electron & Telecommun Eng (India)*, Vol 23, No 1, January 1977, pp19-21). This paper again notes that these atmospherics or "interference" are in the form of a radio signal sweeping from high to low frequencies or sometimes in the reverse order; but it also notes that the signal is modulated in amplitude by repetitive pulse waveforms, and that it may originate in the exosphere (ie beyond the F2 layer between around 400 to 1,000 miles above the earth). The Indian observers have found sweepers as high as 150MHz but seldom below 20-25MHz. At midday as many as 5 to 20 sweepers *per minute* have been heard; the number increasing with receiver sensitivity, indicating that many are weak signals although their strength tends to increase rapidly during the sweep. The observers' technique was apparently to use two conventional narrow-band communication receivers tuned from 1 to 4MHz apart (typically representing up to 1 or 2s difference in receiving the same sweeper).

Since it is well known that sporadic-E conditions occur far more often in India than the UK (in India they are almost a daily phenomenon I believe) it seems possible that considerably fewer sweepers are likely to be heard in the UK than in India and rather less than in northern California. However G3USF (before seeing either the Indian or American papers except in abstract) reported sweepers in the following terms:

"Over the years I have often observed a curious phenomenon at 28MHz. Quite a number of other operators have asked me what it is, and one has told me that he has also heard it at 144MHz. It may occur below 28MHz but on that I have no information.

"It takes the form of a noise rather like a rough, highly unstable oscillator running quite quickly up and down the band. It is *not* an rf heater. Indeed, I do not think it has an rf origin. The geographical spread of the stations reporting it indicates that it is neither local nor regional in its origin.

"In my own experience this phenomenon is almost always, if not invariably, associated with the beginning of a sporadic-E opening, though it is not encountered with all Es openings. It is accompanied by a particularly high level of atmospherics. I have come to think that it may be in some way related to the mechanism of Es formation which has yet to be conclusively elucidated, but this is only speculation and I have not heard of a fully informed explanation.

"I was reminded of all this by coming across an abstract (of the Indian paper). I know about whistlers of course but I have never heard of sweepers, but it occurs to me that this is what I may have been hearing . . ."

Having now seen the earlier papers, I have little doubt that G3USF's "unstable oscillator" is a form of sweeper, though, since they have presumably been heard on only one

receiver at a time, it occurs to me that perhaps these are only the slower moving sweepers (ie what might be called creepers) and that investigation might show that many of the accompanying atmospherics that G3USF reports are also sweepers.

It may be remembered that the very first suggestion that the 28MHz hiss phenomenon was caused by radiation from the sun appeared in this journal as the result of observations by Dennis Heightman, G6DH, in 1936—one of the key discoveries in the history of radioastronomy. It may seem strange that frequent sweepers have received so little attention for so many years. Of course they may prove just a source of unwanted noise and interference, but fairly clearly from G3USF's observations they *could* prove an extremely important clue to unravelling the mechanism of sporadic-E.

Gain of Yagi arrays

It is well known that many amateurs nourish an exaggerated view of the forward power gain they achieve with multi-element Yagi arrays on hf, vhf and uhf. This optimism is partly because it is much easier to achieve (and measure) high front-to-back ratios than forward power gain. In general terms, G6XN has shown how difficult it is to realize much more than 6dB from a single hf Yagi. The "antenna gain contests" popular in the USA and New Zealand suggest that 16-17dB represents very good going on 432MHz, which is probably the amateur band on which the highest gains are likely to be achieved with Yagi arrays. Above 1GHz, where very many elements can be used without the array becoming too massive, it seems to be extremely difficult to realize very high gains, even by carefully duplicating a "proven" design, and the parabolic reflector tends to reign supreme.

At the heart of the problem are the many variables that affect the gain of a Yagi array: element lengths, rod diameters, element spacing, etc. Despite the 50-year history of the Yagi, one suspects that the vast majority of the more successful designs continue to be based as much on pragmatic "trial and error" as upon precise design formulas.

However, a recent publication of the US Department of Commerce and National Bureau of Standards (*Yagi Antenna Design* by Peter P. Viezbicke) provides very detailed information in about 20 or so pages, based on experimental measurements made on 400MHz at a model antenna range while optimizing designs. The information, presented largely in graphical form, shows very vividly the effect of different antenna parameters on realizable gain. For example, it shows the extra gain that can be achieved by optimizing the lengths of the different directors, rather than making them all of uniform length; it also shows just what extra gain can be achieved by stacking two elements, or from a two-over-two array. In fact it shows: (a) the effect of reflector spacing on the gain of a dipole; (b) effect of different equal-length directors, their spacing and number on realizable gain; (c) effect of different diameters and lengths of directors on realizable gain; (d) effect of the size of a supporting boom on the optimum length of parasitic elements; (e) effect of spacing and stacking of antennas on gain; (f) measured radiation patterns of different Yagi configurations.

In very general terms, the highest gain reported for a single boom structure is 14·2dB for a 15-element array (4·2λ long, reflector spaced at 0·2λ, 13 graduated directors): see Table 1. When stacking two arrays, the author shows that the extra achievable gain is reduced at close spacing due to high mutual impedance effects: with two 7-element arrays a maximum of about 2·5dB can be achieved with 1·6λ spacing; with two 15-element arrays it was also possible to achieve the extra 2·5dB but the spacing needed to be 2λ. The use of four arrays, in correctly phased two-over-two systems, can increase the realizable gain by about 5·2dB (one using 7-element units yielded a gain of 14·2dB; one with 15-element optimized units achieved 19·6dB, the highest gain measured during these experiments).

Table 1 — Optimized lengths of parasitic elements for Yagi antennas of six different lengths

	Length of Yagi in wavelengths					
	0·4	0·8	1·20	2·2	3·2	4·2
Length of reflector (λ)	0·482	0·482	0·482	0·482	0·482	0·475
Length of directors (λ)						
1st	0·424	0·428	0·428	0·432	0·428	0·424
2nd	—	0·424	0·420	0·415	0·420	0·424
3rd	—	0·428	0·420	0·407	0·407	0·420
4th	—	—	0·428	0·398	0·398	0·407
5th	—	—	—	0·390	0·394	0·403
6th	—	—	—	0·390	0·390	0·398
7th	—	—	—	0·390	0·386	0·394
8th	—	—	—	0·390	0·386	0·390
9th	—	—	—	0·398	0·386	0·390
10th	—	—	—	0·407	0·386	0·390
11th	—	—	—	—	0·386	0·390
12th	—	—	—	—	0·386	0·390
13th	—	—	—	—	0·386	0·390
14th	—	—	—	—	0·386	—
15th	—	—	—	—	0·386	—
Spacing (directors) in λ	0·20	0·20	0·25	0·20	0·20	0·308
Gain (ref dipole) in dB	7·1	9·2	10·2	12·25	13·4	14·2

Element diameter 0·0085λ. Reflectors spaced 0·2λ behind driven element. Measurements at 400MHz.

(Due to P. P. Viezbicke)

Since one British uhf tv antenna (Antiference XG21), consisting of a single-boom, multi-structure array, claims 21dB gain on Band 5, it is interesting to speculate what could be achieved with a two-over-two stack of these: possibly 25dB or so, which would be a truly remarkable figure for Yagi-type structures. Similarly it would be very interesting to know the maximum gain that might be achieved in practice by using a 432MHz rhombic. On 1·3GHz some 25dB has been realized in antenna contests using a home-made 7ft diameter dish.

My thanks to an IBA colleague, Paul Gardiner, a tv/dx enthusiast, for bringing this illuminating NBS report to my notice. It certainly provides useful design information as well as food for thought.

Up-date on a.m. and dsbsc reception

On a number of occasions, particularly when discussing direct-conversion receivers, I have tended to fall into the customary trap of suggesting that a synchronous (product) detector cannot be used satisfactorily to receive a.m. or dsbsc signals unless either (1) one sideband (and a.m. carrier) is filtered out in the receiver (losing the potential advantage of having two sidebands); or (2) there is accurate phase coherence of the injected carrier (requiring a phase-locked oscillator).

Actually, as anyone with a modern communication receiver (whether direct-conversion or superhet) can readily prove for themselves, it is quite possible to receive a.m.

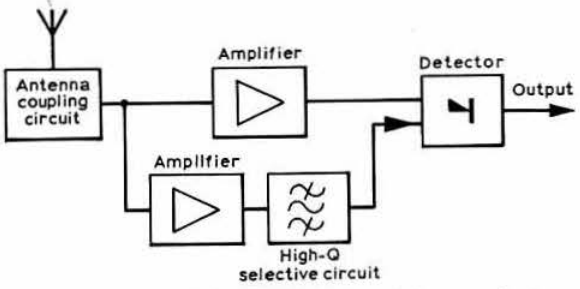


Fig 1. Robinson's original (1922) carrier-reinforcement proposals

and dsbsc signals with free-running LC oscillators provided these are of good stability. Similarly, you *can* receive dsbsc transmissions on an ordinary envelope detector plus bfo, even though many articles and books have told you the opposite. In both cases just tune the bfo or signal to zero beat.

The secret of this apparent flying in the face of theory lies in the neglected "exalted carrier detection" technique which, in effect, gives you a form of phase-coherent synchronous detection without phase locking the oscillator. *Exalted carrier detection is applicable also to nbfm.*

There is of course nothing new about exalted carrier demodulation, although it is possible that only recently have *LC* oscillators without any form of afc become stable enough to make the system attractive. In his history of homodyne and synchrodyne reception, Professor D. G. Tucker (*Journal of Brit IRE*, April 1954) notes that the advantages of carrier-reinforcement were appreciated even earlier than the first announcement of the homodyne: in March 1922, E. Y. Robinson applied for a patent for a system in which the carrier of the incoming (a.m.) signal is filtered out in a path separate from the main signal path and amplified in a high-Q regenerative tuned amplifier before being recombined with the original input signal which has been amplified in a less selective (low-Q) tuned amplifier: Fig 1.

A detailed article "Exalted-carrier amplitude- and phase-modulation reception" by Murray G. Crosby (*Proc IRE*, September 1945, pp581-589 plus appendices) shows **how** such techniques were applied (Fig 2) to the long-distance hf commercial point-to-point circuits operated by RCA, including those with diversity facilities for which they were claimed to be particularly effective. The paper highlighted the advantages of exalted carrier demodulation in reducing the destructive effects of selective fading on double sideband systems and provided "the equivalent of an increase in the selectivity of the receiver".

Readers may need to be reminded that the communication effectiveness of dsbsc is potentially greater than that of ssb and *it is a fallacy to believe that because an ssb signal takes up less bandwidth you can pack more ssb than dsbsc stations into an unchannelized amateur band* (J. P. Costas "Poisson, Shannon and the Radio Amateur" *Proc IRE*, December 1959). Several items in *Wireless World*, eg letter in December 1977 issue, have emphasized that one can effectively use two mirror-imaged sidebands to reject adjacent channel interference, though nobody wants to know.

Using exalted-carrier techniques

I was reminded of exalted-carrier detection by an article by Phil Howell, ZL3RH ("Reception of dsbsc transmission" *Break-in*, July 1977) who was kind enough to note a piece I wrote in *Wireless World* (October 1976) to try to persuade the Home Office to reconsider the ban they had then imposed on the use of dsbsc (as indeed they did and under the current licence anyone can use dsbsc on any band).

ZL3RH notes that the idea that dsbsc cannot be satisfactorily received on a conventional a.m. receiver with adequate bfo "is simply a fallacy which arose in the past from consideration of an over-simplified mathematical model". He continues: "It is true that if a transmitter is deeply modulated with a sustained pure tone, and the carrier is subsequently suppressed, then, if it is not restored at the receiver with phase coherence, periodic demodulation, distortion and frequency modulation occur. However, in practice, because the rapid and quasi-random phase shifts in a speech waveform does not continue long enough, these evil effects will not occur. Furthermore, re-introduction of a carrier at a much greater amplitude than it originally possessed lessens still more the tendency to these effects."

ZL3RH explains that a simple test is to use a stable vfo at signal frequency (eg LM or BC221 frequency meter). "Tune in a weak, preferably distant and noisy a.m. signal

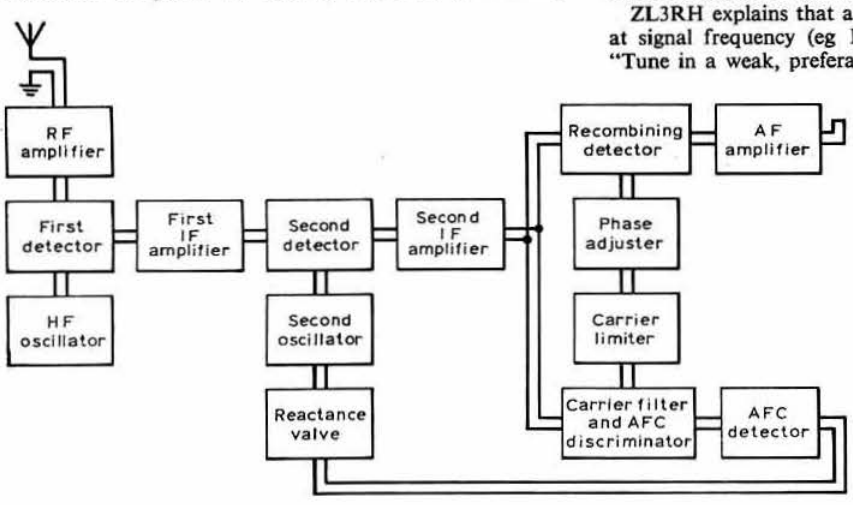


Fig 2. HF receiver described by Crosby (1945) for exalted carrier reception of a.m. and phase-modulated signals using afc and phase adjustment techniques

which you would rate as having a readability of 3 or 4. Turn on the tunable oscillator and set it to zero beat with the carrier; increase the oscillator output (or increase the coupling between it and the receiver) until agc action reduces the audio volume by several S-points; then finally wind-up the audio gain to restore the level of the signal," he writes. It will then be found that the phenomenon of detector capture suppresses the weak, fading incoming carrier and the sidebands now beat with the crisp, locally-generated carrier. Provided it really is zero beat, the detected signal should sound crisper and cleaner, with significantly better signal-to-noise ratio.

ZL3RH describes how a.m. signals received in this way are often boosted from QSA2-3 to QSA4-5, a very worthwhile improvement; but he adds an important word of warning: "Remember you are not going to be able to improve a signal which is already QSA5 by tricks of this sort."

It was perhaps this lack of immediately obvious improvement on other than very weak signals or those distorted and impaired by selective fading that resulted in relatively little interest in developing further the Badessa reciprocating detector (*ART5*, *TT* June 1972). This detector synthesized a coherent reference carrier from the incoming signal: it was described as "a superb weak-signal demodulator for dsb/ssb/a.m./cw". There was no bfo, and the system represented a practical application of carrier-reinforcement techniques.

Similarly, little work appears to have been done in exploiting the use of exalted-carrier techniques for the demodulation of phase-modulated nbfm signals; though such an approach was shown to be possible, in the 1945 paper by Crosby, if the phase of the reference signal is changed by 90° or 270°. Several readers have pointed out in the past that one can receive a stable nbfm transmission on a receiver designed for ssb reception by treating the signal as though it were an ssb transmission.

ZL3RH ends his article by suggesting that there is room for a programme of serious investigation in this field. Like many others he seems to have stumbled on to the phenomenon of detector capture more or less by accident. Indeed I remember my own interest being aroused over 40 years ago by noting that with care I could receive a.m. phone on an 0-v-1 receiver rather better with the detector oscillating than with the regeneration set just below threshold (fortunately I had few neighbouring swls!).

It is widely recognized today that there are significant advantages in using synchronous demodulation, but little attention seems to have been given to its simplest form with exalted carrier, or its use for nbfm, or the recognition that two sidebands are often better than one and that dsbsc is not just an intermediate step between a.m. and ssb but a system that offers much to the amateur experimenter!

Direct conversion with MD108

Dick Rollema, PA0SE, in *Ham Radio* (November 1977) describes in detail a five-band direct-conversion receiver and adds, for good measure, some interesting ideas on design philosophy for dc receivers. For instance, he rejects the two-phase demodulator even though it provides a single-sideband solution, on the ground that "this entirely spoils the main attraction—simplicity—of the dc receiver".

He also rejects the commonly used mosfet demodulator on the grounds that its quadratic characteristic also produces

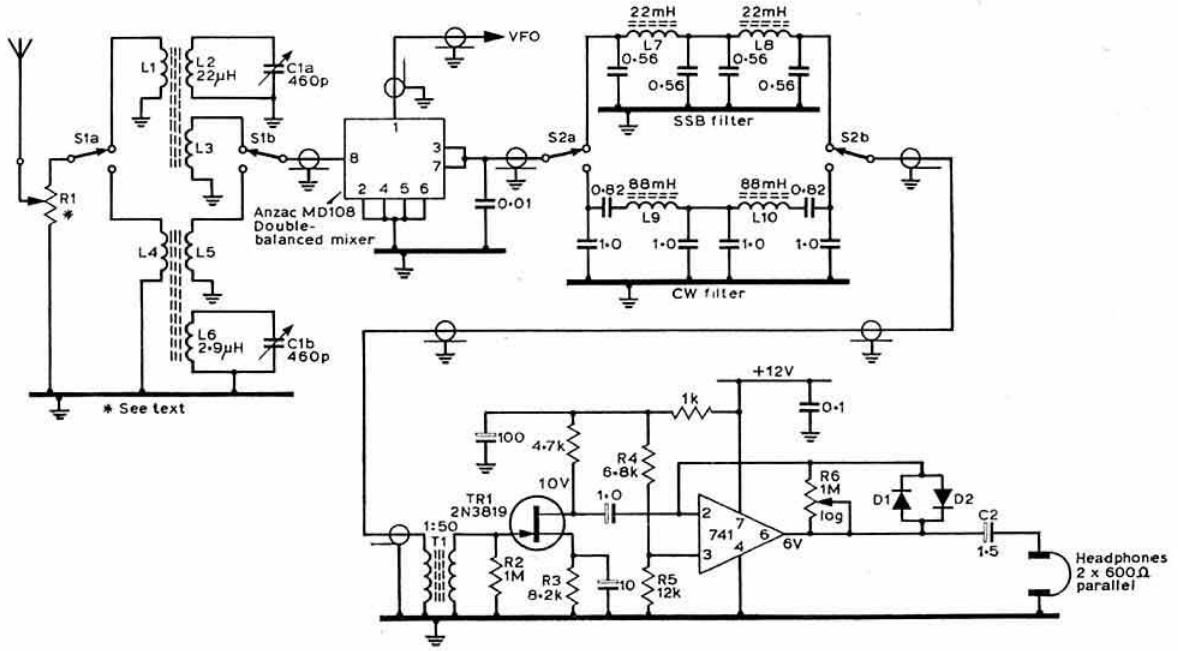


Fig 3. PA0SE's direct-conversion receiver for 1·8 to 21MHz with multiple-vfo/buffer stages (not shown). Pin numbers on 741 refer to round (TO-5) package. R3 is selected for dc drain voltage on TR1 of 10V. R1 is typically carbon pot of about 500Ω. The signal-tuned circuits can be wound on ferrite or, preferably, powdered-iron toroids, L2 covering 1·8 and 3·5MHz, L6 covering 7–21MHz. A simpler vfo might be based on a band-switched Franklin oscillator (*TT* November 1977). PA0SE's receiver is fully described in *Ham Radio* (November 1977)

detection of a.m. signals (surprisingly he rejects exalted-carrier detection of a.m. as not an elegant solution). He similarly finds excessive a.m. detection when using the SL640 type of balanced mixer. His preferred solution (Fig. 3) is to use the Anzac MD108 double-balanced Schottky diode ring mixer which he finds far more sensitive than the homebrew balanced mixers he has tried. He notes that the MD108, although specified for 5-500MHz, will perform well on 1·8 and 3·5MHz. The MD108 and some other packaged mixers may seem a rather expensive approach for a low-cost receiver but the figures given by PA0SE do seem to justify their use, as it provides good sensitivity without any rf stage: it is only on 28MHz and possibly 21MHz that an rf stage would give any worthwhile improvement, assuming that a good receiving antenna is used.

PA0SE departs from "simplicity", however, in his oscillator. To overcome the problems of frequency-conscious components (see *TT* November 1977) he uses *five* separate oscillators in conjunction with a five-gang tuning capacitor, diode switching the different oscillators into a common two-transistor buffer amplifier. This multiple-vfo is hardly a technique that will appeal to a newcomer seeking an effective but simply-built receiver, and it is here that one does feel that a switchable Franklin plus buffer might provide a simpler yet effective solution. Fig 3 shows the PA0SE design with the exception of the vfo/buffer section.

More on luminous hazards

In the September *TT* attention was drawn to a note by ZL1VP on possible radiation hazards presented by the luminous paint used on the meters of certain wartime equipment. It was pointed out that luminous meters were at one time available in the UK surplus market (I bought several) though it was not known whether these presented a hazard of the same order as the ZC1 meters.

As a result of that note I have received a most informative letter from Dr Tony Wrixon of the National Radiological Protection Board at Harwell, Didcot, Oxon. He writes:

"The practice of using radioactive materials to luminize dials and other articles originated at the time of Mme Curie. Until the late 'fifties radium-226 (which was extracted from natural sources) was the only suitable radioactive material. Radium-226 has a number of undesirable properties: it is highly radiotoxic if taken into the body and it emits penetrating beta and gamma rays which can cause external radiation exposure.

"Since the 1950s 'fifties radioactive isotopes have been produced artificially, permitting radium-226 to be replaced by the less radiotoxic isotopes, tritium and promethium-147. More recently the use of radioluminous paints has decreased and the modern method of illuminating dials is by means of gaseous tritium light sources. These are sealed glass ampoules coated internally with a phosphor and containing tritium in the form of its gas. They are intrinsically safer than radioluminous paints because the radioactive material is completely sealed and, unlike radium-226, it emits negligible external radiation when contained within a device.

"Originally, low levels of radiation exposure such as might result from the use of radioluminous instruments were not considered as entailing any risks. When many of the early workers in the radium-luminizing industry developed cancers because of very poor radiation hygiene and the relatively high levels of radiation dose, national authorities were prompted to take some appropriate protective action. Only much later, during the late 'fifties, was the cautious assumption adopted that any level of radiation may entail some risk. Radiological protection standards which would result in relatively low levels of exposure were not considered necessary until recent times. For example, the international radiological protection standard for radioluminous timepieces, the first standard of its kind, was published as recently as 1967.

"Radioluminous paints were used extensively on military equipment during the 1939-45 war. Afterwards many radioluminous instruments were sold off as surplus and some found their way to the public. Nowadays, any surplus radioluminous instrument is required to undergo radiological assessment before being released for sale by the forces.

"The National Radiological Protection Board, which has a statutory responsibility to provide advice on matters of radiological protection, has encountered various pieces of radioluminous military surplus equipment. These include compasses, artificial horizons and other meters. Although some of these would not comply with modern radiological protection standards, we have seldom seen any which could be described as positively dangerous.

"I certainly agree with the comments made by ZL1VP. The principal problems arise from direct access to the radioluminous paint. First of all, removal of the glass face from a meter will substantially increase the external radiation dose rate. Secondly, paint can become flaky with age and might inadvertently be taken into the body. If access to dials with radioluminous paint is absolutely necessary for repair and maintenance, direct contact with the paint should be avoided.

"Finally should any readers be particularly concerned about instruments which they own, the Board would be glad to provide further advice or assistance."

Capacitance meter suggestions

TT (January 1977) included details of two direct-reading capacitance meters originally described in *Television* and using the well-known 555 timer integrated circuit. Brian Castle, G4DYF, built the 0-10μF unit and has put forward some suggestions which may prove useful to other readers. He writes:

"I find the unit requires some decoupling across the ic terminals 1 to 4 and 8 since without this I obtain erratic readings and hand-capacitance effects, even though I have adopted the Veroboard layout as given in the original *Television* article. After adding the decoupling, using 47nF capacitors, the results are excellent. After calibration using a one per cent silvered-mica 180pF capacitor which was to hand, the unit then gave sensible readings at 4·7pF on the lowest range and 2·2μF on the highest range × 2. In fact I can see that soon I shall not be able to do without this useful gadget.

"Incidentally, I have avoided purchasing a 50μA meter for this project by using a 741 op-amp ic to amplify the meter current sufficiently to deflect a 200μA meter, but without providing a separate negative voltage rail. I found that the gain of the 741 is almost independent of the supply voltages until they fall to about 1·3V positive and negative with respect to zero. I have used the 9V battery positive as the positive potential, the battery negative potential and the regulated 5·8V rail as the 'zero' potential for the op-amp.

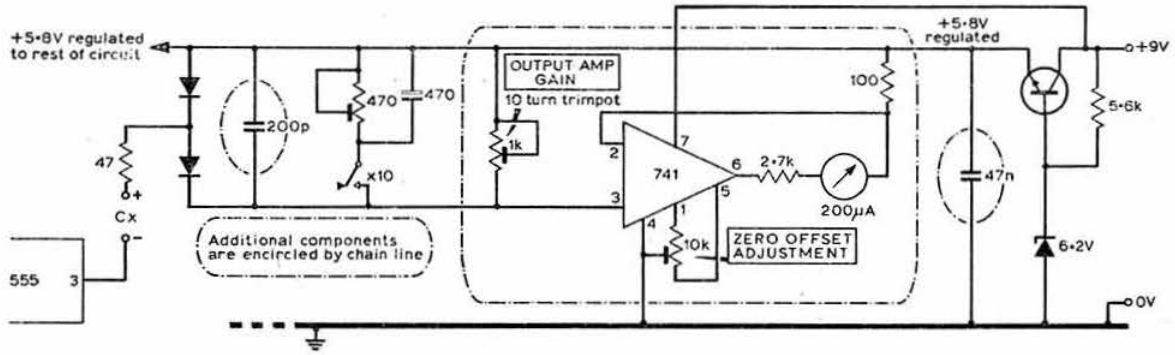


Fig 4. G4DYF's suggestions for using an op-amp with grossly asymmetrical power supply to permit the use of a less sensitive meter in the direct- reading capacitance meter described in January 1977 TT

The 555 produces, via the OA47 diodes, potentials which are always positive with respect to this 5·8V line, and the resultant current is amplified: see Fig 4.

"It may not be widely known that op-amps can often be used in this way with grossly asymmetrical supply lines."

As a final comment, G4DYF mentions that he has found a 200μF capacitor across the 741 input to be necessary; otherwise the readings were low on the high capacitance ranges, presumably due to the 741 not responding so well to dc with a deep ripple as produced when the ic is running at 10 or 100Hz. The op-amp modification is shown in Fig 6 and G4DYF indicates that this circuit was derived from one in *Electronics Today International* (April 1977).

A 15V dc-dc converter

Even though, as G4DYF notes above, it is possible to use op-amps without having a supply line balanced to zero, it is very useful to have some means of providing a balanced supply when only a conventional power unit is available. *Old Man*, No 9, 1977 reprints from *Radio-REF* an article by J. Planchamp, F5HV, describing a dc-dc converter that provides such a facility: Fig 5.

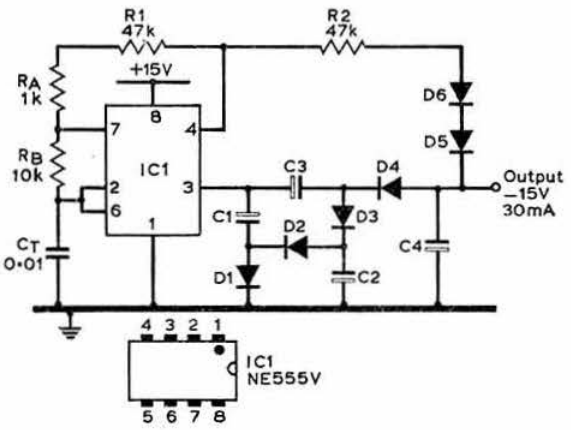


Fig 5. A voltage-tracking dc-dc converter by F5HV to provide balanced supplies for use with op-amps etc. Regulation between 0 and 30mA is stated to be of the order of one per cent

Here again the ubiquitous 555 timer ic forms the basis of the unit, being used as a relaxation-type oscillator. The converter is claimed to provide a negative supply rail of −15V when powered from a +15V rail, with a regulation of about one per cent for current loads of between 0 and 30mA. The oscillator frequency is determined by R_A, R_B and C_T. The output from the 555 is used to feed a voltage-doubler rectifier formed by the diodes D1 to D4 in conjunction with C1 to C4. Components R1, R2, D5 and D6 stabilize the output potential by "voltage tracking" the input voltage. By using a linear 100kΩ potentiometer in place of R1, R2 it is possible to vary the output voltage in applications not requiring a symmetrical supply.

Unfortunately the article does not indicate a recommended value for the electrolytic capacitors C1 to C4 or any diode types. The illustrations, however, suggest that C1 to C3 are identical 35V electrolytic capacitors while C4 would appear to be of appreciably larger value, but provided sufficient capacitance is used the actual values would not be critical, and almost any silicon diodes could be used.

