February 1978

radio communication

journal of the Radio Society of Great Britain

Dr Dain Evans, G3RPE, being installed by the retiring President as the 1978 RSGB President

RSGB PRESIDENTIAL INSTALLATION

House of Commons
London

21 January
1978

(Report next month)

Lord Wallace presenting a shield to the new President as a memento of the occasion

Lord Wallace addressing the gathering before the installation: In front, left to right: Lord and Lady Wallace, Marchesa Marconi (Marconi's widow), Dr Evans, Princess Elettra (Marconi's daughter) and Mrs Pam Evans

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radio communication

February 1978 Volume 54 No 2

CONTENTS

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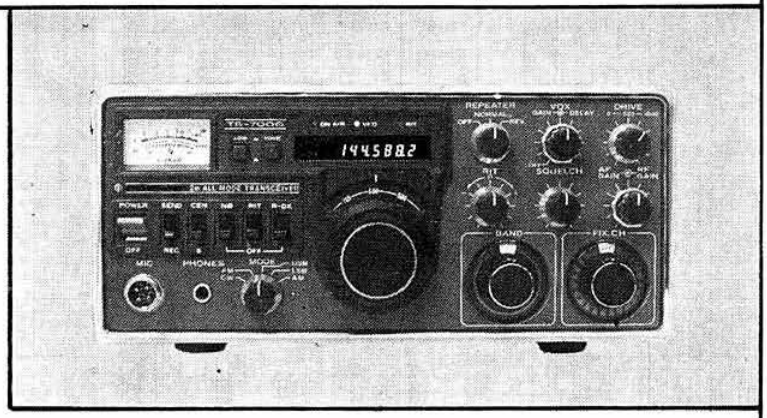


The TS700S, is intended to be the top of the line in 2 metre multi mode stations. TRIO have now incorporated all the facilities which customers have expressed a wish to see in the 700 series. Main new features are:

Digital readout
Built into the rig and using the same easy on the eye blue/green readout tube as the TS-820. The counter is a complete frequency measuring system and incorporates the VFO and carrier oscillator frequencies to measure the CW transmit/receive shift as well as USB/LSB shift. The display reads to 100 Hz on SSB and CW but is automatically rounded off to the nearest 1KHz on FM — However — if you insist on reading to 100Hz, the touch of a switch restores this facility on FM also.

Smooth accurate tuning
Using the new dual ratio gearbox with flywheel action for fast band scanning. It is true to say that nothing compares with a real VFO when it comes to pin point accurate tuning of SSB and CW.

Receiver pre amplifier
The TS-700S is fitted with a low noise switchable receiver pre amplifier with carefully calculated gain figures to give that extra performance when digging into the noise for real DX.

Vox operation
And break in CW using the built in VOX system. Front panel gain and delay controls allow adjustment to suit every situation.

Split frequency working
Using the new external VFO-700S. The frequency of the external VFO is checked by the readout on the TS-700S. Any frequency split or full transceive operation can be carried out using the external VFO. A unique accessory for the VHF operator.

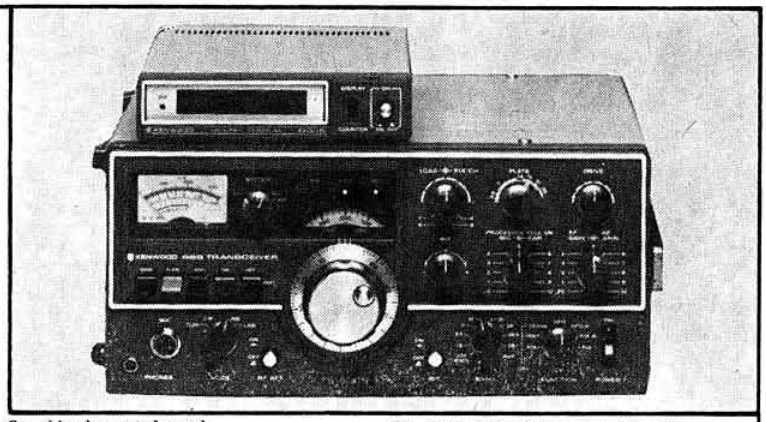
New standards of performance
On the samples which we have checked, the 10dB S/N ration sensitivity is around 0·15 μV on SSB and the 20dB quieting level is less than 0·2 μV on FM. This gives the TS-700S a real lead over any other rig around.

Plus of course all the features which make the 700 series so outstanding. Remember the signal quality resulting from the use of a high supply voltage on the PA and driver giving unbeaten linearity (TRIO) patent. Remember the rugged, go anywhere construction which makes the 700 series so popular on expeditions and field days. Remember the all mode (AM, FM, USB, LSB, CW) operation — not all rigs have them. Remember the Simplex/Repeater/Reverse repeater operation available at the turn of a switch.

Finally, remember the combined reputations of TRIO and Lowe Electronics and you will agree that for the ultimate 2 metre all mode station is has to be the TS-700S.

TS-700S £542 inc VAT. VFO-700S, £83

The new TS520S



The TS520S is the logical development of the TS520, the rig which has earned high praise from amateurs the world over. The TS520S keeps the main design features which made the TS520 a success but has an uprated specification which includes full 160 metre coverage, 15 MHz WWV and an auxiliary uncommitted band for possible future amateur frequency changes.

Outstanding receiver performance
Due to the use of a 3SK35 dual gate MOSFET RF amplifier which gives excellent cross modulation performance. The 3SK35 has a low noise figure (typically 3·5 dB) and high gain (typically 18dB). The result is that the TS520S has a receiver sensitivity better than 0·2 μV for 10 dB S + N/N ratio on all bands.

New speech processor
The TS520S incorporates a new audio compression system for extra punch in the pile ups and when the path is fading—and it does it without the distortion of clipping.

Vernier PA tuning
Slow motion tuning drive to the PA anode tuning control guarantees easy, accurate tuning at all times.

Effective noise blanker
The TS520S is fitted with an advanced noise blanker system for elimination of impulse and ignition interference. Just one of the de luxe features fitted as a standard item to the TS520S. The transceiver is also fitted with a 20dB attenuator selected by a convenient front pane push button.

AC power supply
The TS520S is completely self contained with a built in top quality AC power supply 100-240v. ac. The addition of the optional DSIa DC-DC converter allows mobile operation from any 12v. dc supply.

One thing has not changed
Trio excellent speech quality due to the use of a pair of rugged 6146B PA tubes. When we asked the Trio designers if they were considering a solid state HF transceiver, their relay was "when anyone can produce a solid state PA which can match the low intermod performance of proper transmitting tubes, we shall then produce a solid state rig. Until then, we prefer to keep our signals clean." They are only stating the facts that existing Trio owners know—that Trio signals sound outstandingly good on the air.

All the other features which made the TS520 so popular are retained—RIT control, 8 pole SSB filter, 25 kHz calibrator, separate carrier and mic gain controls, semi break in CW with keyed sidetone, VOX/PTT/MOX operation, low power tune up for long PA life, built in speaker, built in low noise cooling fan, fixed channel operation, etc., etc.

DG-5
A new digital readout unit, the DG-5 is available as an option, and in the TRIO tradition of doing the job correctly, the DG-5 mixes the carrier oscillator, VFO, and heterodyne oscillator frequencies so as to display the true operating frequency.

The DG-5 sits on top of your rig and shows the frequency in six large easy to read digits.

A unique feature is that the DG-5 can be used as a normal frequency counter from 100 Hz to 40 MHz at the touch of a switch.

TS520 owners
The DG-5 will also work with your rig using the DK 520 adaptor kit.

TS520S £489 inc. VAT. DG-5 £132 inc. VAT

LOWE ELECTRONICS LTD

DISCONNECTED RAMBLINGS

Every month I have the impossible task of trying to reconcile two opposing requirements, one the need to give adequate and correct details of particular equipment, the other to provide the reader with some idea of the wide range of amateur and professional equipment which we and our agents carry in stock. On this page, therefore, I shall simply ramble on about some of the wider range in an attempt to cover the second requirement.

NEW THINGS

We have in stock the new TD960 video display unit. Replacing and updating the well known TD224 system, the TD960 is much more than an RTTY video display. It can receive RTTY at 45, 50, 75 and 100 baud but in addition, operates in ASCII code at 110 and 300 bauds for data transmission, VDU use or as a terminal for microprocessor data. It will accept inputs, from current loops, TTL or different voltage levels and anything it can receive, it can also send. The AFSK RTTY generator is built in as is the UHF modulator system for the TV display.

The on screen display is as recommended by the BBC for domestic TV viewing i.e. ORACLE or CEEFAX and consists of 24 lines of 40 characters per line. It's really superb in use—it's all British made, and requires more space than this to describe—just ask us for details.

SRX-30 RECEIVER

For the keen short wave listener and the radio amateur who needs to tune around frequencies other than the amateur bands, the new SRX-30 is the one. This all new receiver covers the entire range of 500 KHz or 30 MHz in 30 bands and caters for AM, USB, LSB and CW reception. Using advanced drift cancelling techniques, the SRX-30 is *the* receiver for stable, trouble free listening. Housed in a rugged case measuring only 12¼" × 5¼" × 9" deep, the SRX-30 operates from 12Vdc or 100-240Vac and with its built in speaker, gives high performance, go-anywhere capability.

The SRX-30 brings a new high standard to low cost listening—at £152 including VAT, it has to be seen and used to be appreciated—ask for full details now.

VHF/UHF OPERATORS

After you have erected your shining new beam and connected the shining new coax, have you wondered where your signal is being lost? That's right—in the feeder. Current thinking suggests using mast-head preamplifiers to boost the signal at the aerial feed point before pushing it down the coax but of course you need some smart switching arrangements to ensure that when you stick RF back up the feeder from the TX, you bypass the preamp, otherwise that puff of white smoke from the mast-head may tell you either (a) the new Pope has been elected or (b) you've just done in your preamp.

From Daiwa, who are well known for top quality RF products, we are now stocking their range of mast-head preamps for 2 metres and 70cm. Models are available which include mast-head selection of two aerials and a top of the range model which gives gain in both receive *and transmit* directions with a built in linear.

If you want to be ahead with your DX chasing, mount a head amplifier by DAIWA on your mast. Send for full details *NOW*.

For the lower frequency bands, many operators have problems involving long aerials and short gardens. We can help out by offering the range of RAK trap dipoles. These top quality aerials cater for all sorts of requirements and include the AL48DXN giving 2KW rated 80/40 m operation in only 23 metres overall length for around £25, the MIDY VN which gives 80-10m coverage at around £40, the superb LISTENER 3 which is designed for the advanced SWL and is complete with feeder, support ropes etc at around £25 and other models down to about £10.

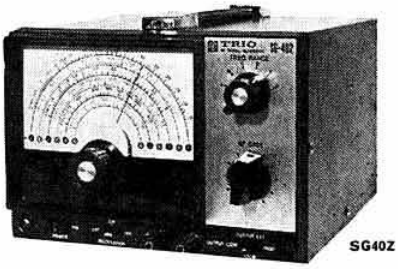
Why bother struggling to find wire and insulators when you can find RAK quality at these prices?

TEST EQUIPMENT

We've been creating quite a stir in the oscilloscope field recently with the professional series of dual trace models from Trio. Three scopes having bandwidths of 10 MHz, 15MHz, and 30MHz complete with two matching full bandwidth X10 probes at prices starting from £250 constitute the best sellers at the moment. For the radio amateur, there is The CO1303D 5MHz bandwidth workshop oscilloscope at £108 inc VAT and the same instrument with RF pickup and two tone oscillator for station monitor use at £129 inc VAT.

Also for the amateur, the DM800 dip meter has sold like mad—in fact the first shipment vanished in a week. Far more than a normal GDO, the DM800 can be used as a signal generator, xtal activity checker and is a first class instrument for many, many purposes.

CO1303D



SG40Z

We should by now have the AG202 and SG402 matching AF and RF signal generators for general purpose shack use. Very neat and compact in matching cases to the 5MHz scope, these two units complete the well equipped workshop or shack—ask us for details.

We also stock every possible accessory from plugs and sockets upwards but it's impossible to list them all. If you send 55p in stamps to Matlock and request our short form catalogue and price lists, you will receive an invaluable reference book of our products—do it *NOW*.

HEAD OFFICE:
119 Cavendish Road, Matlock, Derbyshire. Tue-Sat. 9am-5.30pm. Telephone: 0629 2430 or 2817 9am-9pm Telex 377482.

BRANCHES:
Communications House, 20 Wallington Square, Wallington, Surrey, SM6 8RG. Telephone: 01 669 6700—closed Mondays and Saturday afternoons.
27 Cookridge Street, Leeds, Yorkshire, LE2 3AG. Telephone: 0532 452657—closed Mondays.
Soho House, 362-364 Soho Road, Handsworth, Birmingham B21 9QL. Telephone: 021 554 0708—closed Mondays.

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Sim—GM3SAN, 19 Ellismuir Road, Baillieston, Nr Glasgow. Telephone: 041 771 0364 (evenings and weekends)
Alan—GW3YSA, 36 Pen Y Waun, Efail Isaf, Nr Pontypridd, Glamorgan. Telephone: Newton Llantwit 3809 (evenings and weekends).

SEND ONLY 55p IN STAMPS AND REQUEST SHORT FORM CATALOGUE

Your Route to 70cm Repeater Operation

We are extremely happy to announce a new version of our 144MHz to 432MHz double conversion linear transverter, the MMT432/144R.
The MMT432/144R, based on its predecessor, features a 1·6MHz shift, specifically included for U.K. repeater operation.

The 1.6MHz shift is achieved by the inclusion of two separate local oscillators, (101MHz and 101.4MHz), which produce two ranges at 70cms, (LOW RANGE: 432-434MHz, HIGH RANGE: 433.6-435.6MHz), both for an IF of 144-146MHz. The switching of these ranges, which is accomplished by appropriate linking of the 5 pin DIN power plug, may be wired to allow standard repeater operation, reverse repeater operation etc.
Please note that a suitable toneburst signal must be generated by the 144MHz transceiver to allow repeater access.

FEATURES

- ★ 1·6MHz repeater facility or simplex
- ★ Highly stable regulator-controlled crystal oscillator stages
- ★ Pin diode aerial changeover relay with less than 0.2dB through-loss
- ★ Extremely low noise receive converter
- ★ Built-in automatic RF vox with override facility
- ★ Separate internal PA compartment ensures excellent electrical and thermal stability
- ★ Use of latest state of the art power amplifier transistors provides reliable 10 watts continuous power output

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.
Other spurious outputs:	Better than —65dB	Weight:	975g.
Receive converter gain:	10dB typical	Price:	**£151 + VAT. (£169.88 inc. VAT)**

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BROOKFIELD DRIVE, AINTREE, LIVERPOOL L9 7AN
TELEPHONE: 051-523 4011. TELEX: 628608 MICRO G

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

YAESU

proudly announces a new synthesised 2m FM transceiver FT-227R

The world famous Yaesu state-of-the-art technique has brought computer theory into VHF communications.

What are the frequency splits for repeaters? Don't worry! Yaesu has computerized it. In addition to a conventional ± 600kHz split, any transmitter offset frequency is memorized with a touch of a push-button.

What was my last frequency channel? Don't check! A touch of a push-button will bring you back to the memorized channel instantly.

Why only one knob to select a channel out of 800 channels? Yaesu utilizes a "OPTICAL COUPLING" system to select each channel in 10kHz steps and the channel may be offset 5kHz higher with a touch of a push-button. Thus 800 fully synthesized channels are provided with one knob and no rotary switches to get oxidized and noisy.

When will the FT-227R be available? NOW !

Many, many other features such as automatic encoder-decoder for tone guarded squelch (TGS) (optional). Tone burst accessed repeater operation, automatic final protection, busy channel indicator, high-low out-put selection, diecast front panel, and famous Yaesu quality throughout!

And all at a most attractive price. See your dealer today for an informative catalogue.

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,
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PAUL G3VJF

ICOM FOR QUALITY

OFFER A SUPERB RANGE OF TRANSCEIVERS FOR THE SPRING

Apart from the IC-701 all are available ex-stock and delivery is free

IC-240 Think of the features you would instal in a mobile to provide a combination of optimum usefulness AND SAFETY. You will probably come up with the following requirements:

1 Easy channel selection with minimum knob twiddling—yet with all the normal FM channels available.
2 A fully automatic tone burst which operates only in repeat mode with NO buttons to press either on the front or on the back of the set.
3 Instant reverse repeat at the flick of a switch without any re-tuning or memory programming.
4 A very sensitive receiver with a spurious response performance far better than the average and a very clean transmitter with excellent clear, crisp modulation.
5 A reasonable price—but (more important) a quick, reliable after sales service.

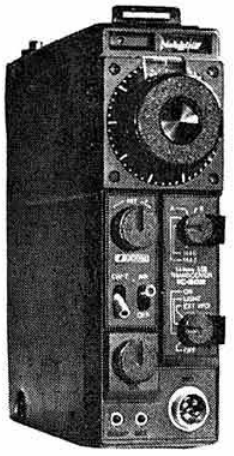
COMPARE THIS LIST WITH PREVIOUS ADS FOR VARIOUS TRANSCEIVERS AND YOU WILL SEE THAT THE 240 WINS EVERY TIME:

IC-240

alone
£179 inc. VAT

IC-202

£162 inc. VAT



◀ IC-202

IC202 The 2m SSB/CW portable which is clean enough to use as a prime mover to drive a linear. The VXO gives continuous coverage over the ranges 144·0-144·2 and 144·2-144·4. The coverage can be extended with extra crystals switchable from the front panel. This is the ideal set to buy if you are thinking of sampling the delights and advantages of SSB on 2m as it gives full coverage of the SSB and CW portions of the band with easy, continuous tuning.

Now available ex stock, delivered free for **£162 inc VAT.**

IC-215

£149 inc. VAT and delivery

IC-215 ▶

IC-215 By far the best 2m FM portable on the market—with more power (3W) than most and batteries some 4 times as big thus giving a reasonable period of operating use. Add to this the superb, clear modulation for which ICOM are so famous and a good receiver, plus a solid, reliable construction and you have really good value for money.

Total channel capacity = 15
Channels fitted = 9 (S20, S22, R3, R4, R5, R6, R7, R8, R9)

Now available at the special offer price of **£149 inc VAT and delivery.**

AGENTS (PHONE FIRST—All evenings only except Norfolk and Burnley)

London—Terry G8BAM (01-556 9366) **Scotland**—Ian GM8DOX (078683 3223) **Norfolk**—Ted G3FEW (05088 632) **Wales**—Tony GW3FKO (0222 702982) **Burnley**—(0282 34841) **Midlands**—Tony G8AVH (021 329 2305) **North West**—Gordon G3LEQ (Knutsford (0565) 4040)

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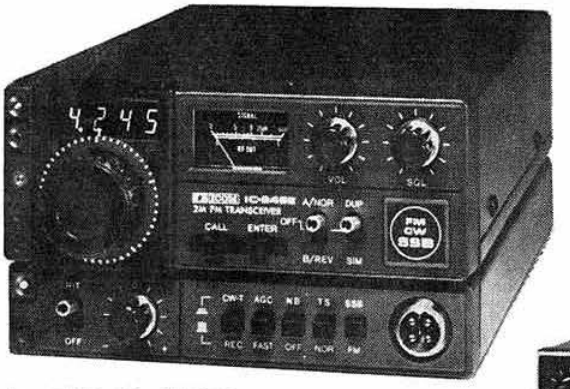


IC-211E ▼

£529

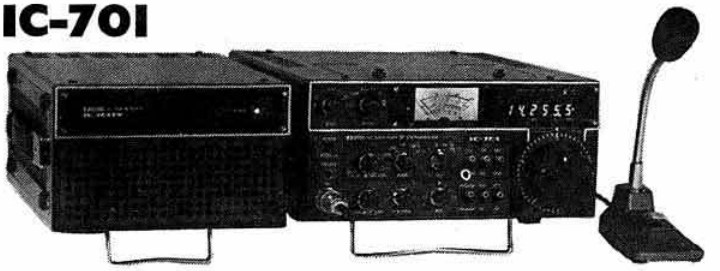
Giving you FM/CW/USB/LSB, all produced from the amazing ICOM synthesizer and patent LSI chip. Frequency read out is to the nearest 100Hz and it is amazingly stable and accurate. You can use the two frequency stores as separate VFOs or for any repeater shift required. The tone burst is automatic, of course, and reverse repeat is available at the flick of a switch. Add a keypad (we will give you the circuit to make your own or you will be able to buy one shortly) and find a new facility which is quite impossible with old-fashioned rigs. The original waiting list has now been dealt with and you can now have one from stock.

▲ IC-245E

£396

This truly amazing little box gets you mobile on FM, USB or (if you really think it a good idea) CW! The synthesizer is the same as the IC-211E and can be tuned to the nearest 100Hz, again with amazing accuracy. Of course such a versatile little box will often be used as a base station and facilities such as keypad operation can be added. They are now ex-stock—but only just!

IC-701



The HF rig to beat them all, which will be available in the spring to those who have their names on the list. *All solid state including the finals. *100W RF output Continuous Duty on All Bands, All Modes. *All bands 1·8-30MHz. *USB, LSB, CW, CW (narrow), RTTY. *Double balanced Schottky Diode mixer used in both Tx and Rx. *Fully synthesised with Digital readout to 100Hz and two stores to enable split frequency operation. *ICOM's unique band-pass tune. *VOX, Semi-break-in CW, RIT, AGC, Noise Blanker. *Built-in RF speech processor. *Extremely compact. *All filters builts in. *12V or mains operation. *Electret desk mic.
After having used this rig for several weeks on the air we think that it is definitely the nicest HF rig we have ever used.

INTRODUCING A NEW RANGE OF MICROPHONES BY LESON. For the time being available only from Herne Bay.
All these are suitable for ICOM transceivers and have a PTT switch and a frequency response 300-2500Hz. They are NOT fitted with a plug.

MODEL	TYPE	BUILT-IN AMPLIFIER	IMPEDANCE	PRICE (inc VAT)
TW232	Ceramic Desk mic with PTT, Lock sw and gain cont. Silver grey finish	Compression amp 0-30dB var.	<4·5K	**£25.00**
DH-218	Moving coil dynamic. Hand held	NONE	500Ω	**£4.99**
DH-233	Moving coil dynamic. Hand held	Pre-amp 0-15dB var.	<3·5K	**£9.00**
CH-229	Ceramic noise cancelling. Hand held	Compression amp 0-35dB var.	<5K	**£15.00**

Post and packing **50p** in all cases. Gain controls are external in all cases

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South Midlands

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2-YEAR GUARANTEE

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FT901 HAVING EXHAUSTED OUR STOCKS OF SUPERLATIVES LAST MONTH SUMMARY OF SPECIFICATIONS SHOULD SUFFICE TO STIMULATE YOUR SALIVA: 160–10m (+ WWV RX). 12 & 234V (PSU Built in). SSB, AM, CW, FSK, & FM (TX & RX). 180WPIP, 80WF 1. Analogue 1 kHz and Digital to 100 Hz. Sensitive, ½μV with AGC controlled Mosfet RF to push pull FET RF, Balance active mixer, push pull i.f. amp to crystal filter then noise blanker. Overlapping filters give continuously variable selectivity 300 Hz to 2·4 kHz and fixed 600 Hz, 2·4 kHz, 6 kHz and 12 kHz (@ 6dB). 80 dB cross mod. rejection, 90 dB desensitisation immunity (@ 20 kHz off @ 14 MHz). Audio Peak and separate notch tuning. Negative RF feedback on 6146B toroidal tuned output stage (—31 dB 3rd order). RF processor, VOX, Curtis electronic keyer, tune button (10 sec. on full power). PLL VFO with memory for any TX, RX or T/RX frequency. Modular plug-in construction, permeability tuning (for possible new band allocations) 25 kHz calibrator, 20 dB switchable attenuator, sidetone, clarifier, advance noise blanker are all features of the FT901—The 1980's Transceiver available from SMC next month. Coming shortly are the matching VHF transverters and phase lock loop synthesized external VFO with scanning facility.

FT901DM

The FT7 Mobile or QRP Base Tranceiver

This is a 10–80m. transceiver, VFO controlled (to 1 kHz accuracy) plus crystal control facility. Selectable sidebands. CW, crystal calibrator clarifier and an advanced noise blanker are some of the features packed into a cabinet only a few inches high, but through careful design the front panel remains remarkably uncluttered. Designed for a linear 10W. output consuming only a few amps it eliminates 30A cables from the passenger compartment and the cooling problems of a massive heat sink. Need more power? Flick in a FL110 (a 200W PIP linear) installed in any suitable place in your car.

THE FT101E complete HF station—Ex-Stock

The FT101E. A complete mains or 12V. DC station contained in a compact 30lb. package, 260W, PIP of SSB (with in-built RF speech processor) 180W. CW and 80W or AM 10 to 160m (inc. 10MHz RX). The sensitive and selective (permeability tuned RF stages and 8 pole crystal filter) receiver offers: threshold adjustable noise blanker, switchable 25 and 100kHz calibrator, ± 5k clarifier (with separate on/off switch), etc., etc.
The VFO is stable and linear (readout to 1kHz), external VFO or crystal control can be selected, with LED indicators illuminated accordingly. Carrier level is adjustable for: tune up, AM and for CW operation, whose performance with the semi break-in keying, with side tone, and the optional filter installed is of a high order. Linear and transverter provisions are made with sockets for: relay contacts, ALC output, all internal HT supplies, low level RF heater links and switches, etc., etc.

Service manual for FT101 Series £12.00 (No VAT p & p free)

FT101E

FRG7 Digital or Analogue

The FRG7 is a general coverage solid state receiver with specifications unparalleled in its price range. It uses a Barlow Wadley Triple-mix, drift cancelling loop for continuous, spin-tuned inclusive coverage of 0·5 to 30MHz.

The receiver is sensitive (0·5μV for 10dB, S + N/N(SSB)) and stable with A.M., SSB and CW modes catered for. A 3 position audio filter, RF attenuator, dial lamp conservation switch, recorder and phone sockets are fitted. It is mains powered, but should the supply fail, or portable operation be required, 8 dry cells are automatically switched in.

FRG-7 Analogue Readout £145 + VAT **SMC COUNTER £50 + VAT**

FRG-7 Digital Readout £199 + VAT **YH55 Headphones £8 + VAT**

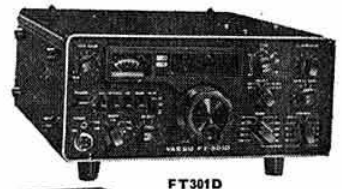
FRG7

The SMC, full specification, internally mounted counter (easily installed in existing receivers) provides: a 100Hz readout (100 fold improvements), flashing + digit (to indicate VFO overrange) and adjustable gate time.

THE FT301 EX-STOCK IN TOTTON

The new FT301 transceiver range (with options installed) offers: Full solid state 12V DC working, external matching mains power supplies with speaker, and an external VFO are available. Plug in boards 160-10m in 500kHz segments, MSF and CB receive, RF speech processor, noise blanker, front panel controlled VOX (with MOX) and PPT, semi break-in keying with side tone, clarifier with separate switch, 11" × 5" × 13¼", 25 kHz crystal calibrator, internal or external speaker.

FT301 100W Analogue
FT301S 10W Analogue
FP301 AC PSU 12V
FT301D 100W Digital
FT301SD 10W Digital
FP301D PSU & Clock etc.



FT301D

YC301 MATCH POWER METER

FL110 ALL BAND LINEAR AMP

YO301 MONITOR TX & RX SCOPE

FOR NEW 23 PAGE STOCK LIST, YAESU CATALOGUE, ETC. (A4) SAE OR 30p STAMPS.

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GW3TMP	Pontybodkin (035287) 845	Howarth Jones
GI3WWY	Tandragee (0763) 840656	Mervyn Anderson

Communications Ltd

OF PROFESSIONAL EXPERIENCE

YAESU

THE NEW FM2015R FROM KYOKUTO DENSHI

EX STOCK ONLY £245 + VAT

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 tripleverter) 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.

FOR VHF MOBILE THE FT227R

The new FT227R uses a 'single knob' tuned digital synthesizer employing a photoelectric sensor for an optical system which eliminates both noisy, unreliable rotary switches, and crystal banks.
Full coverage of 2 metres in 5kHz divisions with a ±600kHz shift plus a memory feature which permits recall of any entered frequency or particular offset.
Bright, large, digital readout gives unequivocal readout of the frequency in use. The receiver offers 0·3μV (for 20dB S+N/N) sensitivity into a ±6kHz (at 6dB) band width whilst maintaining a remarkable immunity to overload and image problems. The 20W DC input transmitter features Hi/low power outputs, AFP, tone burst on repeaters and an out of band inhibition trip etc.

F227R

FT221R

The FT221, complete 2m station—Ex Stock

The FT221. The multimode USB, LSB, AM, FM, CW (with semi-break in and side tone), 2m. transceiver offering the choice of phase locked VFO or 44 crystal channels, simplex or repeater (600Hz up and down shifts), with unique "double push" auto tone bursts, mains or 12V (3A) operation, excellent selectivity SSB 2·4kHz (1·7 : S.F.) or FM 12 kHz. Front panel adjustable VOX and mic gain, a calibrator (1 MHz ÷ 10), 1 kHz readout and linearity, sensitive squelch, clarifier with IRT and IRT with ITT (makes F.S.K. easy), switchable "S" and centre zero tuning meter, noise blanker, serviceable plug in boards all contained in 11½" (14) × 5" × 11½", 22 lb. rigid package.
600 kHz and 1·6 MHz shifts over 4 MHz.

YC221 digital readout unit—Ex Stock £72-50 (+8% VAT)

New service manual for the '221 series £8.00

JAYBEAM 70(4m), 144(2m), 432(70) (Carr. £1.25) VAT 12½%

D5/2m 5 over 5 slot feed	£12.10	PBM10/2m 10 ele. Para	£22.55
D8/2m over 8 slot feed	£16.20	PBM14/2m 14 ele. Para	£27.70
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5XY/2m 8 ele. crossed	£17.70	PBM18/70 18 ele. Para	£16.50
10XY/2m 10 ele. crossed	£23.40	MBM48/70 46 ele. Multi	£19.25
5Y/2m 5 ele. yagi	£6.85	MBM88/70 88 ele. Multi	£25.75
8Y/2m 8 ele. yagi	£8.80	12XY/70 12 ele. crossed	£26.40
10Y/2m 10 ele. long yagi	£18.95	4Y/4m ele. yagi	£11.25
14Y/2m 14 ele. long yagi	£24.25	PMH/70 2 way harness	£5.25
Q4/2m 4 ele. yagi	£14.50	PMH2/C Circ. phasing	£4.50
Q6/2m 6 ele. quad	£19.30	PMH2/2m 2 way harness	£6.05

BANTEX VHF WHIPS (Carriage 90p) VAT 12½%

BGA FG 2m. fibreglass	£8.75	B5U ½ 432 MHz	£5.00
70½, ½ 70 MHz fibreglass	£4.00	UCL Mid loaded	£8.00
144½ ½, 145 FG or S5	£3.50	TLM Trunk lip mount	£5.75
B5 ½ 145 MHz FG	£7.20	MB Magnetic base	£9.05
BGA SS 2m. s/less steel	£8.50	Unwanted base deduct	£0.50

COAX PLUGS (Post and Packing extra) VAT 8%

PL259 Standard UHF plug	£0.48	SO239 4 hole socket	£0.40
UG175 Reducer UR43/76	£0.12	258 Back to back female	£0.80
UG176 Reducer UR70	£0.12	Back to back male	£1.20
PL259R Fix reducer plug	£0.56	"T" Adapt (2FIM)	£1.20
PL259S "Solderless' UR76	£0.51	"T" Adapt (3F)	£1.18
PL259S "Solderless" UR67	£0.51	Angle 90° (IM + IF)	£0.90

HY GAIN HF RANGE (Carr. extra) VAT 12½%

BN86 1 : 1 ferrite Balun	£12.50	TH2MKIII 10-20m 2 ele.	£104.50
103BA 10m 3 ele.	£48.50	TH3JNR 10-20m 3 ele.	£108.00
153BA 15m 3 ele.	£59.75	TH3MKIII 10-20m 3 ele.	£149.00
203BA 20m 3 ele.	£111.95	TH6DXX 10-20m 6 ele.	£179.00
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SMC TRAPPED DIPOLES (Post 45p) VAT 12½%

S 500W P.I.P. 14 SWG	£19.60	P500W P.I.P. Cu/Terylene	
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TA33 3 ele. 200W R.M.S.	£95.00	TA32 2 ele. 300W A.M.	£64.00
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GEM QUAD FIBREGLASS QUAD (Carriage £2-£9) VAT 12½%

GQ3E 2 element	£119.00	GQ4E 4 element	£238.00
GQ3E 3 element	£178.00	CK1Q 1 ele. Conv. kit	£66.00

G WHIP HF MOBILE (Carriage 90p) VAT 12½%

Tribander 10-20m (+ LF)	£17.50	LF40, 80 or 160	£5.25
Multimobile 10/20 (+MM)	£20.52	MM40, 80 or 160	£5.25
Flexiwhip 10m (+ FF)	£10,00	FF15, 20, 40, 80 or 160	£5.25
Basemount ¾" hole mount	£3.00	Telescopic whip for coils	£2.00

TELOMASTS

10' telescope heavily galvanised steel mast supplied with guy rings etc. or c/w full rigging kit.
Carriage £2-£7 ex-stock VAT 8%
30' £25.00 or £43.85 c/w rigging
40' £32.50 or £56.85 c/w rigging
50' £42.00 or £74.50 c/w rigging

HAMTOWERS

Ex Stock in Totton

Galvanised lattice 10' sections. Free standing with climbing steps.
Carriage £3-£20 ex-stock 8% VAT

30' c/w base grillage	£192.35
40' c/w base grillage.	P.O.A

TELETOWERS

Ex Stock in Totton

Carriage and rigging (RK) extra

42'	£121.00 (RK £28)
57'	£174.00 (RK £28)
79'	£224.50 (RK £49)
101'	£303.50 (RK £76)

VERSATOWERS*

New improved models.
(Illustrated right. Also see below.)

Standard P40	£212.00
Standard P60	£252.00
Heavy Duty P40	£286.00
Heavy Duty P60	£333.00

NOTE LOW PRICES

*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 and cheap installation often without resort to concrete.

Access

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FDK MULTI-800D

24 WATTS FM

144-148MHz

AUTOMATIC TUNING

NON-VOLATILE MEMORY

Here's FDK's latest contribution to the digital synthesized revolution. The FDK Multi 800D. 25 watts of dynamic power to cut through the QRM and get to places other rigs can't reach!

The 800D covers all channels 144 to 148MHz in 5kHz segments and there is no guessing what frequency you are transmitting or receiving on. The bright LED display always gives a true frequency readout. We won't bore you with meaningless comparison tables slanted at the rig the advertiser is trying to sell. Instead we'll give you the facts and let you judge for yourself!

If you want to transmit on 145·50 you simply dial 145·50. No confusion, no channel numbers (C.B. operators may find this difficult!) just the plain frequency readout. It may be old fashioned, but try writing S20 under the frequency column of your log book and see what comments the MPT have to make! For repeater operation simply switch to 600kHz and dial up the repeater output frequency—i.e. set rig to 145·750. Reverse repeater? All you need is the flick of a switch from 600kHz to + 600kHz.

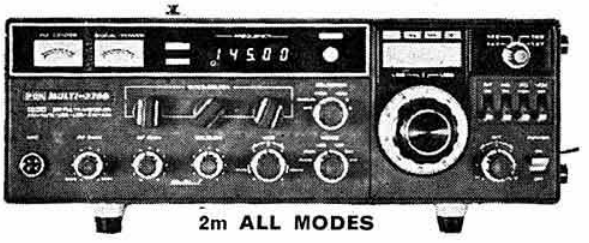
Immediately the display changes to 145·150 and you are monitoring the input channel —and what happens when you press the Tx button?—yes you've guessed it—display reads 145·750. Simple, straightforward and logical.

So what about all this fuss over knob twiddling! On the Multi-800D you don't have to. Tuning is automatic. There is a manual position followed by three speeds of electronic tuning. You can literally QSY from 144 to 146 in a second or so, or alternatively take a leisurely stroll across the band at approx. 10kHz per second. And to assist tuning an audible bleep is emitted every time a 100kHz point is passed, this is particularly helpful when using the fast QSY tuning rate. Oh yes, and the tone-burst is automatic but can be switched out by a front panel control, likewise the power output is continuously variable from 1-25 watts via a front panel control. Finally, the Multi-800D retains its memory even when switched off!

PRICE £239 inc vat & delivery

REMOTE CONTROL DISPLAY £15 inc vat & delivery

FDK Multi-2700 Mk II



2m ALL MODES

There are two types of all-mode 2-metre rigs on the market—the budget rig with its no nonsense bare essentials and the deluxe rig with its many extras that make operating that much more pleasurable. Without doubts the Multi-2700 falls into the latter classification but at a price that is remarkably low compared with its competitors—in fact it is true to say that if we charged you for all the extras the price would be prohibitive. If you want the full story on the Multi-2700 simply send a 7p stamp for the 4 page brochure. But here listed are just a few of its features: 144-146 MHz (143-149MHz on Receive) 16 watts output, vox, IRT, APC, speech compressor, dual VFO control, VCO, synthesized channel switching or analogue vfo, high/low power, FM/SSB/CW/AM/ noise blanker, variable AGC, pre-amp, OSCAR receiver converter, 230 volts AC/ 12 volts DC, LED readout, RF gain control, separate FM/ SSB microphone gains, ALC, variable compression, antivox, variable delay, 100kHz calibrator, squelch, plus or minus 600kHz repeater shift, 1·6MHz repeater shift, microphone, cables, English manual and even a log-book!

In the past 12 months the Yen has risen by no less than 23% against Sterling and yet the price of the Multi-2700 still remains at **£489.** The moral must be buy now—there are some price increases round the corner!

FDK QUARTZ-I6

2m FM £149.75 inc. VAT (fitted 7ch)

NEW LOW PRICE

If ever you needed an excuse to purchase a 2-metre rig for the car here it is. We've managed to negotiate a special deal with our factory in Japan. The result? . . . £149's worth of engineering that even amazes the most critical purchaser for its sheer value and performance. If you still need convincing then thumb through some of the past couple of years' advertising to see when a 2-metre FM rig could be bought for less than £150! The latest factory fresh shipment has just arrived so here's your chance to make the biggest saving of 1978! And here's a prediction too: many of you will look back at this advertisement in a few months' time and be glad you purchased your rig at such an incredibly low price—just a few will regret they hesitated and found the price had risen!

So what do you get for £149?—12 watts FM, 25 channel capability (SO, S20, R3, R4, R5, R6, R7 fitted) 2 priority channels, true S and R channel readout, channels fitted indicated light, Automatic protection circuit, microphone, quick release mobile mount, DC power lead, hardware etc., a 12 months' guarantee and free delivery (channels S21/22/23 available at £7.50 inc. VAT)

OTHER MODELS IN STOCK: 2m Multi-II Auto-scan **£199.68** (fitted 10ch). 70cm U-II **£219** (2ch), **£249** (10ch)

ELECTRONICS

TELEX 897406

FAST MAIL ORDER SERVICE

FDK

MLA-2500

DenTron Radio has packed all the features a linear amplifier is supposed to have into their new MLA-2500. Any Ham who works it can tell you that the MLA-2500 really was built to make amateur radio more fun.

DenTron 160-10m 2000W PEP

£695 inc vat.

- ★ ALC circuit to prevent overloading
- ★ 160 thru 10 metres
- ★ 1000 watts DC input on CW, RTTY or SSTV Continuous Duty
- ★ Variable forced air cooling system
- ★ Self-contained continuous duty power supply
- ★ Two EIMAC 8875 external anode ceramic/metal triodes operating in grounded grid
- ★ Covers MARS frequencies without modifications
- ★ 50 ohm input and output impedance
- ★ Built-in RF wattmeter
- ★ 117V or 234V AC 50-60 hz
- ★ Third order distortion down at least 30 db
- ★ Frequency range: 1·8MHz (1·8-2·5) 3·5MHz (3·4-4·6) 7MHz (6.0-9.0) 14MHz (11·0-16·0) 21MHz (16·0-22·0) 28MHz (28.0-30.0)
- ★ 40 watts drive for 1 KW DC input
- ★ Rack mounting kit available (standard 19" rack)
- ★ Size: 5¼" H × 14" W × 14" D. Weight: 47 lbs.

DENTRON 160-10M 3KW TUNERS ALSO AVAILABLE.

PROMPT DELIVERY — **JUST PART OF OUR STOCK** — **FRIENDLY ADVICE**

JAYBEAM VHF/UHF ANTENNAS

4M ANTENNAS

4Y/4M 4 el. yagi	£12.65 (£2·00)
PMH2/4M 2 way harness	£8.35 (75p)

2M ANTENNAS

C5/2M 5dB colinear	£30.95 (£2·00)
5Y/2M 5 el yagi	£7.70 (£1·00)
8Y/2M 8 el. yagi	£10.00 (£1·00)
10Y/2M 10 el. yagi	£21.32 (£1·50)
PBM 10/2M parabeam	£25.37 (£1·50)
PBM14/2M parabeam	£31.16 (£2·00)
5XY/2M 5 el. x'd yagi	£15.97 (£1·50)
8XY/2M 8 el x'd yagi	£19.91 (£2·00)
10XY/2M 8 el x'd yagi	£26.33 (£2·00)
PMH/2C Circular harness	£5.00 (50p)
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D8/70cm. 8 el. slot	£15.47 (£1·50)
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MBM48/70cm. Multibeam	£21.65 (£2·00)
MBM88/70cm. Multibeam	£28.97 (£2·00)
12XY/70cm. 12 el. x/d yagi	£29.70 (£2·00)
PMH2/70cm. harness	£5.90 (50p)
PMH4/70cm. harness	£12.26 (£1·00)
C8/70cm. 8dB colinear	£39.37 (£2·00)

1296 MHz ANTENNAS

D15/1296 Yagi	£23.06 (£1·00)

CHIMNEY KIT

DL lashing kit (Heavy duty)	£8.20 (£1·50)

WALL BRACKETS

W6 6" wall bracket	£2.59 (£1·00)
W21" wall bracket	£10.15 (£2·00)
W24HD 21" wall bracket	£14.58 (£2·00)

STATION ACCESSORIES

Shure 201 hand mic 50K	£11.25	(50p)
Shure 444 desk mic 50K	£25.50	(75p)
Shure 526T desk mic variable	£31.00	(75p)
Yaesu 844 desk mic 50K	£20.25	(75p)
Yaesu 846 hand mic 50K	£8.43	(75p)
FDK hand mic 600 ohms	£8.43	(75p)
EK151 keyer	£29.95	(75p)
MM202G boom mic	£19.95	(50p)
Single swr meter	£9.50	(50p)
Twin swr meter	£12.50	(50p)

75 ohm UHF cable	Max. £2.50 carr. any quantity	18 p.m.
50 ohm UR43 cable		18 p.m.
50 ohm UR67 cable		40 p.m.
300 ohm twin feeder		9 p.m.
5 core rotator cable		22 p.m.
8 core rotator cable		35 p.m.

MASTS

SPM 16ft. Portable mast		£9.99 (£1·50)
PME 4ft. mast extension		£1.62 (£1·00)
A4 4ft. 6in. × 1½"	Max. £2.50 carr. any quantity	£2.64 (£1·00)
A5 5ft. × 1in		£2.00 (£1·00)
A9 9ft. × 1½in		£5.35 (£1·50)
A10 10ft. × 2in.		£9.28 (£2·00)
A12 12ft. × 2in.		£11.12 (£2·00)

HF BEAMS

Hy-gain TH3 Mk. 3 10-20	£167.00 (£3·00)
Hy-gain TH3 JR 10-20	£121.50 (£3·00)
Mosley TA33 High power 10-20	£110.00 (£3·00)

HF VERTICALS

Hy-gain 12 AVQ 10-20	£39.93 (£1·50)
Hy-gain 14 AVQ 10-40	£56.19 (£1·50)
Hy-gain 18 AVT/WB 10-80	£81.45 (£1·50)

ROTATORS

CDE AR30	£46.12 (£1·25)
CDE AR40	£53.43 (£1·25)
CDE CD44	£106.87 (£1·50)
CDE HAM-2	£145.12 (£2·00)
STOLLE 2010	£48.93 (£1·25)
STOLLE 2030	£54.00 (£1·25)
9502 Channel Master	£45.00 (£1·50)
KR400 Kenpro heavy duty	£95.60 (£2·00)

VHF MOBILE ANTENNAS

Jaybeam TAS 5/8ch 2m.	£13.05 (£1·00)
Jaybeam US 70cm.	£18.90 (£1·00)
Bantex ¼ wave 2m.	£3.93 (50p)
Bantex 5/8ch wave 2m.	£8.25 (£1·00)
Bantex 5/8th wave 70cm.	£5.62 (50p)
ASP201 ¼ wave	£2.95 (£1·00)
ASP2009 ¼ wave	£7.95 (£1·50)
ASP677 ¼ de luxe	£14.95 (£1·50)
ASP Mag. base	£8.50 (75p)
ASP Boot mount	£3.50 (50p)

COMPACT HF ANTENNAS

HQ-1 Mini-beam 10-20	£94.33 (£2·00)
C4 vertical 10-20	£41.45 (£1·50)
EL40X dipole 80-40	£29.00 (75p)

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MORE NAG 500W 2M LINEARS ON THEIR WAY IMPORTED DIRECT BY US. GET YOUR ORDER IN NOW. DELIVERY EXPECTED MARCH

MAIL ORDER & HEAD OFFICE: HOCKLEY AUDIO, 31 SPA ROAD, HOCKLEY. ESSEX. TEL. 03-704 6835 (2 lines)

ALL PRICES INCLUDE VAT — CARRIAGE CHARGES IN BRACKETS

AGENTS—G3XTX J.R. Electronics, 196 Collier Row Lane, Romford, Essex. Tel. Romford (0708) 68956.
GM3GRX Eric Simpson, 6 Drossle Road, Falkirk, Stirlingshire. Tel. 0324-24428

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

BARCLAYCARD — Access

Western

The LATEST and GREATEST from YAESU

FT901DM

All-band, all-mode (inc. FM) HF transceiver. Variable IF passband; rejection tuning; built-in keyer; memory facility and many other first-class features. Write or phone for details.

Western INTRODUCTORY PRICE ONLY £842.62 inc VAT

1978 YAESU PRICE LIST *from* Western

FREE SECURICOR DELIVERY VAT NOT INCLUDED

FT101E	479	FT301D	639
FT101EE	469	FT301SD	495
FT101EX	435	FT301	539
FL2100B	289	FT301S	399
FV101B	73	FP301D	145
SP101B	15	FP301	89
SP101PB	38	FV301	73
*YO100	149	SP120	15
FT200	299	FL110	119
FP200	65	*YO301	152
FV200	73	LL301	28
FT7	299	301 Relay box	9
		FC301	95

*These items — VAT 8%, others 12½%

FRG-7	155	FT901SD	679
FR101D. Dig.	525	FT901DM	799
FR101D	449	*YC500E	269
FR101S. Dig.	439	*YC500S	209
FR101S	355	*YC500J	149
FL101	395	*YP150	45
FL101RF	429	YC601	115
FT227R	189	YC221	73
FT221R	399	*QTR24	14
FT223	149	YD844	17
FTV250	165	YD846	7
FT901D	699	YH55	8
FT901DE	699		

STOP PRESS! Improvement in exchange rate reduces those prices by approx. 9%. Phone/write for exact prices and delivery.