TVI filtering

Steve Cherry, G3SJK, is not at all happy at G3BID's suggestion (*TT* August 1977) that one needs to worry whether a tvi filter looks into a matched load at harmonic frequencies: in fact he points out that it would be a disadvantage to have a matched condition: "The last thing one wants is the antenna and feeder matched at the harmonic frequencies, since that is the sure way of transferring harmonic energy that has got through the filter to the antenna. In fact filters *work* by creating a large mismatch at frequencies beyond cut-off frequency. The termination will have most effect at pass frequencies, some effect on the roll-off and practically no effect in the stop-band."

There are, as G3SJK agrees, some circumstances where G3BID's suggestion of using a balanced form of filter might reduce the radiation of harmonics; the main possibility is where poor screening of the transmitter and leakage from the enclosure results in there being rf on the outer of the feeder cable going into the tvi filter. It should also be stressed that none of these remarks invalidate the earlier suggestion in *TT* of the potential advantages of using an absorptive tvi filter in order to overcome the effects of mismatching at harmonic frequencies at the output of the transmitter *into* a tvi filter. □

4-2-70

Graham Knight, GM8FFX*

New 144MHz transequatorial record

Edgar Muller, YV5ZZ, of Caracas, Venezuela, set a new world record for transequatorial contacts by working over 5,000km to LU1DAU in Argentina on 29 October. YV5ZZ and the LU stations thought conditions would be good when they noticed signals from Oscar 7 in Mode B when the satellite was below the horizon. Edgar went on 50·105MHz and heard LU1DAU working a station in Costa Rica. After exchanging 5 and 9 plus reports they changed frequency to 145·9MHz and established contact at 0230gmt. Signals on 144MHz peaked 589, and after completing the QSO with LU1DAU, YV5ZZ also worked LU7DJZ on cw. Both Argentinian stations were worked a short time later on ssb with 5 and 7 reports being exchanged.

Transequatorial propagation usually takes place between points up to 2,500 miles north and south of the equator. YV5ZZ is at Boca de Uchire 10°N 65°W, while LU1DAU is at La Plata 35°S 57°W. YV5ZZ had further transequatorial contacts on 7 and 8 November with LU3AAT in Buenos Aires and has been heard on different days in November by LU3EMH and LU7FA at Arteaga, Santa Fe. Both Edgar and LU3AAT were using Trio TS700 transceivers with 250W amplifiers. The antennas at both stations were 10-plus-10-element Yagis. Edgar did not notice much difference between vertical and horizontal polarization and he found that, although the 144MHz signals were weaker than those on 50MHz, the fading was less pronounced on the higher band.

Edgar Muller is, of course, well known for his moon-bounce activities, and formerly held the German callsign DL3GD. He is to be congratulated on his achievements and to be thanked for his many telephone calls and letters which ensured that this report came direct and is authentic—unlike the TU to PY contact which was reported in good faith on GB2RS but which later proved to be incorrect.

Double burst ms experiments by G3CCH

Johnny Stace, G3CCH, is well known to all ms operators. His total number of completed ms contacts now exceeds 200—with many more contacts in the log which were only partly completed. During experiments he has noticed that 20 per cent of all signals received by ms arrive at the receiver in two parts. A short initial burst is often followed by a short period of silence, which sometimes lasts for a few milliseconds but can be up to 2s. After this short gap the burst continues, often at much greater signal strengths. For several years he has made notes in his log of all such double burst signals, and finds that it happens on all stations irrespective of whether the meteors involved are "shower", "minor shower" or just sporadic meteors.

With the aid of six Swedish operators, tests were carried out to establish whether all the stations heard the same double bursts. Transmissions of one hour were made by G3CCH and all the reports from Sweden showed that at times one station could hear a signal as double while another station farther away would receive it as a single continuous burst. At times there would only be a short ping at one station while another would copy several seconds of signals. G3CCH has subsequently found that if he could combine the results of all six stations, who were spread over many hundreds of square miles, he would still only hear the familiar bursts and pings—but with the gaps within one burst filled in.

Similar results have been noted at G3CCH when there have been several stations all calling at the same time (yes—there can be pile-ups and even tail-enders on ms). Stations located close to one another each start to be heard at around the same time, while stations farther away can be heard via a burst starting well ahead of the others.

Johnny Stace's earlier experiments with height diversity reception were detailed in the June *4-2-70*, and taking these into account along with his latest "double burst" experiments he concludes that there is an optimum design for ms antennas. Best results will be obtained using antennas with a large vertical aperture but of a design which includes the lowest possible angle above the horizon to assist the really long-haul dx.

G3CCH has recently had a spell of illness which prevented him participating fully in the Orionids, and we wish him well. It is no surprise to know he is thinking of new experiments to conduct with the SM3BIU/SM5CUI gang; these will be to find new ways of making greater use of the limited burst time available by utilizing even higher speed cw.

Meteor scatter on 276 metres

G3POI recently made an ms appearance on medium wave by popping up for a 5min burst on 276m during a BBC World Radio Club programme. The BBC had visited his QTH at Sevenoaks in Kent shortly after Clive had worked the Faroes and Aland Island by ms, and recorded an interview during which he explained the fascinations of contacting far-away stations on vhf by ms. This programme is broadcast throughout the world and often carries items of interest to vhf operators.

Meteor scatter listener

Mike Allmark of Leeds has been making a special effort to get new countries confirmed by reporting to stations on reception of their meteor scatter and sporadic-E signals. Reports to stations using these special propagation modes are most useful to the operators concerned, and Mike's hard work has been rewarded with many QSL cards which would make some transmitting amateurs quite envious. Recent QSLs received by Mike Allmark include CT1WW, OE5MZL, DB5NA/OH0, OH5NW, HG5KDQ, I4AMD and IT9TAI. Mike also reports hearing SP2DX and GM4CXP working each other on cw during the recent Orionids meteor shower.

Lannion beacon FX3VHF

After the conclusion of this year's transatlantic tests on 50·1MHz, the antennas on the FX3VHF beacon at Lannion were repositioned to fire south. Since the change took place on 24 September some Rhodesian amateurs report hearing the beacon on a number of different days. The best of these was on 27 October when Ray Cracknell, ZE2JV, in Salisbury, copied the beacon from 1455 until 1512gmt, at strengths

* PO Box 49, Aberdeen, AB9 8JA.

which varied between S2 and S6. Peter Cutler, G3DAO, in Chichester, has also been monitoring FX3VHF and reports hearing it almost every day. Peter makes the interesting point that on 26 October there was a sudden magnetic storm commencement on the sun's disc at 2300gmt, but whether this connects with the reception of the Lannion beacon by ZE2JV is a matter for further consideration.

G3DAO says it would be nice to get even a small section in the 50MHz band to conduct propagation experiments. The authorities have no doubt read page 384 of the Annan Committee Report, which states that "some frequencies in Band 1 might well be available for services other than broadcasting". This gives us hope of an allocation after the close down of 405-line television around 1982. G3DAO and F9LT are both endeavouring to correlate sunspot data, magnetic activity and solar flares, with any abnormal conditions on the vhf bands.

Faeroe Islands expedition

Those well-known expeditionaires GM3YOR and GM3OLK are planning a trip to the Faeroe Islands (OY) and Iceland (TF) during the period 17 July to 5 August 1978. The Glenrothes lads have made very successful vhf contacts on previous expeditions to Northern Ireland, the Outer Hebrides and, of course, last year's trip to Shetland. The possibility of ms contacts to Iceland will intrigue a great many vhf operators.

As a result of an earlier mention in *Radio Communication* the Glenrothes group has now heard from two members interested in joining the expedition. Anyone else interested in participating in this venture should contact GM3YOR, QTHR.

Auroral reports

The auroral season continues with many events taking place. In last month's *4-2-70* 13 auroral openings were noted in a single 38-day period. This ratio of one to three has continued, with 26 auroral events in the 77-day period between 11 September and 27 November. For those keeping auroral calendars the most recent events took place on 4, 5, 8, 11, 14, 18, 19, 25, 27, 28, 29 and 30 October and on 7, 11, 12, 13, 14, 15, 25, 26 and 27 November. Many of these events are repeats, for example, 14 November is 27 days after the 18 October event, which itself was a repeat of an event on 21 September.

As last month's *4-2-70* explained, there is no guarantee of repeats, but keeping an auroral calendar does help one to keep on the lookout at the most likely times. The ability of amateurs to record, and often predict auroral events has been attracting the attention of non-radio scientific observers—two universities and representatives from the British Astronomical Association have been in touch with *4-2-70* in the last few weeks, and the BAA have 40 observers who will now be linked to the RSGB auroral warning system.

The last major event, which coincided with a bright visual display, took place on the evening of 27 October, but the first radio phase started at 1437gmt. GM4COK in Edinburgh worked SM1BSA in Gotland Island (JR22e) at 1451gmt and continued to work many LA and SM stations until 1620gmt. A second phase started at 2224gmt and lasted until 0310gmt; best dx for GM4COK in this opening was OH0NB in Aland Island, in JU50f QTH square. The event of 14 November started early at 1424 and continued until 1728gmt, with a second phase between 2300 and 0030gmt. During this event GM stations were able to work LA, SM, DL and OZ stations. Some of the other events were weak, and during this type of event even the GM stations can only work each other.

Peter Blair, G3LTF, was flying home from America on 7 November when he was invited "up front" by the captain to see the radio equipment. Peter asked if communications were often disrupted by aurora and the captain said, "You mean one of those over there". They were nearly home, at 64°N and 13°W, and sure enough there, to the north, was a visual auroral display. A subsequent telephone checkout with GM8FFX confirmed that a radio event had taken place that night at midnight.

FM calling frequency

A plea from G8KLV in the November *4-2-70*, to remind operators that S20 is a calling frequency, has met with an enthusiastic response. It seems that a considerable number of fm operators dislike the all-too-common practice of staying on the calling frequency once a QSO has been established. Some of the repeater group newsletters have taken up the cry, none better than the *Central Scotland FM Group Newsletter* in which GM3SNO is quoted as saying, "S20 seems to be getting used as a chat channel again, remember to QSY off it after establishing contact, even if you think you are in a remote area with no-one listening. There are many stations with excellent receiving installations who may hear you monopolizing the calling frequency."

Illegal vhf operation

Robert Elwyn Thomas pleaded guilty at Corwen magistrates' court to using a transmitter without a licence on Denbigh Moors. The solicitor for the Home Office alleged that Thomas had used a transmitter, fitted in his car, to jam the GB3MP repeater by transmitting various messages, music and obscenities. The magistrates fined him, and found him liable for the witnesses' expenses together with half the Home Office's costs.

At Bury magistrates' court on 21 November, Howard John Payne of Radcliffe, Manchester, and Thomas Boardman of Farnworth, pleaded guilty to three summonses of using radio transmitting equipment contrary to Section 1 of the Wireless Telegraphy Act 1949. They were each fined £25 on each charge and £20 costs, a total of £95 each. Some equipment was also confiscated.

Frank Gatenby, John Davies and Ian Walsh, all from the Manchester area, have pleaded guilty to charges under Section 1 of the Wireless Telegraphy Act 1949 and have been bailed to appear for sentencing at Ashton-under-Lyne court. In this case the Home Office solicitor alleged that the callsigns G8NIN, G4FJD and G8NIW were pirated, and the equipment used included a TS700 and a rotary 14-element beam.

No one has yet been apprehended for gaining access to the GB3RF repeater by means other than a 1,750Hz tone. No damage was done—the repeater was merely switched off.

Awards

Special mention this month of Eric Neal, G8GP, of South London, whose night-by-night assiduity on 70MHz brought him Senior No 36 and by virtue of his holding 144MHz and 432MHz Seniors already, qualified him for Gold Leaf Supreme Award No 19—the third top award to be issued this year. It took Eric less than nine months from making his first 70MHz contact to getting the last QSL card for the

award. Awards manager Jack Hum, G5UM, notices the QSL cards come in much quicker on 70MHz.

Jack Hum has had to deal with shipping orders for awards; detailed below are the 20 other awards issued in October. It is interesting to note that more than half are in the more difficult Senior Award category.

70MHz Senior Transmitting: No 34, G3CO; No 35 G3NPI.
144MHz Senior Transmitting: No 114, G4FDX/P; No 115, G4BBA; No 116, GW8HVP/G4FJK; No 117, GI8HXY; No 118, G(GC, GM)6UW/P.
432MHz Senior Transmitting: No 39, GI8HXY; No 40, G8GML; No 41, G8HBQ; No 42, G4GED.
432MHz Transmitting: No 125, G3CO; No 126, G4FDX/P; No 127, G4FDX; No 128, G8IFT; No 129, G8ITS.
144MHz Transmitting: No 506, G4FDX/P; No 507, G4FDX; No 508, G4BBA; No 509, G8IFT.

REAL DX 1977
FINAL PLACINGS

70MHz	**G3DAH—GM3ZBE**	**670km**
144MHz	**GW4CQT—UW6MA**	**3,100km**
432MHz	**GD8EXI—OE3HJW**	**1,560km**

The "Real DX" section provoked many letters last year with a great many changes taking place in that time. It is interesting to note that two of the three entries show new European records set by British stations. The 1978 box will be extended to record separately best dx via moonbounce, meteor scatter, tropo, etc. This should make the "Real DX 1978" section more interesting and more competitive—send details of your dx contacts to PO Box 49, Aberdeen.

Television records

Lawrence Woolf, GJ8AAZ, worked G8GON/P in Devon on two-way 625-line television. The pictures were good quality at both ends, and Lawrence also switched off the camera and changed to his ttl/diode rom callsign caption generator. GJ8AAZ thinks this is the first 432MHz G-GJ fast-scan television contact.

Ray Mohamed, G4EGC, in Sheffield, wonders if his October 1975 fast-scan contact with DK3NZ/TV in QTH locator square FM44e constitutes a record. The contact was established on standard wideband, 625-line, 432MHz, with 150W input at the Sheffield end. Can anyone better the distance of 835km covered by this contact?

Indoor antennas

Do not despair about working dx if you are unable to put up a tower in your garden. Dave Storr, G8GXP, in Wakefield, shows dx can be worked on 144MHz even with low power and a loft antenna. On 18 October he worked more than 100 Continental stations, including such dx as OE3HJW in HH square and even SP9AGI/P9 in QTH locator JJ.

Earlier in the year G8GXP worked IT9, HG, I1, LZ, OE, OK and YU via sporadic-E, all with the same indoor antenna. Dave is now setting skeds for the coming ms season and hopes to report soon on further indoor successes.

The grapevine

The RSGB repeater status list in December *4-2-70* should, of course, have shown the Buxton R4 repeater GB3HH as operational . . . GB3ED the Edinburgh RB14 repeater is now operational and working well . . . the antennas and

feeders at GB3GN are now in position and awaiting some rf . . . during the 2 December aurora PA0OOS worked LB1N(FT12c), SM5BEI(JU72c) and best of all OH1TY in LU33 square . . . further auroral openings on 3 and 4 December . . . UP2BBC now worked by several German stations on 432MHz . . . high activity during the December RSGB 144MHz contest with G3AWZ in Somerset and G4BWG in London outstanding signals at Aberdeen during most of the event.

National VHF Convention 1978

Geoff Stone, G3FZL, has done a great job in organizing all the different aspects of this year's National VHF Convention. CU there.

Finally

Thanks for all the letters. Please send your news and views for publication to PO Box 49, Aberdeen AB9 8JA. □

RSGB NATIONAL VHF CONVENTION

Organized by the RSGB VHF Committee

The Winning Post, Whitton, Twickenham, Middx

Saturday 25 February 1978

- **One-day exhibition and lecture programme**
- **Saturday evening disco, dance and buffet supper**
- **Specialized trade exhibition with emphasis on help to home-constructors**
- **Comprehensive lecture programme on vhf, uhf and microwave subjects**
- **Bring and buy**
- **Home-constructed equipment exhibition**

PROGRAMME

1100	Convention opens (open to exhibitors from 0900)
1400	Keynote address by Dain Evans, G3RPE, RSGB President
1430	Lectures begin in Whitton School

Lecture programme

- "High-power solid-state amplifiers for uhf" by Paul Widger, G8AGU
- "Loop-quad Yagi antennas" by Mike Walters, G3JVL
- "Meteor scatter basics, and advanced procedures" by Ian White, G3SEK, and Clive Penna, G3POI
- VHF contests forum conducted by VHF Contests Committee
- Microwave stream organized by Dain Evans, G3RPE

Plus other items being arranged—details next month

1730	Lecture session ends
1930	Social evening begins. Dancing to a four-piece band; disco; buffet supper
Midnight	Convention ends.

TICKETS: See facing page

How to get there

By car

The Winning Post Hotel is on the northern side of the A316, Chertsey Road, at Whitton, Twickenham, Middlesex. Ordnance Survey Map 170 NGR 140½ 703½. As the A316 is a dual carriageway with few turning points, approach the main entrance of the hotel from the west end of A316—it terminates at the junction of A316 and A305—or enter via a minor road passing Whitton Station to back of hotel. Ample parking space is available at the hotel or in some adjacent roads, but *not* in the Chertsey Road or at Whitton School.

By public transport

Train to Whitton Station from Waterloo (Southern Region), approximately 20 minutes. 5 minutes' walk from station to hotel. No 203 bus passes Whitton Station.

As parking space tends to fill up with so many people attending the convention, pool your travel arrangements and save petrol or come by public transport—the train service is very good.

microwaves

Dain Evans, G3RPE*

Cavity locking of Gunn oscillators

Since G8DEK directed the attention of visitors at the last Winchester round table to the possibility of stabilizing Gunn oscillators by locking them on to ordinary wavemeters (as noted in last month's *Microwaves*), a number of people have followed this up with enthusiasm and not a little success. In his system, G3KSU simply fitted a wavemeter close to the oscillator with the output being fed to the external circuitry via an isolator. The wavemeter, the Q of which is believed to be in the region of 200, produced a dip about 2dB deep and 30MHz wide. When the Gunn oscillator was tuned about half-way down the lf side of the dip, three things happened: the oscillator locked on to the wavemeter; the oscillator would remain locked even when the wavemeter was tuned over ±15MHz, and the noise bandwidth of the Gunn oscillator was sufficiently reduced so that narrow-band signals, which were previously unintelligible in a 3kHz i.f. bandwidth (!), became perfectly readable when the wavemeter was brought into action.

The stability of the oscillator will obviously depend on the Q of the wavemeter employed. G3KSU is currently investigating specimens having Qs of 2,000 and 5,000. The frequency range of stabilization also depends on the amount of power that one is prepared to lose. G8DIC, who has also been experimenting with this technique, found that his system stabilized over a 5MHz range with only a 0·5dB loss.

The locking process depends on the power reflected by the wavemeter at resonance being in the appropriate phase. G8DEK's original suggestion was to use a phase shifter to ensure this. G3JVL reports that if the position of the wavemeter is such that it is difficult to lock the oscillator, then fitting a "tuning" screw anywhere between the wavemeter and the oscillator usually provides enough phase shift to allow locking.

This topic was again discussed at the round table held on 13 November when further details were given of the successful results that had been obtained. This meeting will be reported in the near future but in the meantime preliminary details of one approach are given so that people can start to experiment.

In the technique shown in Fig 1, the cavity is fitted to the rear of the oscillator. The length of guide between the Gunn diode and the cavity is made $\lambda_g/4$ (or presumably any odd number of quarter guide wavelengths). A suitable cavity uses the TE111 mode for which the dimensions are given by the relationship:

$$\frac{f^2D^2}{10{,}000} = 3{\cdot}2 + 2{\cdot}22\frac{D^2}{L^2} \qquad \ldots (1)$$

where f is in gigahertz, D and L in millimetres.

To minimize the risk of the cavity operating on the wrong mode, it is recommended that the value of $f^2D^2/10{,}000$ should be between 7·5 and 11 (2). The corresponding values

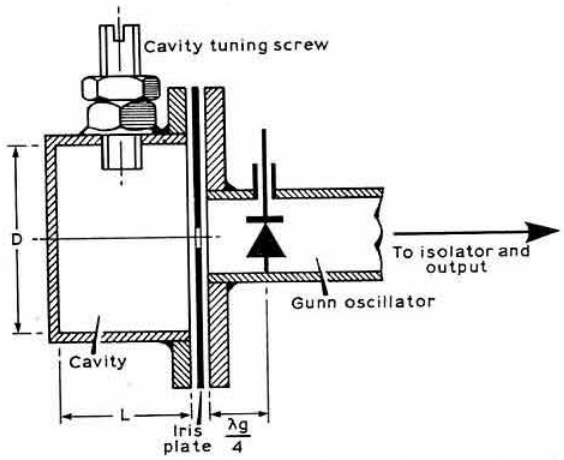


Fig 1. The design of cavities for locking Gunn oscillators

for L, which must be calculated precisely from (1), will then lie between 0·5D and 0·7D.

Care must be taken in the construction of the cavity in order to maintain its Q. Professionally they are usually made from a low-expansion alloy such as Invar which subsequently is plated with gold, for example, to reduce its skin resistance to an acceptably low value. A practical alternative for amateurs is copper, the only disadvantage of which is that the resonant frequency of the cavity will vary with its temperature. To produce a high-Q cavity (and the unloaded Q may easily be 10,000), as much as possible of the material used should be copper, ie the cavity itself, the tuning screw and the iris plate. The inside surfaces of the cavity should be polished, and the amount of solder used inside the cavity should be kept to a minimum.

As an example of the design of a cavity, consider one of maximum frequency 10·6GHz, which will tune into the amateur allocation. Substituting this frequency in (2) produces preferred values for D of 26 to 33mm. A convenient source of copper tube within this size range is the standard water pipe, which has an inside diameter of 26·5mm. Substituting this value for D in equation (1) produces the value for L equal to 18·1mm. A 2BA or similar screw inserted parallel to the E-plane will tune the cavity over a few hundred megahertz.

It is suggested that the size of the iris coupling the oscillator to the cavity be such that the output of the oscillator is reduced by a maximum of about a third (ie about 2dB) as they are tuned together.

The writer will be pleased to hear of people's experience with this technique.

Operating news

Harold Meerza, BRS34348, heard G3ZIV (N Yorkshire) working G3VPK in an ssb 1,296MHz contact during the October openings. Despite G3ZIV being the most northerly station that Harold has heard from his Chatham location, signals were still S5. Apparently G3ZIV's station is a mere 8m asl. On the previous evening, G3ZIV worked G8AUS in Devon when conditions were way up on 432MHz but not so much on 1,296MHz—GB3AND was only just above the

* 4 Upper Sales, Chaulden, Hemel Hempstead, Herts HP1 2AJ.

noise. By contrast on the following night conditions were reversed—less good on 432MHz but well up on 1,296MHz. Harold speculates that perhaps openings are being missed on 1,296MHz because they do not coincide with those on 432MHz, which is an argument for judging band conditions on what they actually are rather than what one presumes them to be. G3ZIV apparently can now generate about 1W of ssb on 2,304MHz and is busy constructing power amplifiers.

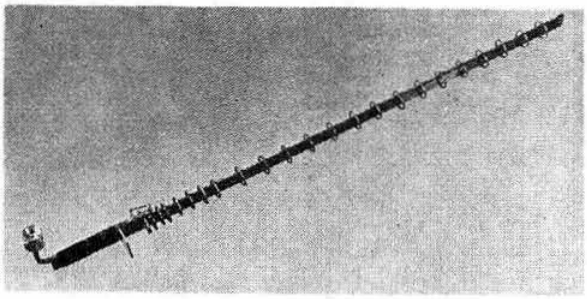
A letter from DL7QY (Berlin) notes that during the same tropo openings in October he worked the following stations on 1,296MHz: DJ3ENA (EH); HB9RG (EH); DJ5BV (DK); G3VPK (AL); G3LQR (AM); DJ6BUA (EK); DJ8QL (EJ); PA0TGA (CL) and PA0AGO (DM). On 2,304MHz he worked DJ3ENA (EH) at a distance of 638km; DK2DPX (EK); OK1KIR/P (GK); DJ6BUA (EK) and DJ8QL (EJ). A test with G3LQR was unsuccessful. DL7QY considered that conditions were also very good on 10GHz but no one seemed to have equipment operational.

As was reported in the October column, G3BNL and G8ADC have been making regular 2·3GHz contacts over the 30km non-optical path from their homes in Bushey and Cardington. The same path is now being worked on schedule three times a week on 3,456MHz with signals S5. G3BNL is using 300mW to a short backfire antenna, with G8ADC using 30mW to a dish 4ft in diameter fitted with a log-periodic feed.

A loop-Yagi antenna for 10GHz

It tends to be difficult to scale conventional Yagi antennas to higher frequencies because of unpredictable factors such as end effects of the elements and the influence of the diameter of booms. However, the success G3JVL had in scaling his 1,296MHz design of loop-Yagi (which is given in the third edition of the RSGB *VHF-UHF Manual*, p8.48; also in *Radio Communication* January 1975, p24) both down in frequency to 432MHz and upwards to 2,304MHz, led him to question just how far he could push this scaling procedure.

The answer is shown in the photo: this scaled 10GHz version uses elements about $\frac{1}{8}$in in diameter formed from brass strip 0·004in thick and 0·020in wide. These are glued to a fibre-glass support strip, rather than to a boom which would have scaled to a mere $\frac{1}{16}$in diameter. This strip reduces the design frequency by a small percentage. The only other difference that had to be made was in the form of the balun, because "scaled" coaxial cable 0·017in in diameter was unavailable at the time of construction.



A loop-Yagi for 10GHz which works perfectly. Its overall length is 10in

Careful measurements of the polar diagram show that the performance of the 10GHz version is virtually indistinguishable from its big brothers. So if anyone wants a 10GHz antenna having a 20dB gain which will fit inside a tube about $\frac{3}{4}$in diameter and 10in long . . .

UK microwave beacons

The following is a list of microwave beacons which currently are operational. A sad omission from this list is GB3IOW, the 10GHz beacon on the Isle of Wight. This had operated continuously since it was first installed in April 1975 but failed at the end of November due to antenna troubles resulting from a combination of corroded guys and 100mph winds. It will be out of action for two or three months, during which time it is hoped to build a more potent beacon.

Beacon	MHz	QTH	Erp W	Antenna	M asl	Keying
GB3AND	1,296·87	ZL63b	50	Slot omni	85	F1
GB3DD	1,296·89	ZL08e	2	HB9CV	263	F1
GB3WRN	1,296·91	YM28g	2	6-el stack	407	F1
GB3UOS	3,456	ZN42c	4	Figure 8	400	F2
GB3LBH	10,100	AL31c	1·5	Slot omni	45	F2, F3
GB3ALD	10,100	YJ30h	1	Sectorial horn	90	F2

GB3LBH, the London 10GHz beacon, continues to operate successfully, It is one of the few beacons (perhaps the only one) which transmits speech. The 1min transmission is repeated every 10min and is produced by a closed-loop tape player which so far has operated about 34,000 times without even a hiccup. In the near future it is planned to transmit data test signals which will enable the variation of error rate with propagation conditions to be measured. It is proposed to transmit "real" data which will describe conditions at the beacon at a later date. The other 10GHz beacon, GB3ALD, also continues to work well. It holds the current beacon dx record at this frequency, the 195km distance from Alderney in the Channel Is to Race Hill near Brighton.

Beacons for which licences have been received but which are not operational are GB3MLE, 1,296·93MHz on Emley Moor; GB3LDN on 1,297·5 and 2,304·05MHz on Shooters Hill, London; and GB3GEC on 2,304·1 and 10,150MHz at Borehamwood, Herts.

Proposed new beacons known to be in the pipeline include GB3EDN on 1,296·990MHz which will be sited in Edinburgh, and GB3CMS on 10GHz which will be established 8km south of Aberdeen.

10GHz tv

The design of a video modulator/psu for klystrons of the 2K25/723A/B type by GW6JGA is given in the 100th edition of the BATC journal *CQ TV*, published in November 1977.

A change

It is with mixed feelings that the writer pens his last *Microwaves*. To have produced 87 columns since October 1970 is a good enough reason for stepping down, but the increasing pressure of other commitments makes it even more appropriate to do so at this particular time. Taking over will be Charles Suckling, G3WDG, who already will be well known to many microwave enthusiasts. The compiler of a column relies very heavily on his correspondents, and the best encouragement that G3WDG can be given would be lots of technical information and operating news addressed to him at: Physical Chemistry Laboratory, Oxford University, South Parks Road, Oxford OXI 3QZ. □

the month on the air

John Allaway, G3FKM *

ONCE again we have a new year with us, and the writer would like to wish all readers every success and happiness. As in *MOTA* for January 1977 he would like to mention the fact that this column depends to a very large extent on reader participation. How about making a new year resolution to supply G3FKM with more information?

January is also the right time to draw readers' attention to the :

IARU REGION 1 HF BAND PLAN

Band		Type of emission
3·5–3·6MHz		cw [2]
3·6MHz	±20kHz	rtty [1]
3·6–3·8MHz		cw and phone [2, 3]
7–7·04MHz		cw
7·04MHz	±5kHz	rtty [1]
7·04–7·1MHz		cw and phone
14–14·1MHz		cw
14·09MHz	±10kHz	rtty [1]
14·1–14·35MHz		cw and phone
21–21·15MHz		cw
21·1MHz	±20kHz	rtty [1]
21·15–21·45MHz		cw and phone
28–28·2MHz		cw
28·1MHz	±50kHz	rtty [1]
28·2–29·7MHz		cw and phone

Notes

[1] For rtty, recommended section of operation shared with cw.
[2] 3,500 to 3,510 and 3,790 to 3,800kHz reserved for inter-continental working.
[3] 3,635 to 3,650kHz is used by USSR stations for inter-continental working.
[4] For sstv, recommended operating frequencies are: 3,735, 7,040, 14,230, 21,340, 28,670—all ±5kHz.
[5] For beacons, 28·2–28·250MHz is recommended.
[6] For the downlink of amateur satellites, 29·4–29·550MHz is recommended.