TRY "SEVENTY" in "SEVENTY EIGHT"

with the

Western 70TV 432MHz TRANSVERTER

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
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- ★ Matches Yaesu styling
- ★ Withstands infinity mismatch
- ★ All units aligned on Hewlett-Packard Spectrum Analyser
- ★ Can be driven by most 28MHz Transceivers

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Electronics (UK) ltd

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The STONER

model

PRO 80-10

SAE for full details

★ MORE THAN 40 000 CHANNELS (100 Hz) 80 to 10 metres inclusive, also WWV (10MHz)
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★ DIGITAL FREQUENCY DISPLAY Absolute frequency accuracy
★ EXCEPTIONAL TALK POWER 200w PEP input /RF speech processing
★ BROADBAND TECHNIQUES No tune-up required
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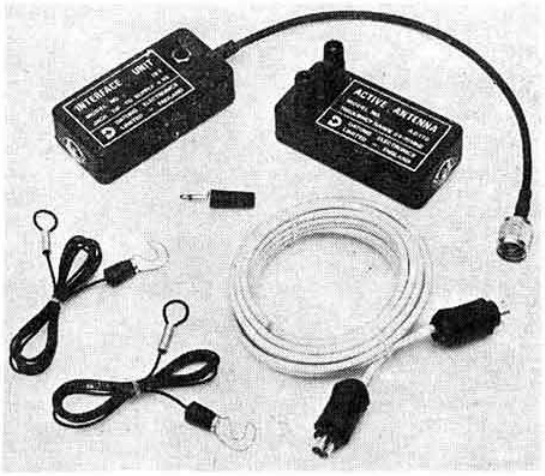
NEW!! Active Receiving Antenna

MODEL AD170

A COMPACT INDOOR ACTIVE DIPOLE FOR 60kHz TO 70MHz

Continuing our policy of constructive innovation we are proud to introduce what we think is the first broadband active dipole antenna at a price which puts it within easy reach of the Radio Amateur or short wave listener.
The Datong Active Antenna is designed for indoor mounting only but in all electrical respects it is in the same league as the active antennas the professionals use, and for which they pay prices comparable to a complete amateur bands transceiver. The same performance advantages which make active antennas attractive to professionals make Model AD170 especially attractive to the amateur. They include:



- ★ Ultra broadband coverage from 60kHz to 70MHz.
- ★ Ideal for remote mounting (eg. loft or attic) since no tuning adjustments are required.
- ★ Only 3 metres long yet signal-to-noise ratios in the LF and HF ranges are comparable to those from much larger conventional antennas.
- ★ Uniform sensitivity over the full frequency range minimizes receiver intermodulation effects.
- ★ Balanced dipole configuration gives choice of polarization plus useful directivity and eliminates dependence on ground plane or earth connection.
- ★ No need for expensive accessories such as antenna tuner units or matching units.

Although active antennas give lower signal strengths than large conventional antennas, received noise levels are also lower and therefore signal-to-noise ratios are comparable when used with modern sensitive receivers.

Model AD170 is supplied fitted with PL259 output plug and complete with the accessories shown in the illustration, ie. interface unit, head unit, 4 metre coaxial connecting cable (extendable if necessary), two 1·5 metre dipole elements, spare jack plug. A separate DC power supply is required (12V at 80mA) and this plugs into the interface box and feeds the antenna via the coaxial cable. A suitable mains power unit is our new Model MPU described below **(see special package price below).**

FREQUENCY-AGILE AUDIO FILTER MODEL FL1

A versatile bandpass or band-reject filter with fully variable bandwidth and centre frequency plus unique search/lock/track capability for automatic removal of heterodyne whistles. Improves reception of CW, RTTY, and SSB. Connects between receiver and loudspeaker.

R.F. SPEECH CLIPPER MODEL RFC

Processes speech as a SSB signal at 60kHz to increase its ratio of average to peak levels without adding harmonic distortion. Improves talk power of SSB, FM, and AM transmitters without increasing the peak transmitted power. Connects between microphone and transmitter. (See articles by Dr. D. A. Tong, Wireless World Feb. 1975, 79-82 and Oct. 1976, 77-81).

UP-CONVERTER MODEL UC/1

Adds full receiving coverage from 90kHz to 30MHz to existing receivers or transceivers tuning 28-29MHz or 144-145MHz. The full range is covered in thirty 1MHz wide synthesizer controlled segments. Also works as a two-metre converter. Connects between receiver and antenna.

PRICES (NOT INCLUDING VAT): AD170 £29.50, MPU and MPU/1 £5.50, AD170 + MPU or MPU/1 special package price £33.00, FL1 £53.00, UC/1 £105.00, RFC £40.00, RFC/M £21.50. (PCB version of RFC)

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When ordering please specify whether output plug is required to suit FL1, AD170, or UC/1.

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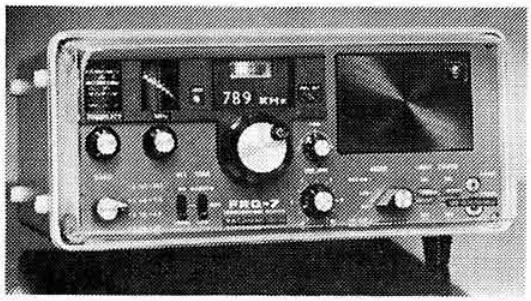

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MMT432/285 with Oscar shift	£119	MMD 050/500MHz counter	£79	MCC70/LO, 4m converter	£20	All 2m converters can be supplied	
MMT432/144, Transverter	£133	Divide by 10 prescaler, 500p.	£25	MCC144, 2m converter	£18	with IF outputs of 2-4-12-14-18-28MHz	
MMT432/144R with 1.6MHz shift	£151			MCC144/LO 2m converter	£20	70cm models with IF outputs of 28-14-	
MMP 12/3 Power supply 12V, 3A stabilized	£50	**VARACTORS**		MCC432, 70cm converter	£24	18- or 144MHz.	
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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.

Price £69.00 + 12½% VAT post free

SPECIAL NOTICE: The above Super-Scan unit is terminated with 14-pin plug to plug into rear of IC-240; but customers IC-240's have to be wired with socket to accept the above units. We can carry out the above modification if required—price £6 inc VAT and return postage.

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RADIO SOCIETY OF GREAT BRITAIN

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Telephone 01-837 8688

Founded 1913
Incorporated 1926

Member society, International Amateur Radio Union

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

The national society representing all UK radio amateurs

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

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D. A. Evans, G3OUF

EDITOR
A. W. Hutchinson

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UK corporate £8, including VAT **Overseas: £8.**

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Zone A: Regions 1, 2 and 18
Zone B: Regions 3, 4 and 5
Zone C: Regions 7, 8, 16 and 19
Zone D: Regions 6, 9, 17 and 20
Zone E: Regions 10 and 11
Zone F: Region 15
Zone G: Regions 12, 13 and 14

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Region 1	Cheshire, Cumbria, Greater Manchester, Isle of Man, Lancashire, Merseyside.
Region 2	All that part of Humberside north of River Humber, North Yorkshire, South Yorkshire, West Yorkshire.
Region 3	Hereford and Worcester, Salop, Staffordshire, Warwickshire, West Midlands.
Region 4	Derbyshire, all that part of Humberside south of River Humber, Leicestershire, Lincolnshire, Nottinghamshire.
Region 5	Bedfordshire, Cambridgeshire, Northamptonshire.
Region 6	Berkshire, Buckinghamshire, Oxfordshire.
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Region 13	Borders, Fife, Lothian.
Region 14	Central, Dumfries and Galloway, Strathclyde.
Region 15	Northern Ireland.
Region 16	Essex, Norfolk, Suffolk.
Region 17	Isle of Wight, Channel Islands, Dorset, Hampshire, Wiltshire.
Region 18	Cleveland, Durham, Northumnerland, Tyne and Wear.
Region 19	Greater London north of River Thames, Hertfordshire.
Region 20	Avon, Gloucester, Somerset.

QTC
amateur radio news

Licence fee increase
The Home Office has announced a 16 per cent increase in the Amateur Radio Licence fee to £6.40 per year. The fee was last raised two years ago.

Regional representative, Region 16
Due to moving to another area, Mr R. E. G. Kendall, G8BNE, has resigned from the office of regional representative for Region 16, and nominations are therefore invited to fill the vacancy.

Not later than 15 March 1978 any five corporate members resident within Region 16 (Essex, Norfolk, Suffolk), may nominate any other qualified corporate member resident in the region for the office of regional representative by delivering their nomination in writing, together with the written consent of such person to accept office if elected, to the general manager at RSGB headquarters. Each such nominator shall be debarred from nominating any other person for this election.

In the event of more than one person being nominated, a ballot will be conducted, details of which will be published in the May issue of *Radio Communication*.

Regional representative, Region 18
On the grounds of ill-health, Mr P. J. Fay, G3AKG, has resigned from the office of regional representative for Region 18, and nominations are therefore invited to fill the vacancy.

Not later than 15 March 1978 any five corporate members resident within Region 18 (Cleveland, Durham, Northumberland, Tyne & Wear), may nominate any other qualified corporate member resident in the region for the office of regional representative by delivering their nomination in writing, together with the written consent of such person to accept office if elected, to the general manager at RSGB headquarters. Each such nominator shall be debarred from nominating any other person for this election.

In the event of more than one person being nominated, a ballot will be conducted, details of which will be published in the May 1978 issue of *Radio Communication*.

Area representative, Highlands
As Mr R. Dixon, GM3ZDH, is no longer resident in the Highlands area, he has resigned as representative for that area. Nominations are therefore requested to fill the vacancy.

Not later than 15 March 1978 any five members resident in the Highlands area may nominate any other qualified member resident in that area for the post by sending their nomination in writing, together with the written consent of such person to accept office if elected, to the regional representative for Region 12, Mr F. Hall, GM8BZX, 45 Priory Cottages, Lunanhead, Forfar, Angus DD8 3NR.

Details of the ballot which will then be held will be published in the May 1978 issue of *Radio Communication*.

Pip tones
The Home Office has agreed that "pip tones" may be used at the end of transmissions when using A3j and where there is poor copy due to weak or fading signals, and to remove any ambiguity that the transmission has finished, the callsigns having been missed. The use of a pip tone is not intended to take the place of callsigns, which should be given in accordance with the licence conditions. The recommended duration and frequency of the tone is 250ms ± 100ms and 800-1,000Hz respectively. This facility is confined to frequencies of 144MHz and above.

New prefix
The administration of newly independent Bophuthatswana advised the ITU that they wished to use the callsign series H5A-H5Z. In reply the ITU stated that this series was available. This is not the procedure usually followed in the allocation of callsign series and may be due to political circumstances concerning the change.

Club lectures
With the approach of WARC 79, and the need for unity in international amateur radio, club secretaries may wish to include in their programmes a talk covering the IARU and international activities. John Bazley, G3HCT, a member of the IARU Working Group, is co-ordinating the requests and will be pleased to advise the availability of a speaker. His QTH is "Brooklands", Ullenhall, Solihull, W Midlands.

New Year Honours List
We congratulate the following radio amateurs on their awards listed in Her Majesty The Queen's New Year Honours List:
CB to Air Vice-Marshal P. S. M. Hedgeland, OBE, BSc(Eng), G2DBA; MBE to Mr J. Brooker, G3JMB, a member of the Mid-Sussex ARS.

East London RSGB Group competition
Only two entries were received for the East London RSGB Group "2oz tobacco tin" home-construction competition advertised in the April and October 1977 issues of *Radio Communication* and elsewhere. The first prize was divided between the two entrants: V. Harper, G4EHC, for his LED dice game; and D. Brotherton, BRS member, for his 1MHz crystal calibrator.

Technical queries and RSGB books
Members are reminded that staff at RSGB HQ cannot undertake to answer technical queries by telephone concerning designs published in RSGB books. Notification of errors or omissions in any book should be sent in writing to the author or editor concerned, with an sase if a reply is desired.

In some cases designs are given with minimal constructional information. These are usually meant only to illustrate certain matters discussed in the text, and it is not recommended that the inexperienced constructor should attempt to build such equipment.

In other cases the published design may include components which the original author used but which are no longer available. *The inclusion of any design is no guarantee that the components listed are all still available*, and the inexperienced constructor is advised to check this point carefully with component suppliers before proceeding further.

VAT and transistors

A note and cutting from GM8FFX draws attention to the ruling by Customs and Excise that metal can transistors are liable to the standard rate of VAT (8%) whereas the plastic case equivalent is subject to 12½% VAT. No logical reason is put forward for this little-known ruling.

Stolen equipment

An RCS frequency counter Type 801A/M, serial number 80S3318, was stolen from a Commercial Communications van at Sandy, Beds, on 14 January. Any information to D. C. Stewart, Biggleswade Police, tel Biggleswade 312222, or Commercial Communications, tel Luton 21884.

RAE examination centres

The following colleges have advised us that they will be holding the Radio Amateurs' Examination in May 1978; entry details are also listed.

Barry. Barry College of Further Education, Colcot Road, Barry, South Glam CF6 8YJ. Time 6.30pm, fee £12.75 (including external candidate fee). Application forms, obtainable from the registrar, should be returned by February 15. Cheques and postal orders should be crossed and made payable to the "County of South Glamorgan".

Burgess Hill. Burgess Hill Adult Education Centre, Marle Place, Leylands Road, Burgess Hill, West Sussex RH15 8JD. Fee £9.25 (candidate fee £4.75, centre fee £1.50, and exam fee £3.50). The last date for acceptance of entries is February 15, and cheques should be made payable to "West Sussex County Council". All enquiries and fees should be addressed to the principal at the centre.

Crawley. Ifield Evening Centre, Lady Margaret Road, Crawley, Surrey. The last date for acceptance is 24 February. Contact R. Scrivens, G3LNM, 16 Sherwood Walk, Furness Green, Crawley, tel Crawley 22540.

Grimsby. Grimsby Adult Education Institute, (usually at) Hereford Centre, The Hereford School, Westward Ho, Grimsby. Closing date for applications is usually about one week before the City & Guilds closing date, and the fee is the current City & Guilds fee. Further information from: Adult Education Office, Chelmsford Avenue, Grimsby; Mr H. Watson, G3HTI, QTHR; or The Hereford School.

London (Holloway). Grafton Radio Society, Holloway Institute, Whittington School, Highgate Hill, London N19. Fee £8.75 (external exam, maximum number 10). Contact B. C. Bond, G3ZKE, 86 Agar Grove, London NW1, tel 01-485 7065.

London (University College). Organized by the RSGB. Application forms, available from the local examination secretary at RSGB HQ, will be accepted until 12 noon on Friday 24 February, and the fee, which must accompany the completed application form, is £9.50.

York. York College of Arts and Technology, Dringhouses, York YO2 1UA. Details from the college, tel York (0904) 704141.

The following colleges list closing dates for RAE entry which are prior to expected *Radio Communication* publication date; however, late entries may be accepted.

Coventry Technical College, Butts, Coventry CV1 3GD, tel Coventry 57221. The fee (including external fee) is £8.75.

Colchester Institute of Higher Education, Sheepen Road, Colchester, tel F. R. Howe, 0206 70271 day, or 70189 evenings. The fee (including local fee) is £8.25, with an additional fee for late entries.

Hinckley College of Further Education, London Road, Hinckley, Leics LE10 1HQ, tel Hinckley 32388/9. The fee is £10.50.

Kingsway Technical College, Old Glamis Road, Dundee DD3 8LE. The fee is £7.75.

Langley College of Further Education, Station Road, Langley, Slough SL3 8BY, tel Mr C. E. Turner, Slough 49222. The fee is £8.75.

Council members, the executive vice-President, the vhf manager, general manager, regional and area representatives, and club secretaries from Regions 17 and 20 at a reception held in Bournemouth on 20 October following a meeting of the Membership & Representation Committee.
The executive vice-President and the general manager addressed the meeting and answered questions. As a public relations exercise, it was a highly successful evening. *Photo: G4AJD.*

Audio filters as an aid to reception — with special reference to the Datong frequency agile audio filter Model FL1

by D. A. TONG, BSc, PhD, G4GMQ (G8ENN)*

Introduction

This article is intended first, to explain why audio filters are useful; second, to discuss what they need to do; and third, to illuminate some of the rather unusual features of the Datong frequency-agile audio filter. In addition to its highly versatile filtering functions, this device has the unique capability of being able to tune itself in order to notch out interference from heterodyne whistles.

Currently in the technical press great emphasis is quite rightly placed on the desirability in receiving systems of putting the selectivity as far forward (ie towards the antenna) as possible. With this as background it may not be obvious that adding selectivity right at the opposite end of the receiver (ie immediately before the loudspeaker) can be as effective as it is. Why then is it so effective?

Basics

Fig 1 shows the block diagram for a conventional single-conversion ssb or cw receiver. The frequencies given are based on a receiving frequency of (for the sake of discussion) 14·200MHz, and an intermediate frequency of 9MHz. Although usually referred to as a "single-conversion" receiver, the diagram clearly shows that such a receiver contains *two* mixers and *two* local oscillators. Both mixing processes are identical in principle (and indeed are often identical in hardware) the only differences between the two being in the frequencies involved.

The diagram also shows that frequency selectivity is present at three different points in the receiver: first, in the preselector as a relatively broad filter (filter 1) centred on 14·200MHz; second, in the i.f. strip as an expensive narrow-band, steep-skirted crystal filter with passband from 9·000 to 9·003MHz; and third (filter 3) in the audio stages. This third filter may often consist merely of a "roll-off" above 3kHz.

Overall, the passband of the complete receiver will only be as wide as the narrowest filter in the chain. In this case the narrowest filter is filter 2 and the receiver bandwidth is 3kHz. On the other hand if filter 1 were changed to a narrowband crystal filter with 3kHz bandwidth, and if filter 2 were made several hundred kilohertz wide, it is clear that the overall bandwidth of the receiver would be unchanged. This conclusion is almost self-evident, but is based on the implicit assumption that mixer 1 acts as a *linear* frequency shifter. From the selectivity aspect then, it does not matter whether the filtering follows a linear mixer or precedes it.

Actually each mixing stage introduces two responses, the wanted one plus the unwanted "image" response; the two being spaced apart by twice the intermediate frequency. Thus in the case of Fig 1, if filter 1 were not present the total receiver bandwidth would be twice the desired value of 3kHz because, as well as responding to signals between 14·200 and 14·203MHz, the receiver would also respond equally well between 32·200 and 32·203MHz. The total bandwidth would be 6kHz, albeit split into two separate chunks.

Thus one concludes that a narrow overall passband can be achieved by putting narrow band selectivity either before or after a linear mixer, provided always that enough secondary selectivity is used before the mixer to eliminate the image response.

Having reached the above conclusion one must also conclude that what applies to mixer 1 in Fig 1 must also apply to mixer 2. Assuming that one wants to narrow the bandwidth down from 3kHz to 100Hz, there are two equivalent alternatives. One can either replace the 3kHz crystal filter with a crystal filter with 100Hz bandwidth, or retain the 3kHz filter and replace filter 3 with an "audio" filter centred on, say, 1kHz and with a bandwidth of 100Hz. In the latter case the 3kHz crystal filter performs the important function of cutting out the image response at 8·999MHz produced by mixer 2 and filter 3. The following general points can be made:

(1) One can regard an ssb or cw receiver as a "black box" whose function is to linearly translate a band of frequencies in the radio spectrum down to audio frequencies.

(2) The receiver must respond only to the desired band of frequencies. In effect, as a receiver is tuned, one is "looking" through a window which can be moved to any desired point in the spectrum and whose width is the receiver bandwidth.

(3) Each stage of frequency conversion within the receiver doubles the number of "windows" and each mixer must be preceded by a filter to "black-out" the unwanted "window" (ie, the image response).

(4) The overall width of the receiver "window" will be

* Datong Electronics Ltd, Spence Mills, Mill Lane, Bramley, Leeds LS13 3HE.

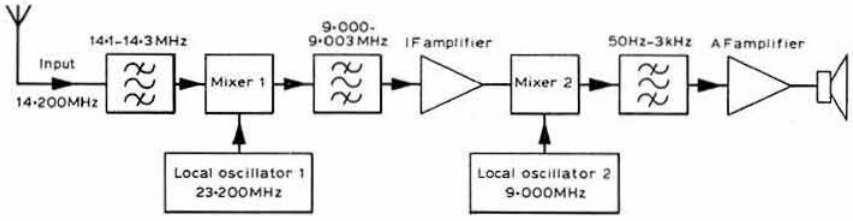


Fig 1. Block diagram of single-conversion superhet receiver for cw or ssb reception on 14·200MHz

that of the narrowest filter in the chain, and from a selectivity point of view it does not matter whether the narrowest filter is at rf, i.f. or af.

(5) The above arguments only apply where linear mixing occurs. Selectivity after, for example, an envelope detector or fm detector is not equivalent to selectivity before such detectors.

Why then all the emphasis on "early selectivity" in receivers? The reason is that the ideal linear mixer does not exist. Real mixers respond to combinations of input and local oscillator signals other than the desired ones, and these spurious responses become rapidly worse as the number and strength of the signals applied to the mixer increase. It makes very good sense, therefore, to cut down the number of signals applied to the receiver as early as possible, and in particular to use the maximum possible amount of selectivity prior to each mixer. It is also important to ensure that no stage is subjected to input signals too large for it to handle linearly.

These factors should all have been taken care of in the design of an existing receiver so that one can assume with reasonable confidence that one's ssb receiver will have its selectivity and automatic gain control action so apportioned that no stage will be subjected to overload conditions. (Naturally some receivers are better than others at doing what they are supposed to do).

This is good news for audio filter users (and manufacturers) because it means that one can simply attach an audio filter to the output of an ssb receiver and the overall receiver bandwidth will then be equal to that of the audio filter. The built-in ssb crystal filter still performs a valuable job since it ensures that the final mixer and the audio filter itself are subjected only to those unwanted signals which can get through the already quite narrow ssb "window".

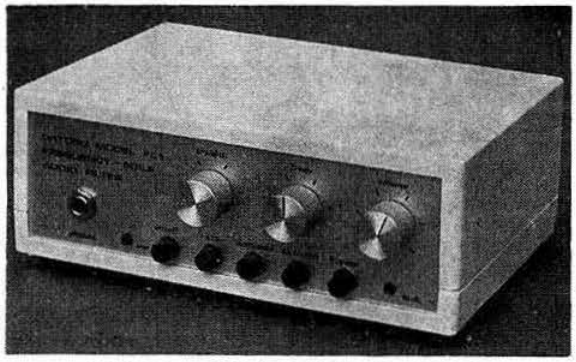
How then does this approach to bandwidth narrowing compare with that of using a narrower crystal filter?

Since the agc system in a receiver responds to all that comes through the main i.f. selectivity, the gain of the receiver will be determined by the strongest signal within the crystal filter bandwidth. This means that the level of a weak cw signal which is being picked out by an audio filter in the output of an ssb receiver may fluctuate in sympathy with the level of another, stronger unwanted signal within the ssb bandwidth. This slight annoyance is easily avoided simply by reducing the rf or i.f. gain and increasing the audio gain to compensate.

On all other counts it seems to the author that a good add-on audio filter used after an ssb crystal filter will outperform a special purpose cw crystal filter, and in addition can offer a much greater versatility. For example, it is possible to provide continuously variable control of bandwidth and centre frequency together with a choice of peak (bandpass) or notch (bandreject) response; features which would be much more expensive to duplicate at i.f. In addition, of course, an audio filter can be installed without requiring any access to the inside of a receiver since it connects to the loudspeaker (or phones) output terminal.

Basic performance requirements

An add-on audio filter is really there to help out with the filtering process which is already occurring in the listener's brain. It is well known that a skilled cw operator can pick out from a noise background signals which an untrained listener may not even be able to detect. To do this for long



Outer view of Model FL1 showing controls

periods is hard work, however, and a good audio filter can substantially reduce the brain's work load, and hence cut down on listening fatigue.

The same comments apply to the case of ssb speech reception. It is sometimes (but not always) *possible* to copy a weak ssb signal through a strong heterodyne but it is certainly not a pleasant pastime. A good notch filter can put the pleasure back by reducing the amount of subconscious brain work required.

To obtain the benefits mentioned above, certain basic characteristics are desirable in the audio filter. These characteristics will now be discussed. It was after considering the following criteria that the Datong Model FL1 was designed, so it will not come as a surprise therefore that it meets them. In the author's opinion then, the following features are desirable.

1. Continuously variable bandwidth. For best reduction of noise one requires the minimum possible bandwidth. On the other hand, the faster the rate at which one wishes to transfer information the wider must be the bandwidth of the information channel. Clearly a compromise is inevitable and each different receiving situation will have its own optimum bandwidth. Factors involved in determining the optimum bandwidth will include the following:

(a) **The operator.** It is he who decides how much of the filtering work he prefers to carry out in his head, and how much to leave to the hardware.

(b) **The mode.** SSB speech, with its relatively large amount of information per unit time, requires a wider bandwidth than rtty or cw.

(c) **CW sending rate.** The faster the sending the greater the bandwidth needed to accommodate the transmission. (After all, cw is basically 100 per cent amplitude modulation of a carrier by a pulse waveform. The higher the frequency

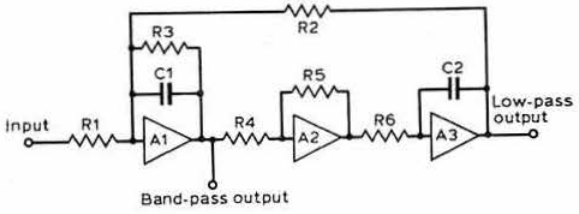
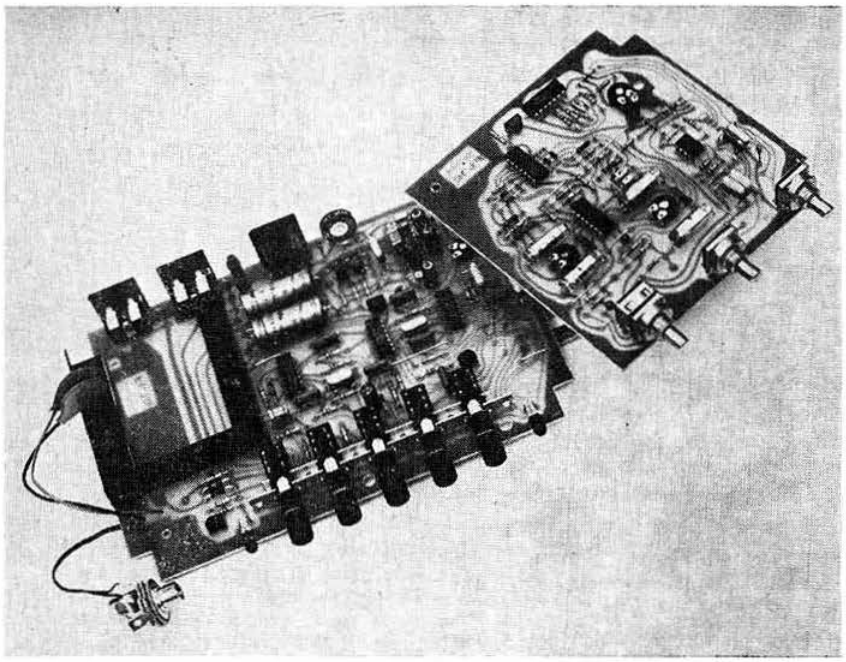


Fig 2. "Biquad" active filter circuit. A1, A2 and A3 are inverting operational amplifiers



Inner view of Model FL1 showing the two printed circuit boards which carry all circuitry including connectors and controls

of the pulses—the dots and dashes—the more separated out from the carrier are the modulation sidebands.)

(d) Interference. The more interference there is to remove, the narrower becomes the optimum bandwidth.

Because all four of these factors are widely variable, a continuously variable bandwidth is essential for best results.

2. Continuously variable centre frequency. A notch filter must have a variable centre frequency because an unwanted heterodyne whistle can occur at any audio frequency and is not under the control of the operator. Similarly a bandpass filter for ssb needs to be movable in frequency because one requires the best readability in given conditions of interference, and one cannot determine in advance which part of the audio spectrum will be most free of interference.

For cw reception a choice of filter frequency allows reception of the particular audio note which is most suitable for the particular operator. Individuals differ in their ability to pick out different notes. A tunable filter also allows one to tune at random across the "window" of cw signals which an ssb receiver presents at its audio output terminal. For best "feel", the tuning law of the filter should be linear as in the receiver so the tuning rate remains the same at all frequencies.

3. Gain independent of bandwidth. There are two basic types of bandpass filter, depending on what happens to the amplitude of the wanted signal as the bandwidth is varied. With one type the background remains at constant level and as the bandwidth is reduced the wanted signal gets louder. With the other type the wanted signal stays at constant level and the background dies away as the bandwidth is reduced. For communication purposes the second type is much more convenient to use.

4. Bandwidth independent of frequency. Again there are two classes of filter depending on what happens to the bandwidth as the centre frequency is changed. In the "constant Q" type, as the centre frequency is raised the bandwidth increases in direct proportion. In the "constant bandwidth" type the bandwidth remains unaffected. Only the "constant bandwidth" type of filter simulates the feel of a receiver as it is tuned. After all, as one scans the band with a receiver one does not expect the bandwidth to change in sympathy. For natural "feel", therefore, the "constant bandwidth" type of filter is required.

5. Peak or notch. For maximum versatility one requires the choice of bandpass or bandreject responses. Bandwidth and centre frequency need to be continuously variable in both modes.

6. Automatic tuning. Some electronic aid to tuning is useful in two distinct applications: cw reception with very narrow bandwidths; and notch filtering. Once the overall receiver bandwidth is reduced below about 100Hz, tuning and frequency stability become so critical that the potential signal-to-noise ratio benefits of still narrower bandwidths may not be achievable with conventional filters. In this case the provision of automatic frequency control (afc) can make a useful difference. The effect is similar to that of afc applied to domestic vhf/fm tuners. Thus the Datong Model FL1 has a purposely unobtrusive afc system with a pull-in range limited to about $\pm$50Hz. This circuit is continuously in action unless specifically cancelled by a panel control. The result is that the system is as easy to use with overall bandwidths as low as 25Hz as it is with a bandwidth of 100Hz.

Notch filtering benefits enormously from automatic tuning. The whole object of notch filtering is to remove only a very narrow band of frequencies surrounding an interfering heterodyne while affecting the wanted signal as little as possible. This demands that very narrow notch bandwidths be used (less than, say, 20Hz) but unfortunately for conventional filters the narrower the notch the more difficult it

is to tune the notch to the interference and to maintain it in tune for any length of time. This is aggravated by the need during net operation to make slight tuning adjustments to the receiver; each such change requiring a corresponding change to the notch filter tuning. To compound the problem, it is very difficult to tune a notch filter by ear. Normally one would first locate the interference by using the filter in a peaking mode; only then would the notch mode be selected. This tuning process takes time to perform and during this time the wanted signal is not audible and communication is interrupted. Finally, Murphy's Law being what it is, just as the notch has been laboriously set up the interference will probably move to a new frequency so that the whole process has to be repeated.

What is needed therefore is a notch filter which automatically locates, locks onto, and tracks unwanted heterodyne whistles. This is exactly one of the things which the Datong Model FL1 is designed to do. The automatic tuning process is normally completed within a few seconds of the appearance of the interference, with no loss of the wanted signal, and with no operator effort. Because the system is automatic it is able to routinely utilize notch bandwidths as low as 5–10Hz.

7. Ease of installation. Finally, on a practical note, an add-on filter needs to contain an audio power amplifier comparable to the one in the main receiver. Installation is then reduced to connecting the filter in series with the receiver's loudspeaker.

Implementation

This section describes in outline how the above performance requirements have been incorporated in the Datong Model FL1 filter.

1. The filter. It is one thing to write down a list of desirable criteria, and quite another to actually combine them into a working product. In view of the vast number of active filter circuits in the literature, it came as a surprise that none could be found which combined properties 1, 2, 3 and 4; not to mention the automatic tuning requirement. The circuit which had to be specially developed for FL1 is based on the so-called "state-variable" type of filter. Such filters are, in effect, special-purpose analogue computers programmed to solve an equation which describes the response of the desired filter. Although somewhat prodigal in their use of operational amplifiers (op-amps) they have the advantages that they are relatively insensitive to variations in their components, and that almost any desired response is obtainable in principle.

One of the more common examples of this approach is the "biquad" filter shown in Fig 2. This uses three op-amps and provides simultaneous lowpass and bandpass outputs. The

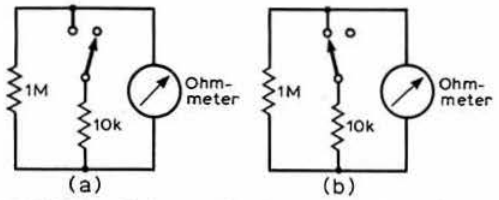


Fig 3. (a) With switch open the ohmmeter indicates resistance of 1MΩ. (b) With switch closed the ohmmeter indicates a resistance of 9.9kΩ, ie 1MΩ and 10kΩ in parallel

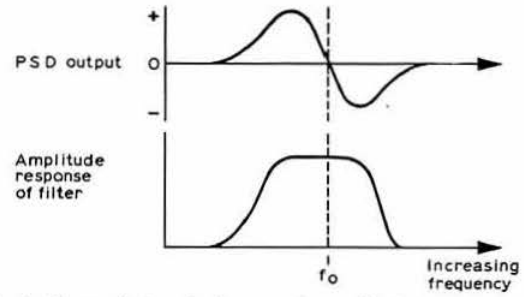


Fig 4. Comparison of phase and amplitude responses of bandpass filter. The top graph shows the output of a phase sensitive detector whose inputs are the output and input of the filter as a function of frequency

centre frequency of the filter is determined by R6, R2, C1 and C2, and the bandwidth by R3 and C1. Normally C1 and C2 would be fixed, R2 and R6 would be equal and varied together to determine the centre frequency, and R3 would be varied to control the bandwidth. This filter has a bandwidth independent of centre frequency but the gain varies with bandwidth. By adding a fourth op-amp to the biquad circuit it proved possible to meet criteria 1, 2, 3, 4 and to generate simultaneously notch, bandpass, and lowpass outputs.

A single stage filter gives relatively poor skirt selectivity. Model FL1 therefore uses two modified biquad circuits coupled together by yet another op-amp and in such a way that the overall response is flat-topped. The shape of the response of the composite filter is in fact very similar to that of a pair of critically-coupled tuned circuits. This flat-topped response is an advantage for almost all purposes since it makes tuning less critical than does a sharply-peaked response, and also makes the filter suitable for use with ssb and rtty signals. The notch response of the composite filter is also improved. Compared with that of a simpler notch filter it is "flat-bottomed".

As described so far, the filter requires a two-gang variable resistor to set the bandwidth, and a four-gang variable resistor, with accurate tracking of each section, to set the centre frequency. The two-gang resistor presents no problem but the four-gang resistor does, not only because of the rarity of such components but also because the filter has to be voltage tuned so that it can be electronically controlled. For this reason a pulse-width modulation method is used to simulate a precisely-matched four-gang linearly voltage-controlled variable resistor.

Consider Fig 3. If the switch is open as in (a) the resistance seen by the ohmmeter will be 1MΩ. If the switch is closed as in (b) the total resistance seen by the ohmmeter will be equal to the parallel combination of 1MΩ and 10kΩ, ie 9·9kΩ. If now the switch is rapidly opened and closed at a rate much faster than the ohmmeter can respond, the meter will indicate some value intermediate between 9·9kΩ and 1MΩ, the actual value depending on the relative times for which the switch is open and closed. By making the switch an electronic switch (in fact a cmos analogue gate) and controlling it with a squarewave whose mark-to-space ratio is proportional to a control voltage, the whole circuit behaves as the desired voltage-controlled resistor. Precise matching of four such resistors is taken care of by the fact that cmos analogue gates come four to a chip. For use in the audio

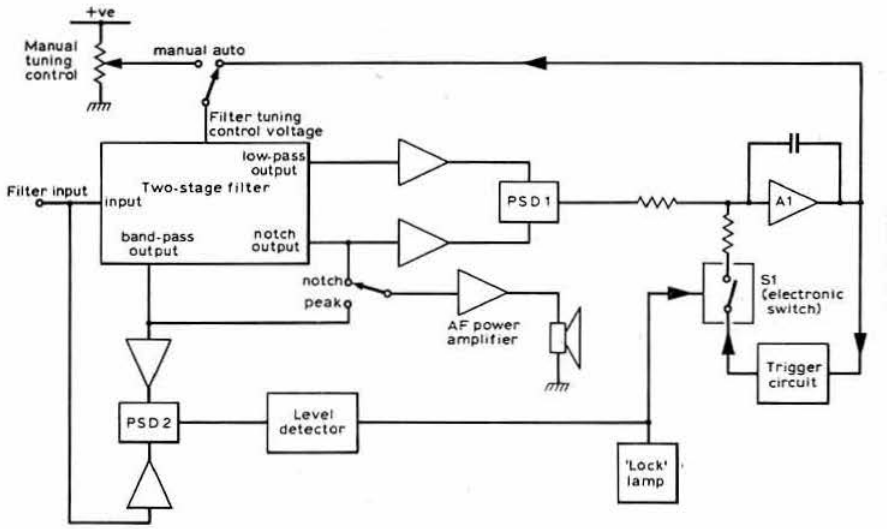


Fig 5. Simplified block diagram of the Datong frequency agile audio filter, Model FL1, showing the automatic tuning system. PSD1 derives the automatic tuning control voltage while PSD2 signals when lock has been achieved

filter the switching frequency must be several times higher than the highest frequency passed by the filter.

2. Automatic tuning. How can the voltage tuned filter be made to tune itself to an input signal? There are three main requirements. First, the circuit must derive in some way a voltage which is proportional to the degree of mistuning of the filter and which can then be used in a negative feedback loop to make the filter track the input signal. Second, the filter must be able to sweep over its complete tuning range in order to be able to locate interference whistles anywhere in its range. Third, the filter must be able to recognize when it has a signal within its passband so that it can change over from a searching mode to a locked mode.

When the filter is precisely in tune with its input signal there will be zero phase shift between its input and output signals. If these two signals are compared in a phase sensitive detector (psd) the output of the latter will change sign when the filter passes through resonance, resulting in the discriminator-like curve shown in Fig 4. Such an output voltage is usable in an automatic tuning negative feedback loop.

A similar but much more sensitive discriminator response is obtained, however, by comparing instead the phase of the notch output with that of the lowpass output. Below resonance the two are in phase, above resonance they are 180° out of phase. This abrupt phase reversal gives a very sensitive indication of correct tuning and is used in Model FL1.

The presence of signals within the filter passband is detected by a second psd which looks for signals at the bandpass output which are in phase with the input signal. If such signals are present above a certain threshold level, a control signal is generated which illuminates a panel lamp to indicate the locked condition, and which also controls an automatic sweeping circuit.

Fig 5 shows this in much simplified form. PSD2 generates the "lock" signal. If PSD2 has no output, switch S1 is closed and amplifier A1 together with the trigger circuit form a sweep generator, and the output of the loop integrator ramps continuously up and down—thereby sweeping the centre frequency of the filter between its extremities roughly once per second. If during the sweep PSD2 detects a signal in the filter passband, switch S1 opens and the sweep instantly stops and remains put. The output of PSD1 then drives the integrator in such a way as to keep the filter tuned precisely to the detected signal even though it may subsequently drift over the full tuning range of the filter. If lock is lost for any reason or if the input signal disappears, the sweep resumes after a delay of about 2s.

The above has dealt with the automatic tuning system from the aspect of its use as an automatic notch filter. The limited afc function described earlier, and which is intended to simplify receiver tuning when using very narrow filter bandwidths in the manually tuned bandpass mode, is achieved by adding a much attenuated fraction of the output from the loop integrator to the tuning voltage derived from the manual tuning potentiometer. In this mode the sweep circuit is disabled.

3. Hardware. It will be appreciated from the foregoing brief description that the circuitry contained in Model FL1 is considerably more complex than in conventional audio filters. The complete circuit uses eight cmos and bipolar integrated circuits, most of which contain multiple functions. For example, three CD4069 cmos hex inverters provide between them no less than 18 separate dc and ac amplifiers which are mainly used in the automatic tuning circuitry. In addition six discrete transistors and 11 diodes are used for various purposes. To reduce construction costs and offset the complexity, almost all handwiring has been eliminated and all connectors and controls mount directly onto the two printed circuit boards. Details of the construction are shown in the photograph.

Conclusion

While good audio filters "speak" for themselves when heard in action, not everyone has had the opportunity to hear one, and it is hoped that this article has put their use and function into perspective.

The author naturally has a soft spot for his own creation, but since the term "audio filter" can mean almost anything down to a single 88mH toroid, he hopes that he will be excused for trying to indicate the quite high level of complexity needed to achieve a performance at the other end of the scale. □

An experimental power amplifier for 144-146MHz using a power-fet

by F. C. FULLER, G4GCJ*

RESULTS of the author's experiments with a power-fet vhf amplifier which uses a Siliconix VMP-1 device are described below. The manufacturer claims that the device has a power gain of 11dB at 145MHz, and produces 5W p.e.p.

Construction

The amplifier was made using readily available components which were soldered on to an etched pcb. This was mounted into a 5in by 4in diecast box with heatsink. The amplifier was built according to the Siliconix application notes and data sheets but, on first testing, was found not to operate satisfactorily. The output matching network was changed, therefore, to the tapped tuning inductor as shown in the circuit diagram by inductors L2 and L3. The power-fet is insulated with a beryllium washer, generously daubed with thermal compound paste.

Alignment procedure

The input resistor, R1, was used to define the input impedance of the amplifier as an aid in the initial trimming. When this was achieved, the resistor was removed.

The amplifier can be run in any class by adjusting the gate bias voltage, but the two classes investigated by the author were (i) Class AB, where drain current is set to 300mA; and (ii) Class C, where drain current is zero. Since the zener-reference diode draws approximately 10mA, this was added to the total current which, in this case, was measured with an Avometer. The bias control, RV1, was then set to give a supply current of 310mA at a supply voltage of 30V.

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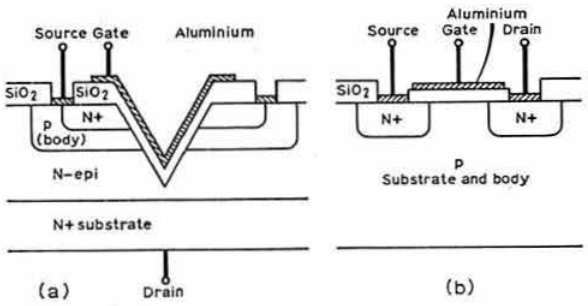

Fig. 2. (a) Cross-section of a vmos channel. (b) Cross-section of a conventional horizontal mosfet

The rf input was provided by an IC22 operating at 145MHz, via an attenuator set to give 0·5W rf output, measured with a Thruline wattmeter. The wattmeter was then connected between the amplifier output and a 50Ω dummy load. The four trimmers were adjusted in turn (no specific order found necessary) to provide maximum output which was of the order of 6·5W with the input resistor removed. Output dropped to 6W when the amplifier was run for Class C operation. Relative efficiencies were as follows:

	Id @ 30V	PD (W)	Po (W)	Efficiency (%)	Gain
Class AB	390mA	11·55	6·5	56·3	11dB
Class C	300mA	9·0	6·0	66·6	10·8dB

It appears that Class C operation provides the best efficiency figures, yet both efficiencies are competitive with regard to current bipolar high power rf devices.

The amplifier was reconnected to act as a receiving preamp to the IC22, and using the attenuator in series with the antenna was found to have a small-signal gain of 20dB.

Conclusion

These results were encouraging and will no doubt stimulate further development of power-fet amplifiers at vhf. The one possible disadvantage, however, is the need for a 30V supply which may discourage mobile or portable operation.

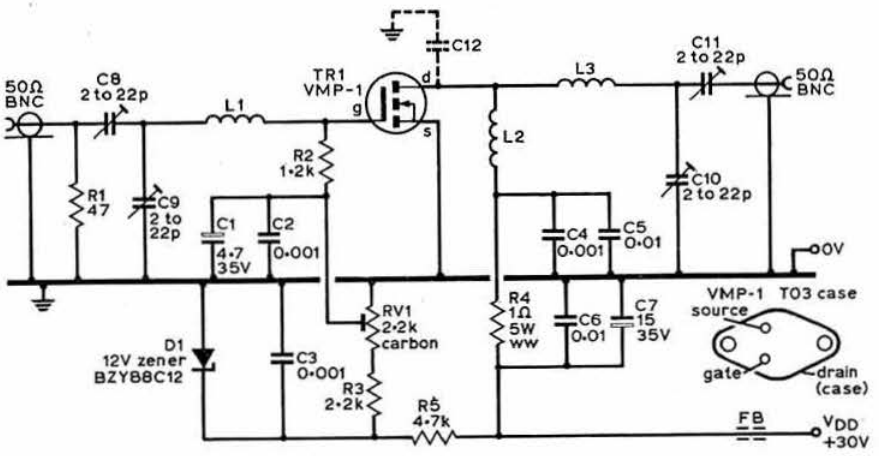

Fig 1. Experimental vhf "power-fet" amplifier

The author was interested to note that Siliconix are shortly to release a "stripline" power-fet capable of operating up to 432MHz with a gain of about 10dB.

Appendix

Structure of both conventional (enhancement) mos and (enhancement) vmos is shown in Fig 2. It can be seen that in the conventional mos structure current flow from drain to source takes place in the horizontal plane, with very little penetration in the vertical direction. In order to accommodate large currents the surface area of the device must be increased. The gate area slightly overlays the N+ substrate of the drain area, allowing a certain feedback capacity, Cdg.

Current flow in vmos is in the vertical plane, and, for a given chip size, has a greater gate area. With the extra layers N− and N+ in the structure, the voltage handling capability of the device is improved, and, as current travels vertically, a large surface area is not necessary for large current handling. The inherent depth of the vmos structure also puts a greater distance between the drain and the gate layers, reducing drain/gate capacity, hence its ability to handle hf and vhf signals at significant power levels.

Since this article was written, the VMP-1 has been modified by Siliconix and is now the VN66AJ. □

Components list

C1	4·7μF/35V tantalum bead	**D1**	12V zener BZY88C12
		R1	47Ω ± 2% TR5
C2, 3, 4	0·001μF disc ceramic	**R2**	1·2kΩ ± 5% ¼W cb
C5, 6	0·01μF disc ceramic	**R3**	2·2kΩ ± 5% ¼W cb
C7	15μF/35V tantalum bead	**R4**	1Ω 5W (wirewound)
		R5	4·7KΩ ± 5% ¼W cb
C8,9,10, 11	Film-trimmer 2-22pF	**RV1**	2·2kΩ preset carbon
C12	Capacitance of device to heatsink, using 0·060in thick beryllium oxide washer, about 20pF		
L1, 2	6 turns, close spaced, ¼in dia, 20swg enam copper wire		
L3	3 turns, close spaced, ¼in dia, 20swg enam copper wire		

A 12V-powered nicad charger

by N. HOULT, G4CIK*

NICKEL-cadmium batteries are now very popular as a source of power for portable equipment, and mains-powered chargers for them are both readily available and easily constructed. There are, however, times when a mains supply may not be available—for example, on holiday. This article describes a charger, for use in such circumstances, which runs from a 12V car battery; note that as the usual set of 10 nicads supplies 13V when fully charged, a car battery cannot be used directly to charge them. The circuit charges the batteries at a constant current of 45mA (as recommended for "AA" size batteries) and will cope with from 5 to 10 cells in series at a time. It is protected against indefinite reversal of its power supply, temporary short-circuiting of its output, and incorrect connection of the battery to be charged.

Circuit description

From the diagram shown in Fig 1, the circuit can be seen to consist of two sections—a dc-dc converter, to step up the input voltage, and a constant current source. The dc-dc converter is of the "single saturating transformer" type, further details of which may be found in [1]. Its mode of operation is as follows: assuming that initially TR1 has just turned on and TR2 turned off, there will then be a voltage approximately equal to the supply voltage across section AB of the primary of T1. This causes the current in this winding to increase linearly with time according to the equation $V = L.di/dt$, where L is the inductance of the winding. The changing current induces an emf in the base winding DEF of T1 in such a way as to keep TR1 turned on and TR2 cut off.

Eventually, as the current rises the core will saturate and its effective relative permeability wlll drop sharply. This causes L to drop and di/dt to rise rapidly. The increase in current brings TR1 out of saturation, reducing V, di/dt and, hence, its base drive, thus accelerating the process, turning TR1 off. The consequent rapid drop in current causes an induced emf in the base winding of T1 to turn TR2 on and TR1 off, the opposite of the initial situation. Thus the circuit oscillates with an approximately square-wave output, with a frequency determined by the inductance L of the primary of T1 and the properties of the core used—about 40kHz in the prototype.

The potential divider R1, R2 provides bias to TR1 and TR2 to start the circuit oscillating; note that C2 is the correct way round, as it is charged negatively with respect to ground by rectification of the induced emf in the winding DEF by the base-emitter junctions of TR1 and TR2.