It is worth mentioning that these are recommendations only and that we in Britain are not compelled to follow them. However, they are sensible and help to keep our hf bands in some kind of order!

Your scribe would be very grateful to anyone who can supply any information concerning the last few contacts made by AC3PT—especially the last one he made before being closed down.

News from overseas

Ian Forse, G4DHA, radio officer on *mv Tugela*, plying between S Africa and Seychelles, is now active on all bands 1·8 to 28MHz, cw and ssb, with the callsign ZS5IB/MM. His QSL manager is Colin Squires, G3XCS, 5 Frith Rd, Saltash, Cornwall.

Bill Stevens, ZD7SD, his wife Sybil, ZD7SS, and G3JMH have kept regular schedules for some time. Bill and Sybil have never left St Helena—a 47-square-mile volcanic area with a total population of 5,000. Their shack overlooks Jamestown and is about 800ft asl with a clear take-off in every direction, and their equipment consists of an FT101E, a two-element quad at 50ft, and a dipole at 40ft. Bill has numerous trophies, cups and certificates, presented to him from various countries for his radio work, and as he is also in touch with the air-sea rescue services in the area he has taken part in many yacht rescues. Bill is a member of RSGB and enjoys contacting UK stations.

The DX Club of Puerto Rico is active again, and its new officers are David Novoa, KP4AM, president; Alicia Rodriguez, KP4CL, vice-president; Luis de la Vega, KP4WI, secretary/treasurer; and directors KP4RK, KP4RF and KP4CLB. The club has a hospitality committee to welcome visitors, and also issues the All Puerto Rico and 8x8x8 Awards. Further information is available from PO Box 1061, San Juan, Puerto Rico, 00902, USA.

DX news

BV2A has been fairly active recently on his crystal-controlled cw frequency of 14,025kHz, and using his other call as BV2B on 14,218kHz on ssb. He seems to prefer calls about 1kHz lower when he is using ssb. CR9AJ is believed to have a regular schedule with Portugal at 0800 on 14,160kHz. Torres has also been worked on 7,085kHz (both cw and ssb) around 1800. Jim Smith, P29JS, has started to organize a net on 14,250kHz commencing at 0700 each morning. Readers who would like a contact with Bhutan might listen to the SE Asia Net on 14,320kHz as A51PN is sometimes one of those taking part.

It is reported that SM0AGD operated for a very short time from Iraq recently. He used the callsign SM0AGD/YI, made 18 contacts, and was closely supervised by Iraqi officials throughout.

SM6CSB has been active from Guinea Bissau as 3CIX. He is expected to be there until the end of 1977 and may have left by the time this is being read.

FH0OM has been worked on his crystal frequency of 14,177kHz at around 1600. After a short period at home in Djibouti (where he has the callsign J28AC) he will return to Mayotte. His wife is also licensed as FH0YL and J28AH.

There seems to be some activity from Qatar. Both A7YXX and A7XZZ have been reported, but it is not known whether they are genuine. The former is said to be DC9NV.

Grenadan stations began to use their new J3 prefixes on 1 November and it seems that they may now be identified by replacing the VP2G in their calls with J3—eg VP2GAJ is now J3AJ.

WD9FCC/VQ9 and WA6OXZ/VQ9 are located at Diego Garcia and expect to be there until July 1978.

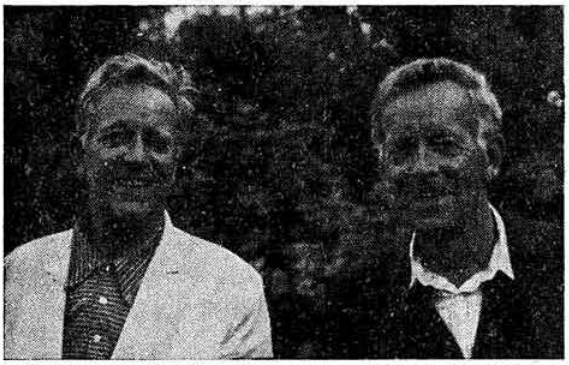
Al Fox, who recently operated for a short time as FH0FX, will be due in St Helena in mid-January. From there he hopes to go on to Brazil and then to the Lesser Antilles.

3D2RM will be in Fiji for about a year. He comes from the USA and his home callsign is W0NDS.

WA6QFO/3D6 (Box 295, Secunda, Tvl, Rep of S Africa) often joins the YL SSB Net on 14,333kHz after 2100 on Fridays.

According to the *New Zealand Herald* (via ZL1AXM) the party which operated from the Kermadec Is recently had an extremely rough return journey to New Zealand. Their 37ft yacht encountered 50-knot winds and waves 25ft high. In all some 12,000 contacts had been made from Raoul Is.

* 10 Knightlow Road Birmingham B17 8QB.



Colin Richards (right)—well known as 9M2CR, 9M2CR/SM5, GW3JET, AP2CR, AP2CR/E Pakistan, 9V1CR, S21CR and 5A2CR!

"VY0C" and "3V8P" both appear to be pirates. In each case their stated QSL manager has no knowledge of them. The station recently using the callsign XF4JJ also seems to be a doubtful one as the expedition to Revilla Gigedo which had been planned and publicized was in fact cancelled.

Top band news

Ian McGarrigle, G8EYU, has kindly supplied an up-to-date list of coastal stations on 1·8MHz. They are as follows: Wick (1,827kHz), Niton (1,834kHz), Lands End and Cullercoats (1,841kHz), North Foreland and Oban (1,848kHz), Stonehaven (1,856kHz), Humber (1,869kHz), Niton and Anglesey (1,925kHz). Hearing them may give some indication of propagation conditions—and it must be remembered that under no circumstances whatsoever should any interference be caused to them by amateur stations.

W1BB's *160 Meter DX Bulletin* dated 1 November 1977 reminds top band enthusiasts that the first 10min of each hour when the band is open for dx working now replaces the former first-timer's organized tests. Experienced operators are asked to call "CQ FT" during this period and to listen very carefully for replies. It seems that stations in Hawaii have now been given permission to use the 1,800 to 1,810kHz part of the band from 4pm to 8am local time—they were previously confined to the 1,995—2,000kHz area. Stew once again asks for co-operation in keeping the "dx window" clear of interference during band openings. The area involved is 1,825 to 1,830kHz.

This band has undoubtedly been the star turn during the period under review. Several UK stations report working Japan, and the following Japanese stations have all been logged between 2100 and 2215: JA1CUW, JA2GQO, JA3AA, JA3AHQ, JA3BDB, JA3ONB, JA5DQH, JA6WGE, JA7AO and JA0SX. At times they have been good signals, and readers are reminded that the Japanese allocation on 160m extends only from 1,907·5 to 1,912·5kHz (cw only). During the time the band is likely to be open it would be greatly appreciated if UK phone stations could try to avoid this area. Although the best opening seems to be at sunrise time in Japan, tests are now being made at our sunrise—this is long path and would represent a very long distance. GD4BEG has supplied sunrise times for JA3 which will be as follows: 7 January 2201, 14 January 2203, 21 January 2158 and 28 January 2154. Openings occur up to one hour before and after these times with JA3s seeming to come through first, JA6s last. GD4BEG also reports a contact with ZS4PB on 27 November and wonders whether this could be the first 160m contact between the UK and South Africa?

Ex-VS9 callsigns

Two more former VS9s have identified themselves—Mike Watling, G3PCW, (15 Fifth Avenue, Catterick Garrison, N Yorks) was VS9AMW during the summer of 1965. He believes that he QSLd 100 per cent and has no cards left, but is willing to oblige with written confirmation to those in his logs who still need one. Dave Morris, who was VS9ADK between 1961 and 1963, still has his logs and a few cards—he may be reached at 7 Rosslyn Rd, Vicars Cross, Chester CH3 5HR.

Dxpeditions

A group of amateurs from the Radio and Electronics Society of India, including VU2TN, VU2AID, VU2IJ and perhaps VU2CJ or VU2YK, is awaiting permission to visit the Laccadive Is.

There is a possibility that several operators from Midway Is may visit Kure Is (KH6) this spring—most likely in April.

W0UO and WA0TUW will be visiting Jamaica during this month and will stay for at least a week, commencing 31 January. They will operate on all bands 1·8 to 28MHz and will use their own calls /6Y5, or WA9FXJ/6Y5 (which is another call held by WA0TUW).

K5CO is back in the USA, but there is a possibility that he may return to Africa at a later date. He says that he has clearance to operate from Benin (TY) and is hopeful that he could also obtain authorization in Mali (TZ).

The group which previously operated from Minami Torishima as KA1S is thinking of making a return visit to the island during March.

Welcome

The following overseas amateurs joined the Society during November: C5ABK, EI1CY, EI3AX, EI4AN, FM7WW, I4CZS, I4KSV, JJ1UMY, OZ2GF and WD4ICV.

QSL via W3HNK

Long Skip has published a list of stations for whom Joe Arcure acts as QSL manager. His address is PO Box 73, Edgemont, Pa, 19028, USA. The stations are:

CN8BG, CQ6LF, CR6KT, CR6LF, CR7GJ, CT1s BT, FL, MZ, RM, TZ, UA, UD, UE, ZW, CT2AK, CT2JAM, CT2SH, CT3AF, CT6UA, CT7RM, CT7UA, CX3BR, DA2DX, DA2DX/HB, DA2DX/HB0, DA2DX/LX, EA8GZ, EA8JJ, EL2BI, EL2CB, EL2EN, EL2ET, EL2EU, EL2EV, EL2X, EP2DX, EP2KB, EP2RL, EQ2DX, F0AZC, FG0AFC/FS7, FL8KP, FY7AX, GW3DJZ, HC8GI, HH2V, HH2WF, HI8MOG, HI8XRG, HM1EJ, J28AI, JA1IVB, JA6BEE, JY9DX, KG6JCZ, KH6GI, KP4DIW, KR6HR, KV4EN, KV4EY, LX1BW, OD5CS, OD5JJ, ON8UH, OX5AP, OX5AU, OY3H, OY5NS, OY7BD, OY7JD, OY9LV, PA0COE, PA0HVM, PJ8AR, PY1CZL, PY1DBE, PY1MO, PY1PY, PY4AKL, PZ1CF, P29BS, SM5BUT, SM0CER, SP9PT, SU1IM, SU1MI, SV0WC, SV0WEE (1970–1972), SV0WUU, SV0WXX (1971), TG8DX, TG9DX, TI2JCC, TR8LE, UA3FF, UC2BF, UM8FM, UW0MF, VE1BFV (Sable Is), VK9BS, VP2s ABA, EEG, EY, KAA, KAB, KK, LAO, LDI VDQ, VY, VP8HA, VP8LC, VP8OD, VS6AI, VS6DD, WA5UKR/YV5, WA5VKJ/HB0, WA5VKJ/LX, XP1AA, XW8EO, XW8FN, XW8GV, YA1VKJ, YS1ESH, YS1GDD, YS1GMV, YS1JWD, YS1RRD, YV4CB, YV5CEY, ZE4JS, ZPs 5AL, 5AN, 5AO, 5CBL, 5EC, 5EF, 5KB, 5LX, 5PT, 5PX, 5RL, 5WU, 5YD,

ZS3CJ, ZS3R, 4S7DA, 4W1GM, 4X4RD, 4X4UH, 4Z4PG, 5A3TX, 5A5TR, 5U7AG, 5Z4PI, 5Z4PP, 8P6BU, 8P6FU, 8P6FV, 8P6IJ, 9C9DX, 9G1JN, 9G1SM, 9H4L, 9J2AB, 9J2US, 9J2YL, 9K2DC and 9L1JT. A grand total of 170!

Contests

The CQ WW DX 160 Contest

2200 27 January to 1600 29 January.

CW only. Exchanges consist of RST and serial QSO number (from 001). Contacts with own country count two points, with other countries five points, and with the USA and Canada 10 points. The multiplier is one for each USA state, Canadian province and DXCC country worked. Note that stations outside W and VE only count as states or provinces not the countries of the USA and Canada as well. Logs must be mailed before 28 February to: CQ 160 Contest, 14 Vanderventer Avenue, Port Washington, LI, NY, 11050, USA. G3FKM has a small supply of log and summary sheets.

In the 1977 event UK scores were as follows:

G3UBR	87,250 points	**GW3GWX**	8,820 points
GI6YM	40,324 points	G4BUO	7,362 points
G4EOK	25,534 points	G3XWZ	5,850 points
GM3ZSP	16,866 points	**GU4EON**	4,690 points
G3YMC	15,246 points	G3JFF	1,932 points

In the multi-operator section **G3VMW/A** scored 90,780 points, **GM3IGW/A** 67,650, G3KMI 25,344, and G4BTJ 15,944. Congratulations to the winners of certificates (printed in bold type).

G8DI has pointed out that the listing of his call in the results of the 1976 CQ WW DX Contest (phone section) was in error. It was a duplication of his cw entry details.

The 1978 French Contest

0000 28 January to 2400 29 January (cw).

0000 25 February to 2400 26 February (phone).

1·8 to 28MHz (French stations are restricted to 1,826kHz on cw only). Work stations in France and French overseas departments and territories. Single-operator entrants may only take part for 36 hours. The same station may be worked on each band, and exchanges should consist of RS/T plus serial contact number (from 001). French stations will also send two figures to indicate their department. Contacts with stations on the same continent are worth three points, and on other continents 10 points. The multiplier is the total of French departments (maximum 95), overseas departments and territories worked on each band added together, and the final score is total QSO points multiplied by this. Send logs to: REF Traffic Manager, Michel Menetrier, F5IN, 2 Square Trudaine, 75009 Paris, France.

The 1978 ARRL International DX Competition

0000 4 February to 2359 5 February and 0000 4 March to 2359 5 March (phone).

0000 18 February to 2359 19 February and 0000 18 March to 2359 19 March (cw). Single-operator (1) all band, (2) high band (14, 21 and 28MHz), and (3) low band (1·8, 3·5 and 7MHz) classes. Multi-operator and multi-transmitter sections also. Entrants should send RS/T followed by a figure indicating the transmitter input power. W/VE stations will send report plus state or province. Stations may be worked on each band. The final score is the total QSO points multiplied by the total of USA states and Canadian provinces worked on each band added together. Each QSO counts three points. (Only the 48 contiguous USA states count). Logs and summary sheets must reach ARRL, 225 Main St, Newington, Conn, 06111, USA, no later than 17 April. Log sheets (100 contacts per sheet) and summary sheets are available from G3FKM (sase please).

QTH CORNER

A7YXX	via DC9NV, W. Rass, Hauptstr 22, D-8552 Hoechstadt Aisch, W Germany.
AP2MQ	via JA3CMD, T. Nakanishi, PO Box 15, Uzumasa, Kyoto 616, Japan.
C5AT	Thure Jansson, OH2BFJ, Bergstrask, SF-02400 Kirkkonummi, Finland.
CE0ZE **CE0ZM**	Dr A. Regal, N4WW, 5301 Jessamine Lane, Orlando, Fla, 32809, USA.
JT1AN	via W7PHO, W. H. Bennett, 18549 Normandy Terrace, SW, Seattle, Wash, 98166, USA.
KZ0DX	via QSL Bureau, PO Box 407, Balboa, Panama Canal Zone.
P29HV	VK3HV, W. G. Francis, 31 Donald St, Morwell, Vic, 3840, Australia.
P29KL	via SM5AWO, G. Karisson, Trollbeksveg 47, S-13500 Tyreso, Sweden.
PY0BXC	F. Souto Maior, Rua Almeida Belo 241, Apt 302, Olinda, PE, 53000 Brazil.
TA1IB	Ismail Bayer, Agneshogsgatan 31-E, S-59100 Motala, Sweden.
TA2FK	Ferdi Kinacav, Rassnasvagen 17-D, S-59100 Motala, Sweden.
TK7GAS	via FG7XA, J. Sahal, PO Box 444, 97164 Pointre-a-Pitre, Guadeloupe.
TT8HV	G. C. Fogg, WB5OOE, Box 626, Allen, Texas, 75002, USA.
VP1UR	Buzz Jehle, 6960 Bunker Hill Road, New Orleans, La, 70127, USA.
VR4AS	W. A. Stark, PO Box 10, Kira Kira, Solomon Is.
ex-VS9AR	H. Rylands, TU2EF, BP 21017, Abidjan, Ivory Coast.
ZD9GG	via ZS1Z, F. Ferucci, Box 341, Paarl, 7620, CP, Rep of S Africa.
3C1X	via SM6PF, N. Strom, Warenbergsg 14, S-52100 Falkoping, Sweden.
5H3KS	K. Schmidt, PO Box 205, Dar-es-Salaam, Tanzania.

RSGB QSL Bureau, G3DRN, 30 Bodnant Gardens, London SW20 0UD.

Results of the **DL AGCW Summer QRP Contest 1977** show G3DNF with 11,228 points, GM3OXX 6,810, GW8PG 6,358, G3UYM 5,595 and G3NEO 2,976. G3NEO and GM3OXX were top scorers on 1·8 and 14MHz respectively. There were 57 entrants in the QRP section. The **1978 Winter Contest** will take place on 21/22 January and the **Summer Contest** on 15/16 July—rules are unchanged. In future the summer event will take place always on the third complete weekend in July.

Results of the **1977 CQ WW 160 DX Contest** have been received and UK scores were as follows:

Single-operator

G3UBR (op G4BCH)	87,250 points	**GW3GWX**	8,820 points
GI6YM	40,324 points	G4BUO	7,362 points
G4EOK	25,534 points	G3XWZ	5,850 points
GM3ZSP	16,866 points	**GU4EON**	4,690 points
G3YMC	15,246 points	G3JFF	1,932 points

Congratulations to **G3UBR** who was world fourth—top score being made by KV4FZ (270,648 points).

Multi-operator

G3VMW/A	90,780 points	G3KMI	25,344 points
GM3IGW/A	67,650 points	G4BTJ	15,944 points

G3VMW was world second, and **GM3IGW/A** world fifth in this section.

Awards

The Oman Award
This award is issued by the Royal Omani ARS. Amateurs must have proof of having worked A4X stations on the following bands since 1 November 1972: 3·5MHz (2), 7MHz (1), 14MHz (3), 21MHz (3) and 28MHz (2)—a total of 11. QSOs via Oscar count as for 28MHz. Any mode may be used but the same station may count only once for each band. Applications and confirmations should be sent to: The Awards Manager, ROARS, Post Box 981, Muscat, Sultanate of Oman. There is no charge.

The WALA Award
For contacts with Norwegian stations since 1 January 1950. Applicants from outside OH/OZ/LA and SM must produce evidence of having contacted 20 different LA/LB stations—at last six of whom must have been located north of the Arctic Circle (this must be clearly indicated on the QSLs). Contacts may have been on cw, phone, or mixed, but not cross-band, and minimum reports required are RST 338 or RS 33. Contacts with JW and JX count as being north of the Arctic Circle. Certified list plus 10 IRCs should be sent to: NRRL Award Manager, Hans E. Kinck, LA4YF, N-3800 Bo 1 Telemark, Norway. (The list should show date, time, callsigns, signal reports, and locations of stations worked.)

The Ex-G Certificate
New rules now apply to this award because of the club's greatly enlarged membership, and the sponsors say that the new certificate is far superior to the older version. Requirements are as follows: (1) For non-members of the Ex-G Radio Club—confirmed contacts with eight members in the USA (not more than two from any one call area) plus four in Canada, and four elsewhere. (2) For members—10, six, and six respectively are required. A certified list of confirmations, signed by two amateurs or a club secretary, accompanied by eight IRCs (non-American) should be sent to: Don Rayner, W3CTR, Awards Manager, 416 Burkhart St, Johnstown, Pa, 15906, USA. European applicants should send their applications to: Lt Cdr H. Cunningham, 235 Station Rd, West Moors, Dorset BH22 0HZ. Please note that all contacts must have been with current 1977 members and that previous contacts do not count. Listeners may also apply.

The Radio Club Paraguayo has provided a list of awards which may be obtained by sending a certified list of QSLs held (signed by G5GH) plus five IRCs to: RCP Award Manager, PO Box 512, Asuncion, Paraguay. Note that all contacts must have been made since 15 May 1952.

All Mediterranean Countries (AMCA)—for 20, 30 or 41 countries from the following: A2, A5, AC3, C31, CP, HB, HB0, HV, JT, LX, OE, TL, TT, TZ, UC, UD, UG, UH, UI, UJ, UL, UM, UO, XT, XW, YA, ZE, ZP, 3D6, 4U1, 5U7, 5X5, 7P8, 7Q7, M1, 9J2, 9N, 9U, 9X.
Tropics of Cancer and Capricorn Award (TCCA)—for 12, 20 or 28 countries from S2, BV, China, EA9(Sahara), KH6, A4, A6, SU, TZ, C6, VU, XE, XZ, 5A, 5T5, 5U7, 7X, 7Z, A2, CE, C9, LU, PY, VK, ZP, ZS, ZS3, 5R8.
All Zone 11 Prefixes (AZ11P)—for 12, 19 or 30 prefixes in CQ Zone 11. These consist of ZP1 to ZP9, PY1 to PY0, and special prefixes in Brazil and Paraguay.
The **Diploma Sud-America (DSA)**—for contacts with countries in ITU zones 12, 13, 14, 15, 16 and 73 as follows: 18 countries in five zones, 25 in six, and 33 in six ITU zones.
The **Diploma Paraguay**—for contacts with five ZP stations.
Worked All ZP (WAZP)—for contact with all nine ZP call areas.
Certificado Radio Club Paraguayo—for contacts with 15 ZP stations. The ZP 100, ZP 150 and ZP 200 awards are given for contacts with 100, 150 and 200 ZPs.
The **ZP3 Award**—for contact with two ZP3 stations.
The **Diploma Departamentos del Paraguay**—for contact with 12, 16 or 20 departments.
Note that a ZP contact is obligatory when applying for the AMCA, TCCA, and DSA. Awards may also be applied for by listeners.

The Andalucia Award
For contacting stations in Andalucia (EA7) since 1 January 1974. European applicants must have worked 20 in Seville, six each in Malaga, Cordoba and Grenada, four each in Cadiz and Huelva, and two each in Jaen, Almeria plus two EA9s in Ceuta and Melilla. Any mode/bands. Log data, certified by a national society, should be sent with 10 IRCs to: Delegacion URE, Award Manager, Box 479, Sevilla, Spain. The award is available on a heard basis for listeners.

A number of attractive Japanese awards are available including the following:
Worked All Japan (WAJA)
For confirmed contact with all 47 JA prefectures.
All Japan Districts (AJD)
For confirmed contact with all JA districts, JA1—JA0.
Heard All Continents (HAC)
Specially for listeners who have all continents confirmed.
Asian DX Award (ADXA)
For confirmed contact with at least 30 Asian countries (as per DXCC list) including Japan.
Japan Century Cities (JCC)
For confirmed contact with 100, 200, 300, 400, 500 or 600 Japanese cities.
Worked All Cities Award (WACA)
For contact with all cities.

All awards cost eight IRCs, and certified lists of QSLs held should be sent to: Awards Manager, Japan Amateur Radio League, PO Box 377, Tokyo Central, Japan. Note that all contacts must have been made since 30 July 1952. Each award is available to listeners as well as transmitting amateurs.

Band reports

The most interesting band seems to have been 1·8MHz during the past month. Typical winter conditions have resulted in late opening of 14 and 21MHz, and 28MHz has been very poor. However, the occasional "CQ" call is still worthwhile!

Your scribe would like to thank the following for supplying information used in this section: G2WS; G5JL; G6GH; G2s CDT, DHV and HKU; G3s AAM and GVV; GM3IAA; G3KSH; GM3LYY; G3s CWI, RCA and ZFC; GD4BEG; G4s EHQ, ETN and EZT; GI4GDV; G8MFS; SP3AGE; and BRSs 17567, 31301, 33915 and 36928.

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

1·8MHz. **0000** *4U1ITU*. **0200** *VE1AXT, WA2SPL*. **0300** *EP2SV, W1-W4, YV1OB, ZE7JX*. **0600** EA8HQ, *W3AJS/HC2*, K1PBW, *K6SE, VE7UZ, W1BB/1, W5TO, W9DR, ZF1CD, ZF2AW*. **0700** *PY1RO, W9MAL, XE1AN* (QSL to **W5GJ**). **2100** (see text) *EA8CR, VK6HD, ZC4IO*. **2200** *IS0LYN* (1, 803kHz).

3·5MHz. **0000** EA9FE, TF5KP, W1-W4, W5, W8. **0100** CN8CW. **0200** EA9FL, PJ2AAX. **0500** OA4VR. **0700** ZL4AV. **1900** OE6DK/YK. **2100** CT3AB, JA1KXY, JA4CIB, ST2SA, VP2MSA, W1, W2. **2200** CN8CW, JA6BSM, 5H3KG, 7X5AS, 8P6GN. **2300** VP2s LCT, VAT.

7MHz. **0600** CE2JK, *EL2ET HC2SL, PJ8JM, W6-W7*. **0700** *KH6WGG*, VK, *W6-W7*. **0800** CP8DLS, *W6-W7*, XE2NL, ZL.

14MHz. **0000** KC4AAC. **0800** JT1KAA, KL7, VK9NI, *VK9RH, VP8PJ*, ZL1YL/K. **0900** JA, JT1BK, KC6MJ, VK, VS6, ZL2LA (ex-G3PHO). **1000** VE3JQA/SU (QSL to VE1RU), TT8HV, VK, ZL.

1300 CE0ZE, VK0KH. **1400** XE1AK, LI2B/YI (raft "Tigris"), ZL2HE. **1500** HZ1SH, VS5XU. **1600** *FB8ZL*, J28AP, J28BA, TR8BA, 3B8BJ. **1700** *FB8WE, FR7BE*, KH6BB, W7, ZS2MI. **1800** FP8DX, HH2MC (QSL to WA4AKU), *PY7BXC/0*, W7, VE7, ZL3GG. **2000** VE3HRS/TZ6, VP8PM, WD9FCC/VQ9, 3C1X. **2100** HR6SWA, VK. **2200** *ZD8TM*.

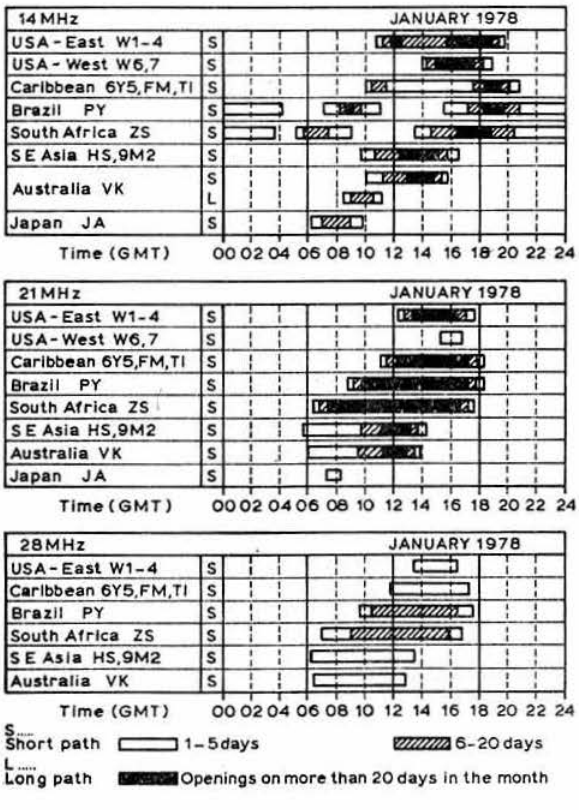
21MHz. **0900** *C5AT*, JA, *KG6JIH, WB7TKB/SU, VS6EJ*, ZL. **1100** *EA6*, S79DF, *VS6BB*, ZL. **1200** *A9XCE*, VK9RY, W. **1400** HK0CLS, TK7GAS, VE3FXT/S8, 3C1X. **1500** CR3BS, H5IND, W6, W7. **1600** PY7BXC/0, W, ZP. **1700** *FO8EX, VP1*, W, *XE*. **1800** W6, WA7FEQ. **1900** KC4AAC.

28MHz. **0800** TU2FH, 9M2BY. **0900** VK6TU, VU2KT. **1000** A2, HI, LU, VK5WO, 5B4. **1100** EA8, SU1CR, TA1ZB, 3D6, 7P8, 9G1. **1200** FM7, VP2MUU, ZD7PV, 6W8, 8P6. **1300** CE, HK0AQ, KP4DSZ, KV4AD. **1400** *FG7, J28BD, KP4, N4RD, OA, TK7GAS*, VP8s LP, PC, WA3TAG, *ZP*, 5T5ZR. **1500** CT2BB (QSL to W1EP), *FM7*, VP1AJ, VP8s NO, PE, W1-W5, W0, *ZS3*. **1600** *CX5RV*, WD4LGE, YV5ACM/4. **1700** K0IMO.