The rectifier following the inverter is a conventional voltage doubler providing between 17V and 23V for the constant-current source TR3. It is of fairly conventional design, using a medium power transistor to cope with momentary overloads due to short circuits on the output or reversal of the battery being charged. As reversal of the battery causes very high power dissipation in TR3, LED3 is fitted to warn of this condition. D4 is to prevent the nicads discharging into the charger should it be switched off with them still connected. LED1 provides an indication that the inverter is working, while LED2 indicates that a battery is

Table 1. Properties of the Mullard FX2236 core

Effective magnetic path length, l_e	19mm
Effective area of magnetic path, A_e	27mm²
Effective permeability, μ_e	950 to 1,840
Winding space	2·11 by 6·21mm
Saturation flux density, B_{sat}	350mT

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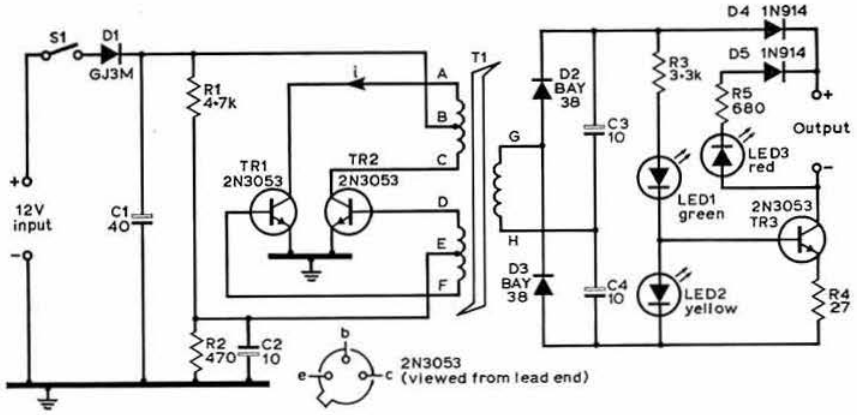

Fig 1. Circuit diagram of charger

being charged, and provides a voltage reference for the constant current source. LED2 will only light if a current is drawn from the output because the base-emitter junction and R4 would otherwise provide a shunt across it, reducing the voltage to about 0·8V—and LED2 requires nearly 2V before it will light.

Components

D1, to protect the inverter against supply reversal, is a high-current germanium rectifier, chosen for its low voltage drop. A possible alternative would be the base-emitter junction of a germanium power transistor. All three transistors are medium power silicon types, and may be replaced by any similar transistor with voltage ratings of 40V and peak collector current ratings of 300mA. It is worth mentioning that the type specified has a high limit for Vce(sat), and if the transistors used approach this limit the efficiency and output voltage of the inverter will be reduced. Therefore, it is recommended that this parameter be checked first, using the circuit of Fig 2; a good transistor will give a value of 500mV or less (300mV for the transistors used in the prototype).

Due to the high frequency, the rectifier diodes D2 and D3 are critical and only the types listed in the components list or equivalents should be used. Normal rectifiers (1N4001 etc) will not work, and most small signal diodes have inadequate current ratings. The remaining diodes may be of any silicon type. If a different core is to be used for T1, one should be selected with characteristics as close as possible to that specified; important properties are listed in Table 1.

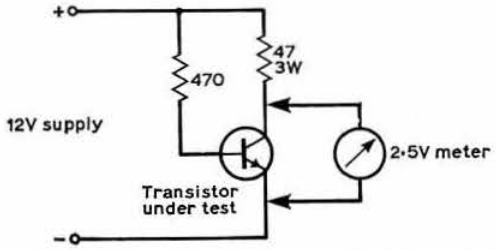

Fig 2. Circuit for measuring Vce(sat) under the conditions used in the charger ($I_C \approx 250mA$)

Components list

C1	40μF 16V electrolytic	**LED 3**	Red
C2, 3, 4	10μF 16V electrolytic	**R1**	4·7kΩ ¼W
D1	GJ3M or similar	**R2**	470Ω ¼W
D2, 3	BAY38, BAV10	**R3**	3·3kΩ ¼W
D4, 5	1N914	**R4**	27Ω ¼W
LED 1	Green	**R5**	680Ω ¼W
LED 2	Yellow	**TR1-3**	2N3053.

T1 Wound on two Mullard FX2236 cores with DT2202 former

Primary ABC:	25 + 25 turns 34swg
Base winding DEF:	5 + 5 turns 34swg
Secondary GH:	25 turns 34 swg

Construction

Any convenient type of construction may be used as the layout is non-critical. TR3 should be fitted with a push-on heatsink, and, to minimize rf interference from the inverter, the circuit should be enclosed in a metal box with all leads in and out decoupled with disc ceramic capacitors.

Setting up

Connect a 12V supply to the unit via a 500mA meter and load the output with a set of discharged nicads or a zener diode of about 11V and a suitable power rating. If neither is available, a resistor of about 200Ω may be used, but trouble may be experienced in getting the inverter to start with the load connected; this is because a resistor loads the inverter most heavily as the voltage is just starting to build up, whereas a battery or zener load draws no current until about 16V is reached.

Monitor the voltage across winding GH of T1 with an oscilloscope (or if one is not available, measure the output of the voltage doubler) and switch on. The waveform observed should be a good square wave of about 25V peak-to-peak amplitude, or the output of the voltage doubler should be about 22V. If the circuit fails to oscillate, try reversing connections D and F of T1. If this fails, or if oscillation is erratic, some adjustment to the values of R1 and R2 may be required. If all is well, the circuit will take a current of less than 150mA, and will start reliably every time.

Next, measure the output current and set it to 45mA, if necessary by changing R4. Finally, correct operation of the indicator LEDs may be checked.

Reference

[1] Texas Instruments Ltd Application Report No B83. □

Microwave path checking

by B. CHAMBERS, G8AGN*

Introduction

Although this article deals mainly with checking paths for line of sight conditions at microwave frequencies, some aspects of propagation over obstructed paths are also discussed briefly.

If the transmission path between a transmitter and a receiver is said to be "line of sight", this means that the receiver can "see" the transmitter and vice-versa. This does not necessarily imply, however, that a person standing next to the receiving antenna can literally see the transmitter, assuming that his eyesight is good enough and the atmosphere is clear and still, since, as will be shown later, a path which is obstructed at optical frequencies may be line of sight at microwave frequencies.

The significance of the path between a transmitter and a receiver being line of sight is twofold. First, even if the transmitting and receiving antennas have only modest gain, the transmitter output power required to pass a signal over a line-of-sight path which may be several hundred kilometres in length is generally only of the order of a milliwatt. Second, it is a fairly simple matter to calculate the system power budget for a given line-of-sight path and hence to estimate the probable signal-to-noise ratio at the receiver. A measurement of the actual received signal-to-noise ratio will then provide a check on the overall performance of the system. This approach is most useful since it does not rely on the amateur having access to sophisticated test equipment.

Background theory

In practice the received microwave signal will have propagated through a portion of the earth's atmosphere. Since the properties of the latter—such as pressure, temperature and humidity—vary with position, it is to be expected that its refractive index will also vary. This variation will have a marked influence on the actual path taken by the microwave signal in going from the transmitter to the receiver. Since the refractive index, n, of the earth's atmosphere has a value which is only slightly greater than unity, it is usual to work in terms of the refractivity, N, which is defined as

$$N = (n-1) \times 10^6 \qquad (1)$$

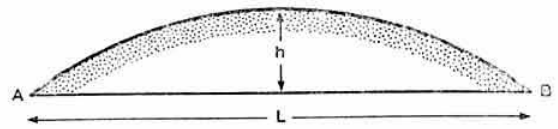

Fig 1. Microwave path over smooth earth showing earth bulge h

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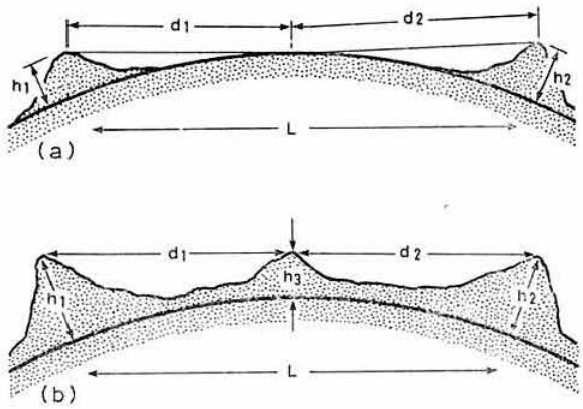

Fig 2. Preliminary path checks for line-of-sight conditions over (a) smooth earth path (b) path containing one significant obstacle

The dependence of N on pressure, temperature and humidity is apparent from

$$N = \frac{77{\cdot}6}{T} p + \frac{3{\cdot}733 \times 10^5}{T^2} e \qquad (2)$$

where p = the atmospheric pressure (mb)
e = the water vapour pressure (mb)
and T = the air temperature (°K).

The first term on the right-hand side of equation (2) corresponds approximately to the optical value of refractivity; the second term, which must be included at microwave frequencies, accounts for the presence of water vapour. Hence light waves and microwaves are affected differently in propagating through the atmosphere. Unless mixed land-sea paths are being considered, it is usual to assume that the refractive index of the atmosphere does not vary with distance along the path, and that under average propagation conditions decreases in an approximately linear manner with increasing height up to about 1km. The variation above this height is of no interest here. The effect of a decreasing refractive index with height is that, instead of propagating in a straight line, the microwave ray now follows a curved path whose radius of curvature is normally somewhat larger than the radius of the earth. For convenience the ray path between the transmitter and the receiver can again be considered to be straight if the earth is assumed to have an effective radius which is

Table 1

L (km)	h (metres) K = 1 (no atmosphere)	K = 1·17 (average optical value)	K = 1·33 (average microwave value)
5	0·5	0·42	0·38
10	2·0	1·7	1·5
15	4·4	3·8	3·3
20	7·9	6·7	5·9
25	12·3	10·4	9·2
30	17·7	15·0	13·2
35	24·0	20·5	18·0
40	31·4	26·7	23·6
50	49·0	41·8	36·8
75	110·3	94·0	82·7
100	196·1	167·2	147·1
200	784·3	668·7	588·2
300	1,764·7	1,508·3	1,326·8

different from reality. The amount by which the effective radius at a given time differs from the real radius is determined by the local variation with height of the refractive index and is best characterized by the effective earth radius factor K, where

$$K = \frac{\text{effective radius of the earth}}{\text{real radius of the earth}} \qquad (3)$$

Under abnormal propagation conditions the value of K may lie anywhere in the range 0·4 to infinity, or may even be negative; but more usually, in the UK at least, K has a value in the range 1 to 1·5 [1]. For this reason the value of 1·33($^4/_3$) is often used for average propagation conditions.

The next factor to be considered is that of the curvature of the earth. Fig 1 shows the two ends A and B of a microwave path which are separated by a distance L. The height, h, of the earth bulge at the midpoint of the path may be calculated from

$$h\,(\text{metres}) = \frac{L^2\,(\text{km})}{51K} \qquad (4)$$

(Imperial unit equivalents to the equations are given in the appendix). Table 1 shows the magnitude of h for path lengths up to 300km and for three values of K.

It can be seen from Table 1 that the effective height of the earth bulge decreases as the value of K increases, and vice-versa. Values of K greater than 1·33 correspond to above-average microwave propagation conditions, and if the value of K becomes infinite or negative then the condition known as ducting occurs when the earth is effectively flat. Also from Table 1 it would appear that for *normal* values of K the smooth earth can be assumed to be flat for path lengths less than about 20km. If the path length is longer than this then it is advisable to make a preliminary check for possible line-of-sight conditions before taking the trouble to construct a detailed ground-profile diagram. The preliminary check consists of assuming that the earth between the transmitter and the receiver sites is smooth as shown in Fig 2(a) and calculating the sum of the distances d_1, d_2 to the horizon from each end of the path. If this total distance ($d_1 + d_2$) is greater than the path length L then the path *may* possibly be line of sight. The distance, d, to the horizon

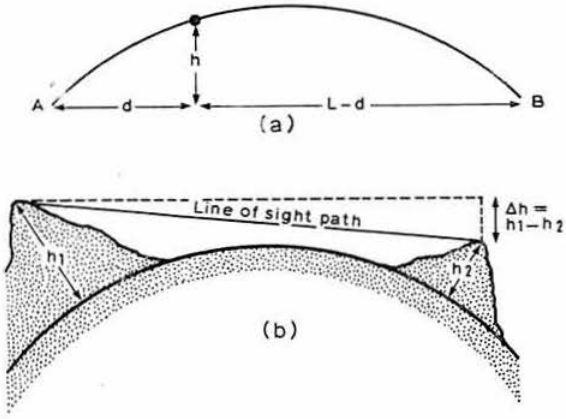

Fig 3. Geometry of parabolic arc profile diagram

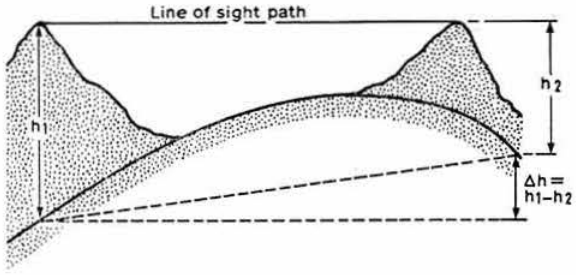

Fig 4. Tilted parabolic arc profile diagram

from the top of a hill which is of height h may be found from

$$d\ (\text{km}) = 3{\cdot}57\sqrt{K\,h\,(\text{metres})} \qquad (5)$$

Table 2 gives values of d for various values of h and K.

If the ground profile between the transmitter and receiver sites can be assumed to contain only a single significant feature, as shown in Fig 2(b), then the preliminary check can be modified to include this. Under these conditions the path *may* be line of sight if

$$L > 3{\cdot}57\ \sqrt{K(h_1 - h_3)} + 3{\cdot}57\ \sqrt{K(h_2 - h_3)} \qquad (6)$$

For a more detailed path check it is necessary to draw a ground-profile diagram. This is essentially a side elevation or ground section of the path between the transmitter and the receiver which is drawn with the vertical or height scale greatly exaggerated in comparison to the horizontal or distance scale. The smooth circular earth profile would then be depicted as a portion of an ellipse. This is difficult to construct for an arbitrary path length but, fortunately, because the vertical scale on the diagram is greatly exaggerated the elliptical arc can be approximated very closely by a parabolic arc which is rather simpler to construct. Fig 3(a) shows a parabolic arc representation of the surface of a smooth earth between a transmitter and a receiver. The height h of the earth bulge at a distance d from end A of the path is given by

$$h\,(\text{metres}) = \frac{d\,(L - d)}{12{\cdot}74\,K} \qquad (7)$$

where L and d are in kilometres and L is the path length.

When the heights h_1 and h_2 above sea level of the transmitter and receiver are added to the diagram, as shown in Fig 3(b), it can be seen that the line-of-sight path is, in general, not horizontal since h_1 and h_2 usually are not the same. If desired, an additional term can be added to the right-hand side of equation (7) to tilt the ground profile

Table 2

h (metres)	Distance to horizon d (km)		
	K = 1	K = 1·17	K = 1·33
100	35·7	38·7	41·1
200	50·5	54·7	58·2
300	61·8	67·0	71·3
400	71·4	77·3	82·3
500	79·8	86·5	92·1
1,000	112·9	122·3	130·2
3,000	195·5	211·8	225·5

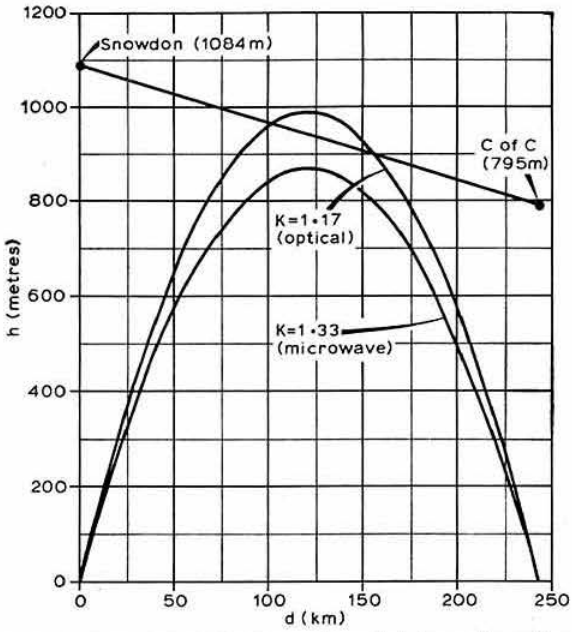

Fig 5. Parabolic arc profile diagram for path between Snowdon and the Cairnsmore of Carsphern

diagram so that the line-of-sight path is horizontal. Then h is given by

$$h\ (\text{metres}) = \frac{d\,(L - d)}{12{\cdot}74\ K} + \frac{d\,(h_1 - h_2)}{L} \qquad (8)$$

and the resulting ground profile diagram is as shown in Fig 4.

Practical examples

The use of equations (7) and (8) is best illustrated by some examples of real paths. Consider first the path between Snowdon (1,084m asl) and the Cairnsmore of Carsphern (795m asl) which is mainly over the sea and is approximately 243km in length. Using equation (7), values of h in metres are calculated at 20km increments of d. The results are given in Table 3 and are plotted in Fig 5 for K values of 1·17 and 1·33, corresponding to the average optical and microwave cases respectively. It can be seen from Fig 5 that the path at the midpoint is obstructed at optical frequencies by an earth bulge some 50m in height. At microwave frequencies, however, the minimum path clearance is approximately 65m. Before the path can be positively classified as line of sight, the frequency of the transmitter must be specified and one further check made; this will be discussed after a further example, illustrating the use of equation (8), has been given.

The second path to be considered is that over land between Merryton Low (488m asl, 7km NE of Leek) and Cleeve Hill (329m asl, 5km NE of Cheltenham), a distance of 136km. Values of h calculated from equation (8) for path increments of 10km and two values of K are given in Table 4 and plotted in Fig 6. It can be seen from the figure that if the earth were smooth then the path would certainly be line of sight for both values of K. Since the path is overland, however, the height of the ground above sea level must be

Table 3

d (km)	h (metres) K = 1·17	K = 1·33
0	0	0
20	298·5	262·6
40	543·4	478·1
60	734·8	646·4
80	872·5	767·6
100	956·9	841·8
120	987·7	869·0
140	965·0	850·0
160	888·7	781·8
180	758·8	667·6
200	575·4	506·3
220	338·6	298·0
240	48·2	42·4
243	0	0

superimposed on top of the smooth-earth (ie sea level) profiles already plotted to obtain the actual ground clearance. In practice it is rarely necessary to draw the complete ground profile since a glance at the appropriate map will usually be sufficient to identify the critical points along the path. Normally this can be done using maps with a scale of 1: 250,000 but in cases of doubt the larger scale 1 : 50,000 maps should be used. Along the path being considered here, the critical point occurs at a distance of about 80km from Merryton Low. At this point, in the vicinity of Birmingham, the ground rises to a height of at least 150m, which is sufficient to obstruct the path even under normal microwave propagation conditions. Hence it is probable that this particular path is never line of sight.

Fresnel Zone clearance

In the preceding paragraphs it has been assumed that a path which is not actually obstructed by a closely spaced obstacle is line of sight. In practice this is not necessarily the case since the microwave signal does not propagate from the transmitter to the receiver as a single ray but as a cone of rays. The received signal has contributions from a number of these rays, and the magnitude of the former will depend on the relative phase of these contributions. Thus an obstacle such as a hill situated near to the line-of-sight ray may block some of the contributing rays and lead to a decrease in received signal. It is usually assumed that the obstacle will have negligible effect on the received signal level if it is situated more than a certain distance away from the line-of-sight ray, as shown in Fig 7. This minimum distance is

Table 4

d (km)	h (metres) K = 1·17	K = 1·33
0	0	0
10	96·2	86·1
20	179·0	160·3
30	248·1	222·8
40	304·4	273·4
50	346·9	312·2
60	376·1	339·3
70	391·8	354·5
80	394·1	357·9
90	383·0	349·6
100	358·4	329·4
110	320·5	297·4
120	269·1	253·6
130	204·3	198·0
136	159·0	159·0

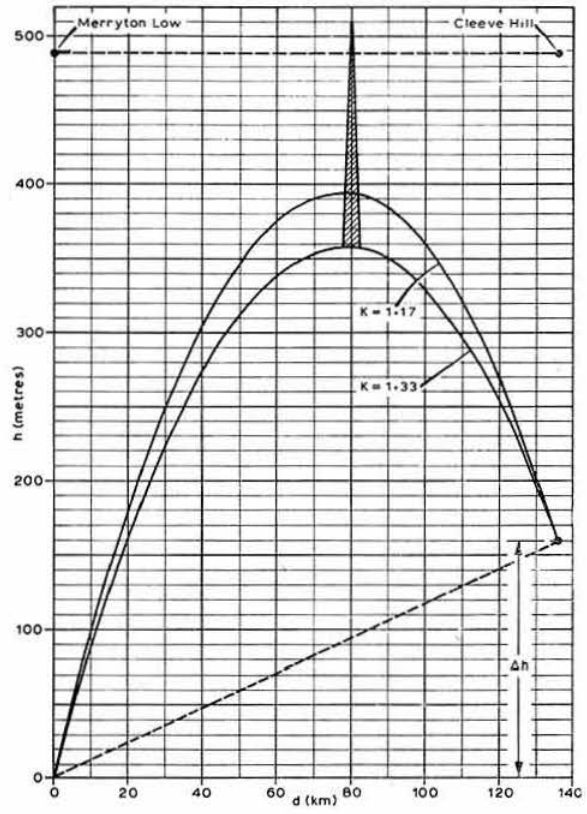

Fig 6. Tilted parabolic arc profile diagram for path between Merryton Low and Cleeve Hill

normally taken to be 0·6 of the first Fresnel Zone (often denoted as F_1), or

$$S_{min}\,(\text{metres}) > 0{\cdot}6F = 329\sqrt{\frac{d_1\,d_2}{(d_1 + d_2)\,f}} \qquad (9)$$

where d_1, d_2 are in kilometres and are the distances from each end of the path to the point under consideration, and f is in megahertz. To illustrate the use of equation (9) examine again the 243km sea path considered previously. It was found that the minimum path clearance of the line-of-sight ray was approximately 65m for K = 1·33. If the path is to be considered as truly line of sight then the value of S_{min} must be less than this figure at the frequency of interest. Using equation (9) and letting d_1 = 135km, d_2 = 108km gives S_{min} = 43·4m for f = 3·45GHz, and S_{min} = 25·5m for f = 10GHz. Hence the path is truly line of sight at these frequencies for K = 1·33.

If an obstacle is closer to the line-of-sight ray than the distance S_{min}, or the line-of-sight ray is actually obstructed, then the strength of the received signal will be diminished. To obtain an estimate of the additional path loss due to the obstacle in this case, it is often assumed that the latter can be replaced by a simple knife-edge whose diffraction loss properties are well known. Fig 8 shows the diffraction loss for a knife-edge obstacle as a function of the clearance, S,

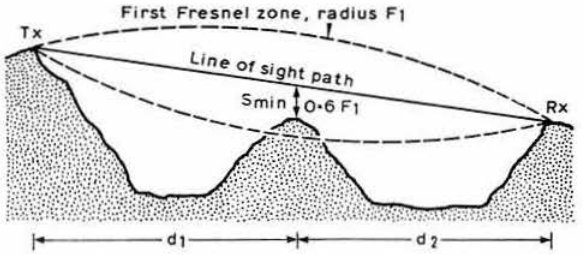

Fig 7. Fresnel Zone surrounding line-of-sight ray on a microwave path

of the line-of-sight ray. It can be seen now why the value of S_{min} was chosen to be $0{\cdot}6F_1$ since this corresponds to the case of no diffraction loss. Note also that when the obstacle just touches the line-of-sight ray (S = 0) the diffraction loss is 6dB.