Once again, many thanks to all correspondents, and also to the authors of the following for items extracted: *CQ Magazine* (**W1WY**), the *Ex-G Radio Club Magazine* (**W3HQO**), *DX News Sheet* (**Geoff Watts**), *RSZ Newsletter* (**9J2KL**), *Long Skip* (**VE1AL/3**), the *West Coast DX Bulletin* [**WA6AUD**] and *DX'press* [**PA0TO**].

Please send all items for March issue to **reach G3FKM** no later than **3 February**. □

Propagation predictions



Conditions in January will differ little from those forecast for the previous month. Towards the end of the month hf bands will remain open a little longer than up to now. It is again pointed out that all times are given in gmt; this is done to facilitate conversion into local time of various dx countries such as east and west USA, Asia and Australia.

These propagation predictions have been published by the RSGB for the last 11 years, and by the Polish Amateur Radio Society PZK since 1972.

HF PROPAGATION STUDY

The maximum usable frequency (muf) for a given path at a given hour, varies from day to day. The highest probable frequency (hpf) is derived from statistical analysis of the daily muf values and is that value exceeded on three days of the month. Likewise, the optimum working frequency (owf or fot) is the value exceeded on 27 days.

HPF, muf and fot thus relate only to the probability (0·1, 0·5, 0·9 respectively) of a sky-wave path existing—there is no inference that signals will be workable. For amateur purposes it is found that bands between hpf and half hpf provide the best communications.

The prediction tables show the hpf in megahertz times 10, at two-hourly intervals of gmt, on a number of different routes to/from the UK.

Predicted HPFs (MHz x 10) for January 1978

GMT =	00	02	04	06	08	10	12	14	16	18	20	22	24
Aden	152	143	122	187	335	360	333	317	261	187	155	148	152
Ascension	180	172	149	129	238	332	338	315	306	266	208	188	180
Bahrain	138	139	116	186	331	348	327	293	230	174	135	135	138
Bangkok	115	121	100	163	304	327	279	256	187	133	111	112	115
Barbados	150	141	128	125	121	178	322	331	318	290	215	169	150
Bermuda	129	128	115	119	110	122	284	329	329	290	200	152	129
Bogota	141	138	124	126	117	140	303	329	321	290	216	164	141
Buenos Aires	168	164	145	128	149	260	304	317	314	281	209	181	168
Cape Town	182	169	144	135	289	323	340	318	301	229	199	183	182
Colombo	125	135	112	190	329	342	326	293	221	161	129	129	125
Cyprus	130	130	112	147	300	326	310	293	238	168	133	128	130
Dakar	180	172	149	129	238	332	338	315	308	266	208	188	180
Denver	125	117	110	108	108	103	112	208	298	242	162	129	125
Fairbanks	125	121	126	121	125	150	141	138	149	152	134	131	125
Falklands	169	164	147	128	176	251	285	318	314	275	208	182	169
Gibraltar	101	97	88	82	143	223	228	221	205	152	119	103	101
Hong Kong	102	103	89	133	286	241	197	161	136	122	108	107	102
Honolulu	125	119	120	120	124	125	130	128	116	167	133	130	125
Iceland	82	84	78	70	70	169	227	227	197	124	88	86	82
Jamaica	130	126	115	119	110	139	257	328	328	288	200	152	130
Lagos	181	172	148	131	286	343	341	315	304	249	185	188	181
Las Palmas	148	143	126	112	168	300	312	298	289	233	180	155	148
Lima	155	149	133	126	126	141	321	329	319	289	213	173	155
Los Angeles	125	117	120	115	112	121	120	136	265	229	149	128	125
Malta	114	112	100	98	215	270	262	256	219	149	121	112	114
Mauritius	159	144	129	177	323	356	335	317	274	194	167	155	159
Mexico	125	121	106	110	102	145	152	281	321	265	173	136	125
Moscow	92	88	86	86	213	268	270	241	185	117	97	93	92
Nairobi	168	145	130	162	328	341	336	317	281	205	174	164	168
New Delhi	120	129	103	180	315	317	277	216	164	130	112	119	120
New York	125	125	115	110	101	103	227	309	323	267	178	136	125
Osaka	110	119	100	107	223	182	135	120	119	115	108	115	110
Perth	130	134	111	190	329	309	238	230	218	158	125	128	130
Rio de Janeiro	169	164	147	128	161	305	315	317	314	279	209	162	169
Salisbury	173	163	139	153	289	329	340	319	290	215	187	174	173
Seychelles	155	121	117	177	309	318	335	318	263	192	163	153	155
Singapore	120	129	103	180	315	331	321	276	200	141	112	119	120
Suva (s)	124	124	114	117	135	225	237	196	144	121	122	131	124
Suva (l)	182	174	152	131	244	230	221	180	162	196	210	192	182
Sydney (s)	102	103	89	133	286	238	229	229	166	122	108	107	102
Sydney (l)	157	150	134	126	130	225	191	174	149	173	204	174	157
Teheran	131	135	110	190	329	342	323	284	213	154	129	129	131
Vancouver	125	117	116	120	110	105	111	114	180	186	136	130	125
Wellington (s)	111	117	98	111	200	229	239	213	143	115	110	117	111
Wellington (l)	171	168	148	129	183	201	176	164	155	188	205	186	171

Bands recommended are those between hpf and half hpf.

These prediction tables were first introduced in April 1976, and although it was hoped to be able to improve on the hpf factor for a number of routes, insufficient reports have been received to enable a meaningful alteration to be made. Our thanks go to those few who have, however, taken the time and made the effort to submit reports.

It is felt that these tables have proved useful in their present form, and it is our intention to continue with their publication. Reports would still be welcomed by G4AQI, QTHR.

The 1977 AGM

This brief report is primarily intended for those members unable to attend the AGM. It is an informal account in advance of the minutes of the meeting and is in no way a formal record of the occasion.

The 51st Annual General Meeting of the RSGB took place at the Institution of Electrical Engineers, London, on 2 December 1977. The meeting was opened at 6.30pm with over 160 members present. The President, Lord Wallace of Coslany, was in the chair, and with him on the platform were Dain Evans, G3RPE, president-elect; John Brown, G3DVV, hon treasurer; and George Jessop, G6JP, general manager. G6JP announced that the meeting must end and the building be vacated at 8.30pm.

Formal agenda items

Minutes of the 50th AGM. Mr Caws, G3BRL, said that he did not propose the adoption of the minutes of the 49th AGM as he was not present at the last AGM. Mr Jessop apologized for this error of identification, and Mr Caws replied that if he had been present he would have been pleased to propose them. The minutes of the 50th AGM were then approved.

The second item on the agenda, to adopt the accounts for the year ended 30 June 1977, was proposed by G6JJ and seconded by G3UMI. G3IIR asked for a breakdown of the cost of repeaters and this was supplied by G3DVV. G3IIR said he would like to see this information in the accounts in future. G3OWF raised questions concerning staff numbers and remuneration which were answered by G6JP. G3IIR questioned the reported loss on the Alexandra Palace Exhibition when in fact it contained other losses, including the Leicester exhibition; and he felt this should be shown in the accounts. G3DVV replied that the loss did include Leicester, but the profit on books sold was not easy to assess; he would consider the point about more details in future.

The question of the auditors' qualification of the accounts was then raised. Mr Wright, of the auditors, was present at the meeting, and he dealt with this and several other questions regarding the qualification. He explained the sampling system used in conducting the audit, and said that, as documents to clarify certain queries which this had raised could not be produced the auditors' report could not be unqualified. G3DVV said that all income had been correctly documented at the time received, but at the time of the audit the auditors could not satisfy themselves that this had been done. He went on to say that steps had been and were being taken to ensure that all the documents required would be available in future; a new accountant had been appointed and things should be better organized. G3TJA proposed that the motion to adopt the accounts be put, and G3NPF asked what the legal position would be if they were not accepted. G3DVV replied that the vote would be recorded in the minutes and the next item on the agenda would follow.

The proposal to adopt the accounts was then put to the meeting and the count showed 73 in favour and 71 against. G3OWF pointed out that he held 41 proxy votes. It was stated that proxy votes could only be included if a ballot of the members present was called. Considerable discussion then ensued, and G4APG supported by the requisite number of members called for a ballot. There being insufficient time to conduct a ballot at the meeting it was agreed that the proposal, subject to ballot, be again put to the meeting. This was done and votes recorded by a show of hands were: 82 in favour, 75 against with 13 abstentions. G6JP said that ballot papers would be sent to all members present who had signed the attendance book.

The next item on the agenda was the declaration of the Council election results (see page 22), and as there had been no nomination for the vacancy for Zone E it was proposed to co-opt Mr D. H. Adams, GW3VBP, as Council member for that zone.

After considerable discussion on the next agenda item, Council was authorized to fix the remuneration of the auditors for the ensuing year.

The President then announced that Arthur Milne, G2MI, had been elected an honorary member of the Society in recognition of his many years' service as QSL Bureau manager. The announcement was greeted with loud acclaim. G2MI and Mrs Milne were then invited to the platform where G2MI was presented with his honorary membership certificate and badge, and an FR101D receiver as a token of the Society's gratitude. Mrs Milne was also presented with a gold watch in recognition of her work for the QSL Bureau.

Arthur Milne with his new FR101D

By then it was 8.15pm and the President announced that the IEE had agreed to an extension of time until 8.50pm to allow time for the presentation of trophies and an informal discussion. Lord Wallace then concluded the formal meeting by making the following address:

"On taking office as President I said I did not wish to pose as a 'new broom'. Nevertheless it did become clear that closer links between the rank and file member and Doughty Street and Council were desirable and necessary. In other words we seemed to be able to communicate efficiently and readily to all parts of the world, but in the affairs of this great and rapidly growing Society we were not so good—with frequent acute QRM.

"For that reason the Presidential Working Party of Dain Evans, John Allaway and myself was put in hand. It has been a somewhat unusual set up. No long, wordy meetings and fat files, but a receiving point for the views and ideas of members and local societies. As a result a mass of useful information has been collected and sorted from which, very shortly in the coming year, positive recommendations will be put to Council. It is here that John Allaway and I pay tribute to Dain Evans' work in collating the information obtained which has appeared in summary form in *Radio Communication*. It is your Society; we asked for your voice—we got it! For the same reasons the Regional Representatives' Conference was convened after a lapse of time. The result was a positive and constructive exchange of views and the results are being considered by the M & R Committee on 10 December.

"It is essential in my opinion that this type of contact should not be neglected. It is a vital and important point of contact which needs to be further developed to strengthen our lines of communication.

"Effort has been made during the year to raise the image of the Society at public and official levels. I think success can be claimed. I hope local societies will do their best to publicise their activities in their local press.

"Changes will be taking place in the new year. David Evans takes over as general manager, and George Jessop will continue in service with the Society until the end of June as a consultant. George has served the Society well as Council member, general manager, and president over a period of years. In due course I have no doubt members will wish to mark his service, in the meantime on your behalf I express our gratitude.

"John Brown retires as treasurer. We thank him for his loyal and expert service. His successor is to be Mr P. F. D. Cornish, G3COR.

"The transfer of the editorial dept of *Radio Communication* has given a little extra space at Doughty Street; even so, with the growth

of the Society, Doughty Street is bursting at the seams. At no distant future a headquarters adequate to meet modern needs must be found.

"May I thank all members for their support during my period of office. Presidential office in the RSGB is no joy-ride but it has been a useful and stimulating experience for a back-bench swl. Even SWLs can prove useful!"

Informal discussion

After the presentation of trophies, an informal discussion took place. In reply to written questions submitted by G3IIR, the general manager said that approximately 5,700 members (32%) were resident in Zone C; five meetings of the Membership & Representation Committee had been held during the year, three in London, one in Manchester, and one in Bournemouth; and that none of these meetings had been attended by the Council member for Zone C. G3IIR commented that he felt the Council member for Zone C should retire and allow someone else to take over.

The Zone C member, G3MXJ, expressed surprise that he had not received the courtesy of being told of the question beforehand. He said all meetings of the M & R Committee had been held on working days and that he had previously given notice that he could not attend on those days. This was probably why frequently there was not a quorum at meetings which only the retired and elderly attended. G3MXJ then listed the number of Council, regional and other meetings he had attended and the numerous clubs he had visited. He felt that this sort of activity was more important than attending inconclusive committee meetings, and that it was important that committee meetings be held on non-working days to encourage more younger members, not retired members, to take part. (*Warm applause*)

G3OWF had submitted a written question asking for guidelines on expenditure on various items, and asked that more information on these matters be published. The President said this would be considered but was dependent on space availability.

GM8FFX raised the subject of members, known by the Home Office to have broken the Wireless Telegraphy Act, being in positions of responsibility. G6JP replied that Council had taken steps in certain cases of which it had been officially notified.

G3ZYE felt that the present policy regarding published details of candidates standing for election to Council was unsatisfactory, and asked that Council consider the possibility of candidates putting forward their aims and views. The President replied that this would be considered.

A member who did not identify himself said that the Society had produced excellent technical articles and information in its journal, but it failed on administration and correspondence. Apart from this he felt the Society did a fine job. (*Applause*)

G3PAQ spoke of the interference to repeaters, particularly the jamming on 70cm which he claimed resulted from the announcement of the Home Office's intention not to licence further repeaters. The chairman of the VHF Committee, G3BA, said there had been a lot of sniping at the committee over repeaters but that the Repeater Working Group had done a good job.

Several questions were asked regarding non-inclusion of items sent for GB2RS bulletins. G6JP replied that the selection of news was made on a general interest basis. What was omitted was club news of local interest only or information already published in the journal.

At this point time ran out, and G3AAE wound up the proceedings by thanking Lord Wallace for his conduct of a difficult meeting and for all his good work as President during the year. This was greeted with a standing ovation.

Raynet—Radio Amateurs' Emergency Network

The following is a paper presented by Mr P. Balestrini, G3BPT, the Society's emergency communications manager, at a symposium on major incident intervention held by the City of London police on 19 and 20 October 1977.

IN introducing the Radio Amateurs' Emergency Network, one should perhaps commence by introducing the radio amateur. The radio amateur is to many people many things—a body of like-minded persons interested in the science and art of communication; a group of dedicated enthusiasts sitting up all night and making meaningless noises; and, regrettably, in some cases that group of persons which gets all the blame for any strange noises or disturbances on "the box".

Needless to say most of the radio amateurs in the UK are primarily interested in the science and art of communication, and many had long felt that there was a need for a national emergency service to cope with emergency communications under disaster conditions. Before any organization could be established, an emergency of magnitude occurred when, during the last few hours of January 1953, storm disaster struck the east coast. Post Office telephones, government wireless stations and utility services were out of action for days. Ignoring the terms of their licences, and in the best traditions of service to the community, radio amateurs placed their stations and communication experience at the disposal of the authorities. The North Sea floods, which brought death and destruction to the east coast of England on an unprecedented scale, led to the formation of the Radio Amateurs' Emergency Network, today universally known as Raynet.

Raynet has since grown to an organization of over 1,800 currently registered members, with over 70 groups in the UK and representation in the Channel Islands and Northern Ireland. Home Office approval was given for the formation of the organization under the terms of the amateur (sound) licence, and at the present time members are permitted to operate under emergency or exercise conditions at the request of the police, the British Red Cross Society, the St John Ambulance Brigade and county emergency planning officers.

The organization of Raynet is co-ordinated by a national committee appointed by the Council of the Radio Society of Great Britain. The committee appoints controllers who are responsible to it for local liaison with their respective user services. Direct liaison between the groups, the committee, senior user services and the Council of the RSGB, is organized by the RSGB emergency communications manager.

Members of Raynet have been called upon to provide communication assistance on numerous occasions, resulting in their presence during flood alert conditions and searches for missing children. Last summer members were involved in the fight against forest and heath fires, and many of them were on duty for several days—fortunately with the co-operation and understanding of their employers.

Under a special dispensation recently granted by the Home Office, Raynet groups are allowed to be present on stand-by at county shows and similar events. Several groups, while in attendance at these shows, have been able to provide instant communication when urgent medical attention was required. On more than one occasion doctors called to incidents have confirmed that a life has been saved by the prompt relaying of the call for their assistance.

While long-haul communication facilities (including radio teleprinter) exist in the organization, it does not normally provide a national network because disasters in this country are normally parochial in nature. At the same time, however, groups can communicate on common channels and provide back-up facilities with neighbouring areas when required.

To achieve an efficient standard of service and operating capability, groups hold training nets to test and up-date radio coverage of their area. Regular exercises, both "in house" and in co-operation with user services, are held to practise message handling under simulated emergency conditions.

As a voluntary organization there is no membership fee, although many groups have a small annual subscription to cover administration costs, production of newsletters, etc. The radio equipment is generally the property of individual members. All Raynet members carry identification cards issued by the Raynet registration officer, and personal visible identification is provided by the Raynet armband (white and yellow with RAYNET in black letters). Vehicles are identified by means of the Raynet emblem window sticker and either a yellow sticker with the lettering Raynet in black, or a yellow disc carrying the words Raynet Emergency Radio.

In support of an incident, Raynet can provide mobile or hand-portable equipment for working either back to mobiles for onward relay to a base station, or direct to base equipment at incident headquarters or control, or any variant of the above. Area coverage can

be provided by the use of the vhf and uhf repeater stations now becoming available.

While many groups have base stations, ready for emergency use, located in police stations, British Red Cross Society premises, etc., they are also capable of setting up field stations complete with portable antennas and emergency generators. Raynet does not have groups in every part of the country, however, but membership is increasing all the time.

As a professional communicator, the author realizes only too well that no matter how sophisticated a communication system may be, under disaster or emergency conditions it may fail or become overloaded. Under these conditions Raynet can provide that "extra channel", and cream off some of the additional traffic generated by the incident itself.

Special skills are required for communications personnel to be able to deal with disasters or emergencies, as events such as these happen without warning. Raynet members, in the best spirit of community service, voluntarily equip and train themselves to employ their communications expertise whenever required to do so.

Summing up

Raynet operates with the full authority of the Home Office.

Raynet services are available free to the user services.

Raynet services are not limited by any geographical or constitutional boundary.

Raynet members are dedicated to the provision of an efficient communication capability and are technically qualified in the maintenance of their own equipment.

raynet

P. Balestrini, G3BPT *

Chairman's comment

Another year and another season, so once again the Raynet Committee chairman is guest writer for the column. In looking back over the year the committee was most impressed by the enthusiasm and progress made by groups in general and the new groups in particular. There are around 2,000 total registered members with over 70 groups.

We were very pleased to be invited to take part in the City of London Police Symposium on major disaster intervention, and particularly pleased with the interest and enquiries made by emergency planning officers from as far away as Clwyd.

I have often been asked "Why bother?", (indeed this was the title of an excellent lecture given by Julian Maud at Lancaster earlier this year). I think that "we bother" because Raynet service is the best way that the radio amateur can be SEEN to be repaying the investment of valuable frequency space that various World Administrative Radio Conferences have made in the radio amateur. This view is shared by many of the European societies with particular reference to the vhf and uhf bands . . . and 1979 is not very far away! To quote from the Lancaster lecture: "It seems a great pity that in areas without a Raynet group it seems to take a major disaster to point out (to the emergency services as well as to radio amateurs) that extra communications are indispensable". Think of the Summerland fire on the Isle of Man. Think of the explosion and fire at Flixborough . . . There are now Raynet groups in the Isle of Man and in Lincolnshire.

We can all communicate, but communication as such is very different from message handling; Raynet is accepted as a professional body of communicators with professional standards. These standards are maintained by exercise and procedure quite different from the ordinary run-of-the-mill QSO and chat on the club channel. To again quote from the Lancaster lecture: "In many minds the question 'how can the radio amateur who appreciates the problems or realizes the potential hazards in his own areas serve his community or start a group?'" Contact the RSGB emergency communications manager either at home or via RSGB headquarters; he will advise on neighbouring groups or offer guidance and counsel on getting started.

May I ask all groups to use their influence on neighbouring areas, let us make 1978 Raynet Year . . . after all it is our 25th year. Recruitment is the committee message for the good of the community, the radio amateur, the RSGB and, most important, the preservation of frequency allocations.

Out and around

Regrettably a couple of discrepancies appeared in the last column, the callsign of the retiring group controller for central Norfolk should be G3PTB; and Alf Othen, G3FSZ, has been appointed sector controller, Surrey Raynet, and also group controller, Surrey (Airports) group. At the time of going to press two new appointments have just been confirmed: Peter Tucker, G4DWZ, group controller, North London; and John Simkin, G8IYS, group controller, South-east London. Essex Raynet now have a permanent installation on 70·375 for exercise and emergency use only; this installation will have monthly tests.

Information from the groups includes various newsletters, which are always read with interest by the committee; time and postage expense excludes individual acknowledgements to all correspondents. Exercise reports received include: Exercise soundproof from Cheshire; Exercise Watersedge from Kent, and Exercise Polycross from Avon. Operational activity reported includes assistance to the county emergency officer, Avon, on the occasion of the royal visit on 8 August; and operational assistance to the BRCS at the occasion of the Holkham Fair in Norfolk (thank you G3HRK).

Cleveland Raynet have produced a technically-viable proposal for a portable vhf repeater which has the committee's backing. Further proposals are awaited from groups that are interested in uhf repeaters or uhf/vhf transponders/talkthrough systems (contact the emergency communications manager before proceeding). We are happy to report increasing activity in Scotland and are grateful to Alan Denniss, G3CNV, who regularly maintains contact as county controller, West Midlands, with the groups within his control area.

I would finally say thank you for the loyalty to and support of the system by the individual member, the controllers, and the Raynet Committee. We look forward to a steady growth in 1978, thereby extending our valuable service to the community. **THANK YOU.**

* "Merrivale", Willow Walk, Culverstone, Gravesend, Kent DA13 0QS.

Mobile rallies calendar

19 March	White Rose Mobile Rally, Lawnswood School, Leeds. Details from G4DZI.
2 April	University College of Swansea RS Mobile Rally, University College of Swansea. Details from J. O. Morris, 1 Hadland Terrace, Norton, Swansea SA3 5TT, tel Swansea (0792) 68675.
14 May	East Suffolk Wireless Revival, near Ipswich. Details from G4EVN.
21 May	Northern Mobile Rally, Victoria Park Hall, Keighley. Details from G8DFZ.
21 May	Welsh Amateur Mobile Rally, Barry Rugby Football Club, Cemetery Lane, Barry, South Glam.
28 May	Hull & District ARS Mobile Rally, University of Hull, Cottingham Road. All the usual attractions. Details from sec G3WYW.
10 June	Scottish Amateur Radio Mobile Rally, The Palace of Arts, Bellahoustoun Park, Glasgow. Details from GM4FDM.
11 June	Elvaston Castle Mobile Rally. Details later.
18 June	RNARS Mobile Rally, HMS Mercury, Petersfield, Hants. Details from G4DIU, tel Havant 79464.
25 June	Longleat Mobile Rally. Details from G4FRG.
9 July	Upton Radio Rally. Details from M. Monro, G8DLL, 127 Monarch Drive, Worcester. Tel Worcester 423276.
16 July	Hornsea ARS Mobile Rally, Hornsea School, Hornsea, North Humberside. Details from G8KFK.
23 July	Cornish Mobile Rally, Truro. Details from G3NKE, tel Camborne 712419.
20 August	Preston Mobile Rally. Details later.

General rules for vhf/uhf/shf contests 1978

The rules governing all RSGB vhf/uhf/shf contests to be held in 1978 will be selected from the following general rules, which will be referred to by number. Supplementary rules will be added for the more complex events such as VHF NFD.

Please read these rules carefully.

Cover and summary sheets and up to 10 log sheets can be obtained from the contest adjudicator. If you are entering a contest it is only necessary to tick the bottom of the cover sheet (Form 427) and enclose an sae. All stationery is A4 size (30 by 21cm); envelopes which will hold flat sheets will carry far more than those which require the sheets to be folded. Larger quantities of log sheets may be purchased from RSGB Publications (Sales).

1 Date and time. See individual contest details.

2 All entries must be sent to the adjudicator at the address given with the rules for the contest.

3 All operators must be members of the RSGB or have a membership application in progress.

4 Sections:

(a) There are two sections:
Section F —fixed stations;
Section P —portable and temporary stations.
If less than 10 entries are received for either section, Rule 4b will apply instead. /A stations will be listed with portable stations, but may not enter portable contests run under Rule 4d.

(b) All classes of stations with no separate sections.

(c) Fixed stations only (excluding /A).

(d) Portable stations only (excluding /A).

All equipment, including antennas, for portable and temporary stations must be installed on the site during the 24 hours preceding the contest, or during the contest itself. This does not apply to storage of equipment, or to its prior installation more than 1km away from the contest operating position.

Portable stations may be required to provide proof of permission to use a site.

5 Locations

(a) Entrants may not change the location of their stations during the contest.

(b) Entrants may change the location of their stations during the contest on one occasion provided that only the highest scoring contact with a given station is claimed in the event of a repeat contact. Repeat contacts must be clearly marked as such in the contest log.

6 Modes

(a) Contacts may be made on all permitted modes.

(b) Entrants may transmit only A1 (cw) or F1 (fsk) and contact only other stations transmitting these modes.

7 Scoring system

(a) Contacts made between the distances shown in the table will score as indicated. Contacts on borders between scoring rings score **low.**

Km	Points	Km	Points
0–50	1	250–300	11
50–100	3	300–350	13
100–150	5	350–400	15
150–200	7	400–450	17
200–250	9	and pro rata	

Note that, (i) all radial rings are 50km wide, (ii) all possible scores are **odd** numbers.

(b) Contacts will be scored at one point/kilometre.

8 Awards

In each section there will be an award to the highest scoring station. An award will also be made to the runner-up in each section in which there are 10 or more entries.

Additional awards will be made when appropriate.

9 Cross-band contacts

(a) Cross-band contacts do not count for points.

(b) Half points may be claimed by both stations for a cross-band contact if two-way communication cannot be established on the same band.

10 Repeat contacts

(a) Only one scoring contact may be made with a given station on each band covered by the contest (ie callsigns that are fixed, /A, /P 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. Serial numbers start at 001 and advance by one for each contact.

(b) One contact may be made with a given station (as defined in 10a) during each activity period. Only three out of seven activity periods will count towards the final score. However, all available logs should be sent to the adjudicator for the purpose of checking. To be eligible for an award, an entrant must take part in a minimum of three activity periods. Serial numbers start at 001 for each activity period and advance by one for each contact.

11 Contest exchange

The contest exchange shall consist of:

(a) Both callsigns;

(b) RS or RST report followed by serial number;

(c) Both QTH locator(the standard five-symbol location system) and QTH.

For stations operating within Great Britain the QTH must be given as a point identifiable on the Ordnance Survey Route Planning Map (Scale 1:625,000) or as a direction and distance up to 25km from such a point, to the nearest kilometre. For a station operating from outside Great Britain, the QTH must be readily identifiable.

No points will be lost if an entrant is unable to obtain a serial number or complete location information from a station not taking part in the contest. But the receiving operator must obtain enough information to be able to calculate the claimed distance score.

12 Log keeping

Entrants must keep their own log records in accordance with licence requirements.

The logs for contest entries must be made out on current RSGB contest log sheets or if computer readout sheets are to be submitted these must be cut to A4 size format.

(a) Date/time (gmt);
(b) Callsign of station worked;
(c) My report on his signals and serial number sent;
(d) His report on my signals and serial number received;
(e) QTH locator received;
(f) QTH received;
(g) Points claimed.

Note: In multiband contests serial numbers must start at 001 on each band used.

13 An entrant must operate within the terms of his/her licence.

14 An entrant may not engage in more than one contact concurrently.

15 Stations using telephony in the recognized cw sub-bands 70·025–70·15MHz, 144·0–144·15MHz, 432·0–432·15MHz and 1,296·0–1,296·15MHz, or transmitting on beacon frequencies, are liable to disqualification. Entrants should observe the provisions of the IARU/RSGB band plans.

16 Stations that persistently overmodulate, radiate poor quality signals, or otherwise contravene the code of practice for vhf/uhf contest operation (see p63), are liable to disqualification or loss of points.

17 Special event callsigns (eg GB) may not be used.

18 Contacts made via a repeater or man-made satellite will not count for points.

19 Proof of contact may be required.

20 Entries

(a) All entries must be accompanied by an RSGB VHF/UHF contest cover sheet (Form 427) for each band used. The cover sheet must be correctly made out and the declaration signed. In multiband contests entrants must also complete a multiband summary sheet.

(b) All entries must be postmarked not more than 15 days after the end of the contest.

(c) All entries become the property of the RSGB and will not be returned.

(d) Gross errors in log keeping render the entrant liable to disqualification.

21 Failure to comply with any of the rules given for a particular contest may result in disqualification.

22 The ruling of the Council of the RSGB shall be final in all cases of dispute.

General rules for RSGB hf contests 1978

The general rules for all RSGB hf contests are given below. For each contest throughout the year a short supplementary set of rules will be published which must be read in conjunction with the general rules.

1. Entrants must operate in accordance with the terms of their licences.

2. Only one contact on each band may be claimed with a specific station, whether fixed, portable, mobile or alternative address. Duplicate contacts must be logged and clearly marked as duplicates without claim for points. Proof of contact may be required.

3. Unless otherwise stated, single-operator entries only will be accepted. A single-operator station is one manned by an individual operator who receives no assistance whatsoever in operating, log keeping or checking etc, from other persons during the contest period.

4. Only fully-paid-up members of the RSGB resident in G, GD, GI, GJ, GM, GU and GW may enter.

5. A contact consists of an exchange and acknowledgement of an RS report on telephony, or an RST report on telegraphy, and a three-figure serial number starting with 001 and increasing by one for each successive contact throughout the contest, irrespective of the band or mode in use. Serial numbers, *when sent*, must be recorded from non-competing stations.

6. Entries must be clearly written or typed on one side only of RSGB contest log sheets or international A4 size paper using blue or black ink.

(*a*) *Separate log sheets must be used for each band.*

(*b*) Logs must be kept, and entries submitted, in gmt.

(*c*) Each entry must include a cover sheet incorporating a signed declaration.

(*d*) All entries become the property of the RSGB. In the event of any dispute the ruling of the Council of the RSGB shall be final.

(*e*) All entries must be postmarked not later than 15 days following the contest. If acknowledgement of receipt is required. British Isles entrants should include a stamped addressed postcard which will be returned to the sender. Overseas entries will not normally be acknowledged.

(*f*) Entries must be addressed to the adjudicator, whose address will appear in the supplementary rules for each contest, with the name of the contest marked in the top left-hand corner of the envelope.

7. For scoring purposes, aeronautical mobile and maritime mobile stations will count only as the minimum score of the particular contest and not for any bonus or multiplier.

8. Awards. (*a*) Awards are made at the discretion of the Council of the RSGB and may consist of trophies, plaques or certificates. Awards are, where possible, presented at the RSGB AGM following the contest.

(*b*) The standard award format for contests is as follows: Some winners and section leaders will be the holders of particular trophies, and these will also receive a special certificate or plaque. Certificates of Merit will be awarded to the entrants placed first, second and third in each section of the contest, from (i) the British Isles and (ii) overseas.

9. Disqualification. Entrants may be disqualified for failure to observe the above rules or supplementary rules.

Code letters for use in RSGB contests

County/Region	Letters	County/Region	Letters	County/Region	Letters	County/Region	Letters
Alderney	ALD	Durham	DHM	Isles of Scilly	IOS	Salop	SLP
Antrim	ATM	Dyfed	DFD	Isle of Wight	IOW	Sark	SRK
Armagh	ARM					Shetland	SLD
Avon	AVN	Essex	ESX	Jersey	JER	Somerset	SOM
				Kent	KNT	Staffordshire	SFD
		Fermanagh	FMH			Strathclyde	SCD
Bedfordshire	BFD	Fife	FFE	Lancashire	LNH	Suffolk	SFK
Berkshire	BRK			Leicestershire	LEC	Surrey	SRY
Borders	BDS			Lincolnshire	LCN	East Sussex	SXE
Buckinghamshire	BKS	Mid Glamorgan	GNM	Greater London	LDN	West Sussex	SXW
		South Glamorgan	GNS	Londonderry	LDR		
		West Glamorgan	GNW				
Cambridgeshire	CBE	Gloucestershire	GLR	Lothian	LTH	Tayside	TYS
Central	CTR	Grampian	GRN			Tyne & Wear	TWR
Cheshire	CHS	Guernsey	GUR	Greater Manchester	MCH	Tyrone	TYR
Cleveland	CVE	Gwent	GWT	Merseyside	MSY		
Clwyd	CWD	Gwynedd	GDD				
Cornwall	CNL			Norfolk	NOR	Warwickshire	WKS
Cumbria	CBA			Northamptonshire	NHM	Western Isles	WIL
		Hampshire	HPH	Northumberland	NLD	West Midlands	WMD
		Hereford & Worcester	HWR	Nottinghamshire	NOT	Wiltshire	WLT
Derbyshire	DYS	Hertfordshire	HFD				
Devon	DVN	Highlands	HLD	Orkney	OKE		
Dorset	DOR	Humberside	HBS	Oxfordshire	OFE	North Yorkshire	YSN
Down	DWN					South Yorkshire	YSS
Dumfries & Galloway	DGL	Isle of Man	IOM	Powys	PWS	West Yorkshire	YSW

Code of practice for vhf/uhf contest operation

1. Obtain permission from the landowner or agent before using the site, and check that this permission includes right of access. Portable stations should observe the Country Code.
2. Take all possible steps to ensure that a site is not going to be used by some other group or club. If it is, come to an amicable agreement *before* the event. Groups are advised to select possible alternative sites.
3. *All transmitters* generate unwanted signals; it is the level of these signals that matters. In operation from a good site, levels of spurious radiation which may be acceptable from the home station may well be found excessive by nearby stations (up to 25 miles or even further).
4. Similarly, *all receivers* are prone to have spurious responses or to generate spurious signals in the presence of one or more strong signals, even if the incoming signals are of good quality. Such spurious responses may mislead an operator into believing that the incoming signal is at fault, when in fact the fault lies in his own receiver.
5. If at all possible, critically test both receiver and transmitter for these undesirable characteristics, preferably by air test with a near neighbour before the contest. In the case of transmitters, aim to keep all in-amateur-band spurious radiations, including noise modulation, to a level of —90dB relative to the wanted signal. Similarly, every effort should be made to ensure that the receiver has an adequate dynamic range.
6. Above all, be gentlemanly at all times. Be helpful and *inform all stations* apparently radiating unwanted signals at troublesome levels—having first checked your own receiver! If asked to close down by a Government or Post Office official, do so at once without objectionable behaviour. If the site owner requests your station to close down, accede to his request without hostility.

General rules for RSGB hf receiving contests

1. All entrants operating from the British Isles must be fully-paid-up members of the RSGB.
2. Single-operator entries only will be accepted.
3. To claim for points, a station may be logged once only on each band, whether fixed address, portable, mobile or alternative address.
4. A receiving station log must show in columns: date/time, callsign of station heard, report and serial number sent by station heard, callsign of station worked, band in megahertz, bonus points, total points.
5. Where two or more bands are in use, separate log sheets must be submitted for each band.
6. In the column designated for "station worked", the same callsign may only appear once in every six contacts logged.
7. A cover sheet shall be submitted with a contest log as under transmitting section General Rule 6(c) except that the last sentence of the declaration shall read: "I certify that I do not hold a transmitting licence."
8. The following rules from the transmitting section general rules also apply to receiving contests: 3, 6(d), 6(e), 6(f), 7, 8(a), 8(b), 9.

General rules for listeners' vhf/uhf contests 1978

1. The following rules from the general rules for vhf/uhf/shf contests published in this issue shall apply: 1, 2, 4b, 5a, 7a, 10a, 18, 20, 21 and 22.

2. Listeners' contests are open to all non-licensed members of the RSGB. Only the entrant may operate the receiving station.

3. Logs must show in columns: (a) date/time (gmt), (b) callsign of station heard, (c) my report on his signals, (d) report and serial number sent by station heard, (e) callsign of station being worked (f) location given by station heard, (g) points claimed.

On 144MHz the callsign in column (e) may occur only once in every 20 contacts logged. CQ and test calls do not count for points and should not be logged. If both sides of a QSO can be heard, both can be claimed for points.

The Hanson Trophy will be awarded to the entrant with the highest aggregate score in all the swl contests between 4 March and 3 September 1978.

contest news

UHF 432MHz—2·3GHz Contest results

Four members of the VHF Contests Committee entered this event and between them collected four of the seven certificates. No previous comparable successes can be claimed by the committee.

Over the last few years changes have been made to the rules which comply with the IARU format in an endeavour to satisfy UK entrants. The date and timing are both criticized. UHF and microwave enthusiasts are invited to attend the committee's "talk-in" at the VHF Convention in February. Comment on this and other contest matters are invited.

A number of operators chose to concentrate their efforts on one band; their decision proved rewarding. G4BEL concentrated on 1·3 and 2·3GHz and won both bands, defeating the portable club stations. Two winner's certificates are on the way and the RSGB 1·3GHz Trophy will be presented to him at the convention. G3NNG made a one-band entry, leading the 432MHz fixed section by a very substantial margin.

Other certificates go to G4BPO/P and GW3UBX/P (432MHz portable winner and runner-up respectively). G3VPK receives the runners-up certificates for both 432MHz and 1·3GHz fixed station section. *G5HD*

432MHz FIXED SECTION

Posn	Callsign	Points	QSOs	QRA	Best dx	Km
1	G3NNG	18,264	116	ZL23	PA0NYM/P	514
2	G3VPK	9,966	65	AL14	F1EBN/P	369
3	G3FZL	6,740	54	ZL50	PA0NYM/P	407
4	G3JMA	5,980	74	AL11	PA0EZ	355
5	G4CQR	5,137	73	ZL49	PA0EZ	370
6	G3OHM	4,226	43	ZM41	G4EDY/P	231
7	G8AKT	3,799	50	ZM79	F1EBN/P	428
8	G8HBQ	3,699	35	ZN13	G4EEE/P	280
9	G8AZA	3,499	22	ZO69	PE0MAR/P	388
10	G3ZZJ	3,432	36	YN37	G4BPO/P	304
11	G5UM	2,321	30	ZM35	G3DAH	180
12	G8AYY	1,951	22	ZM41	G4BPO/P	205
13	G3ZFP	1,925	38	ZL18	G8HVY/P	190
14	G8BJG	1,910	35	AL41	ON6AT/A	255
15	G8BXJ	1,306	17	YL38	G3XGS	238
16	G6XM	1,244	15	ZL22	G3AUS	180
17	G3COJ	1,171	14	ZL37	PA0EZ	409
18	G4AEZ	295	5	ZL30	G4EEE/P	95

432MHz PORTABLE SECTION

Posn	Callsign	Points	QSOs	QRA	Best dx	Km
1	G4BPO	20,497	106	AM67	DC9VA	521
2	GW3UBX	15,028	97	YM44	F1DBN/P	378
3	G4BRA	14,116	120	ZL26	PA0NYM/P	473
4	G4EEE	11,623	84	ZL53	F1EBN/P	502
5	G3AKF	8,750	82	ZL59	PA0NYM/P	500
6	G4ALE	4,965	69	ZL60	F1BJB	338
7	G8FMG	4,287	60	ZM78	G8FIS	212
8	G8EIK	3,760	46	ZL08	ON6AT/A	283
9	GM8BJF	2,266	12	YP42	G3NNG	444
10	G4BZD	1,914	17	ZN44	G4EEE/P	260
11	G3SBV	1,748	26	ZL60	G4BPO/P	133

1,296MHz FIXED SECTION

Posn	Callsign	Points	QSOs	QRA	Best dx	Km
1	G4BEL	2,704	24	AM51	PA0NYM/P	400
2	G3VPK	2,472	25	AL14	PA0EZ	304
3	G3JXN	1,676	33	ZL39	ON6AT/A	270
4	G6XM	1,153	14	ZL22	G3AUS	180
5	G3FZL	1,047	21	ZL50	G6XM	117
6	G3JMA	957	22	AL11	G3XDY/P	90
7	G3COJ	879	18	ZL37	G3VPK	100
8	G8ACJ	331	7	ZL68	G3ULT/P	64
9	G8AYY	317	6	ZM41	G4BRK/P	105
10	G4AEZ	278	8	ZL30	G4BRK/P	65
11	G3OHM	246	5	ZM41	GW3ONP/P	86

1,296MHz PORTABLE SECTION

1	G3XDY	2,591	21	AM67	GW3ONP/P	304
2	G3BRK	2,352	35	ZL26	G3AUS	226
3	G4ALE	2,057	34	ZL60	G3LQR	149
4	G3ULT	2,013	25	ZL59	G3XDY/P	198
5	G3WOI	1,943	23	ZL53	GW3ONP/P	179
6	G3SBV	1,251	25	ZL60	G3XDY/P	133
7	G4FEV	1,233	21	ZM78	G3XDY/P	126
8	GW3ONP	661	5	YM44	G4BRK/P	172
9	G8EIK	588	12	ZL08	G3VPK	80
10	GM8BJF	93	1	YP42	G3BW	93
11	G4BZD	48	2	ZN44	G3HCW	27
12	G3XWZ	5	1	ZN63	G3DBZ/P	1
	G3DBZ	5	1	ZN63	G3XWZ/P	1

2,304MHz SECTION

Posn	Callsign	Points	QSOs	QRA	Best dx	Km
1	G4BEL	196	2	AM51	G4ALE/P	120
2	G4ALE/P	191	2	ZL60	G4BEL	120
3	G3XDY/P	109	3	AM67	G4BEL	67
4	G3WOI/P	98	1	ZL53	G4ALE/P	98

144MHz CW Contest (November 1977) results

Conditions for this contest were extremely poor—described also as grim, flat, below flat and abysmal. One optimist thought them fair, although there was little evidence to support this. Some good QSOs were made, however, both G/DL and G/GM. Nevertheless, contestants enjoyed the event although no doubt due to poor conditions there were 29 entries compared with 39 last year.

Again the difference between the RSGB contest and the IARU Region 1 24-hour event was the subject of some comment. It was interesting to note a number of Continentals calling CQ towards this country on Sunday morning and afternoon with very few takers. However, on Saturday evening they had been less evident. Since it is difficult to justify a 24 hour cw contest in November, RSGB proposes to suggest a reduction to, say, eight hours at the IARU Region 1 Conference, and this, if adopted, could eliminate the incompatibility.

The winner will be awarded a certificate, as will the leading fixed station G3POI. Thanks are due to G2HH and G8LT for checklogs. *G3FZL*

Posn	Callsign	Points	QSOs	Best dx	Km
1	GW3WOH/P	595	74	F6KBF	536
2	G3POI	580	56	DK6ASA	746
3	G3YYF/P	464	64	F6CJG/P	570
4	G3NNG	394	69	GM4DSZ	604
5	G3BDQ	367	49	DK0BN/P	505
6	G4DEZ	304	56	GM4DSZ	609
7	G4DZW	275	50	G4ERG	325
8	G3DAO	267	37	DK0VL	695
9	G3UKV	261	43	ON6AT/A	465
10	G3GNR	234	30	G3ERN	330
11	G3SPJ*	228	54	G3KKP	288
12	G4ATV	208	38	ON6AT/A	351
13	G3XTT	193	43	ON6AT/A	335
14	G2DMR	165	45	DK0BN/P	670
15	G5HD	161	35	F8BG	380
16	G4ERG	149	19	G4DZW	360
17	G5KV	135	41	F6EOQ	360
18	G2BLA	129	35	PA0WWM	319
19	G3UYM	127	27	ON6AT/A	280
20	G3SCZ	121	39	G4BYK	
21	G4FDX	120	36	ON6AT/A	301
22	GW3UOO	118	22	GM4COK	294
23	G3EJF/P	102	18	G3POI	
24	G4DLB/P	101	21	G4AEQ	270
25	G4BRK	99	39	ON6AT/A	285
26	G2WS	96	20	G4FXW	236
27	G3CMH	85	19	F6ECI	425
28	G4GHS	76	16	G3SPJ	329
29	G3TMQ	63	25	G3TLK	218

* Using only 3W.

August 70MHz Fixed Contest results

Although conditions on the band were mainly reported as average. QSB seems to have been troublesome. As always, some stations worked everyone available, hours before the end and others thought the contest to be just the right length. General opinion was favourable and this was reflected in the level of activity with all G prefixes active.

Congratulations and certificates go to the winner, GU3HFN, who has a very notable lead, and to G3UKV, a newcomer to the band, in second place.

G4BEL

Posn	Callsign	Points	QSOs	QTH	Pwr in	Ant	Best dx	Km
1	GU3HFN	535	47	YJ48	180	4/4	G3JYP	550
2	G3UKV	381	55	YM28	50	4Q	GU3HFN	370
3	G3WCS	371	47	YN47	75	4el	GU3HFN	429
4	G3PYE	320	58	AM61	100 out	4el	GI3RXV	575
5	G3UKC	317	52	AL56	100	5el	G3XCS	380
6	G3PFM	312	54	ZK21	45	5Q	G3JYP	423
7	G3ONP	289	44	YM40	40	4/4	GU3HFN	353
8	G4DKX	273	42	AM56	100 out	4	GU3HFN	410
9	G3JYP	268	28	YO38	100	8Q	GU3HFN	550
10	G4GJM	214	54	ZM79	120	4el	GM3OXK	400
	G3WHK	214	52	ZL49	200	4el	G3JFO/P	320
12	G3XBY	213	41	ZM52	110 out	5el	GU3HFN	335
13	G3SPJ	206	51	AL41	50	4el	G3JYP	380
14	G3RDQ	203	37	ZL63	130 out	4el	G3JFO/P	354
15	G4ASR	200	48	AL22	100	6el	G3VVT	350
16	G8GP	199	51	ZL50	50	3el	G3JFO/P	315
17	G3LVP	197	43	AL33	50	4/4	G3JFO/P	326
18	G4APL	185	47	ZL60	50	4el	G3JFO/P	345
19	G4AGK	184	46	ZL08	15 out	4el	GM3OXK	405
20	G5RP	183	37	ZL34	50	4el	G3JYP	332
21	G6UW	175	38	AM61	50	4el	G3LDR/P	355
22	G3TAL	161	27	ZK14	5 out	4el	G3JFO/P	403
23	G3BTO	155	33	ZL55	50 out	4el	G3JFO/P	330
24	G3TWG	146	38	ZL37	18	4el	G3WCS	265
25	G5UM	144	30	ZM35	18	4el	G3JYP	223
26	G3RQZ	143	43	ZL50	50 out	4el	G3JFO/P	320
27	G4EKB	130	35	ZLO7	15 out	4el	G3JFO/P	260
28	G4CLB	102	34	ZL37	40 out	4el	GU3HFN	270
29	G3VCT	47	15	ZL37	5 out	4el	GU3HFN	257
30	G3KSU	42	14	ZK25	20	Dip	G3PYE	188
31	G4AGQ	37	13	ZL66	6	Dip	G4ASR	103
32	G3RYN	17	7	ZM35	1½	3el	G3SPJ	—

Check logs acknowledged from G3JFO/P, G3VPS/P and G4ERP/P.

70MHz CW Contest rules

1000 – 1500gmt 22 January 1978.

All entries and checklogs to: VHF Contests Committee, c/o Mr C. W. Suckling, G3WDG, 31 Oakwood Road, Chandlers Ford, Eastleigh, Hants SO5 1LW.

The following general rules, published in this issue of *Radio Communication*, will apply: 1, 2, 3, 4a, 5a, 6b, 7a, 8, 9a, 10a, 11–22.

First 1·8MHz Contest 1978 rules

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

2 **When.** 2100gmt Saturday 11 February to 0200gmt Sunday 12 February 1978.

3 **Eligible entrants.** All radio amateurs licensed to use 1·8MHz. Single-operator stations only may enter.

4 **Sections.**
(a) British Isles stations – RSGB members only.
(b) Overseas stations (including EI).

5 **Contacts.** CW (A1) only in the 1·8–2MHz band. County/region code letters, as published in this issue of *Radio Communication*, must be sent after the RST plus serial number group; eg, for a contact from Kent – 599001 KNT.

6 **Scoring.**
(a) British Isles section. Three points for each contact, with a bonus of five points for the first contact with each new British Isles county/region, and for the first contact with each new country outside the British Isles.
(b) Overseas section. Three points for each contact with a station in the British Isles (not EI), with a bonus of five points for the first contact with each new county/region.

7 **Logs.** Column 5 to be headed "Code rcvd". Entries must be addressed to the RSGB HF Contests Committee, c/o C. A. P. Henderson, 76c The Avenue, Beckenham, Kent BR3 2ES.

8 **Awards. (a)** The Somerset Trophy will be awarded to the winning station, and certificates of merit will be sent to the second- and third-placed entrants. The Maitland Trophy will be awarded to the Scottish entrant with the highest aggregate number of points in this contest combined with the Second 1·8MHz Contest 1977.
(b) A certificate of merit will be awarded to the highest-placed entrant whose 18th birthday falls on or after 13 February 1978. Entrants wishing to compete for this award should state their date of birth on the cover sheet, and write clearly "Under 18" at the TOP of the cover sheet. Entries will only be eligible for this award where operation has taken place under the entrant's own callsign, and from the "main address" as stated on the station licence.

VHF NFD

The 432MHz log from the Sutton & Cheam RS was lost in the post. A duplicate has been scrutinized with the result that G4CQR/P scored 1,049 points, 15th place. The club's overall placing was 11th. The Cornish ARC was unable to submit a summary sheet. G4CRC and G4DWB scored 1,246 aggregate, 36th place.

Contests calendar

22 January	70MHz CW (Rules in this issue)
11-12 February	First 1·8MHz (Rules in this issue)
4-5 March	144/432MHz and SWL
11-12 March	Commonwealth (Rules in November issue)
19 March	70MHz Open
1 April	1,296MHz Open
2 April	432MHz Open and SWL
9 April	Low Power
22-23 April	144MHz CW
6-7 May	432/1,296/2,304MHz
7 May	Region Round-up CW
21 May	Region Round-up SSB
27-28 May	144MHz Portable
3-4 June	HF NFD
17-18 June	Microwave
24-25 June	Summer 1·8MHz
1-2 July	VHF NFD and SWL
16 July	3·5MHz FD
30 July	144MHz QRP
13 August	70MHz Open and SWL
2-3 September	SSB FD
2-3 September	144MHz Open and SWL
October—November	432MHz Cumulative
7-8 October	432/1,296/2,304MHz
14-15 October	21/28MHz
21-22 October	7MHz SSB
22 October	70MHz Fixed
4-5 November	7MHz CW
4-5 November	144MHz CW
11-12 November	2nd 1·8MHz
3 December	144MHz Fixed

club news

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

REGION 1—RR Wm. M. Furness, G3SMM, 16 Coniston Avenue, Sale, Cheshire M33 3GT.

Ainsdale (AARC)—Thursdays fortnightly. 12 and 26 Jan, 9 and 23 Feb and 9 Mar. Ainsdale Scout Headquarters. For details please contact G2CUZ.

Blackburn (East Lancs ARC)—First Thursday in each month. 7.30pm. YMCA. Blackburn. Sec E. A. Lomax, G4DGR, West End PO, Accrington. Lancs.

Blackpool (B&DARS)—First Monday in the month. Phone G5ND (Blackpool 64508) for details of venue.

Bolton (B&DARS)—Main meeting first Wednesday in each month. informal meeting third Wednesday in each month. 8pm. Bolton Recreation Club, Kensington Place, Bolton. Hon sec G4FSN (ex G8LXD).

Bolton (Edbro Radio Club)—New club! Details from the sec c/o Edbro Ltd, Lever Street, Bolton.

Bury (BRS)—Main meeting on the second Tuesday of the month. RAE classes and cw instruction every Tuesday as well as informal meetings of members. 10 Jan (RTTY today-G3VDB), 14 Feb (Understanding swr-G3RSM), intervening Tuesdays (Noggin and natter sessions with G3BRS on the air). Mosses Youth and Community Centre, Cecil Street, Bury. Sec E. Thirkell, G4FQE, tel Rochdale 32730.

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

Chester (C&DARS)—Tuesdays, 8pm, except for first Tuesday in the month. YMCA Chester. Further details from the ASR. G3PYU.

Douglas (IoMARS)—Mondays fortnightly. "Keppel Hotel". Creg-ny-Baa, Nr Onchan. Sec GD4FWQ, tel Douglas 22295.

Eccles (E&DARC)—Tuesdays, 8.30pm. White Swan, Worsley Road. Swinton. Sec G4AEQ.

Lancaster University (UoLARS)—Wednesdays, 8pm. Furness College. Visitors are welcome, as are skeds on hf and 2m-club callsigns are G8DOU and G3ZBY. There are RAE and morse test classes. Enquiries to John Morris, G4ANB, Dept of Physics.

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

Liverpool (L&DARS)—Tuesdays, 8pm. 17 Jan (visit of RR). Conservative Association Rooms, Church Road, Wavertree. Sec G4EST.

Liverpool (North Liverpool RC)—For details of meetings please contact R. Porter, G3VXK, 11 Cranmore Avenue, Crosby, Liverpool L23 0QD; tel 051-928 1610.

Liverpool University (UoLARS)—Meetings each lunchtime. Visitors from the Polytechnic and other colleges most welcome. Club shack, Reilly Building: Club active on Top to Two, G3OUL/G8JUL. Ex-members, and others, interested in attending the Society's Dinner (probably in March 1978) please contact the sec, Geoff Plucknett, G4FKA, UoL, Guild of Undergraduates, 2 Bedford Street North, Liverpool L7 7BD.

Manchester (M&DARS)—Wednesdays, 7.30pm. 4 Jan ("Expedition to St. Pierre"), 11 Jan (Oscar 6), 18 Jan (Antennas), 8 Feb ("ICs" G8IYX), 22 Feb (Contest preparation). 203 Droylsden Road, Newton Heath, Manchester 10. Sec G8IYX. G3HOX is active on hf and vhf—"take a listen".

Manchester (South Manchester RC)—6 Jan (Review of club project-DF rx using ics-G3WFT), 13 Jan ("Digitally stabilized vfo" T. Winter, G4AOK), 20 Jan ("MSF controlled digital clock" B. Wainwright), 27 Jan ("Antenna instruments" M. Barnsley, G3HZM), 3 Feb ("Assembling a station" R. Parkinson, G3FNM), 10 Feb ("Test equipment" P. Torry, G3SMT), 17 Feb ("Fault finding" D. Holland, G3WFT), 24 Feb ("A transverter for 70MHz" G3SMM). Fridays, 8pm. Sale Moor Community Centre, Norris Road, Sale. Informal meetings on Monday evenings, "Greeba", Shady Lane, Baguley. Other details from sec G3VIW, tel 061-973 3355.

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

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

Ormskirk (OARC)—New club. Wednesdays at members' QTHs. For details contact G3SZV or sec Peter Kay, G4GCB, 24 Laurel Avenue, Burscough. Alternatively listen 145·000MHz fm/a.m. Wednesdays 1930-2030. Club interests: vhf/uhf, hf, rtty, contests, atv.

North Western Repeater Group—Informal meetings on the third Thursday in each month, 8pm. "Globe Club", Willows Lane, Accrington, Lancs. Details from sec G3RXH.

Preston (PARS)—Thursdays fortnightly commencing 12 Jan, 8pm. "Windsor Castle" (private room), St Pauls Square, Preston. Sec G8KTM.

Salford (Dial House RS)—Wednesdays, 5.30-9.30pm. Dial House, 21 Chapel Street, Salford, Lancs. Net channel 145·25MHz fm-the club station G3WDH monitors this frequency every club night for any other station. Details from sec G8JCM, c/o M38 at above address.

Stockport (SRS)—Second and fourth Wednesdays in the month, 8pm. 11 Jan ("Airways" S. Aspinall, G3VSA). Blossoms Hotel, Buxton Road, Stockport. *Note:* Annual dinner and dance, Saturday 11 Feb. Sec G3FYE. New members and visitors always welcome.

Thornton Cleveleys (TCARS)—First and third Wednesdays in each month, 8pm; morse practise from 7.30pm. St John Ambulance Hall, Fleetwood Road North (next to "Gardner's Arms"), Thornton. Details from sec A. Bullock, G8MKO, 26 Lancaster Avenue, Thornton Cleveleys, Blackpool.

UK FM Group (Western)—Informal meetings first Thursday of the month, 8.30pm. Legh Arms, Knutsford. Sec G3LEQ, tel Knutsford 4040.

Warrington (W&DARS)—Tuesdays, 7.45pm. Grappenhall Community Centre, Bellhouse Lane, Grappenhall, Warrington. Sec R. E. J. Staples, G3MMD, 3 Willow Close, Lymm, Cheshire, tel Lymm 3533.

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

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

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

RR1 extends every good wish for 1978 to all Society members in Region 1.

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

Birmingham (Birmingham University RS)—Tuesdays during term, RAE classes fortnightly, 7pm. Students' Union. Sec G4CKK. Meetings followed by tour of real ale establishments. Club stations G3IUB and G8IUB.

Birmingham (Midland ARS)—10 Jan, 7 Feb, 7 Mar (Construction and club station), 7pm. Brasshouse Centre, off Broad Street, Birmingham. 17 Jan (New Year's resolutions), 21 Feb ("An evening with BASF" by James Williams), 8pm. Room 110, University of Aston, Gosta Green, Birmingham. Sec G8BHE.

Birmingham (Slade RS)—Alternate Fridays commencing 20 Jan, 8pm. The Committee Room, Church House, Erdington, Birmingham. Sec G4FGF.

Birmingham (South Birmingham RS)—Thursdays (HF night on the air), 7.30pm. Fridays (Construction and morse classes), 7.30pm. 11 Jan (Surplus sale), 1 Feb (Lecture by G4ELO), 1 Mar, 8pm. Hampstead House, Fairfax Road, West Heath, Birmingham B31 3QY. Sec G8KPA.

Bromsgrove (B&DARC)—13 Jan, 10 Feb, 8pm. Avoncroft Art Centre, Bromsgrove. Sec G4GBE.