To return to the second path example, the ground obstruction for K = 1·33 was found to be approximately 20m at a distance of 80km from Merryton Low. At this distance, using equation (7) modified to calculate F_1 rather than $0{\cdot}6F_1$, $S/F_1 = -0{\cdot}37$ for a frequency of 3·45GHz and $S/F_1 = -0{\cdot}64$ for a frequency of 10GHz. Hence from Fig 8 the additional path loss due to diffraction when K = 1·33 may be estimated as 11dB at 3·45GHz and 14dB at 10GHz. It should be emphasized that these estimates are probably on the conservative side since the ground obstruction at microwave frequencies may well consist in practice of a number of obstacles each with its own diffraction loss. The treatment of multiple obstacle diffraction, although fairly straightforward, is outside the scope of this article. Further details can be found elsewhere [2].

If a given path is found to be obstructed, transmission losses due to obstacles other than hills, such as trees, hedges and buildings, may also have to be taken into account. It is difficult to quote definitive values for these losses since they will depend not only on frequency but also, more importantly on the water content of the obstacle in question. As a rough

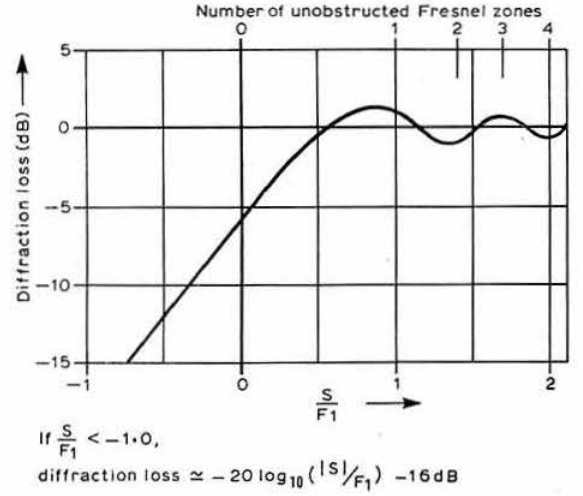

Fig 8. Diffraction loss due to a knife-edge obstacle

guide, measurements made at a frequency of 3·3GHz [3] have suggested that the following should normally be regarded as opaque to microwaves:

(a) rows of trees in leaf, if more than two in depth;
(b) trunks of trees, whether leafless or in leaf;
(c) walls of masonry, if more than 20cm in thickness;
(d) any but the lightest wooden buildings, particularly if containing partitions.

In spite of these rather gloomy conclusions and their implications for propagation across an urban environment, it should be pointed out that in the author's experience 3·4GHz signals have been received through hedges and individual trees in leaf and in one case over a 1km path through a housing estate, the transmitting and receiving antennas being inside houses on opposite sides of a hill some 30m high. The lesson to be learned from this test is clear; even if on paper a particular path is not line of sight it is still possible, on occasion, to transmit signals over it, as other propagation effects such as diffraction, scattering or ducting may come to the rescue. Herein lies the challenge and fascination of amateur radio at microwave frequencies.

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[2] "Multiple knife-edge diffraction of microwaves", by J. Deygout. *IEEE Trans on Ant & Prop*, 1966, AP14, pp 480–489.

[3] "Some experiments on the propagation over land of radiation of 9·2cm wavelength, especially on the effect of obstacles", by J. M. McPetrie and L. H. Ford. *J IEE*, 1946, 93 IIIA, pp 531–538.

Appendix

Imperial Unit equivalents of equations (4)–(9)

$$h_{feet} = \frac{L^2}{1{\cdot}5K}, \text{ L in miles} \quad (4)$$

$$d \text{ miles} = 1{\cdot}22\sqrt{K\,h_{feet}} \quad (5)$$

$$L > 1{\cdot}22\sqrt{K(h_1 - h_3)} + 1{\cdot}22\sqrt{K(h_2 - h_3)} \quad (6)$$

L in miles; h_1, h_2, h_3 in feet

$$h_{feet} = \frac{d\,(L - d)}{1{\cdot}5K} \quad d, L \text{ in miles} \quad (7)$$

$$h_{feet} = \frac{d\,(L - d)}{1{\cdot}5K} + \frac{d\,(h_1 - h_2)}{L} \quad (8)$$

d, L in miles; h_1, h_2 in feet

$$S_{min}\,(\text{feet}) > 1369\sqrt{\frac{d_1 d_2}{(d_1 + d_2)\,f}} \quad (9)$$

d_1,d_2 in miles, f in megahertz

Some meteorological aspects of the anomalous propagation of radio waves

by E. R. Thomas*

RADIO transmissions within the vhf/uhf bands (30–3,000MHz) are often directional and line of sight so that the horizon is about the limit for useful transmissions. At these frequencies radio waves passing upwards through the atmosphere are lost into space; that is, they are not reflected by the ionosphere as are radio waves of lower frequency, and for this reason vhf/uhf transmissions are beamed more or less horizontally. Unlike longer waves the whole of the path length of vhf/uhf transmissions is in the troposphere, which is the layer of air extending from the earth's surface up to about 11km (35,000ft)—in European latitudes—and is the region within which clouds, rain and weather occur.

Propagation of the vhf/uhf radio waves through the troposphere is greatly influenced by refraction, which is the change of direction, or gradual bending, to which energy waves (radio, light, sound) are subject on passing through a medium of varying density or electrical properties. The refraction of waves passing through air is probably better described by reference to light waves, which are visible, rather than to radio waves which are not.

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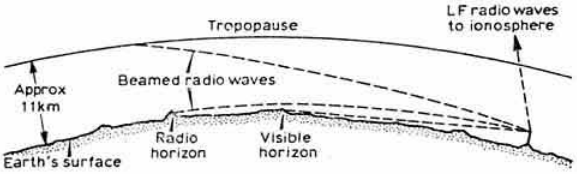

Fig 1. Transmission paths of radio waves

Visual refraction

Mirages are examples of the influence of abnormal refraction in the layers of air close to the earth's surface. They are the result of large vertical temperature gradients which considerably affect the air density in the vertical, and are of two main classes. The most common is the "inferior" mirage which is seen over flat strongly-heated surfaces, eg desert or road surfaces. This mirage produces the illusion of an expanse, or pools, of water. In this case the eye, looking more or less horizontally, sees objects well above the horizon as the light waves are refracted away from the earth's surface (Fig 2), and the apparent expanse of water is really a view of the sky.

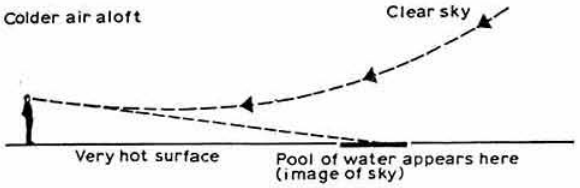

Fig 2. Inferior mirage

The other less common mirage is the "superior" mirage which is seen above a flat surface of much lower temperature than the air above it. The light waves in this case are refracted downwards towards the earth's surface, so that objects which are beyond the normal horizon appear on or even above it (Fig 3).

This "superior" mirage is of considerable importance in vhf/uhf transmissions because it allows one to "see" beyond the normal horizon.

Radio refraction

VHF/UHF radio waves are subject to greater refraction than light waves due to moisture in the atmosphere. Invisible water vapour is always present in the troposphere, and the amount is subject to considerable change, especially near the surface and in the lower troposphere. It varies from one place to another, and from time to time at the same place. The amount of water vapour (or moisture) in the atmosphere is commonly referred to as humidity. The presence of this moisture in the air is of fundamental importance in the study of the anomalous propagation of radio waves because the water molecules become electrically polarized and re-orient themselves as the electric field changes. These charged water molecules considerably enhance the degree of refraction of radio waves.

The degree of refraction is normally measured and expressed by the refractive index (n) of the medium, and is the ratio of the velocity of the wave in a vacuum to its velocity in the medium. The refractive index of air is fractionally greater than 1 and depends on pressure, temperature and humidity; it generally decreases with height so that the rays which pass through the troposphere acquire downward curvature. As the radio refractive index (n) is a quantity only slightly greater than unity (about 1·0003), a fractional percentage change in its value is very important in propagation studies. Very small changes in its value can have a profound effect on the destination of a radio wave.

To simplify calculations it is usual to subtract 1 from the index and multiply the remainder by one million to arrive at N units. Mathematically this is represented as

$$N = 10^6 (n - 1)$$

Under normal atmospheric conditions the refractive index decreases with height, in the lower levels of the troposphere, by about 40 N units/km (3,280ft). This results in normal line-of-sight radio transmissions. When the refractive index decreases with height at a rate of 157 N units/km the radio waves assume a curvature equal to the radius of the earth. Decreases greater than 157 N units/km produce a super-refracting layer in which ducting may occur.

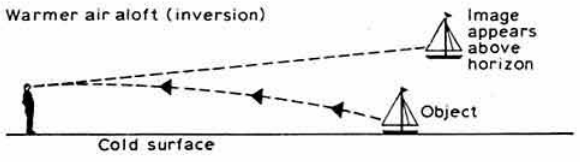

Fig 3. Superior mirage

When ducting occurs the radio waves travel beyond the visible horizon, confined within a shallow layer of air just above the earth's surface—being refracted by the air and reflected by the ground. When this phenomenon occurs it is referred to as "an opening". Whether or not a super-refracting layer leads to ducting depends upon the angle of incidence of the ray and the thickness of the layer. The greater the angle between the ray and the plane of the super-refracting layer, the greater must be the depth of the layer to bend the ray so that it is directed back to the earth's surface. The longer the wavelength the greater the depth of the layer required to allow ducting to take place. The frequency of the phenomenon is, therefore, much greater at the shorter wavelengths.

Normally in the troposphere the temperature decreases with height, but occasionally this state is reversed; that is, the temperature within a shallow layer increases with height. This is referred to as a temperature inversion. The meteorological situation favouring "ducting" or "an opening" is a low level temperature inversion with considerable moisture (or high humidity) below the inversion, and a rapid decrease in moisture above.

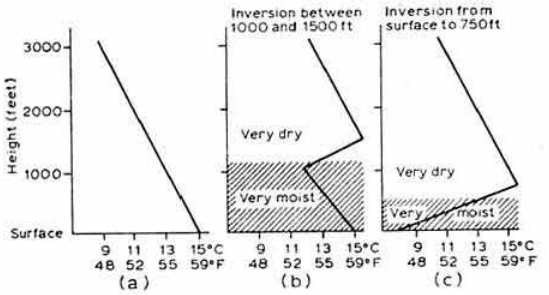

Fig 4. (a) Normal atmospheric condition. (b) Upper layer inversion. (c) Lower level inversion

Fig 4(a) depicts diagramatically the normal atmospheric condition of decreasing temperature with height (moisture not shown). Fig 4(b) depicts an inversion in the layer from 1,000 to 1,500ft, and Fig 4(c) depicts an inversion from the surface up to about 750ft. Both Figs 4(b) and 4(c) indicate situations where ducting is possible. When the air below the inversion is very moist, as indicated by the hatched parts of the diagram, and very dry above, the probability of ducting is greatly enhanced.

Inversions as depicted in Fig 4(b) are often produced in anticyclones (areas of high pressure) where the air in the centre of the high pressure sinks in the lower levels of the troposphere towards the surface. As the air descends towards the surface it is compressed and as a result its temperature rises. (A well-known example of such a heating process is the effect on air in a bicycle pump when it is compressed). A small inversion starts well above the surface and increases in intensity day by day as the air descends slowly to the lower levels—usually to about 2,000ft. Inversions of varying intensity can be found almost always in anticyclones.

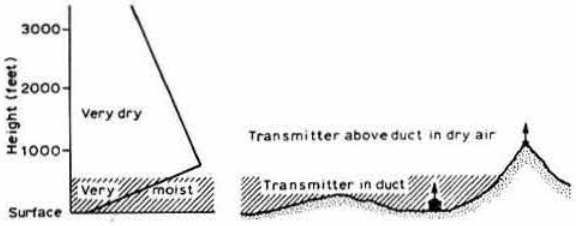

Fig 5. Overnight inversion

Anticyclones quite often move slowly, especially over temperate region land masses in winter where they produce cold but dry weather. During their slow drift across the earth's surface they can produce quite intense inversions (with temperatures increasing with height by about 5°C in a 200ft layer). The very dry air above the inversion (which gives the dry weather) and the moister air below are the preferred conditions required for ducting, and in these situations the ducting may last for several days.

Inversions are also produced when warm dry air moves over colder water. The air is cooled in the lowest layers and at the same time moisture is taken up into this layer from the sea surface. Strong ducts are often produced by this method, especially, for example, when hot air blows off the African continent over the Mediterranean. Such ducts can last for long periods and often persist throughout day and night.

Other inversions which occur over land from ground level to a height of a few hundred feet (as shown in Fig 4(c)), are usually the result of night-time cooling of the land, especially in winter when the nights are long. For these inversions to form there should be little or no cloud during the night and not much wind. The inversion starts to form about sunset, as the earth loses heat into space, and intensifies throughout the night to become most intense about dawn. The cooling of the air near the surface often results in mist, fog, dew or ground frost, all of which are indications of moist air within the inversion layer. As the sun rises, the surface temperature increases—there being little or no cloud—and gradually the inversion is destroyed and the moisture dispersed through the atmosphere, as the mist, fog, dew and ground frost disappear. These inversions, therefore, are normally night-time phenomena which give the best, though temporary, ducting conditions around the dawn period.

In overnight inversions the colder air near the surface tends to sink towards lower ground, so that the most intense of these inversions occur over the lower parts of sloping ground or in valleys. It is possible that vhf/uhf transmitters sited on preferred high ground could be above the inversion, and above the ducting layer, while a lower level transmitter would be within the ducting layer (Fig 5). This situation is less likely to occur with anticyclonic inversions, which are normally at a higher level in the atmosphere.

So far reference has been made to ducting and to the enhanced range of vhf/uhf radio waves, beyond the normal horizon, during these openings. However, it can happen that, when a super-refracting layer exists, interference may occur between two or more transmissions which have traversed slightly different paths. Signals arriving at the receiver at the same time may have left the transmitter at slightly different times, resulting in multipath fading. In the lowest layers of the atmosphere there appear to be many small-scale, short-lived or moving inhomogeneities which give rise not only to fading, but to rapid fluctuations in the fading. So while an opening offers an exciting opportunity to operate beyond one's normal horizon, there are exceptions when, at times, disappointing operating conditions occur due to multipath fading. The same meteorological factors described in this article are at work, but multipath fading indicates that the actual structure of the atmosphere is much more complex than the simple examples considered in this article. □

International beacon project

This project is sponsored and encouraged by IARU Region 1 and organized by Alan Taylor, G3DME. The establishment of the beacon stations has stimulated scientific interest in the propagation paths revealed by reception of the beacons. In addition, they fulfil a practical role by providing signals on what is often otherwise a dead band. With the increase in solar activity during the next few years more of the beacons will become regularly audible in the UK.

Freq (kHz)	Station	Original freq (kHz)	Location	Remarks
28,185	OA4VHF	—	Lima Peru	(1)
28,200	Common	28,200		
28,202·5	9J2BBB	—	Lusaka, Zambia	0500–0600gmt 1500–1600gmt
28,205	DL0IGI	28,195	Mt Predigtstuhl, Germany	QSY 28,200 H+00–05 H+30–35
28,207·5	N4RD	—	Englewood, Fla, USA	
28,210	3B8MS	28,190	Signal Mount, Mauritius	
28,212·5	ZD9GI	—	Gough Island S Atlantic	(2)*
28,215	GB3SX		Crowborough, England	
28,217·5	VK2WI	—	Sydney, Australia	(1)
28,220	5B4CY		Limassol, Cyprus	
28,222·5	YU	—	Yugoslavia	(1)
28,225	VE3TEN	28,175	Ottawa, Canada	
28,227·5	FX3TEN	—	France	(2)
28,230	ZL2MHF	28,170	Mt Climie, New Zealand	
28,232·5	VP8	—	Falkland Is.	(2)
28,235	VP9BA		Southampton, Bermuda	
28,237·5	LA	—	Norway	(1)
28,240	PY1CK	28,160	Rio de Janeiro, Brazil	(3)
28,242·5	ZS	—	South Africa	(1)
28,245	A9XC		Hamala, Bahrain	
28,247·5	EA2OIZ	—	Spain	"Unofficial"
28,250	W	28,150		(1)
28,255	W6	—	Calif USA	(1)
28,260	VK5	—	Australia	(1)
28,265	VK6	—	Australia	(1)
28,270	VK8	—	Australia	(1)

Notes: (1) In planning stage
(2) Under construction (2)* Expected to be operational soon
(3) Being re-built after period of unserviceability

swl news

Bob Treacher, BRS32525 *

DX news

It seems as though most correspondents took advantage of the long festive holiday to search around the bands, looking for those rare, elusive countries which only seem to be active when other chores curtail listening habits.

For Robert Small, A8841, the period meant new stations in the shape of 3C1X, VE3HRS/TZ6, BV2B and ZL3NR/C on Chatham Island. Noel Phelps, BRS35608, caught up with 3C1X, KX6LA and FB8WE, all on 7MHz cw. Neville Spry, BRS17567, managed a new station on 3·5MHz in the shape of 9N1NFO, who is WB4NFO in disguise. He is in Nepal to promote amateur radio and should have been active for about six weeks.

At the time of writing, the bands have been quite active, with enough good dx to keep most people happy. The 28MHz band has been open again, producing fine signals from W and VK, and the usual crop of "goodies" from the African continent. The 21MHz band has also been fair, with ample numbers of novice VK stations audible on ssb below 21·200. On 14MHz there have been the usual good ones from the Pacific area—A35, KG6R, VK9X and FK8; while 7MHz has been particularly good during morning hours, with dx being heard until 1130gmt on some days. Best dx reported on 7MHz ssb was FG7BA, and KP4RF—59 plus 20 at 1015gmt—plus numerous Central and South American countries. USA and Canadian signals around 7·200MHz have been very good at around 0830 until 1000, with west coast signals heard in G including W7ISX (Washington), WA7PDW (Arizona), AA6AA, W6FCF and W6RKP in California. Activity on 3·5MHz has not seemed as intense compared with previous winter dx seasons. Signals from the USA were, if anything, up on previous years, but little activity has been reported from the Caribbean and South America.

As Dave Sharred is now licensed, we have no 1·8MHz dx news.

Old-time dx

In the last issue, your scribe mentioned that Neville Spry had been sorting through his logs to increase his all-time countries total. He says that he has had a whale of a time digging out dust-laden and moth-eaten log books, going back many years. Some of the old-time countries unearthed included FO8 Clipperton, C9 Manchuria, YIs by the dozen, ZAs when they were genuine, CR8 Goa, FF8, I5 Italian Somaliland and JZ0. Neville now stands at 310 confirmed out of 326 heard.

The Dutch connection

A while ago your scribe received a letter from Jack der Does, NL645, who is the contest manager for VERON, the Dutch society, and, now that we have a monthly column, here are some details of an idea he has suggested. A three-hour contest between SWLs in G-land and PA0, to see who can log the most prefixes during that period. Points would be awarded according to the continent in which stations logged were situated. The idea seems a good one to your scribe, but comments would be welcome. If enough favourable comments are received we can take things a step further.

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

1977 HF Countries Final Table

Station	28MHz	21MHz	14MHz	7MHz	3·5MHz	1·8MHz	Total	Mode
BRS35608	113	173	193	184	108	42	813	cw
BRS17567	115	191	241	75	127	9	748	ssb
BRS35943	110	177	212	92	118	15	724	ssb
ARS37223	89	186	221	70	94	17	677	ssb
BRS35454	111	149	204	73	114	20	671	ssb/cw
BRS38876	54	133	174	100	115	41	617	ssb/cw
A8841	78	150	228	56	84	0	596	ssb/cw
BRS32286	84	146	173	57	110	4	574	ssb
BRS38356	67	128	153	44	69	0	461	ssb
BRS25901	33	84	173	66	76	13	445	ssb
A9191	52	126	161	35	54	0	428	ssb/cw
ARS39015	43	121	135	40	46	2	387	ssb/cw
BRS37782	40	82	110	26	55	5	318	ssb
BRS37583	31	76	108	43	53	4	315	ssb
BRS37884	24	46	76	36	70	2	254	ssb
ARS37790	22	56	94	28	33	2	235	ssb
A9107	21	40	109	13	30	1	214	ssb
BRS34968	5	18	95	14	71	4	201	ssb
BRS20185	15	57	87	13	10	0	185	ssb
ARS38280	19	48	65	16	26	1	175	ssb
A8837	24	43	74	17	11	0	169	ssb
BRS36910	20	40	76	3	8	3	150	ssb
A9199	21	41	47	17	11	2	139	ssb
BRS38934	21	24	47	16	36	3	137	ssb
BRS37587	2	16	32	23	55	4	132	ssb
A9098	5	11	48	14	20	3	101	ssb
BRS38940	2	13	69	2	2	1	89	ssb

All-time Countries Table

Station	28MHz	21MHz	14MHz	7MHz	3·5MHz	1·8MHz	Total	Mode
BRS17567	236	265	319	136	220	17	1,188	ssb
BRS32525	194	260	283	188	226	25	1,176	ssb
BRS25901	197	269	308	179	182	16	1,151	ssb
BRS35943	135	227	266	172	203	18	1,021	ssb
BRS38876	74	189	233	150	181	61	888	ssb/cw
BRS35454	114	185	247	103	147	22	817	ssb/cw
BRS32286	96	195	225	75	172	4	767	ssb
A8841	84	169	262	57	108	0	680	ssb/cw

The rest of the mail

John Holmes, BRS38934, has been experimenting with different antenna systems—with some success. He is considering a vertical now, but his ultimate aim is a beam. Over the holiday period John heard some of his first dx on the 3·5MHz band, including PJ2FR and PY2XB.

Keith Kerr, BRS35943, returned home from college to find his 28, 21 and 14MHz antennas scattered over the garden as a result of December storm damage. Fortunately, however, his 3·5MHz antenna was not affected.

Robert Small, A8841, continues to suggest that he is always at his rig, with another impressive list of dx heard. Worthwhile callsigns appear on all bands 28-3·5MHz; to pick a few of the good ones: H5 on 28MHz, FK8 and ST0 on 21MHz, and 8Q7 and VK0RH on Norfolk Island on 14MHz. His QSLd total now stands at 244, thanks to returns from ZM7AT, FH0FX Mayotte Is, SM0AGD/S2 and VK0KH Macquarie Is.

The 1977 HF Countries Table appears for the last time. Congratulations to Noel Phelps in first BRS, and to Robert Small in first A positions.

Finale

Hopefully something of interest was found in the above. Any news, views and comments, including thoughts on the G/PA0 contest, will be welcomed by 2 March for the April issue and 23 March for the May issue. □

technical topics

Pat Hawker, G3VA

A FEW weeks ago I spent a nostalgic hour at the "Wireless Show" at the Victoria and Albert Museum, where some 150 sets from about 1922 to 1956 had been gathered together and arranged to illustrate the different trends and styles in cabinets. Those massive wooden and bakelite cabinets of the 'thirties; the wartime "utility" models; the pioneering designers for Murphy and Ekco; the rising-sun loudspeaker frets of the Pye transportables that so dominated living rooms before the coming of the telly; and the transistor portables with their tiny and tinny loudspeakers. Not a communication receiver in sight (except perhaps the Forces PCR welfare set), but a fascinating display for all that and, it must be admitted, more interesting than most of the up-to-date radio exhibitions for consumer sets that one sees today. Worthy, one would think, of becoming a permanent display.

Looking at logic

Several years ago I attempted to outline the main logic "families" and to indicate the main differences in terms of switching speeds, potentials and power consumption (*Amateur Radio Techniques*). Although there have been changes in relative popularity and (for professional applications) a fairly rapid rise in the importance of iil or i^2l (integrated injection logic), the situation has remained fairly stable for several years.

However, for those seeking a more detailed outline of the differences between the logic families, an article "Digital electronics fundamentals for the users" by John W. Wentworth appears in *SMPTE Journal* Vol 86 September 1977, pp626-36, and can be found in various science libraries. It covers dctl (diode-coupled transistor logic), rtl (resistor-transistor logic), dtl (diode-transistor logic), ttl or t^2l (transistor-transistor logic), cmos or cos/mos (logic based on complementary symmetry metal-oxide-semiconductor field-effect transistors), ecl (emitter-coupled logic or current-mode logic, cml), and iil or i^2l. The following notes are partly derived from this article.