Burton-on-Trent (BonT&DARS)—Wednesdays, 7.30pm. Stapenhill Institute, Burton-on-Trent. G3ACR. New members welcome.

Cannock Chase (CCARS)—First Thursday in each month (Business meeting), other Thursdays (HF and vhf club stations,

natter-nites, morse classes, talks, etc), 9pm. Bridgtown Social Club, Walsall Road, Cannock. Sec G8MWE. Visitors welcome.
Coventry (CARS)—Fridays, 8pm. Baden Powell House, 121 St Nicholas Street, Radford, Coventry. Sec Dave Parker, 41 Brookdale Road, Nuneaton CV10 0BL.
Coventry Technical College (CTCARS)—Mondays and Thursdays, 7pm. Winfray Annexe of the College. G8ISJ.
Coventry (University of Warwick ARS)—Wednesdays during term, talk-in on S20, 7pm. Cryfield Farm, University of Warwick, Coventry. Vice-president G8MIA.
Hereford (HARS)—First and third Fridays in each month, 8pm. Civil Defence HQ, Gaol Street, Hereford. G4CNY.
Kidderminster (K&DARS)—18 Jan (Night on the air), 1 Feb (Film show), 15 Feb, 1 Mar, 8pm. Youth Centre, Bromsgrove Street, Kidderminster. Sec G4CTU.
Lichfield (LARS)—First Monday and third Tuesday in each month, 8pm. Swan Hotel. Tuesday meetings are natter-nites. New members and swls welcome. Sunday net noon, 21·150MHz. Sec Ted Bowen, RS33003, tel Tamworth 68756.
Lichfield (Chad RC)—Alternate Wednesdays commencing 18 Jan, 8pm. The Naval Club, Burton Old Road, Lichfield. Sec G4ESK.
Mid-Warwickshire (MWARS)—First and third Mondays in each month, 8pm. 61 Emscote Road, Warwick. Sec G8CXL.
Redditch (RRC)—Second and fourth Thursdays in each month, 8pm. WRVS Centre, Salop Road, Redditch. G3EVT.
Shrewsbury (Salop ARS)—Thursdays, 7.30pm. The Albert Hotel, Smithfield Road, Shrewsbury. Sec G3VZG. New members welcome.
Solihull (SARS)—17 Jan, 21 Feb, 3 Mar (Social outing), 7.30pm. The Manor House, High Street, Solihull. Sec G3PYR.
Stoke-on-Trent (S-on-TARS)—Thursdays, 7.30pm. 2A Racecourse Road, Oakhill, Stoke-on-Trent. G4CWN.
Stoke-on-Trent (North Staffs ARS)—First and third Mondays in each month (Lectures, etc), other Mondays (Natter-nites, Raynet and club station G4BEM), 7.30pm. Harold Clowes Community Centre, off Dawlish Road, Bentilee, Stoke-on-Trent. Sec G8CMR. New members welcome.
Stourbridge (StARS)—First Tuesday in each month (Informal), 9pm. "Shrubbery Cottage" public house, Heath Lane, Oldswinford, Stourbridge. 16 Jan (Annual construction contest), 6 Feb (Construction and morse evening), 20 Feb ("TV" by G3ZUL), 6 Mar (Construction and morse evening), 7.45pm. Longlands School, Brook Street, Stourbridge. Sec G4CLX.
Stratford-upon-Avon (S-upon-A&DARC)—Meetings will be arranged in Jan and Feb (dates to be decided) at the Youth Hostel, Alveston. Sec G4EXR, tel Stratford 5638, weekends only. New members welcome.
Sutton Coldfield (SCRS)—Second and fourth Mondays in each month, 7.30pm. Central Youth HQ, Clifton Road, Sutton Coldfield. Sec G8KRW.
Tamworth (TARS)—Second and fourth Mondays in each month. Indoor Sports Centre, Corporation Street, Tamworth. New members welcome. G4EUF.
Telford (T&DARS)—Wednesdays, 7.30pm. Phoenix Centre, Webb Crescent, Dawley. Sec G8MXS, tel Much Wenlock 357. Visitors welcome.
Willenhall (W&DARS)—Alternate Wednesdays. Morse classes available at the end of each meeting. "The Three Crowns", Stafford Street, Willenhall. G3YHN xyl.
Wolverhampton (WARS)—Mondays, except last Monday in each month, 8pm. Neachells Cottage, Danescourt Road, Stockwell End, Tettenhall, Wolverhampton WV9 9PH. Sec G8EDG.
Worcester (W&DARC)—9 Jan, 21 Jan (Annual dinner–see chairman), 6 Feb, 6 Mar, 8pm. The Old Pheasant, New Street, Worcester. Sec G3TQD.

REGION 4—RR T. Darn, G3FGY, Sandham Lane, Ripley, Derbys.
Derby (DADARS)—Wednesdays, 7.30pm. Morse classes Tuesdays and Fridays, 7pm, when arranged. 119 Green Lane, Derby. Hon sec Mrs J. Shardlow, G3EYM.
Derby (NHARG)—Fridays, 7.30pm. Nunsfield House, Boulton Lane, Alvaston, Derby. Hon sec Ian Cage, G4CTZ.
Grimsby (GARC)—First and third Thursdays of every month, 8pm. 5 Jan (Talk on pcbs by G3RGC), 2 Feb ("Antennas" by G3IYT), 16 Feb ("Contest operating/repeater working", speakers to be arranged), 2 Mar (Night df hunt). Alexandra Club, Cleethorpes. Hon sec Reg Scarlett, 1 St Martin's Crescent, Grimsby.
Leicester (LRS)—Mondays, 7.30pm. Club House, Gilross Estate Cottage, off Groby Road, Leicester. Raynet group meets on second Thursday of every month, County Hall, Glenfield.
Loughborough (LSARC)—Wednesdays during term time. Details from Loughborough Students' Amateur Radio Club, c/o Students' Union, Edward Herbert Building, Loughborough University, Ashby Road, Loughborough.
Mansfield (MARS)—First Friday of every month, 7.30pm. New Inn, Westgate, Mansfield.
Melton Mowbray (MMARS)—20 Jan (Talk about RSGB, and demonstration of video taping equipment, by Tom Darn, G3FGY), 17 Feb ("Radio control of models" by W. W. Storer, G6JQ), 7.30pm. St John Ambulance Hall, Ashfordby Hill, Melton Mowbray. Sec G3NVK.
Nottingham (ARCON)—Thursdays, 7.30pm. 5 Jan (Forum), 12 Jan (Question time), 19 Jan (Activity night), 26 Jan (Talk and demonstration of equipment by Lowe Electronics). Sherwood Community Centre, Mansfield Road, Nottingham. Sec G4EKW.
Nottingham University (NURC)—Alternate Thursdays during term time. Contact Roger Dixon, G4BVY, c/o Students' Union.
Scunthorpe (SARC)—Technical lectures, demonstrations, etc, Tuesdays, 7.30pm; morse class approximately 9pm. RAE class, Thursdays, 7.30pm. The Shack, Grange Farm Hobbies Centre, Franklyn Crescent, Scunthorpe. Hon sec G8GIH, QTHR. Visitors welcome.

REGION 5—RR P. F. Chilcott, G4BBA, 258 Coneygree Road, Peterborough PE2 8LR.
Bedford (B&DARC)—Wednesdays, Ravensden. Chairman now Ron Watson, sec Martin Packer, G4FFC.
Cambridge (C&DARC)—Fridays, 7.30pm. New Shack! Air Training HQ, Newmarket Road. Sec G4BAO.
Cambridge (CUWS)—Tuesdays during term. Christ's College. Sec G4DZY.
Corby (CTCARG)—Mondays, 7.30pm. Corby Technical College. Clubhouse and GB3CI in grounds.
Dunstable (DDRC)—Fridays, 8pm. Chews House, 77 High Street South. Sec G3HJF.
March (M&DRAS)—Tuesdays, 7.30pm. 2 Grays Lane. Sec G8GNE.
Northampton (NRC)—Thursdays, 8pm. Spencer Dallington Community Centre, Tintern Avenue, off Gladstone Road. Sec G8LHR.
Peterborough (GPARC)—26 Jan (AGM), 23 Feb (Films), 7.30pm. Southfields Junior School. Sec G4BBA, tel 65213.
Peterborough (PR&ES)—Third Friday each month, 7.30pm. Scout Hut, Occupation Road. Sec G3EEL.
Shefford (S&DARS)—Thursdays, 8pm. Church Hall, Sec G8HHO.

REGION 6—RR F. S. G. Rose, 84 Cock Lane, High Wycombe, Bucks HP13 7EA.
Banbury (BARS)—First Friday of each month, 7.30pm. The General Foods Sports and Social Club, Spriceball Park, Banbury. Sec S. L. Terry, G8OCT, tel Banbury 4769.
Bracknell (BARC)—Mondays, 8pm. Coopers Hill Centre (adjacent to station). Please contact sec G3YMC for meeting details.
Burnham Beeches (BBRC)—First Monday of each month, 8pm. Hedgerly Scout HQ. Sec Peter Flynn, tel Farnham Common 2609.
High Wycombe (Chiltern ARC)—25 Jan (AGM), 8pm. 42 Castle Street, High Wycombe. All members please attend. 29 Jan (Hobbies day, Molins, Saunderton. Amateur radio on show). Sec G4FRL, tel Kingston Blount 52006.
Maidenhead (M&DARC)—Please contact sec for details of next meeting.
Milton Keynes—For meeting details ring G3THC, tel Milton Keynes 316730.
Newbury (N&DARS)—First Monday in each month, 7.30pm. Newbury College of Further Education, Oxford Road, Newbury. Sec G4EEE.
Oxford (O&DARS)—Second and fourth Wednesdays in each month, 7.30pm. Civil Service Sports Club, Marston Road, Oxford. Sec G4BHR.
Oxford University (OURS)—Please contact sec M. Evans, G8LTE, Worcester College, Oxford, for meeting details.
Reading (RARC)—Please contact sec G4CCC for details of next meeting.

RR6: Happy New Year, to all.

REGION 7—RR N. A. Smith, G3HFO, 7 The Byeways, Surbiton, Surrey KT5 8HT.

Addiscombe (AARC)—Tuesdays, 9pm, "Spreadeagle", Portland Road, Woodside. Sec G3SJX.

Ashford (Echelford ARS)—Second Monday and last Thursday of every month. 7.30 for 8pm. The Hall, St. Martin's Court, Kingston Crescent, Ashford, Middx. Sec G3TDR, tel Staines 56513.

Bexley Heath (North Kent RS)—Second and fourth Thursdays, 8pm. St. Mary's Institute, 2 North Cray Road, Bexley. Sec G4ARQ.

Coulsdon (CATS)—Third Monday in each month, 7.30 for 8pm. 16 Jan (Tape and slide lecture "Expedition to St. Pierre and Miquelon Islands"). 1st Purley Scout Hall, Purley Park Road, Purley. Sec G8KDQ, tel 668 3963.

Cray Valley (CVRS)—First and third Thursdays, 8pm. Christchurch Centre, High Street, Eltham, London SE9. Sec G3YWO.

Croydon (Surrey Radio Contact Club)—First and third Wednesdays in each month, 7.30 for 8pm. TS "Terra Nova", 34 The Waldrons, Croydon. Sec G3FWR, tel 01-657 3258.

Crystal Palace (CP&DRS)—Third Saturday in each month, 8pm. 21 Jan ("Basic Amateur Radio Techniques" by Graham Cluer, G4AVV). Emmanuel Church Hall, Barry Road, East Dulwich. Sec G3FZL, tel 699 6940.

Guildford (G&DRS)—Second and fourth Fridays in each month. Model Engineers HQ, Stoke Park, Guildford. Sec G4BHQ, tel Guildford 76375.

Kingston (K&DARS)—Second Wednesday in each month, 8.15pm. 11 Jan (Surplus equipment sale). Berrylands Scouts and Guides HQ, Stirling Walk, Raeburn Avenue, Surbiton. Sec G4APG, tel 399 8113.

New Cross (Clifton ARS)—Fridays, 8pm. 225 New Cross Road, London SE14. Details from R. A. Hinton, 42 Sutcliffe Road, Welling.

Reigate (RATS)—First Tuesday in each month, 8pm (Natter nights). Marquis of Granby, Hooley Lane, Redhill. Third Tuesday in each month, 8pm. Constitutional Centre, Warwick Road, Redhill. Sec G3XSZ.

Sutton and Cheam (S&CRS)—Meetings at Sutton College of Liberal Arts, Cheam Road, Sutton and at Ray's Social Club, London Road, North Cheam. Details from sec G2DMR.

Thames Ditton (Thames Valley ARTS)—3 Jan (AGM), 7 Feb (Junk sale), 8pm. Giggs Hill Green Library, Giggs Hill Road, Thames Ditton. Sec G3ZNW.

Wimbledon (W&DRAS)—Second and last Fridays in each month, 8pm. St John Ambulance HQ, 124 Kingston Road, Wimbledon SW19. Sec G3XTC, tel 01-644 3968.

REGION 8—RR D. N. T. Williams, G3MDO, "Seletar", New House Lane, Thanington, Canterbury, Kent.

Brighton (B&DRS)—8pm, prompt. Catholic Church Hall, Bristol Road, Brighton. Details from N. Hewitt, G8JFT.

Burgess Hill (Mid-Sussex ARS)—7.45pm. Marle Place, Burgess Hill. Details of future events from G3PEQ.

Canterbury (East Kent RS)—5 Jan (Grand junk sale), 2 Feb ("The electronics of physiotherapy" by G3ZZZ). Further details of future events from hon sec G8GHH, QTHR.

Chichester (C&DARC)—First Tuesday and third Thursday in each month. Lancastrian Boys School. Details from G4ETU, tel 0243 88069.

Crawley (CARC)—United Reform Church Hall, Ifield, Crawley. Details from G3MGL.

Dartford (DHDFC)—Second Friday in each month. Scout House, Broomfield, Dartford. Details from Jeanette Maggs, 25 Leybridge Court, Eltham Road, Lee, London SE12.

Dover (South East Kent YMCA ARC)—4 Jan (Project progress), 11 Jan ("Ham interference on cable tv" by G8LKS), 18 Jan ("CQ DX"), 25 Jan (Debate "G8s and the hf bands"), 1 Feb (Quiz SEKYMCAARC *v* EKRS), 8 Feb (Project progress), 15 Feb ("30 years of radio" by Tony Dukes), 22 Feb (Films and slides), 1 Mar ("Merits of QRP" by G8KEN).

Eastbourne (Southdown ARS)—9 Jan (Film show), 6 Feb (To be arranged). Further details from hon sec G8CVV, pro G3LFZ.

Gravesend (GRSGBG)—Mondays, 7.30pm. The Windmill Tavern, Shrubbery Road, Gravesend.

Hastings (HERC)/(ITT(H)S&AC)—Details of future events of both units from G8DNO.

Horsham (HARC)—First Wednesday in each month. Civil Defence HQ, Moons Lane, Brighton Road, Horsham. Details of future events from G3NPF.

Maidstone (MYMCAARS)—First and third Fridays in the month, 7.30pm; devoted to the beginner, RAE class and morse tuition. Alternate Fridays; a wide range of lectures and use of club shack. Melrose Close, Loose. Details from Harry Poppy G8KMX, tel Maidstone 61792.

Medway (MARTS)—Details of events and venue from G4EVY, 5 River Drive, Strood, Rochester, Kent.

Ramsgate (Kent Coast ARC)—Details of meetings from G4DTA, QTHR.

Tunbridge Wells (West Kent ARC)—Details of future events from new secretary, B. Castle G4DYF, 6 Pinewood Avenue, Sevenoaks.

Worthing (W&DARC)—Tuesdays, 8pm. Adult Education Centre, Union Place, Worthing. Details from P. J. Robinson G8MSQ.

Kent Repeater Group—Details of membership from G3XDV, 5 Lambs Walk, Whitstable, Kent.

Sussex Repeater Group—Information from G8HVV.

REGION 9—RR H. W. Leonard, G4UZ, 4 Start Bay Park, Strete, Dartmouth TQ6 0RY.

Camborne (Cornish RAC)—First Thursday in each month, 7.30pm. 5 Jan ("Marconi 75th Anniversary Co-ordinated" by G3VWK), 2 Feb ("Let's control the volts" by G3XFL), 2 Mar (Quiz). SWEB Clubroom, Pool, Camborne. Cornish net each weekday 10am on 3·715MHz, and on Sundays 11am on 3·692MHz. Details from G3NKE, tel Camborne 712419. Visitors always welcome at club meetings.

Exeter (EARS)—Second Monday in each month, 7.30pm. Community Centre, St Davids Hill, Exeter. Details from G3HMY.

Newquay (N&DARS)—Alternate Wednesdays, 7.45pm. Treviglas School, Newquay. Details from G8GOR, tel Newquay 4168.

North Devon (NDRC)—Second Wednesday in each month at QTH of G4CG, fourth Wednesday at QTH of G2FKO. Full details from G4CG.

Plymouth (PRC)—First and third Tuesdays in each month. 7.30pm. Virginia House, Bretonside, Plymouth. Visitors most welcome. G4EJO.

Saltash (S&DARC)—First and third Fridays in each month, 7.30pm. 6 Jan ("Swiss amateur radio" by G5BSX). Burraton Toc-H Hall, Saltash. Sec G8LLR, tel Plymouth 771135.

Torbay (TARS)—Fridays, with special meeting on last Saturday of each month, 7.30pm. 28 Jan (Home construction night), 25 Feb (to be arranged). Rear of 94 Belgrave Road, Torquay. Torbay net weekdays 3·756–3·764MHz, Mondays to Fridays 10·30am, Saturdays 9.30am. Full details from G3UIQ, tel Newton Abbot 3025. Visitors to club meetings most welcome.

RR G4UZ and ARs G4CG, G3NKE and G3GDW, wish all in Region 9 a very happy New Year.

REGION 10—RR R. G. Barrett, GW8HEZ, 23 Carshalton Road, Beddau, Pontypridd, Glam.

Barry (BCoERS)—Thursdays, 8pm. Barry Rugby Football Club, Reservoir Road, Barry. Details from sec S. N. Lloyd Hughes, GW8NVN, 1 Min y Mor, Barry. Members wish to thank the past secretary, Dan Adams, GW3VBP, for his many years of support.

Blackwood (BARS)—Fridays 7pm. 13 Jan (Slide show on activity in Canada, by GW4DWN/VE8). Oakdale Community Centre, Oakdale, Blackwood. Details from GW4BLE, 10 Llanthewy Road, Newport, Gwent.

Bridgend (Glamorgan VHF/UHF Group)—Second Wednesday in each month, 7.30pm. NCB Social Club, Tondu, Bridgend. Details from sec GW4BDV.

Cardiff (CRSGB)—Second Monday each month, 7.30pm. 9 Jan ("Front Panels by Photo etch", by GW3RWX, plus constructors' trophy), 13 Feb (Film show). Pantmawr Inn, Pantmawr Estate, Cardiff. Details from sec GW3VOW, 9 Millrace Close, Lisvane, Cardiff.

Merthyr (Hoover ARS)—Mondays, 7.30pm. Hoover Social Club, Pentrebach, Merthyr. Details from GW3RNC.

Newport (NARC)—Mondays, 7pm. Adult Educational Settlement, Brynglas Road, Newport. Details from sec, GW8MER.

Pembroke (PRSGBG)—Last Friday in each month, 7.30pm. Defensible Barracks, Pembroke Dock, Dyfed. Details from sec GW3XJQ.

Pontypool (PRSGBG)—Tuesdays, 7pm. Education Settlement, Park Hill Road, Pontypool. Details from GW3JBH.

Port Talbot (British Steel Corporation ARS)—Thursdays, 7.30pm. BSC Sports and Social Club, Margam. Details from GW4ESV.

Rhondda (RARS)—Every other Thursday, 7.20pm. Transport Employees' Club, Porth. Details from GW3PHH.
Sully (S&DSWC)—Mondays, fortnightly, 7pm. Sully Bowls and Social Club, 58 South Road, Sully. Details from sec GW8JHF.
Swansea (SARC)—Tuesdays fortnightly, 8pm. The Commercial Inn, Killay. Details from sec GW8CMA, QTHR.
Swansea (University College of Swansea RS)—Mondays, 7.30pm. Room 801, Applied Science Building. Details from sec J. Morris, 1 Hadland Terrace, West Cross, Swansea, tel 68675.

REGION 11—RR P. H. Hudson, GW3IEQ, "Silhill", Dinas Dinile, Caernarvon LL54 5TW.

Rhyl (R&DARC)—It is regretted that this club has been closed until further notice.
Conway Valley (CVARC)—Second Thursday in each month, 7·45pm. 12 Jan (Hot pot supper). The Quarry Offices, Llandulas. In November a most interesting visit was made to the School of Engineering Science UCNW at the invitation of the UCNWARS.
Bangor (UCNWARS)—Thursdays, 7.30pm. School of Engineering Science, Dean Street, Bangor. Events for the Spring term are being prepared.

RR11, GW3IEQ, wishes all members and their families in the region a happy and prosperous New Year.

REGION 12—RR F. Hall, GM8BZX, 45 Priory Cottages, Lunanhead, Forfar, Angus DD8 3NR.

Aberdeen (ARS)—Friday evenings. The Cowdray Club premises, 5 Fonthill Road, Aberdeen. Sec GM4BKV.
Dundee (Kingsway Technical College ARC)—Wednesdays, 6.30pm. Kingsway Technical College. Sec GM4FLP. The AGM was held on 16 November and the following offices were elected: chairman, GM4CUZ; secretary, GM4FLP; treasurer, GM4AQM; committee GM8BZX, GM2CPC; students' representatives, J. Winter and J. Lowden; NFD Committee, GM4FLP, GM4AGS, GM3ZXE, GM4BAG; VHF Committee, GM8BOW, GM4API, GM8BZX; social and publicity, GM4AGS, GM4BAG; catering, GM2CPC; QSL manager, D. Black; projects, GM4API.
Inverness (Technical College ARC)—Every second Wednesday, 6.45pm. Room C30. Sec W. Lee, 36 Old Mill Road, Inverness. The club is considering a quarterly newsletter to stimulate interest, and a VHF transmitter receiver project with a certificate of merit for the best effort. 70MHz equipment has been obtained, and the club members hope to be active on this band soon.
Lerwick (ARC)—Wednesday evenings. Annsbrae House. Sec GM3HTH.
Moray Firth (MFARS)—Wednesdays, Elgin Technical College. Sec GM8LVG.
Perth (P&DARG)—Tuesdays, 7pm. Perth Technical College. Sec GM4DQJ. The first meeting of the club was in September with an attendance of 19. A winter programme is being arranged with talks, films, etc. The club station operates under the call GM4EAF.

Approximately 50,000 blank "Tayside" QSL cards are still available to residents in the Tayside area. Anyone interested in a supply should contact the Dundee club secretary, GM4FLP, as soon as possible.

REGION 13—RR A. B. Givens, GM3YOR, 41 Veronica Crescent, Kirkcaldy, Fife, KY1 2LH.

Berwick upon Tweed (Border ARS)—First and third Fridays in each month, 7.30pm. Roxburgh Hotel, Berwick upon Tweed. Details from sec GM8IIO.
Dunfermline (DARS)—Second Wednesday in each month, 7.30pm. CCTV Studio, Pittencreiff School, Maitland Street, Dunfermline. Details from sec GM3MGX, tel Limekilns 313.
Edinburgh (E&DARC)—Tuesdays, 7.30pm. City Observatory, Calton Hill, Edinburgh. Details from sec. GM8MJV, tel 031-663 2033.
Edinburgh (Leith Nautical College ARC)—First and third Thursdays in each month, 7.30pm. Leith Nautical College, Milton Road East, Edinburgh 15.
Edinburgh (Lothians RS)—Second and fourth Thursdays in each month, 7.30pm. Adult Education Centre, Riddles Court, High Street, Edinburgh. Details from sec GM4BYF, tel 031-447 3201.
Glenrothes (G&DARC)—Third Sunday and every Wednesday in each month, 7.30pm. Old Nursery School, Provosts Land, Douglas Road, Leslie, Fife. Details from sec GM4BRM, 31 Church Street, Glenrothes.

It is also believed that clubs meet at Heriot Watt University, St Andrews University and Ferranti (Edinburgh), but no details are available.

REGION 14—RR I. L. McKechnie, 41 Westerlea Drive, Bridge of Allan.

Ayr (AARG)—Every second Sunday evening commencing 8 Jan. 19 Feb (Film), 5 Mar (NFD). Community Centre, 24 Wellington Square, Ayr. Details from sec GM3THI.
Greenock (G&DARC)—Tuesdays and Fridays, 7.30pm. 22 Inverkip Street, Greenock. Details from sec GM3LYI.
Motherwell (Mid-Lanark ARS)—6 Jan ("Oscar", GM8BKE), 20 Jan ("Napier, Gauss, Lechar", GM8ARV), 3 Feb ("Couplers", Mr D. Crone, IBA), 17 Feb ("FM, ssb", GM3EDL), 3 Mar (AGM and "Black Boxes", GM8DOX). Wrangholm Hall, Community Centre, Jerviston Street, Motherwell. Details from sec GM8FHK, tel Motherwell 66581.
Glasgow (West of Scotland ARC)—Fridays commencing 6 Jan, 7.30pm. 20 Jan ("VHF amps", GM3HBT), 17 Feb (Visit to Motorola), 2 Mar (GM5BKJ), 16 Mar (Phone Patch Live), 30 Mar. Details from sec GM4FDM.

Members and wives of the Radio Club de Normandie were guests of the Southdown ARS for a weekend last summer and are seen here with their hosts at Hurstmonceux Castle. Left to right: F3DH, F9CB, F3DI, F9NW, F5NK, F6BTP, F1XI, F6DEX, F6ESS, F1CZB, F1DZM, swl Roger, G3JYG, G3LFZ, G3MHF, G3RZC, G4CLV, G4EKX, G8DNO, G8KDS, G8KQN, G8KXJ, G8NFO, G8SC, G3POQ, G3TOE, G3ZFE, G3ZQB, G4BCO, G4BLS, G8BQX, G8KPE, swl Lewer, swl Jol-Christensen, swl Chapman

REGION 15—RR H. J. Campbell, 26 Kilcoole Park, Belfast BT14 8LB.

Ballymena (BRC)—Tuesdays, 8pm (RAE and morse classes). 86 Old Cullybackey Road Ballymena Fridays (club night) Sundays 3pm. (special projects). Sec GI8LSF.
Bangor (B&DARS)—First Friday in each month, 8pm. 6 Jan (SSTV), Feb (Army communications), Mar (Constructional competitions). Redcliffe Hotel Seacliff Road Bangor. Sec GI4AAM, 14 Manse Road Bangor.
Belfast (QUoBRC)—Tuesdays, 8pm. Queen's University Radio Club, 37 Fitzwilliam Street, Belfast.
Belfast (CoBYMCARC)—Saturday mornings in new premises, 4th Floor, YMCA, 12 Wellington Place, Belfast. Sec GI8MQR. New members welcome.
Belfast (BRSGBG)—Third Wednesday in each month, 8pm. 90 Belmont Road Belfast. Varied winter programme. Details from GI8FOK.
Carrickfergus (CYMCARC)—Second Wednesday in each month, 8pm. Carrickfergus YMCA. Sec GI4FUE. New members welcome.
Mid-Ulster RSGB Group—First Sunday in each month at QTH of GI4BAC. Always something interesting. Sec GI3WWY.
North Ulster (NURSGBG)—For details, contact GI3UHL, QTHR.

Ken Alford, G2DX, (l) with Mike Hearsey, G8ATK, and Douglas Johnson, G6DW (r) at a meeting of the Farnborough RS. G2DX was the first president of the society and during the meeting he was presented with a copy of the Blackwater Valley Award endorsed "In recognition of devotion to the amateur radio movement"

REGION 16—RR R. E. G. Kendall, G8BNE, "Wesley", Ranworth Road, Hemblington, Blofield, Norwich.

Bury St. Edmunds—New club! Second Monday of each month, 7.30pm. Details from J. Munro, 29 Angel Hill, Bury St. Edmunds.
Chelmsford (CARS)—First Tuesday in each month, 7.30pm. (Future lectures will include "Moon-bounce" by P. Blair, G3LTF.) Marconi College, Arbour Lane, Chelmsford. Details from R. Brocks, 30 Rowan Drive, Heybridge, Maldon.The society held its AGM and junk sale in October, when 44 members attended and nine new members joined. Ron Ferguson, G4VF, retiring as president after 25 years, was presented with a silver tankard and life membership of the club. Roy Martyr, G3PMX, was elected the new president.
Colchester (CRA)—Wednesdays, 7.30pm. 114 Ipswich Road, Colchester (above Candor Motors). Details from G3YAI.
Great Yarmouth (GYRS)—Last Thursday in each month, 67 Southdown Road, Great Yarmouth. Details from G3NHU.
Harlow (H&DRS)—Tuesdays 8pm. Mark Hall Barn, First Avenue, Harlow. Details from G3WUX.
Ipswich (IRC)—Wednesdays fortnightly. Ranelagh Road School, Ipswich.
Loughton (L&DRS)—Loughton Hall, Rectory Lane, Loughton. Details of meetings from G8DZH, QTHR, tel 01-508 3434.
Lowestoft (L&DARC)—Fridays, 7.30pm. Morse class every Tuesday. YMCA, Park Road, Lowestoft.
Martlesham (MRS)—First Wednesday in each month, 7.30pm. 1 Feb (Subject to be announced), 1 Mar ("RSGB representation" by G3MXJ). Details from M. Appleby, PO Research Centre, Martlesham, Ipswich.
Norwich (Norfolk ARC)—Wednesdays.
Norwich (U of East Anglia R&EC)—Details from P. Gowen, G3IOR.
Southend (S&DRS)—Fortnightly, 8pm. Church Hall, Sir Walter Rayleigh Drive, Rayleigh, Essex. Contact hon sec G3YOA, A. R. Adams, 9 Fairland Close, Rayleigh, Essex.
Vange (VARS)—Thursdays, 8pm. Youth Hall, Barstable Tenants' Community Association, Long Riding, Basildon. Details from Mrs D. Thompson, 10 Feering Row, Basildon SS14 1TE.