Table 1. Comparison of the ttl series

Series	Category	Typical propagation delay	Typical power dissipation per gate
7400/5400	basic	9ns	5mW
74H00/54H00	high-speed	6ns	12mW
74L00/54L00	low-power	33ns	0·55mW
74S00/54S00	Schottky-clamped	3ns	12mW
74LS00/54LS00	Schottky-clamped low power	9ns	1mW

Propagation delay is defined as the time delay between the application of a signal to the input of a logic circuit and the change of state at the output. In general terms, the maximum operating frequency of a standard 7400-series device is usually between 10 and 20MHz.

Table 2. Abbreviations in common use

bbd	bucket-brigade device
ccd	charge-coupled device
crom	control read-only memory
dil	dual-in-line package
dip	dual-in-line package
earom	electrically alterable read-only memory
eprom	erasable programmable read-only memory
fpla	field-programmable read-only memory
hex	device with six similar circuits
locmos	form of high-speed, high-output cmos
lpttl	low-power transistor-transistor logic
oxim	oxide-isolated emitter-coupled logic
prom	programmable read-only memory
quad	device containing four similar circuits
ram	random access memory
rom	read-only memory

For amateurs the most popular series are the standard "7400" series of ttl devices, although these are being increasingly challenged by the cmos "4200" series. (Note that in both these cases the serial numbers are common to several manufacturers, although the devices also carry a manufacturer's prefix, see later.) Military-grade ttl devices (5400-series) are intended for use over the wide temperature range −55°C to +125°C and a voltage range of 4·5—5·5V instead of the standard (7400-series) ranges of 0°C to 70°C and voltage range 4·75 to 5·25V: the 0°C limitation of standard devices should be noted for any units used outside the shack.

Devices in the 74C00-series and 54C00-series are not ttl logic devices but are cmos devices using the same pin

Table 3. Prefix letters of ic and display devices

AD	Analogue Devices	**O**	Pinlite
AM	American Micro-systems	**P**	Pinlite
		PA	Signetics
AY	General Instruments	**RC**	Raytheon
C	General Instruments	**RM**	Raytheon
CA	RCA	**S**	American, Micro-systems, Raytheon
CD	RCA		
CM	General Instruments	**SAK**	Philips
CMP	National	**SCL**	Solid State Scientific
CT	Caltex	**SD**	Signetics
DG	NEC	**SE**	Signetics
DH	National	**SG**	Silicon General
DL	Litronix	**SI**	Sanken
DR	RCA	**SL**	Plessey
DT	Tungsol	**SLA**	Opcoa
FPQ	Fairchild	**SN**	Texas Instruments
HBF	SGS	**SP**	Raytheon
HP	Hewlett Packard	**SSS**	Precision Monolithic
HROM	Harris	**STK**	Sanyo
ICL	Intersil	**SU**	Signetics
IM	Intersil	**TA**	STC, Toshiba
LH	Opcoa	**TAA**	Mullard, Philips
LM	National, Fairchild, Raytheon, Signetics	**TAD**	Mullard, Philips
		TBA	Mullard, Philips, ITT, SGS
LP	Elremco		
M	Motorola	**TDA**	Philips, SGS
MAN	Monsanto	**TIL**	Texas Instruments
MC	Motorola, Signetics	**TMS**	Texas Instruments
MCM	Motorola	**TP**	Texas Instruments
MFC	Motorola	**U**	Fairchild, SGS
MK	Motorola	**UA,uA**	Fairchild, Signetics
MLC	Motorola	**UAA**	Siemens
MLM	Motorola	**UC**	Solitron
MM	National	**ULN**	Signetics, Sprague
MN	Philips	**ULS**	Sprague
MPQ	Motorola	**ULX**	Sprague
MV	Monsanto	**UPC**	NEC
N	Signetics	**XR**	Exar
NE	Signetics	**ZN**	Ferranti

Some common devices (555, 741 etc) are often known by number only but, in practice, usually carry a manufacturer's prefix. The above list is not exhaustive and is intended only as a guide.

diagrams as functionally equivalent ttl devices. There are also, for example, new ranges of op-amps, such as the RCA CA3140, which feature a high-impedance mosfet input stage; they are used as a plug-in replacement for the popular 741 op-amp package (*Ham Radio* January 1978, pp76-8). Apart from the high input impedance they are claimed to have improved slew rate and wider frequency response at comparable cost.

Within the ttl family are various important categories denoted by a letter or letters within the type number: **high-speed** ttl (74H00, 54H00); **low-power** ttl (74L00, 54L00); **Schottky-clamped** ttl (74S00, 54S00); and **Schottky-clamped low-power** ttl (74LS00, 54LS00); see Table 1. The high-speed ttl devices achieve higher switching speeds at the price of substantially higher power dissipation, basically by using lower-value resistors (mostly about half-value). Low-power ttl devices, on the other hand, use resistor values about 10 times those of the basic version, decreasing power consumption but resulting in longer time-constants, thus increasing propagation delays and, hence, reducing maximum switching speeds.

Schottky-clamped devices incorporate Schottky-diodes ("hot-carrier diodes") in parallel with the conventional junctions to eliminate "depletion zone" problems; as a result, these devices can be switched faster than either conventional or high-speed ttl devices, with power dissipation about the same as for the high-speed devices. Low-power, Schottky-clamped ttl devices use higher value resistors to reduce power consumption but with switching speeds still comparable to normal ttl devices (resistors about five times those of basic ttl gates).

Two other variations should be noted. One is the **Schmitt-trigger** ttl devices, which are useful in applications where significant "noise" is present or where slowly changing voltages have to be converted to pulse-type signals. The other is the ttl **tri-state** device where the output can be logic low, logic high *or* floating; these are often used as output stages in larger-scale ttl devices.

The cmos field-effect devices are basically voltage-operated, whereas the other logic families are basically current-operated; they do not incorporate passive resistors. The most important advantage of cmos is that the devices consume very little power except when they are actually being switched and they can also be operated over a much wider range of supply voltages (3—15V for the "A" series; 3—20V for the "B" series).

In comparison with ttl, cmos devices are somewhat slower in switching speeds, affected both by the supply voltage and by the capacitance of the load. In some applications they may, however, use only about one-thousandth the power. Power dissipation is essentially proportional to the rate at which logic changes occur, since the gates draw virtually no power when in a steady-state condition (which is why, for example, a cmos keyer may never need to be turned off). For example, with a 10V supply, the power per gate at 1kHz switching is typically 4μW but at 1MHz would be 4mW.

Emitter-coupled logic (ecl or cml) has found applications in pre-scalers and vhf digital counters; its special features are the high maximum switching speeds (comparable to Schottky-clamped ttl) and relative freedom from noise spikes. The high speed results from the fact that the transistors do not go into saturation; some ecl devices have achieved switching times of well under 1ns in large scale integration. However, the use of rather different supply voltages makes it difficult to mix ecl and ttl devices, and interfacing circuits are normally required.

Manufacturers tend to classify small-scale-integration (ssi) as 1 to 12 gates per package, medium-scale-integration (msi) as 13 to 100 gates per package, and large-scale-integration (lsi) as arrays having more than 100 gates per package.

Many of the recent applications of digital logic in amateur radio have depended on the exploitation of digital "memory". Here it is worth remembering that, like the traditional "baker's dozen" (13), one gets a "binary bonus" in memory systems where 1k is equal to 1,024 and not 1,000.

Other abbreviations are now being freely used without explanation and these may not be familiar to all readers. Table 2 gives a short selection, mostly concerned with the many forms of "memory" devices.

Another problem is identifying ic manufacturers when only the type number is known, and Table 3 represents an attempt to list the more common of the prefix letters used for ICs and display devices: it is based on a list prepared by "Kip" in *Break-in* August 1977.

Stable bfo using cmos

Jan Martin Noeding, LA8AK/G5BFV, has found that a useful and stable 455kHz bfo can be built from such cmos ic devices as the MC14011CP or MC14069BCP (Fig 1). When bench tested over a period of 24 hours it remained stable to within 100Hz. Supply voltage should be about 6 to 10V, although it has been used with Vcc as high as 22V.

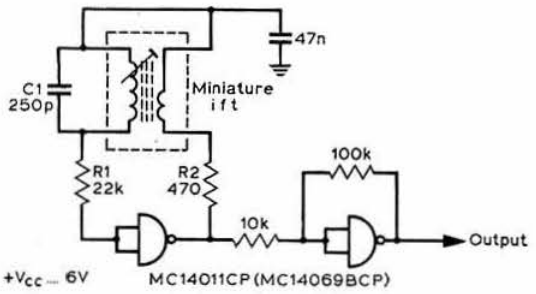

Fig 1. LA8AK's stable bfo using cmos device

The tuned circuit is a miniature Japanese ift with the original capacitor replaced by C1, a 250pF styroflex type. Without C1 the frequency increased to about 1,700kHz (R1 should be reduced in value), suggesting that a similar approach could be adopted for an i.f. of around 1,600kHz.

For optimum stability R1 should be the maximum value that sustains oscillation; the lower the frequency the higher the value of resistor that can be used.

Absorbing vhf in crowds

A recent short note in the *ABU Technical Review* reported that users of radiomicrophones have sometimes experienced problems as a result of underestimating the effect of a large crowd of people between microphone and receiver. To quote this report:

"A recent important radio outside-broadcast involved the use of radiomicrophones which proved disappointing and caused several anxious moments. All the points had been

thoroughly checked out in advance and the final broadcasting points had shown a good reserve of signal, but during the broadcast the signals proved marginal and we had to operate at the limits of the equipment. As our commentators were relatively clear of the crowd, it would appear that an absorption effect was caused by the bulk of the crowd between the transmitter and receiver, particularly as a check made clear of the crowded area indicated results comparable to the original tests. The absorption was more marked with a 400MHz radiomicrophone than one operating at 30MHz."

Radiomicrophones are, of course, an extreme example of low-power radio links with relatively inefficient transmitting antennas, nevertheless this report may be worth remembering when trying to use hand-held equipment in comparable circumstances.

FM tuning indicator

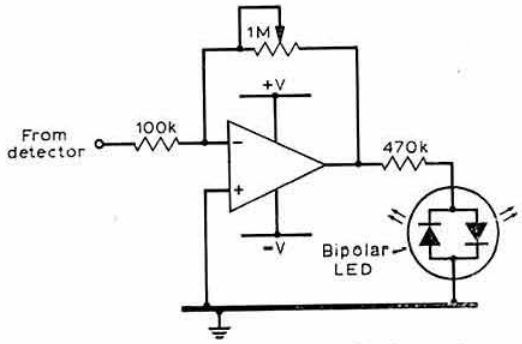

Fig 2. Centre-zero tuning indicator for fm receivers

From *Old Man* No 11 1977 (possibly reprinted from *73* magazine) comes a zero centre indicator for fm receivers suggested by Michael Black, VE2BVW (Fig 2). Operation is described as follows: "To adjust, tune-in a station and adjust the 1MΩ potentiometer for a null. Then ask the station to modulate and fine adjust so that modulation peaks do not light the LEDs. Stations are properly tuned when neither led is lit".

Another squelch for the CA3089E

As a result of seeing the squelch circuit used by G4EMW in conjunction with receivers based on the CA3089E ic (*TT* December 1977 p946 Fig 8), Andy Hamm, G4EBI, was prompted to send along a rather simpler arrangement which he has used in several receivers based on the CA3089E (Fig 3). He points out that it has the attraction of using only a 741 op-amp without any additional discrete transistors, and is driven by the noise-operated squelch circuitry within the CA3089E. The 4·7kΩ resistor and 100nF capacitor ensure stable switching; the 10kΩ divider potentiometer sets the 741 output within the operating range of the CA3089E mute, pin 5, while the 4·7kΩ resistor at pin 3 of the 741 provides a load for the emitter-follower squelch output.

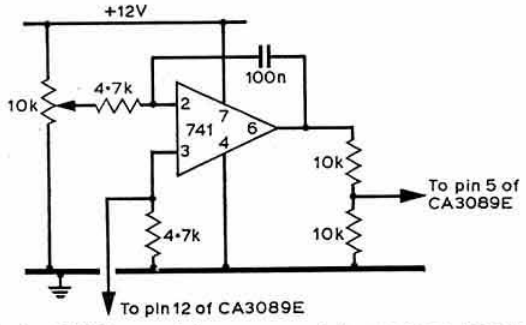

Fig 3. G4EBI's squelch arrangement for receivers based on the CA3089E devices

More on electronic dc fusing

The resettable electronic dc fuse described in the November, 1977 *TT* clearly appealed to a number of readers as an idea of considerable practical value. But both John A. Young, GM4DQD, and A. F. Harrison, G3SEU, comment that during the period that the resetting button is "momentarily" depressed the system provides no protection to the equipment. They point out that it would seem to be preferable to use a double-pole relay, particularly since these are as widely or more widely available than single-pole types. The fuse can then be arranged to open and protect the load should the button S1 be held down during overload conditions.

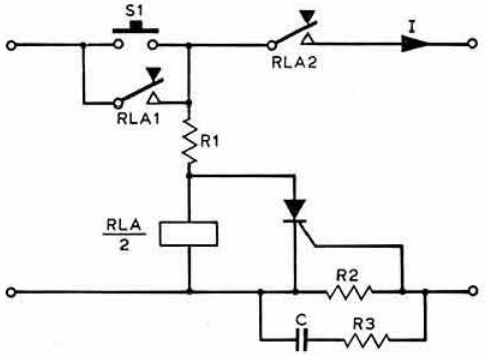

Fig 4. GM4DQD's suggested resettable electronic dc fuse using double-pole relay for added protection

GM4DQD suggests that the free-handle circuit breaker arrangement shown in Fig 4 will give useful protection, and adds that "although the tripping of this circuit breaker will be as rapid as the agility of the relay allows, the operation is unlikely to be fast enough to protect fully semiconductor devices. In such cases an electronic rather than an electronic/electromechanic overload trip is advisable. Conversely, if a heavy in-rush current is to be accepted (but with subsequent close protection) a capacitor C and resistor R3 can be added across R2, but the response to the later lesser overload current will be somewhat delayed."

He continues: "If an on-off switch is preferred to the momentary contact switch, the same free-handle feature can be realized with a single-pole relay as shown in Fig 5. In the original circuit with a momentary-contact switch the relay series resistor R1 may be short-rated, but with the on-off switch control the corresponding resistor must be rated for continuous connection across the supply."

G3SEU notes a further point for the "belt and braces" people. He suggests putting the electronic fuse, set at a slightly lower rating, in front of a normal fuse. Then a long switch closure, or similar effect, would still be protected, while the

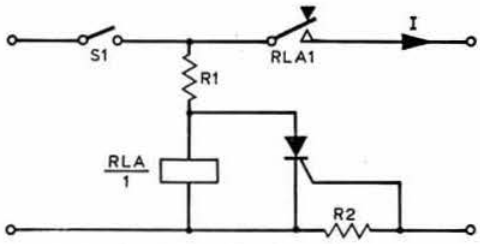

Fig 5. The use of a single-pole relay with switched closure

normal(?) temporary overload would cause the relay to trip *without* blowing "the one and only remaining cartridge fuse".

Matching coaxial cables

Wyn Mainwaring, G8AWT, has made effective use of a technique for matching together different coaxial cables or socket-to-cable problems that is novel to me; although as indicated later I am not sure whether this is as easy to implement as an alternative idea that was drawn to the attention of readers by G3KYH in *TT* (October 1971) and has subsequently been included in several editions of *ART*. But first let G8AWT explain his technique. He writes:

"Much radio equipment is built to professional standards, including 50Ω impedance coaxial feeds, of which there are many (and an expensive range of inter-series connectors). The well-established BNC devices are ample for the power levels found in amateur radio and usable to 10GHz; it is small and positive in a quick connection with no threads to cross or bind.

"However, older gear is more likely to have 75Ω outlets or feed impedance, via a B-L connector. The nickel-plated versions of B-L are a better long-term proposition than the more common aluminium-bodied plug, mating with a nickel or cadmium-plated socket. It depends on a firm push 'home' to minimize dielectric air-gap and to ensure reflection-free connection at very high frequencies.

"How can we join the two systems? A $\lambda/4$ coaxial matching transformer (taking into account the velocity factor of the cable) can provide the answer if this can be made by using a solid polythene cable of an impedance that is the geometric mean of 75/50Ω systems, ie 61Ω, or in terms of solid polythene cables, 67pF, 100pF and 82pF per metre-length of cable. But how can we make a 61Ω length of cable?

"This can be done without disturbing the inner or cutting the outer conductor of a piece of single-cored UR43 (or the flex-cored UR76) as follows:

"Start with the cable correctly terminated at one end with a 50Ω BNC connector. Then carefully strip the black pvc sheath from a good $\lambda/4$ length at the other end (68in for 28MHz, 28in for 70MHz, 13½in for 144MHz etc); the outer can then be pushed back like a sausage skin to reveal the solid polythene dielectric. Next some readily-available plumbers' ptfe pipe-thread tape (0·06mm thick seems a common type) is lap-wound over the length of polythene, forming two layers from the braid towards the free end, then returning towards the braid, forming a three-layer lap, totalling five layers over the polythene. It is this taped length that forms the new-impedance cable, an overall diameter of 3·5mm being needed for this mixed dielectric length of cable.

"The braid now needs to be eased back over the taped section resulting in a shrinkage of about four per cent. As much care as possible should be exercised in replacing the braid smoothly and keeping it in place with adhesive pvc tape, which can be multi-layered to bring the diameter up to a convenient size for the B-L plug at the 75Ω matching end, or for accepting a larger pvc tube (from some domestic fringe-type cable) which may be sealed from the weather with Bostick No 1 or pvx adhesive."

G8AWT sent along a short length of modified cable showing that it all makes up into a very neat arrangement with the $\lambda/4$ matching section built-in to the cable.

However, the alternative technique suggested in 1971 by G3KYH and based on an article in *Electronic Engineering* (April 1962) is shown in Fig 6. This permits any two cables of different impedance to be matched together by using appropriate lengths of the cables as shown, so avoiding the need for a cable at the geometric mean impedance. G3KYH simplified the original formula to that shown and noted that "for a 50/75Ω transformer this works out to an electrical length of 29·3° for each section of cable. The physical length must of course take into account the velocity factor of the cables (typically about 0·66 —0·80)".

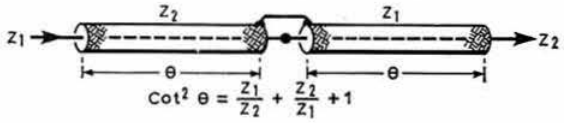

Fig 6. Transmission line transformer used to provide a simple means of matching 50Ω and 75Ω coaxial cables

Voltage-controlled noise generator

This idea comes from Jan Martin Noding, LA8AK/G5BFV, although it is based on a suggestion by DB3RC in *CQ-DL* No 4, 1977. The circuit shown in Fig 7 has been modified to suit the particular requirements of LA8AK for use with the "Alignment aid for vhf receivers" described by J. R. Compton, G4COM, in *Radio Communication*, January 1976. Two units have been built and both worked instantly, delivering a maximum noise output of the order of 10dB (μV). Several transistor types have been tried for TR2 and it seems probable that optimum results will be achieved with a device having as low V_{BE} as possible. Type MPS918 showed the best performance, starting to produce noise with an input voltage of approximately 6V; the BC547 began to produce noise at 9V. However, if a 12V supply is available a BC547 will suffice, although the MPS918 (and possibly

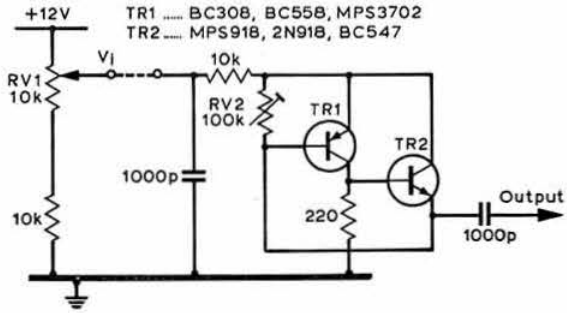

Fig 7. Voltage-controlled noise generator used by LA8AK in conjunction with G4COM's "alignment aid for vhf receivers"

2N3904) will result in more continuous tuning. TR1 does not appear to be at all critical, and types such as BC308, BC178, BC558 or similar devices may be used. The noise maximum is set by RV2 but it could usually be replaced by a 10 to 50kΩ fixed resistor. When an attempt was made to bypass the collector of TR2, LA8AK reports, this reduced the noise output level.

Using the SL664, SL665 nbfm ICs

John Wilson, G8KIS, and Richard Lambley, G8LAM, have been carrying out some practical tests using the new Plessey SL664, SL665 devices designed to provide i.f./af circuits for nbfm receivers and transceivers. Each of these devices provides the basis of a complete i.f. strip and consists of a pre-amplifier, limiting amplifier, quadrature detector, carrier squelch, dc volume control and audio output stage. The SL664 provides 250mW af output into 8Ω, while the SL665 has low-level af output intended to drive high-impedance loads.

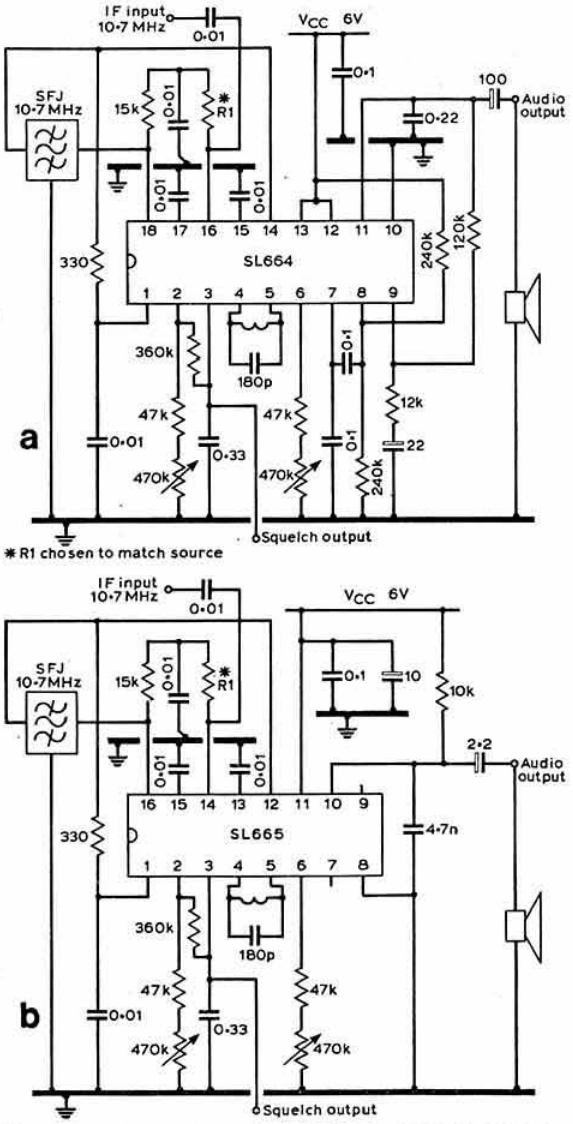

Fig 8. The basic test circuits for the Plessey SL664, SL665. Note that in each circuit a correction has been made to the connections shown in the early data sheet issued by Plessey

Fig 8 shows the test circuits used (these differ from that shown in the original provisional data sheet which was found by G8KIS to contain an error). Some practical points noted by G8KIS include:

(1) Rf should be chosen to match the receiver's crystal filter.

(2) The SFJ filter acts as a roofing filter after the first i.f. gain block (46dB) and can be any ceramic filter of 330Ω impedance of the type intended for domestic wideband fm receivers. It *must*, however, be one selected for 10·7MHz as these cheap filters are manufactured to rather wide tolerances.

(3) The 470kΩ dc volume control should be *linear*.

(4) The 470kΩ squelch control is very critical of adjustment and can profitably include a fine control wired in series.

(5) The tuned circuit between pins 4 and 5 can be a single-tuned i.f. transformer, but G8KIS/G8LAM found that a small toroid wound with about 15 turns in parallel with an adjustable trimmer was both smaller and of higher *Q*.

(6) Although not obvious from the data sheet, the SL665 does not incorporate internal muting. However, the use of a few extra components and virtually any npn silicon transistor provides full squelch facilities (Fig 9).