REGION 17—RR L. Hawkyard, G5HD, 100 Shirley High Street, Southampton, Hants.

Basingstoke (BARC)—First Saturday and third Wednesday in each month, 7.30pm. Chineham House, Popley, Basingstoke. Sec G3CBU.
Basingstoke (UK FM Group Southern)—First Wednesday of each month. 1 Feb (Lecture tba). Chineham House, Popley, Basingstoke. Details from sec Mrs J. Payne tel Aldershot 26108.
Bournemouth (Wessex ARG)—First and third Fridays in each month, 7.30pm. The Dolphin Hotel (club room), Holdenhurst Road, Bournemouth. Sec G. Cole, G4EMN, tel Bournemouth 20027.
Chippenham (C&DARC)—Tuesdays, 7.30pm. Sheldon School, Hardenhuish Lane, Chippenham. Sec G8BXG.
Fareham (F&DARC)—Wednesdays, 7.30pm. Porchester Community Centre, Room 9. Sec D. Thompson, tel Fareham 2799.
Farnborough (F&DRS)—Second and fourth Wednesdays in each month, 7.30pm. Railway Enthusiasts' Club, Access Road, off Hawley Lane, Farnborough. Sec G4FEA.
Guernsey (GARS)—Tuesdays and Fridays, 8pm. Details from sec GU8ITE, PO Box 100, St Peter Port, Guernsey. At the recent AGM, Richard Stockwell, GU8FBO, was elected the new president.
Horndean (H&DARC)—Second Thursday in each month, 7.30pm. Merchiston Hall, Horndean. Net Sundays, 6.30pm. 21·40MHz. Sec G4CHO.
Jersey (JARS)—Sundays, 10.30am, and Fridays, 8pm. Le Hocq Tower, St Clement, Jersey. Sec Mary McTaggart, 19 Parade Road, St Helier.
Poole (PRAS)—Last Friday in each month, 7.30pm. Poole Technical College. Sec Graham Tizzard, tel Poole 4641 ext 34.
Portsmouth (P&DRC)—Wednesdays, 7.30pm. Portsmouth Community Centre, Malins Road, Buckland, Portsmouth. G3CNO.
Salisbury (SR&ES)—Tuesdays, 7.30pm. Salisbury Activity Centre, Wilton Road. Sec G3FIX.
Southampton University (SUARC)—Tuesday evenings. Also informal meetings every lunchtime in the clubroom, Old Union Building. Sec D. Price, G4BIX, Chemistry Dept.
Southampton (SRSGBG)—First Monday in each month, Lanchester Building, Southampton University; Wednesdays, the clubroom, Kent Road; both at 7.30pm. AR G4COM.
South Dorset (SDRS)—7.30pm. Lecture Hall, South Dorset Technical College, Newstead Road, Weymouth. Details from G3YWG.
Swindon (SD&ARC)—Alternate Wednesdays, 7.45pm. Clubroom above Coldharbour Public House, Blunsdon, just north of Swindon. Sec G8KWC.
Winchester (WARC)—First and third Fridays in each month, 7.30pm. Antrim House, St Cross Road, Winchester. G4BKE.

REGION 18— P. J. Fay, 5 Harland Way, The Glebe, Washington, Tyne & Wear.

Durham (DUARS)—Alternate Wednesdays during term. Physics Dept, Durham University. All local amateurs are welcome to join. Talk-in by G4DUR on R5 or S20 before all meetings.
Easington (AR&EC)—Tuesdays and Thursdays, 7.30pm. Easington Village Workmen's Club. RAE and morse tuition if required (the club has a good RAE pass record). ATV can be received on 625 lines. The club is now equipped with an hf transceiver as well as other gear. Sec G4COI.

Great Lumley (AR&EC)—Alternate Wednesdays, 7.30pm. Great Lumley Community Centre. Sec G8JLQ. Assistance with RAE and morse if required. Arrangements have now been made to hold a bigger and better mobile rally in October 1978.
Hartlepool (HRC)—Mondays, 7.30pm. Methodist Church Hall, Grange Road. Sec G3NWU, 73 Eamont Gardens, Hartlepool.
Middlesbrough (Post Office ARC)—All amateurs welcome, but first contact the sec Mr G. P. Gaunt, G8CDP.
Middlesbrough (Teesside Repeater Group)—Last Tuesday each month, 7.30pm. 196 Marton Road, Middlesbrough, Cleveland. All amateurs and SWLs invited but first contact sec Mrs Pauline Bland, G8MBK, 5 Belgrave Drive, Normanby, Middlesbrough, Cleveland.
Morpeth (Northumbria RC)—Now meets Thursdays, British Legion premises, Gambois, near Blyth. Sec G4AVO.
Newcastle Upon Tyne (Tyne & Wear Repeater Group)—First Wednesday in each month. Arts Common Room, University of Newcastle. Open to all amateurs and SWLs. John Thexton G3URE, has resigned, so the secretary is now Fred Signey, G4DOB, 264 Silver Lonnon, Newcastle Upon Tyne, NE5 2HJ, tel Newcastle 744444.
South Shields (SS&DRS)—Fridays, 7.30pm. Trinity House. Old and new members welcome. Sec G8BQF, 67 Lauderdale Avenue.
Tyneside (TRS)—Mondays, 8pm. The Community Centre, Vine Street, Wallsend. Sec Alex Frazer, 35 Percy Street, Tynemouth.

Will local members having gear for sale please let RR18 know on a postcard, before the 20th of each month, for inclusion in the monthly "For Sale" list sent to all clubs in the region.

REGION 19—RR (Post vacant)
Acton, Brentford & Chiswick (ABCRC)—Third Tuesday in the month, 7.30pm. Chiswick Trade and Social Club, 66 High Road, Chiswick. Sec G3GEH, tel 01-922 3778.
Barking (BR&ES)—Mondays (Construction) Wednesdays (CCTV techniques), Thursdays (Informal). Morse classes Tuesdays, 7.30pm. Westbury Recreation Centre, Westbury School, Ripple Road, Barking, Essex. Sec N. Dowsett, 44 St Anne's, Barking.
Cheshunt (CDRC)—New premises—Church Room, Church Lane, Wormley, Herts, Wednesday, 8pm.
Chingford (Silverton RC)—Fridays, 7.30pm. Friday Hill House, Simmonds Lane, Chingford E4. Visitors very welcome. Sec G4AJA, tel 01-529 2282.
Ealing (EDARS)—Tuesdays, 8pm. Northfield Community Centre, Northcroft Road, London NW13. Newcomers and old-timers very welcome. Sec M. E. J. Cummings, G8KPN, tel 01-997 5947.
East London RSGB Group—Details from sec J. B. Bundock, G4CJQ, tel 01-524 3169.

Officers of the recently-formed Kodak Amateur Radio Societ (G4FVJ) presenting a Silver Jubilee Crown to Corny Unruh, WA2EOQ, as a souvenir of his recent visit to the company. Corny is a member of a similar company-based radio society at Eastman Kodak, Rochester, NY.

The Kodak Amateur Radio Society was formed about two years ago, has about 15 members (all company employees), and is affiliated to the RSGB. Left to right: Ron Ray, G2TA, Phil Ellis, G4AEM, Angela Hornagold, G4CKQ, Richard Walker, G3XYJ, and Corny Unruh, WA2EOQ

Edgware (E&DRS)—Second and fourth Thursdays in the month, 8pm. Watling Community Centre, 145 Orange Hill Road, Burnt Oak, Edgware. Sec G4BZY, tel 01-952 2495.
Harrow (RSH)—Fridays, 8-10pm. 6 Jan (Junk sale), 13 Jan (Film show), 20 Jan (AGM), 27 Jan (Informal). Roxeth Community Centre, Scott Crescent, West Harrow, Middx. For details of February meetings please contact sec G4FBK, tel 01-864 1412.
Havering (H&DARC)—Wednesdays, 8pm. British Legion Club, Western Road, Romford.
Holloway (Grafton RS)—7.30pm. Holloway Institute, Archway Annexe, Highgate Hill, London N19. Sec G3ZKE.
Ilford RSGB Group—Thursdays, 8pm. 50 Mortlake Road, Ilford. Details from D. T. Sapworth, G3YMW.
Northolt (British Airways European Division ARS)—First Monday in each month. Trident Club, Western Avenue, Northolt, Middlesex. This club is open to non-BA employees by invitation. Contact G3OUF, tel Amersham 21573 for details. Civil Aviation Sunday net 1100-1200gmt on 3·68MHz, listen for G3NAF or G3BEA.
Shelburne (SRC)—Wednesdays 7pm-9pm (Electronics for beginners); Thursdays, 7pm-9pm (Club evenings). Shelburne Youth Centre, Hornsey Road, London N4.
South Kensington (Baden Powell House Scout ARG)—Third Tuesday in each month, 8pm. Baden Powell House, Queensgate, South Kensington.
Southgate (SRC)—Second Thursday in each month, 8pm. The Scout Hut, Wilson Street, Winchmore Hill Green, London N21. Sec G4AEZ, tel 01-366 7166.
St. Albans (Verulam ARC)—Main meetings fourth Thursday in each month, 7.30pm for 8pm. 26 Jan ("Slow scan tv" by Keith Clarke, G3KRC), 23 Feb ("Vintage wireless" by A. R. Constable, chairman of the British Vintage Wireless Society). Market Hall, St. Albans. Informal meetings, second Thursday in each month. RAF Association Headquarters, Victoria Street, St. Albans. Hon sec G4DUS.
Stevenage (S&DARS)—First and third Thursdays in the month.
UK FM Group (London)—Second Tuesday in each month, 7.30pm for 8pm. Grove Park Hotel, junction Bolton/Spencer Roads, Grove Park, Chiswick.

REGION 20—RR G. Mather, G3GKA, 8 Hills Close, Keynsham, Bristol.
Bath (B&DRG)—Tuesdays, 8.30pm. The Crypt, Ascension Church, 35a Claude Avenue, Oldfield Park, Bath. Sec N. S. Cridland, Flat 3, 30 Paragon, Bath BA1 5LY.
Bristol (BARC)—Tuesdays, 7.30pm. The University Settlement, Barton Hill, Bristol 5. Hon sec G8GFZ.
Bristol (Shirehampton ARC)—Fridays, 7pm. Twyford House, Shirehampton. Hon sec G8KUM. HF and vhf station all modes, occasional lectures and films. RAE and morse classes in progress. New members welcome.
Bristol (BRSGBG)—30 Jan (AGM), 7-9.30pm. Small Lecture Theatre, Queens Building, University Walk, Clifton, Bristol 8. Hon sec G4FRG.
Bristol (North Bristol ARC)—Meetings Fridays, 7pm. RAE instruction Wednesdays, 7pm. Lockleaze Community Association, Romney Avenue, Lockleaze, Bristol BS7. Hon sec G8KSS, club address.
Cheltenham (CARA)—First Thursday and third Friday in each month, 8pm. 3 Jan (AGM). The Old Bakery, Chester Walk, Cheltenham. Hon sec G3KII.
Gloucester (GARS)—First and third Thursdays in the month, 7.30pm. 5 Jan ("QRP" by G4CLR), 2 Feb ("Two metres" by G4CIB), 6 April (A talk by G2HDU). Chequers Bridge Centre, Painswick Road, Gloucester. Hon sec G3MA.
Weston-super-Mare (WsMARS)—Second Friday in each month, 7.30pm. Room Lewis M2, Worle School, New Bristol Road, Worle. G3PQE.
Yate (Y&DARC)—First Saturday in each month, 8pm. G3RQN QTH. All welcome, including SWLs. Local chat channel S24, 145·6MHz, 2100 Wednesday and Saturday. Further info from G8LGC.
Yeovil (YARS)—5 Jan ("Antenna fundamentals" by G3MYM), 12 Jan (Members' radio slides), 19 Jan ("Antennas for small gardens" by G8MZI), 26 Jan ("Transmission line fundamentals" by G3MYM), 9 Feb ("Radio quiz with a difference" by G3MYM), 16 Feb ("Microwaves, their use in telecommunications" by G4GHI), 7.30pm. Hut 101, Houndstone Camp (three miles west of Yeovil, off A3088). Hon sec G3NOF. Info at main gate, S20 fm talk-in.

Assistance is wanted for the RSGB stand and station at the Royal Bath and West Show, Shepton Mallet, 31 May to 3 June; please contact G4GHI or G8NOF.

members' ads

These subsidized flat-rate advertisements are accepted as a service to members of RSGB. They must be submitted on the Members' Ads order form printed in alternate issues of *Radio Communication*, or on a postcard similarly laid out. Each **must** be accompanied by a **recent** *Radio Communication* wrapper addressed to the advertiser, as proof of membership, and a remittance by postal order or cheque (stamps not accepted) for 75p for 40 words or less. Excess words must be paid for at the same rate of 75p for 40 words or less. They will not be acknowledged. Those not clearly worded or punctuated will be returned. No correspondence concerning this service can be entered into.

The closing date for each issue is the 1st of the preceding month, but no guarantee of inclusion in a specific issue can be given. Valid advertisements not published in the issue following receipt will be held over until the next issue.

Trade or business advertisements, even from members, will not be accepted for Members' Ads but should be submitted as classified or display advertisements in the usual way. Traders who are members must enclose a signed declaration that the items for sale or wanted are part of, or intended for, their own personal amateur station.

The RSGB reserves the right to refuse advertisements, and accepts no responsibility for errors or omissions or for the quality of goods offered for sale. Advertisements may be edited or abbreviated as necessary.

Post to: MEMBERS' ADS, RSGB, 88 BROOMFIELD ROAD, CHELMSFORD, ESSEX CM1 1SS.

Do not post to RSGB HQ or Advertising Representative.

FOR SALE

Eddystone 940 gen cov rx, £100 ono cash. Prefer buyer collects. Microwave Modules 432MHz converter, 18-20MHz i.f., £12. *Wanted:* Bird 43 Thruline frequency elements, state power range, frequency and price. All letters answered, postage refunded. G8HHI, QTHR. Tel Yateley 871555.

Trio TS520, superb rig, few months old, comp, as new, £400 ono. G4FJB (G8EPE), QTHR. Tel 021-705 7158.

Hallicrafter's SX101, ssb, a.m., calibrator notch, dept, notch frequency, 1·8 to 30MHz amateur bands, manual, £50. Oscilloscope, Solartron CD513, £25. G4DZV, QTHR.

FT101 Mk1, 160m and 600Hz cw filter fitted, new pa and driver bottles, recently overhauled, £195. SSM Europa transverter, all leads, manual, for use FT101 etc, £45. G8IZM, QTHR. Tel Morecambe 415414.

Collins KWM-1, psu, £75. Mobile psu with 300W inverter for above, £35. G3KBH, QTHR.

Motorola 70-88MHz mobile fm 2-way transceivers, 30W rf power, 6/12V dc, some valves needed and xtals, less control boxes, maker's manual available on loan, six available, £40, or £7 ea, plus carr. G4DVH, QTHR. Tel St. Helens 53018.

Drake R4B, mint cond, £185 ono. Tel Littlehampton 6161 ext 55/56, daytime.

Xtals for ladder filter experiments etc: 8·950MHz HC18U, £1 ea, 4+ 75p ea, 10+ 60p ea; some 5·000MHz HC6U still available, £1 ea. Send sae with remittance and order to R. Bowell, 16 Margarite Way, Wickford, Essex SS12 0ER.

Yaesu FT200 and FP200, brand-new cond, all 10m xtals, £220. Philips millivoltmeter 1mV-300V dc, GM6010, £15. Noise gen TF987/1, requires new diode, £5. G4AQA, QTHR. Tel 0482 655856.

Pye Cambridge AM10B modified to 2m fm, fitted 144·48, S0, S20, S22, R7, RR7R, c/w hb control box, mic, toneburst, ready to use, £50. McEwen, G3VKQ, 625 Kenton Road, Harrow, Middx. Tel 01-204 8970, evenings.

TR2200GX, S0, S20 to S24, R6, R6R, nicads, charger, helical antenna, rig in exc cond, £120. GM8BKE. Tel 0501 30819, after 7 pm.

FLDX400 tx, mic, never used, mint cond, £180. Tel Pritchard, Hereford 65092.

Mains oil-filled transformers 1,185V-0-1,185V, 360mA, £9. New vacuum, variable 1,000pF capacitors, £10. 250MHz ÷10 prescaler, £12. Transformer 450V-0-450V, 500V-0-500V, 250mA, Its, £4.50. Mains stabilized psu, meter, adjustable 9 to 18V dc, 3·5A, £15.50. SAE enquiries, carr extra. G4DFE, QTHR.

Barlow Wadley XCR30 portable communication rx, £80. Grundig TK248 stereo, reel-to-reel tape recorder, £50. Buyer collects. H. Bruce, 136 South Street, Andover, Hants SP10 2BS.

RTTY UT4 PCBs available, providing for uart fifo's and XB6 clocks, double-sided 8 by 6 main board, psu board, drilled with printed legend, circuitry and description, £22 post paid. Ken Michaelson, G3RDG. 40 The Vale, London NW11 8SG. Tel 01-455 8831.

Icom IC210, fm, vfo, mains/batt, superb rig, £180 ono, or swap for fb QRO 2m linear or 70cm gear. WHY? Cambridge d/mount, 6ch, fm, £50 ono. R6 tx/rx xtals, HC6U 8/44MHz, £3 pair. G8BWR. Tel 0926 48388.

High power Marconi atu with balun, silver plated throughout, handles legal limit with ease, £25. G4BCO. Tel Hastings (0424) 436004.

FT221, pa, aux xtal for normal/rev rptr operation, immac, £260. Trio JR310 rx and spkr, £60. Shure 201 mic, £2.50. ARAC rx module 28-30MHz, £20. ASC11 keyboard, £10. Trans eht 1,125-0-1,125, £7. Trans 5V 7A ct for HTR 4-125, £2.50. PR 4-125 untested, £5. 4-400, £10. GM3XNE, QTHR. Tel 0294 67326.

Racal RA117E, mint, ssb unit, preselector synthesizer, psu, all in cabinet with case for 117E, handbook, sell £375 ono, or exch tx/rx hf bands. MK sstv monitor, spare 5FP7, £50. B40D and ssb unit, mint, £50. Delivery possible. G3VUF. Tel 0670 2790.

Welmac 8ch tape punch, 15 ch/s, psu, £30. Hartley 13A 'scope, rebuilt timebase, £15. Keyboard, no electronics, £7. Mullard audio preamp module LP1184/2, £2.50. All with manuals. *Wanted:* Solartron CX1441 'scope, plug-in. G8ISI, QTHR. Tel Liphook (0428) 723168.

HW8, psu, £90. FT75B, psu, £200. Both in good cond and carr incl. Sgt Short, 13 Signal Regiment, BFPO 40.

Drake R-4C, FS-4 frequency synthesizer, spkr. FKD TM56, vhf/fm 2m rx, boot mount antenna, Hy-Gain 12AVQT, 10-80m vertical antenna. All good as new, best offer secures, will separate. Tel 01-790 2557 or 01-203 3635.

G-whip multi mobile ant coils for 80, 20, 15, comp with extend section and base mount, £22. Pye Ranger 4m tx/rx, xtals for 70·26 and 70·365, £15. Army 62 set, fair cond, comp with headphones and mic, £10. Labgear Topbander, good cond, £15. TW2 tx, 2m, 10W, comp with psu, £15. G4FB. Tel Seaford 894310.

KVG XF-9A filter, both sideband xtals, £18. Kokusai MF455-10K filter with 453·5 xtal, £11. G3AMF, QTHR. Tel 01-989 9224, evenings.

KW Viceroy Mk3 tx, vgc, £70 ono. G3PJN, QTHR. Tel Chesterfield 6040, after 6pm.

HQ1 miniature hybrid quad 10-15-20, hardly used, £70. Home-brewed linear, (pair 813s), psu, spare valves, £60. G3JEP. Tel Exmouth (03952) 4863.

KW 2000A, vgc, £150. 2m JXK converter 28MHz i.f., £8. Three unused 813 valves (American), £9. Two 813 bases, new, £2. *Wanted:* FT221R. G3VHA, QTHR. Tel Bellbroughton 730484.

Yaesu FT75 c/w ac and dc psu, £185. Datong frequency agile audio filter FL1, £32. Both in exc cond. *Wanted:* 100W 2m linear amp. G3ZZS, 21 Woodford Road, Glenholt, Plymouth PL6 7HX. Tel 707550.

Two pairs Pye Pocketphones, xtalled 433·2MHz, using dry cells, one pair comp, one pair less half tx case, circuits, two pairs Pye rechargeable batts, £50 the lot, will split. *Wanted:* Portables, mobiles for 98MHz fm. Tel John, Hengoed 813607.

Creed 7E, silence cover, base, £22. Tape tx, £12. Terminal unit TU5, comp PCBs, not boxed, £12. MBM46, £10. 5Y/2M, £3. 4Y/4M, £6. Buyer collects. *Wanted:* TA33JR HQ1, or similar. G3ZUL. Tel Stourbridge 5917.

Woden transformers, unused: DTM21, mains 0-10-200-240V; 500-450-0-450-500V, 250mA; 0-4-5V, 5A; two 6·3V-4-0-4-6·3V, 4A; DCS13 smoothing choke 12H, 250mA; PCS12 swinging choke 5/25H, 250/50mA, 2-8μF 1,000V; 1,000V meter; 500mA meter; switches, lamps, fuses, 5U4G, etc; all mounted in 12in by 6in by 12in case, £15 the lot. UMI modulation transformer, £3. Buyers collect. G3DTX, QTHR. Tel Little Chalfont 3108.

KW2000B, little used, mobile psu, £25. Datong speech processor made from board, own case and controls, works well, £19. G3OSZ, QTHR. Tel 051-648 4189.

Hilomast NK9 pneumatic mast, accessories, nine metres, brand-new, boxed, unused. Property of deceased amateur. Current retail price for mast alone, £231, will accept £180 ono. Buyer collects. Court. Tel 01-857 4758, after 7 pm.

Liner 2, 144·1-144·33, mic, mobile mount, manual, mains psu, £120. Trio VOX3 for TS700, £12. *Wanted:* TR2200 G or GX, C828M, C146A, MR2 rx. G3TCG, 6 Bramble Bank, Vigo Village, Meopham, Kent. Tel Fairseat 822043.

"Rad Com", vols 23 to 51, incl; *SWM*, 21 vols, five copies missing; *73* mag, May 1970 to Feb 1971; all vgc, 30p per vol, for the lot. Buyer collects or arranges. G4BC, QTHR.

Shack clearance many items: components, transformers, transistors, inductors, etc. Send sae for long list. G8CHE, QTHR.
House purchase forces sale. Brand-new FT101E, FRG7 and FDK Quartz 16, cartons still factory sealed and unopened, fully guaranteed. FT101E, £420. FRG7, £145. FDK Quartz 16, £150. Can arrange insured delivery. G3LNC, QTHR. Tel Dunstable (0582) 65114.
Codar CR70A, mint cond, one year old, recently aligned, £30. Buyer collects. Peter Jones, 5 Mere Avenue, Middleton, Manchester.
Pair Eimac 3-500z, new, boxed, £50 plus post. Tel 0403 72 2909.
New 6146 valves, in makers' boxes, £2 ea. Minimitter MR44/11, amateur bands, double conversion rx, £28. 18AVT/WB trap vertical, £35. G3GHY, QTHR. Tel Southampton 846568.
FT101E, mint cond, under guarantee, four months mobile use, £410. Multimobile whip, all coils, top to ten, mint cond, £30. Going vhf mobile. G4DIU. Tel Havant 79464, after 7pm.
Amateur tv, comp stn: 4X150A tx, 150W i/p, vision and sound modulator, in Imhoff cabinet; Ikegami 625 camera, lens; Ikegami 9in monitor; prefer to sell complete, but will split. Buyer collects. Offers to G3ZUL, QTHR. Tel Stourbridge 5917.
HQ1 Minibeam, 10, 15, 20, £40. Buyer collects. G4FXS. Tel 021-458 3537, after 7pm.
HP-21 scientific calculator, as new, charger, carrying case, instructions, £42 ono. G3UYK, 6 Eling Close, Winchester, Hants. Tel Winchester 822204, day or 880819, evenings.
Collins 75S3B, 32S3, KWM2A, 30L1, S16F2, 312B4; Drake T4XC, Magnum 6, late R4C, 4 NB filters, spkr, L4B. All mint cond. Offers. G3NNT. Tel 0695 422203.
Marconi TF867 sig gen 15kHz-30MHz, good cond, £25. DX100-U, mint, £40. Heathkit Mohican rx, £30. TF4288/1 valve voltmeter, £10. Buyers must collect, evenings or weekends. G3SDK, QTHR.
FT2F 12V 2m 10W tx/rx, auto xtal t/burst, R3 to R7, S0, 145·8, S20 S24, preamp, 600kHz shift rx, £110. IC22A 12V 2m 10W tx/rx, t/burst, 13ch, S0, S13, S20 to S24, R3 to R7, rev R3, £135. G8BPU, QTHR. Tel Bollington 73242.
Trio 9R-59DS rx, spkr, manual, perf cond, long wire, £50. R1155 rx, 200kHz-18·5MHz, mains psu, manual, spare set of valves, £10. Tel Andrew Tickle, 051-722 4900, after 6pm.
IC240, as new, fitted reverse repeater and low power mods, £180. *Wanted:* FV101B and FL2100. Consider exch. G3GXQ, QTHR. Tel Leeds 641298.
Belcom Liner 2, good cond, 144·1-144·33MHz, £105 ono, or exch for Trio JR500SE/JR310 plus cash. Letters only please. G8LKR, QTHR.
FTDX500 tx/rx, 560W p.e.p., a.m./ssb/cw, spare valves, manual, £195. Or, including KW E-Zee match, SWR50A, 50Ω dummy load, W2AU 4:1 balun, £215. S. Williams, 7 Oddfellows Street, Scholes, Cleckheaton, West Yorks BD19 6NX (near M606/M62). Tel 0274 379615, after 5pm.
Liner 2, manual, etc, £100. Sentinel 2m converter 4-6MHz i.f., £7. Jordon Watts driver unit (LS), £5. 20mA, 6in dia cirscale meter, £5. 1kΩ, 0·7A rheostat, £1. All above, plus postage. BCC 2 and 4m base stns, a.m., £10 ea. Brenell STB2, fault on record, £30. Thirty 7in tape reels, £15. Cossor 1049 'scope, £5. Advance constant voltage transformer, 125W, 230V o/p, £5. Prefer buyer collects latter items. G3ZNW, QTHR. Tel 01-432 2556 (work), 01-397 8820 (home).
IC20, S0, S20, R4, R5, R6, R7, £92 ono. Lowe monitor rx, S0, R6, R7, £30 ono. G3LZN, QTHR.
FDK Multi 7 2m tx/rx, 10W autotone, must sell, £100 ono. 5/8 2m mag mount antenna, £12. G8NAE. Tel Keynsham 2859.
KW Vespa Mk2, psu, vgc, £75. G4CP, QTHR. Tel Bloxwich 76372.
Tilt over tower, 30ft in three 10ft sections, buyer collects, £35 ono. G3TAZ, QTHR. Tel Luton 26995.
Heathkit SW 717 gen cov, exc cond, manual, £50 ono. *Wanted:* FR50B or similar rx, must be good on cw. G4FMK, 8 The Parkway, Canvey Island, Essex SS8 0AA. Tel Canvey Island 3805.
CR100, good wkg cond, £15 ono. AR10 28-30MHz double conversion rx module, in case with SEM 2m converter and audio amp, only two months old, £55 ono, or will split. G8NZS. Tel Rugby 815506, after 6pm.
New 7360s, in makers' packing (RCA), £4 ea. Pair TT21s, unused, £6. Pair TT21s, used but OK, £3. G4DZC, 53 Highfield Crescent, Portswood, Southampton.
Liner 2, preamp, ac psu, new mic, £105. G3WWH, QTHR. Tel Bayston Hill 3383.
FT101 10-160, spares incl pair inverter transistors, SJS6, fan, manual, etc, offers around £300. *Wanted:* scanning rx, covering aircraft 120-140MHz. Also Digitex frequency counter, Atlas 215X with ac psu, required urgently. G3IES, QTHR. Tel 0272 500742.
KW2000E, mains psu, all of ten metres, unmarked, no mods, brand-new pair matched 6146s, spare valves, manual, £265. G3PZF, QTHR. Tel St. Albans (0727) 57665.
Double HROs, 19in horizontal rack cabinet, £6. Two synchro repeaters and radio compass indicator, £8. Polyquad Starmounts, manual, £5. HRO dial, £4. BC221, psu, manual, £17. AR88 manual, £1. Bliley 100kHz xtal, £1.50. Large compass, £8. GM6MS, QTHR.
Modified WAC dx rx, comp with spare valves, batteries and coils, ranges mw and sw down to 30MHz. Also K model. Hayman. 66 New Road, Abbeywood, London SE2 0QG. Tel 01-310 7355, after 7pm.
HC6U xtals 8·066666, 8·075000; HC18U 18·000MHz, £1.50 ea. Denco IFT11/465CT, BFO2/465, 50p ea. IN4001, ten for 20p. 2N3053, BC478, four for 30p. Cambridge driver and mod transform 50p. Above items used. Kitchen. 18 Welch Road, Newton, Hyde, Cheshire SK14 4DJ.
Creed 7E/RP teleprinter/punch, no silencer, £20. 2F papertape reader, £10. Both carr extra. Vintage RCA-TV wobbulator, offers? Various chrome handles and audio filters, sae details. *Wanted:* 5-pin WW2 Belling Lee spigotted plugs and sockets. G3SBA, QTHR. Tel 05827 4815.
GEC 660 mobile, hb/a.m., mic, less xtals, rx faulty but all comp, 17 by 5 by 20mm, £25. Pye Bantam lb/fm, £15. GM8HQZ, QTHR. Tel 031-346 0591.
KW2000A, ac psu, £120. G3RVE, QTHR.
Choice IC22A, xtal toneburst, or C828M, toneburst, both as new, orig packing, R3, R4, R5, R6, R7, 145, S20, S21, S22, S23, S24, £140 ono. PF1 tx/rx, nicads, xtalled RU8, requires attention, £30. G3LXX, QTHR. Tel 0625 48526.
KW2000E tx/rx, ac psu, £245. CQP512 vhf highband 3ch fm handportable suitable for 2m, with nicad, £45. *Wanted:* MM 4m converter, 4-el 4m beam, or larger. MM 70cm/2m converter. 70cm Multibeam. KW E-Zee match. G3UGF, QTHR. Tel 0274 814218.
Yaesu FRG7, mint, £125. Pye fm/hb Bantam, £20. Creed 7E, recently overhauled, £20. Pye Cambridge international broadcast rx, wooden cabinet 12in spkr, 11 wavebands, £15. Buyers collect. *Wanted:* G2DAF rx, wkg order. Tel Kenilworth 54609.
"Television" colour tv with cabinet, needs some alignment, offers. BC221B with charts, £20. Radiovision Hambander rx, £5. Amateur bands rx, Electroniques front end, £10. TT21 a.m./cw tx, rough, £8. Property deceased amateur. Buyers collect. G3PSP, QTHR. Tel 01-950 6827.
FT221, late model, immac, preamp, £275 or offers. Datong FL1 audio filter, £35. Bauer keying paddle unit, unused, £5. G4FBK, QTHR. Tel 01-864 1412, after 6.30pm
60ft Hamtower, incl tubemount, all hardware, £80. FT101B, cw filter, mic, spare tubes etc, £320. FV101, £40. FL2100B, £180. All mint. TA compressor, £15. Shure 444, £14. New Heathkit HD-1410 iambic keyer, £30. Garrard 401 turntable, £16. Carr by arrangement. Further details Robson, GM3CFS. c/o Post Office, Reay, Nr Thurso, Caithness.
Complete set ICs and displays (6 X FND507) *Radcom* May '76 counter, £10. *Radio Amateurs' Handbook* (1976), £4. 2m amp (QQVO7-50), psu, super job, £20 (collect only). 2m fm tx, 6ch, 8W out (spurious. >70dB), £20. Trio 7010, immac, £120. MM432/28 converter, £15. QQVO7/50 (new), £5. QQVO3/20 (good), £2. QQVO3/10 (new), 50p. QQVO2/6 (new), £1. 4CX250B (good), £3. *VHF/UHF Manual,* £4. *Amateur Radio Techniques,* £2. *Radio Data Reference Book,* £2. G3ZYL. 20 Park Road, Bracknell. Tel Bracknell 22169, weekends.
S-meter, suitable AR88, r/h zero, 5mA, £4. 866A, brand-new, boxed, £2.50. Scorpio electronic ignition kit, £10. G3HBW 2m fet coverter kit, i.f. 4-6MHz, £8. Both new, in cartons. American headphones, high Z, brand-new, £7.50. All items plus postage. G3GUU, QTHR.
Liner 2, mint cond, unfitted preamp, boxed, manual, £105. SSM 9MHz xtal filter, ssb gen with homebrew mixers and vfo, giving QRP o/p on 2m, £20. White, 31 Astbury Avenue, Wallisdown, Poole, Dorset.
KW2000A dc psu, £25. *Wanted:* Manual or circuit diagram for sig gen, oscillator test No1, CT212, purchase or loan. G4DXO, 102 Woodland Avenue, Hove. Tel Brighton (0273) 561616.
Marconi Atalanta rx 16kHz-29MHz with rejector, handbooks, homebrew psu, £190 pair. QVO8-100, £15. G3ZON, QTHR. Tel 01-546 3447.
Sailing-yacht and car-seeking xyl demands sale of: FT277/FR101B, cooling fan, few hours use only, orig packing, manual, etc, mint, £349. Europa B 2m transverter, new, six hours use only, connectors for FT101, £70. 18AVT/WB, £40. 10XY 2m crossed Yagi with twin coaxial and 6-way polarization control box, £20 the lot. KW 50Ω dummy load SO239 connection, £10. KW E-Zee match SO239 connection, £20. Morse records, £5. Going QRT. GW4DTV. 27 Aberconwy Parc, Prestatyn, Clwyd. Tel Prestatyn 88358.
HRO, nine coils, three bandspread, psu, xtal, £25. Pye fixed station tx/rx, handbook, £17. G3USZ, QTHR. Tel Upminster 23699.

FRG7 rx 0·5 thru 30MHz, a.m., ssb, cw, stable phase locked loop system, tuning facilities, recording socket and cassette recorder included in price, still under guarantee, £130. Prefer buyer collects after inspection. G3BIA, QTHR. Tel 01-977 6705.

Liner 2, fitted preamp, clean signal, £110. G8KHI, QTHR. Tel Letchworth (04626) 4603, after 6pm.

KW2000A, spkr, ac psu, mic, manual, circuit, £145. KW1000 linear amp, £120. Hy-Gain TH3 3-el three band beam, £45. FT101E, mint, £365. Buyer inspects, tests and collects. G3JYJ, QTHR. Tel 01-764 2744, between 10am and 4pm.

AR88D and Eddystone 840C, both orig cond, £45 ea. R1155N with o/p and p/p, £15. Voltmeter Electronic CT54, £54. Racal counter timer SA550, £50. *Wanted:* R216, comp. McBride, 4 Little Fancy Close, Plymouth. Tel 0752 775375.

Two valve amps, £4 ea. Various transformers, 50p ea. Garrard magazine tape deck, £9. Tape amp, £7. *Wanted:* Circuit or details for "Venner counter" TSA 3336, Collaro idler wheels, pick-up arm. D. A. Griggs, 5 Collingwood Avenue, Muswell Hill, London N10 3EH.

Hudson FM208 with 145·0 xtals, transmit wkg, rx not functional on 2m, with circuit, £30 ono. Buyer collects. Tel 01-286 1833, 6pm to 8pm.

70cm 46-el Multibeam, £10. 4m 4-el Yagi, £6. Various 2m Yagis, apply for details. 70cm Microwave Modules converter, 28MHz i.f., £14. Pye Ledex unit. *Wanted:* HQ-1 Minibeam. G3XJS, QTHR. Tel Holmer Green 2344.

KW2000E, ac psu, £245. KW107 antenna tuning system, £55. 12AVQ vertical 15, 20, 10, £15. KW lp filter, £10. Doram auto-key, £10. Shure 444 desk mic, £12. G3NUL, QTHR. Tel Newmarket 730181 (Sffk).

2m 40W valve tx, a.m./fm/cw, with psus, £35. 19in b/w tv, uhf, vgc, £15. 25 × 50 prismatic binoculars with case, etc, hardly used, £25. Mr Lonnon. Tel 025-681 298, evenings.

Collins filter F455 FO5, £5. Kokusai filter MF455 30W, £10. *Wanted:* Original 75A2/3 manual. G3GBB, QTHR. Tel Bury St Edmunds 66496.

Liner 2, property of late G8FGW, with preamp, mic, non-commercial mains psu, consider delivery up to 50 miles, £115. G3EUS, QTHR. Tel Hitchin 33390, evenings.

Creed tty equip: model 54 with cover, model 85 printing reperf with cover, model 6S6M auto sender with magnetic clutch; two GPO auto telex psus, five rolls tape, two rolls Class A paper, £47 the lot. G8DEV, 15 Chapel Fields, Swinford, Leics LE17 6BS.

FL50B plus FR50B fitted vox, good cond, £150. Trio 7010 ssb tx/rx, £140 ono. G4FJO, QTHR. Tel 04895 3664.

Katsumi EK9X electronic keyer, sidetone oscillator, £12. Sentinal 2m converter 28–30MHz i.f., £12. Eagle ac millivoltmeter, £15. *Wanted:* 4CX300 tubes, urgent. G4CKL, QTHR. Tel 0623 23801.

Exch: Mosley Mustang beam, exc, very clean cond, 12 months external use; for decent compact 'scope with rf capability; might sell to reasonable offer. *Wanted:* 2m mw i.f. converter. G4ASP, QTHR. Tel Cleveleys 76814.

Trio TS700, £250. *Wanted:* Manual for Pye U450T. G3ZTR, QTHR. Tel 0262 74337.

Atlas 180, £200 ono. Hustler mobile hf antenna 80m to 10m, £40. Stolle 2010 rotator, RZ100 ballrace, cable, £40. 2m halo, £1. 2m Hi-Q break, £4. Two axial fans, 115V, £1. G4CHD, QTHR. Tel Cheltenham 53178.

Trio 7010 2m ssb, £140. Icom IC215 2m fm, 14ch fitted, comp with nicads/charger, helical whip, six months guarantee, £150. G8AVH, 30 Bedford Drive, Sutton Coldfield, West Midlands. Tel 021-329 2305.

Heathkit DX100, vgc, recently professionally serviced, £50. AR88LF rx, £40. Buyer collects. G3MLN, QTHR. Tel Chesterfield 3826.

TS700, vgc, £295. Liner 2 psu, £14. PCBs for p.e.p. meter, *QST* Dec '76, £1. Noise/gen, *Rad Com* Jan '76, £1.50. SD 306s, £1.85. G4DED, QTHR. Tel 086 75 2215.

Mosley Elan 10–15m, 3-el beam, one year old, £45. Hy-Gain 12-ACQ 10–20m vertical, £18. Technical Associates audio compressor, £12. Buyer collects. G3TTJ, 27 Oxendene, Warminster, Wilts. Tel Warminster 212779.

Pye Vanguard, incl cont box, mic, cables, S0 rx xtal, tx converted to fm, wkg well on 2m, £20. Buyer collects. Xtals: new HC6U, 8MHz R7 tx, £1.50; 72MHz tx, miniature S0 145·26, 145·4, S20 145·6, 145·7, £1 ea. Winters, 48 Stonor Road, Hall Green, Birmingham. Tel 021-745 2750.

BCC69 4m tx/rx (tunable), ac psu, mic, xtal, antenna, comp station, £8.50. Transistor portable rx, lw/mw/sw, 1·5–22MHz, £8.50. 100/10kHz calibrator, xtal and ic, £1.75. Neat 160m ssb tx/rx with 12V psu, needs attention, £14.50. 4m xtals (sae list), 50p. G2HCV, QTHR. Tel 01-954 2960.

Technical Associates audio filter, 2·5kHz to 80Hz bandwidth, switched, £16.50. Homebrew linear, 3XPL509, professional case, fan, £10. Minimitter MC8 converter, 160–10m, mains or battery, 1·5 MHz i.f., £9. G4DIB, QTHR. Tel 01-467 9033.

Resistors 0·25W high stability, carbon film, full length axial leads, five each of thirty well-spaced values 4·7Ω to 2·7MΩ, surplus from bulk order, 150 brand-new resistors, £1. D. J. Thwaites, 15 Springhead Road, Kemsing, Sevenoaks, Kent.

FR50B 10–80m, handbook, £70. Burton, G4CZD, QTHR. Tel Gravesend 61252.

HQ1 Minibeam, little used, £55. RTTY Creed 7TR3, reperf, £15. 6S5 Auto tx, £5. G4DUM, QTHR. Tel Crayford 526460.

Codar AT5, mains psu, 12V dc psu, unmarked, £30. Homebrew ham-band rx, incorporating "Q-fiver", £15. Weston E772 multimeter, £10. G3VW, QTHR. Tel 01-205 1443.

Sommerkamp FR100B amateur bands rx, exc cond, £80 ono. Or exch for good Liner 2, cash adjustment of course. G3SFO, QTHR. Tel 0302 770345, evenings.

Lafayette HA800 amateur bands rx, fm discriminator, £68 ono. Microwave Modules 2m converter 28–30MHz i.f., £10. Codar hf preselector, £6. Braemar 4-track spool tape recorder, mic and tapes, £12 ono. G8IFT, QTHR. Tel 021–453 4748.

Trio TS700G, ch R3, S20, S21, S22 fitted, comp with VOX-3 unit, only seven months old, little used, £350. G4CCH, QTHR. Tel Scunthorpe 0724 68180, 9am–6pm, ask for Howard.

"RSGB Bulletin", calendar years 1951–55 incl, and 1962–7 incl; *Radio Communication* 1968–73 incl, unbound, good cond, what offers? Jermyn inverter, charges 24V battery from mains and, when mains supply fails, automatically provides 300W 240V 50Hz square wave, exc cond, in wkg order, £55. Buyers collect. Kingston upon Thames area. Tel 01–942 1230.

OS2 'scope, £14. MK Products rtty demodulator, new tones, £40. *Wanted:* Eddystone 770R, E-Zee match, Datong clipper. G4DAT, QTHR. Tel Burnham (Bucks) 4749.

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Yaesu FT75B 80–10m mobile tx/rx, dc psu, nine xtals fitted, £170. 75Ω swr meter 50–500MHz, £12. Soligor 90–260mm zoom lens, £70. G4CGE, QTHR. Tel 0296 89611, office hours.

KW Viceroy, manuals, £65. G2DAF tx, £30; rx, £20; both with 898 dials. Avo No7, leather case, £20. Sig gen TF144G, £10. PM14/2M Parabeam, £16. Auto trans 110/220/240, weighs 26lbs, £5. New AR88 RCA manual, £2. G2AQJ. Tel Salisbury 25929.

Six 4CX250B valves and uhf airflow bases, £8 ea. QQVO640A valves and ptfe bases, new, £6. Two 12V 5Ah nicads, £6 ea. 28V 20A stabilized psu, new, £20. G8BSR. Tel 0952 460096.

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Urgent. Back copies of *Rad Com* in good cond: Feb 1972, Oct 1974, Dec 1974, Feb 1975, Mar 1976, July 1976; your price paid. G4AZC. Oakcroft, Kingston Lane, East Preston, Nr Littlehampton, Sussex. Tel 090 62 73145.

Any information on Advance sig gen, type D1. GW4EVJ, QTHR. Tel Clydach 843948.

Circuit diagram (buy or borrow) of "Oscilloscope Miniature CT52". Also back numbers *QST* and 73 mag. Kelman, 61 The Fairway, Oadby, Leicester. Tel 708585.

BC620 or BC659, comp with psu PE117. GM3PIP, QTHR. Tel Mintlaw 2319.

Majestic eight valve vintage domestic radio rx C1938, mains standing model (American made). Valve voltmeter, please state type. Wartime "spy" suitcase type hf tx/rx, wkg. M. Colmer, 26 Beech Avenue, Brentwood, Essex.

Commercial portable vhf tx/rx, wkg or not on 2m but must be high band, Ultra Cub or similar unit. WHY? Please write giving details and price. G4ANW, 16 Chestnut Drive, Broadstairs, Kent CT10 2LN.

Good price paid for Nems Clarke 1907 vhf rx manual or copy, or generous deposit paid for loan. Also manual for R-220 vhf rx, and valves 6688, 7077, 7868, 6DZ4. Fletcher. Tel Nottingham (0602) 397446, reverse charges.

Swansea University Club stn requires following items: two Creed 7E or similar teleprinters, three high band Pye Cambridges, and two bases and chimneys for 4CX250B valves. Contact secretary, J. O. Morris, 1 Hadland Terrace, Norton, Swansea SA3 5TT. Tel Swansea 68675.

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Instruction manual or handbook for Taylor valve tester, model 45C, loan or sale. G3WJK, 102 Old Farm Avenue, Sidcup, Kent.
National NC-120 rx, buy, beg, borrow manual or circuit for photocopy. Write M. G. Hayman, 66 New Road, Abbey Wood, London SE2 0Q6. Tel 01-310 7355, after 7pm.
HQ1 Minibeam; AR30/AR40 rotator, comp, or similar; Class D wavemeter; all in wkg order. Details, price, can collect. G8MPN, 19 Princes Gardens, Codsall, Wolverhampton. Tel Codsall 3509.
Datong UC/1 up-converter, must be unmodified. G3PEJ, QTHR. Tel 0723 70739.
S-meter for AR88D rx, good cond. Tel 01-749 3430.
B2 tx/rx, comp, first class cond, manual. Coleman, G5BH, QTHR. Tel 01-672 7592.
Tank capacitor from American TA12 WW11 tx, 360pf approx, urgently required. G3AMF, QTHR. Tel 01-989 9224, evenings.
Datong agile filter. Exch two c/b hand held dual channel superhet tx/rxs, 100mW o/p, 9V operation, mint cond, orig packing, suitable conversion 28MHz. G3UIE, QTHR. Tel 048 95 2108.
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Handbook for Hammerlund HQ145A rx, borrow or buy. GM8NGL. Tel 031-663 9071.
Telford Communications TC7 rx, wkg order. K. M. Brown, 165 Canterbury Road, Morden, Surrey SM4 6QG. Tel 01-648 0028, after 6pm.
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G-whip mobile antenna, must be comp. G4EGB, QTHR.
Ex-RAF World War 2 British airborne radio, radar equipment, circuits, publications; especially indicator units having 6in and 3in crts, comp or suitable for refurbishing. Strong, 58 Napier Road, Ashford, Middx. Tel Sunbury 87913.
Codar AT5 tx, in good cond. G8NSJ. Tel Walsall 25380, evenings.
Gen cov or amateur bands rx, Heathkit RA1 or similar. Details to Ellis, "Sundial Cottage", Brockhampton, Cheltenham, Glos. Tel Andoversford 523.
FP200, preferably grey. Keen, 112 Kirkleatham Lane, Redcar, Cleveland TS10 5DD. Tel 064 93 76945.
1966 or '7 ARRL *Radio Amateurs' Handbook* Vibroplex or similar bug-key, cheap B29 or similar rx. *For sale:* Photocopy handbook for 770R Mk2 rx, £1. G3AIO, QTHR. Tel Pembury 2836.
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HQ1 Minibeam. Also Z-match or atu. G4DBV. Tel 021-427 1684.
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Looking ahead

25 February—International VHF Convention, "Winning Post", Whitton, Middlesex.
2 April—NRSA Radio and Electronics Exhibition, Belle Vue, Manchester. Details from G8BCG or G4BVE.
5-6 May—RSGB Amateur Radio Exhibition, Alexandra Palace, London N22.

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144·030 ..	b	b	b	b	b	b	b	b	b	b	b	b	b	b
144·4/433·2 ..	a	b	a	b	b	c	b	c	b	b	b	b	b	b
144·480 ..	b	b	b	b	b	b	b	b	b	b	b	b	b	b
144·800 ..	b	b	b	b	b	b	b	b	b	b	b	b	b	b
144·850 ..	b	b	b	b	b	b	b	b	b	b	b	b	b	b
145·000/SO ..	a	a	a	a	a	a	a	a	a	a	a	a	a	c
145·050/R2T ..	a	a	a	b	b	a	b	a	b	b	b	b	b	b
145·075/R3T ..	a	a	a	b	b	a	b	a	b	b	b	b	b	b
145·100/R4T ..	a	a	a	b	b	a	b	a	b	b	b	b	b	b
145·125/R5T ..	a	a	a	b	b	a	b	a	b	b	b	b	b	b
145·150/R6T ..	a	a	a	b	b	a	b	a	b	b	b	b	b	b
145·175/R7T ..	a	a	a	b	b	a	b	a	b	b	b	b	b	b
145·200/R8T ..	a	a	a	b	b	a	a	a	b	a	a	b	a	b
145·300/S12 ..	b	b	b	b	b	b	b	b	b	b	b	b	b	b
145·350/S14 ..	b	b	c	b	b	b	b	b	b	c	c	b	b	b
145·400/S15 ..	b	b	b	b	b	b	b	b	b	b	b	b	b	b
145·500/S20 ..	a	a	a	a	a	a	a	a	a	a	a	a	a	c
145·525/S21 ..	a	a	a	a	c	a	a	a	b	a	a	b	a	b
145·550/S22 ..	a	a	a	a	c	a	a	a	b	a	a	b	a	b
145·575/S23 ..	a	a	a	a	c	a	a	a	b	a	a	b	a	b
145·600/S24 ..	a	a	a	a	c	a	a	a	b	a	a	b	a	b
145·650/R2R ..	b	b	b	a	b	b	a	b	b	a	a	b	a	b
145·675/R3R ..	b	b	b	a	b	b	a	b	b	a	a	b	a	b
145·700/R4R ..	b	b	b	a	b	b	a	b	b	a	a	b	a	b
145·725/R5R ..	b	b	b	a	b	b	a	b	b	a	a	b	a	b
145·750/R6R ..	b	b	b	a	b	b	a	b	b	a	a	b	a	b
145·775/R7R ..	b	b	b	a	b	b	a	b	b	a	a	b	a	b
145·800/R8R ..	a	a	a	a	a	a	a	a	b	a	a	b	a	c
145·95 ..	a	b	a	a	b	b	b	b	b	a	b	b	b	b

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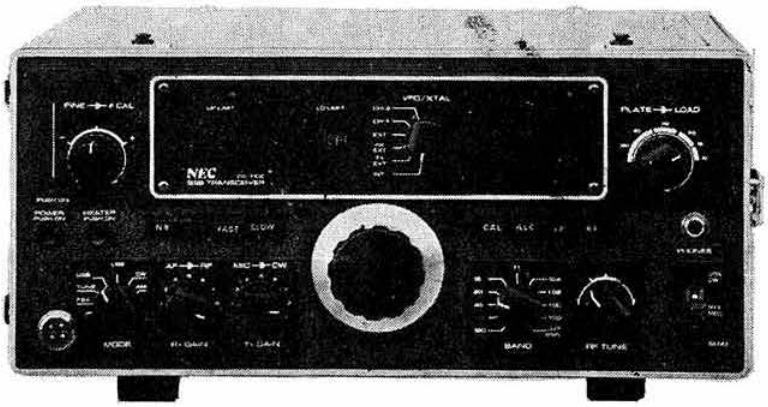
NEC  NEC

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Whether it is HF—VHF—or UHF we have a range of equipment to suit your purpose. We can supply a wide range of equipment from most of the world's leading manufacturers. It would be impossible in this space to advertise all the specifications of a quarter of the equipment we can supply. Send us 25p in stamps or P.O and we will forward you all the information you require. If it is just a general enquiry please forward SASE. Our mail-order service is one of the finest in the country. All orders of equipment in stock are despatched the same day. Terms are C.W.O. but we are pleased to accept order on receipt of your ACCESS or BARCLAYCARD number. We ship to all parts of the world, and would be pleased to quote air or sea freight cost on orders from overseas. We can arrange HP terms with a deposit of 20% and the balance payable over 8, 12, 18, or 24 months. We have a wide range of secondhand equipment which changes daily so it is rather difficult to print a list but a quick telephone call will confirm what is available at that date. All secondhand equipment carries a three month guarantee. Carriage is extra on most items but we would be pleased to quote. Some of the carriers who promise to deliver in 24 hours often don't and they are not immune to the fact that people do drop cartons.

Our range covers all the requirements of up to date Amateur activities. Transmitters, Transceivers, Receivers, Linear Amplifiers, Antennas, Test equipment, etc and you can find on our shelves equipment, some imported direct, by ATLAS—BELCOM—COMTEK—CUSHCRAFT—DECCA—DRAKE—CALLETTI—G. WHIP—HY-GAIN—JAYBEAM—MICROWAVE MODULES—NOVEL—OMEGA—CDR—S.T.E.—SWAN—TECHNICAL ASSOCIATES—TRIO—YAESU, to name a few.

Our location is such that we can be easily reached from North, South, East or West. Situated on the A574 just off the A580 (East Lancs Road). Turn at the GREYHOUND MOTEL and we are about ¼ mile on your right. NO PARKING PROBLEMS AT ANY TIME. We are 5½ miles from the M6 and 6 miles from the M62.
Shop hours are 9.30 to 5.30 Monday to Friday; 9.30 to 5pm on Saturday.

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TS820 HF Transceiver	£645.00
DG1 Digital read out option	£127.00
TS520 HF Transceiver	£432.00
TS520S HF Transceiver	£489.00
TS700S VHF Transceiver	£542.00
TR7500 VHF FM Transceiver	£225.00
PS6 Power supply	£57.00
TR7200 VHF Transceiver	£189.00
PS5 PSU with clock	£58.00
TR2200GX 3 channels	£139.00
TR2200GX 12 channels	£169.00
TR3200 70cm Transceiver	£182.00
TR8300 70cm Transceiver	£227.00
R300 General coverage receiver	£184.00

Crystals and accessories

YAESU

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FR101D Receiver	£399.37
FR101D Digital Receiver	£511.87
SP101B Speaker	£17.87

NOVEL New range.

SWR200B Switched 50-75 ohms SWR Meter 3-200MHz 2000 watts HF 200 watts VHF	£36.26
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Collins F455 FA150 RTTY Filter for 75S3B Rx	£45.00
Comtek 2 metre Linear Amplifier	£100.00
Drake R4C Receiver with 7 Broadcast crystals	£400.00
Drake R4C with 2 Filters & Noise Blanker	£475.00
Drake MS4 Speaker	£16.00
Drake T4XC Transmitter and AC psu	£225.00
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Heathkit SB230 Linear Amplifier	£325.00
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Trio TR7200G Transceiver	£130.00
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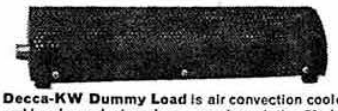

Decca-KW Dummy Load is air convection cooled and has been designed as a purely resistive 50 ohm load up to 30MHz. Power capability up to 1000W.

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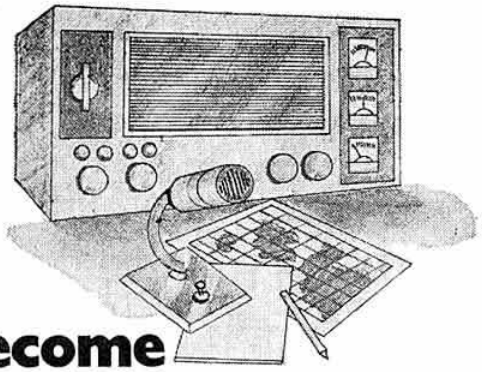

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SPECIFICATION

Frequency coverage:	432-434MHz (low range) 433·6-435·6MHz (high range)	Receive converter noise figure:	3dB maximum
		First oscillator:	101MHz or 101·4MHz
Selectable Offset:	1·6MHz	Second oscillator:	116MHz
Input frequency range:	144-146MHz	First if:	28MHz
Input modes:	SSB, FM, AM or CW	D.C. power requirements:	11-13·8 volts. 12·5 v nominal
Input drive for full output:	10watts nominal	Current consumption:	2·1amps peak
Power output:	10watts continuous rating	RF connectors:	50 OHM BNC sockets
Output impedance:	50 OHM	Power connector:	5 pin din socket
Relative 404/405.6MHz output:	Better than —65dB	Size:	187 × 120 × 53mm.
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Receive converter gain:	10dB typical	Price:	**£151 + VAT. (£169.88 inc. VAT)**

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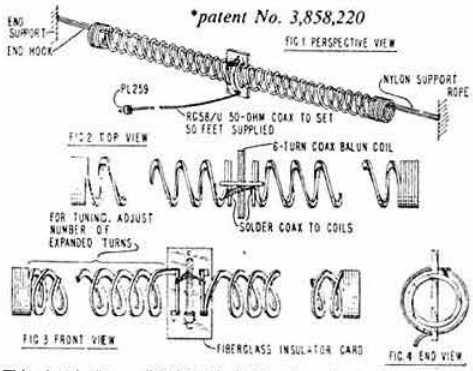

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radio communication

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