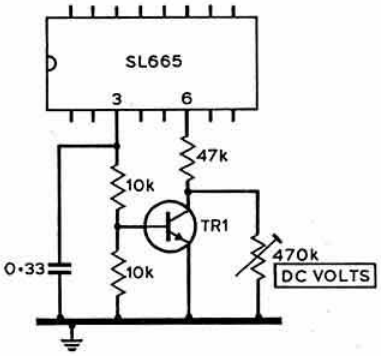

Fig 9. The use of external components to provide a muting facility on the SL665

G8KIS reports that they found the squelch hysteresis very pleasant operationally, and preferable to the usual delay time-constant. In this way, if the squelch opens, it then remains open until the signal sinks a further 10dB into the noise. There is no annoying blast of noise on loss of incoming signal, provided that the control is set correctly.

Because of the enormous gain of these devices, a good layout is essential and decoupling components should be as near the ic as physically possible.

It is clear that these new devices provide a useful addition to the SL600 and SL1600 ranges, being purpose designed for narrow-band fm and suitable for vehicle, hand-held and domestic receivers. □

microwaves

Charles Suckling, G3WDG *

THE new writer takes over the pen with, perhaps, some of the mixed feelings which Dain Evans mentioned when writing his last contribution to this column. First of all, the writer would like to join with many in thanking Dain for the tremendous effort which he has put into microwaves. He has not only written this column since its beginnings in 1970, but has also been a contributor of articles to *Radio Communication* and is, of course, joint author of the RSGB *VHF/UHF Manual*. In addition, he has put much effort into microwaves through other channels, including a number of RSGB committees and international meetings.

Many readers will know that Dain has been involved in RSGB affairs for a number of years. It is certain that the Society as a whole has benefited from his enthusiasm, and will continue to do so, particularly during his period of office as President this year.

To take over such a well-established column is a daunting task, and the writer hopes that this will be made easier by as large a volume of correspondence as possible. Thus details of new equipment, operating news, ideas and opinions will all be most welcome.

1977 10GHz Cumulative Contest

Until last year, contest operation on 10GHz had been limited to one or two multiband contests per year. In view of the high current level of activity on 10GHz, the Microwave Sub-committee and VHF Contests Committee organized a series of cumulative contests during last summer, similar to the events which have been held for some years on 432MHz.

There was an enthusiastic entry for this contest—20 stations sent in logs—and the results are published in "Contest news" in this issue. In all, a total of 170 contacts was made during the five periods, and 44 stations were operational. In addition to the entrants, the following stations were active: F5ZA, G8DIC, G3IZD, G5HD, G3SDH, G3YJH, G8MFJ, G8FMJ, G8FLK, G3BNL, G3JVL, G8AGN, G4BGP, G8ADP, F3LP, G8EUQ, G3PFR, G8CKT, G4ETU, GW8MEU, G3EGV, G8BTY and G2RY. Activity seems to have been centred in three main areas—the south coast, the west country and the Midlands; little or no activity was reported from the London area, or from Scotland, which is surprising in view of the interest in 10GHz in these areas.

Most contacts were made over line-of-sight paths, but a significant number were established over non-optical paths. For example, GU3JHM/P contacted G4CNV/P and G3VPF/P in South Dorset, G3KSU/P on the Isle of Wight, G8DIC and G3JVL/A on Hayling Island and G8BCO/P and G8ARO/P on the South Downs; the path to the South Downs was 164km in length, the longest to be covered during the contest. These contacts were all made by super-refraction using "standard" equipment (low-power Gunn oscillators, wide-band receivers and dishes 10-24in in diameter). This type of equipment is also capable of covering some overland obstructed paths, as was demonstrated by the contacts between GW4BRS/P and G8BCO/P and G8ARO/P over the 116km path from Mynydd Maen (NGR ST260977) to Walbury Hill (NGR SU364622). These contacts are particularly interesting as subsequent attempts by GW4BRS/P to repeat them with G4CNV/P and G3JHM/P failed. It is likely, therefore, that the earlier contacts were made under enhanced propagation conditions.

The use of higher power equipment, by one or two stations, demonstrated that results could be obtained over even more difficult paths. For example, GW4BRS/P, near Brecon (NGR S0012216), copied weak signals from G3VPF/P over the 146km path from Hardy's Monument (NGR SY613876), and G4DDK/P received G3WDG over the 102km path from Clee Hill (NGR S0593755) to Bristol. On these occasions both G3VPF/P and G3WDG were using wideband transmitters with output powers in excess of 1W. As far as is known, no contacts were made using narrow-band equipment, although a weak carrier was received at Bristol by G3WDG from G8DEK (Winchester) by tropospheric scatter during two of the periods.

While operation on 10GHz appears, happily, to use common standards, the same cannot be said of the talkback situation. To the author's knowledge, 144MHz ssb, 432MHz fm and 144MHz fm were all in use. The result of this is simple—less microwave contacts. It would be a significant step forward if only two agreed frequencies were used; eg 433·2MHz (fm) and 144·33MHz (ssb). Also, it would be highly desirable to agree on a common polarization for talkback. While vertical polarization may have advantages, in enabling simple omni-directional antennas to be used, it is not commonly in use by fixed stations. Also, as longer distances are attempted on 10GHz with improving equipment, small hand-held portable equipment becomes inadequate for talkback and beam antennas have to be used to ensure reliable communication. Therefore, in order to maintain uniformity with normal usage, it seems sensible that horizontal polarization should be used. Let us hope that this situation improves next year, as it is unfortunate that contacts can be missed due to incompatibility of talkback equipment.

Talkback aside, most stations reported that they had enjoyed the event, particularly as it gave an excellent opportunity for improving equipment and operating skills. Over three-quarters of those who sent in logs made use of the information sheet service, and so this will be provided again for this year's event.

RSGB National VHF Convention 1978

The Microwave Committee will be organizing a lecture stream at this convention, to be held on 25 February. The first lecture will be given by Peter Tunbridge, G8DEK, on the subject of locking Gunn oscillators as a simple approach to narrow-band operation on 10GHz. The second lecture, entitled "Getting started on 2·3GHz", will be given by G3WDG. It is hoped to review some of the designs available for converters, antennas and transmitters. In this context, the writer would be very pleased to receive information from stations operational on this frequency, particularly with regard to any results obtained with the 2C39A pa described in *Ham Radio Magazine* (February 1975) and the interdigital converter which appeared in the January 1974 issue of *QST*. □

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4-2-70

Graham Knight, GM8FFX*

Beacons

The Lerwick beacon continues to be an excellent auroral indicator—the 144·965MHz signal has now been heard in 14 countries. DM4PSN, in far away QTH locator GK07c, is the latest dx station to report hearing GB3LER via aurora.

Brian Bower, G3COJ, the IARU Region 1 beacon co-ordinator, reports that the French beacon FX0THF has now changed frequency to 144·895MHz and that the Lannion beacon has moved up to 50·104MHz. This 4kHz shift in frequency should separate it sufficiently from the adjacent television transmission which has given some problems to monitoring stations in Europe. F8SH reports that the antennas on this interesting beacon will be left beaming south until the spring.

G3COJ has also received details of plans for additional beacons in Norway. Jan Martin, LA8AK/G5BFV, sends the news that the construction of two beacons, to be located at Kristiansands (DS70d), is well advanced and that the keyers will incorporate four 256 PROMs. The proposed callsigns and frequencies are LA5VHF (144·880MHz) and LA3UHF (432·880MHz). A further beacon, LA4UHF (432·890MHz), is proposed for Haugesund (CT square), and this will complement the existing service from LA4VHF on 144·890MHz. All three are expected to commence operation within the next few months.

American repeaters

David Evans, G3OUF, Don McLean, G3DNQ and John Kelly, GM3POK, have recently been to the USA, and all three took the opportunity to operate through the WR prefixed repeater stations. During a visit to the ARRL headquarters in Connecticut G3OUF learned that there are 2,876 repeaters in the USA—2,103 of these are on the 144MHz band. The number of repeaters per state varies from nine in Vermont to 186 in New York. Many towns have more than 20 repeaters and nearly all the 144MHz units have 600kHz channel spacing. In America they do not use R numbers but talk about their "three-one, nine-one" repeater—signifying that the input is on 146·310MHz and the output is on 146·910MHz.

John Kelly, GM3POK, enjoyed operating through the multiplicity of 144MHz repeaters available to amateurs mobile in the San Francisco Bay area. He remarks on the high level of activity, even in the middle of the night, and on the fact that California has 343 different repeaters.

Don McLean, G3DNQ, operated through a great many repeaters during a recent visit to Canada and the USA, and he too, mentions the large number of repeaters serving some cities, giving the town of Portland, Oregon, as an example. While driving from the airport to the home of G3PST/W7 Don operated through four of Portland's 18 repeaters. Operation through these "open" repeaters was easy, with no time-out or access tones, but G3DNQ was also interested in the "closed" repeaters. These "closed" repeaters have special access tones and can only be operated by subscribing members of that repeater group. G3PST/W7 values special repeaters because of the extended facilities available through these so-called "private" units. They have built in "auto-patch"—a device which interfaces the repeater with the local telephone company. Using a home-made touch-tone key pad, G3PST/W7 "dialled" the appropriate code which produced the dialling tone then, pressing the buttons a few more times, called his home telephone. Within seconds he was talking to his wife on the telephone, via the repeater, and giving her 20 minutes warning of his arrival home. Scotsman G3DNQ was all the more interested in this facility when he learned that local calls are included in the telephone rental in America.

While driving in California Don's callsign was "G3DNQ mobile whisky six", but he says "it is definitely considered anti-social to pause, 5,000 miles from the UK, before uttering the final two words". G3DNQ also passes on the information that permission to use a British callsign with the appropriate suffix is easily obtained by writing to the FCC, Washington DC, 20554, USA, and requesting Form 610-A which will be sent free of charge. One of the form's requirements is that the applicant knows the rules, and these are obtainable from the US Government Printing Office, Washington DC, 20402. They will send "FCC rules and regulations part 97", but this time they will cost $1·30.

British repeaters

Having received American repeater news from G3DNQ, and knowing that he probably operates mobile, daily, through more British repeaters than anyone else, GM8FFX asked Don McLean to give his personal views on the British repeater scene. Don lives in Bishop's Stortford, Herts, and travels to London's West End each working day. His car is equipped with an IC22 driving an FM40 to a 5/8 vertical for 144MHz, and an IC30A to a 5dB-gain colinear for 432MHz. For the first quarter of his journey Don is able to access GB3PI on R6, and GB3LO on R7 for the remainder.

Don is most enthusiastic about the many 432MHz repeaters and says: "As I drive from my home to London I move from one community to another, switching channels as I go, thus: RB0 (GB3SV), RB10 (GB3ER), RB2 (GB3LV), RB14 (GB3HR), RB4 (GB3NK) and RB6 (GB3LW), and I have the nice sense of joining a different circle of friends every 20 minutes or so." He likens these short visits to "first footing".

G3DNQ feels that future 432MHz repeaters should continue to serve communities only. Don stresses that care should be taken in choosing the correct repeater site so as to maximize reception within the community's boundaries (so that the smallest and simplest portable equipments are adequate) and minimize reception outside the boundaries (so as not to conflict with co-channel communities). He also feels that, as these uhf repeaters are serving small pockets of population, they should be easy to access and use, with a minimum of complication; and that the technical ingenuity used to provide "time-out controls" would be better used to provide a service such as deviation frequency indication.

With regard to future 144MHz repeaters, G3DNQ considers that the Greater London area urgently needs several more vhf repeaters—on different channels, but covering the same service area. He finds it remarkable that

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we have failed completely to learn the lesson that was accepted so quickly in many North American cities.

On the general point of repeater frequencies, G3DNQ thinks channels R0, R1, R2, R8 and R9 should be allocated, on the advice of the VHF Committee and its Repeater Working Group, to any new area repeaters going into service from the end of 1978. Similarly the odd numbered uhf repeater channels should immediately be included in plans for future community repeaters. "The longer this is delayed the more redundant quartz there will be" is the final point from G3DNQ's most interesting letter.

Do repeater operators agree with G3DNQ? They are invited to write to *4-2-70*, the only national forum for repeater news and views.

New repeater proposals

The following groups have submitted proposals for 432MHz repeaters under Phase 3: GB3EX, Exeter, RB0 (G8GRF); GB3FC, Fylde coast, RB2 (G4BLH); GB3FF, Fife, (GM-3OLK); GB3HD, Huddersfield, RB2 (G8LWU); GB3HE, Hastings, RB14 (G4FET); GB4HF, Hereford, RB6 (G3-WRA); GB3KL, King's Lynn, RB4 (G8BHG); GB3NN, Bacton, RB2 (G3OBZ); GB3NR, Norwich, RB0 (G8GTZ); GB3OH, Stirling, RB4 (GM8DOX); GB3PF, Pendle Forest, RB0 (G4BLH); GB3SK, Folkestone, RB6 (G3XDV); GB3SY, Barnsley, RB6 (G2CPX); GB3UL, Northern Ireland, RB2 (GI3TLT); GB3VH, Bath, RB14 (G3VEH); GB3YL, Yarmouth, RB14 (G3NTV); GB3YS, Yeovil, RB2 (G8KME). Further details about these proposed repeaters can be obtained from the operators whose callsigns are given in brackets.

Proposals for 144MHz repeaters have been received from: GB3BL, Blandford, Dorset, R1 (G4EMN); GB3HI, Island of Mull, R4 (GM3RFA); GB3WT, West Tyrone, R7 (GI3XCZ); and a new proposal has been received from Torquay, R4 (G3UIQ).

Repeater news snippets

No site yet for GB3PR . . . Proposal for GB3AR now vetted by the RWG . . . GB3TW's spare set of filters are not yet silver plated; the group are anxious to find someone who can do this type of work . . . G4BIU reports that the proposed R1 repeater for Cumbria has got the Solway, Carlisle, Dumfries and Galloway clubs together and improved Anglo-Scottish relations no end . . . Whispers from the Sheffield direction indicate that the four asterisks on the RSGB computer print out (available from RSGB Publications) indicate an ssb repeater—"Zoot Alors" says G3FPK.

Repeater group of the month—Kent

The Kent Repeater Group, under chairman Colin Marsh, G8IYN, are responsible for GB3KR, GB3EK, GB3CK and GB3SK. Their vhf repeater, GB3KR, has been operational on R4 for almost two years and is located on a site 430ft asl near Dover. Standard IARU tone access is incorporated, along with an unusual time-out indicator, Anyone going over the normal 80s period is re-accessed, but with low-level pips superimposed on his transmission. These pips continue for a few seconds after he stops speaking, making operators realize they have timed-out. There is an element of self-training in this feature, as users soon learn to avoid the pip indicator.

The transmitter section is an IC240 which feeds a 2-el beam, while the receiver is connected, via a single filter, to a pair of stacked 2-el beams. GB3KR can operate independently of the mains supply and did, in fact, do so quite often during the power strike; battery operation is indicated by an intermittent 400Hz tone. Under conditions of severe interference the repeater automatically switches into a mode which adjusts the squelch, to allow only fully-quietening stations to be re-transmitted; this mode is indicated by 875Hz tones. Problems of crackling noises, due to the "rusty bolt" effect of the tower and its guy wires, have been tackled by the group. After much experimentation it was found that the interference was minimized by strapping each group of three guy wires together.

The Kent group's other operational repeater is GB3EK on RB2 from Margate. This unit is the forerunner for GB3CK (RB0), which is now licensed and will soon be operational from Ashford. GB3SK is an RB6 Phase 3 repeater, proposed to serve the Folkestone community. Future plans for the group also include incorporating a microprocessor into GB3KR. Under the guidance of tutor Chris Dawson, G8BRD, a student at Kent University is making the 6800-based microprocessor control logic as part of an MSc course. The secretary of the Kent Repeater Group is Mike Dennison, G3XDV, who can be contacted at 5 Lambs Walk, Whitstable, Kent, for further details.

New sun cycle

At a recent meeting of the American Geophysical Union, Mr Charles Sargent, the chief solar forecaster at the Space Environment Centre, Boulder, Colorado, predicted a very active sun by 1980. He said the 11 years ahead could be the second most active period for the sun in the last 100 years. Although he did not guarantee daily auroral events he did predict large-scale solar activity by 1980 and promised, "It will be good times for vhf amateur radio operators".

Tropo conditions

The high pressure systems which hovered around Europe at the end of the year gave many operators unexpectedly long dx contacts for the months of December and January. On 144MHz, stations in Britain were working distances of up to 800km on cw, ssb and fm. F1KLV, OZ1OF, ON5NV, DC1XC and PA0VV all had pile-ups of British stations calling, anxious for dx QSOs. On 432MHz, Harold Meerza, BRS34348, at Chatham, found conditions above average for the cumulatives, and he reports an outstanding signal from G8AGU at home in Devon—"just as loud as when G8AGU goes portable on a mountain top". Bob Rothery, G3RJR, in Birmingham, Howard Bottomley, G8BCL, in Halifax, and G3CO in Colchester were among the many operators working Continental dx on 432MHz ssb. PA0FWS and ON5RU were the most outstanding signals on the band, with DC9KU not far behind with just 4W p.e.p. from QTH locator square DK.

Meteor scatter

There was a great deal of activity on both cw and ssb during the Geminids meteor shower which peaked during the period 12-14 December. Clive Morton, G4CMV, in Leeds, had a sked with CT1WW (WB64b) starting at 0630gmt on 12 December. The QSO was completed within an hour and Clive went on to have further sideband contacts with I4AE (FE28g), I1KTC (EF44g), F1JG (CD23b) and SM3-BYA (IV06j). Keith Fisher, G3WSN, in Chelmsford,

contacted about 10 stations, with best signals being received from F1JG, I4EAT and I0DLP. Clive Penna, G3POI, in Sevenoaks, used both cw and ssb to work stations in DL, EA, F, I1, HG and YU, and hardly went to sleep for three days. Dave Price, GW4CQT, was even more enthusiastic and, literally, did not go to bed at all during the shower, snatching the odd hour of sleep between working many sked and random contacts. He made 12 hours of recordings during the shower—perhaps we shall hear some extracts at the ms lectures at the VHF Convention on 25 February.

The behaviour of stations on 144·200MHz seems to have improved greatly since the Perseids, but the cw enthusiasts around 144·100MHz were troubled by a persistent Class B operator who was using ssb in the cw segment. G4DZU and G3WSN were heard telling the station exactly where he ought to be in the band. No 70MHz or 432MHz meteor scatter contacts have been reported this time but a number of stations are going to attempt 432MHz QSOs later this year.

Auroral reports

As reported briefly last month, Dr Simmons, of the British Astronomical Association, and Ron Livesey, the BAA co-ordinator of auroral observing, are very interested in the high number of events reported in 1977 by RSGB members. The BAA has 40 observers, one of whom is located in Shetland—an ideal place for visual displays. The BAA observers are now linked to the RSGB auroral warning system, and it is hoped that this will assist both societies in recording even more auroral events in 1978.

For those keeping auroral calendars, the most recent events took place on 7, 11, 12, 13, 14, 15, 25, 26 and 27 November and on 2, 3, 4, 11, 28, 29 and 30 December. Willie Low, GM8NSU (YR70e), first noticed GB3LER had gone auroral at 1155gmt on 11 December; by noon several Scottish stations were participating in this unusually early-in-the-day event. Gordon Smith, GM4DSZ, reports that GB3LER was still auroral at 1545gmt on the same day. Gordon finds that the 50MHz converter built into his FR101D receiver is very useful, as auroral notes on television signals in that band often indicate an impending aurora before any signs are apparent on 144MHz. The event on 28 December started at 1930gmt and continued until 2345gmt. SM4CFL was a 5 7a signal in Aberdeen at 2000gmt, with very little audio distortion. GM3GUI's cw signal was heard both direct and 2·5kHz lower, due to the auroral doppler shift. The events of 29 and 30 December were weak with only GB3LER and SK4MPI being heard via the aurora.

A study of the dates given in the last five issues of *4-2-70* reveals that many of the auroral events are repeats. The event of 11 September repeated on 8 October, missed (or we did) 4 November, but recurred on 2 December and again 27 days later on 29 December. In fact the four events of 13, 19, 21 and 22 September repeated (by 30 December) three times and the fifth event, on 11 September, has recurred four times.

An exchange of the auroral information collated during the year by the RSGB and the BAA has taken place, and details of visual events not already noticed by radio operators will be included in *4-2-70*. On 1 January the source of all the events—the sun—was 147 million km from the earth, the closest it will be during this year.

REAL DX 1978

70MHz Aurora	G3TYE-G3ZSS	320km
144MHz Tropo	GM8MBP-DF5GX/P	1,300km
144MHz MS	GM8NCM-SM3BIU	1,340km
144MHz Aurora	G3ZIG-UR2RQT	1,800km
432MHz Tropo	G8CQS-G8KPP	330km

Moonbounce

About 15 members of the Harwell & D ARS have been involved in a 144MHz moonbounce project. They have erected a special 50λ rhombic antenna and, even on 144MHz, this means it is more than 680ft long and 60ft wide. Sam Harris, formerly W1FZJ, and now working at the huge dish at Arecibo, Puerto Rico, first suggested that a rhombic antenna was suitable for moonbounce more than a decade ago and, on Sam's advice, VK3ATN used phased rhombics for successful eme contacts.

The antenna is 30ft above the ground, has been made to specifications supplied by K0MQS and is believed to be the first "moonbounce rhombic" in Europe. Because the antenna is, of course, fixed, it has taken some time to evaluate the correct window point, but all was in order for recent contacts with W6PO and three other American stations. Callsigns and reports were exchanged, with the letters R and O being received from W6PO—signifying, in the special moonbounce report code, that the information had been copied 100 per cent. G4DZU, at Leeds, and SM7BAE have both heard moonbounce signals from Harwell, and the group were able to copy their own eme echoes during tests conducted over the New Year period.

Dave Price, GW4CQT, has been doing further work on his bay of 432MHz quad antennas and he is now able to rotate and elevate the massive array. Results on reception have been encouraging but further modifications are planned before attempting eme transmission.

Peter Blair, G3LTF, who worked all continents on 432MHz moonbounce last year, continues to experiment with his 20ft dish antenna which incorporates a dual-dipole feed system. Peter averaged three successful moonbounce contacts during each month of last year, and the only station heard but not worked recently was KP4RF in Puerto Rico.

A score of Supreme Awards

The most coveted of all the RSGB awards, the Supreme, reached a total of 20 by the end of 1977. In December, Roy Andreang, G4CMT, of Hull, already the holder of Seniors for 144MHz and 432MHz, was able to cap these by turning in a claim for a 70MHz Senior, which automatically qualified him for Supreme Award No 20. It was the arrival of not one but two QSL cards from the Channel Islands that brought his total countries worked on 70MHz to the six and, thus, earned the necessary 6 + 60 for what is unquestionably the most difficult of any of the three Seniors to achieve. G4CMT did this from a sea-level site using an FT101 as a prime mover on all three bands.

The following is a list of holders of the Supreme. It will be noticed that there is a complete absence of BRS and Class B operators; listeners are reminded that they too are eligible for Senior Receiving and Supreme awards. Only three

Seniors have been issued for 144MHz reception and none at all for 70MHz or 432MHz.

Supreme Award holders

No 1 G3MCS, No 2 G5NU, No 3 G3ZYC, No 4 G3COJ, No 5 G4BEL, No 6 G5DF, No 7 G3DAH, No 8 G3ZMD, No 9 G4NHE, No 10 GD2HDZ, No 11 G5UM, No 12 G3XBY, No 13 G3JXN, No 14 G3EHM, No 15 G3BW, No 16 G3OHC, No 17 G3FIJ, No 18 G4AGE, No 19 G8GP, and No 20 G4CMT.

Late news

Tropo conditions were good during the first two weeks of January with outstanding 144MHz signals being received from F6EKJ/P in CH square and from DF5GX/P in EH11j 20 miles from the Swiss border. The Quadrantids shower peaked on 3 January with Dr Simmons in Glasgow observing 23 meteors in one hour. G4CMV worked OE5JFL (GI48e) via ms ssb, and GM8NCM used the same mode to work SM3BIU (HX18j) in just 28min. A weak aurora occurred on 3 January with a large scale event following on 4 January. This was first noticed by GM4AOR at 1215gmt and it lasted continuously until 2140gmt, with further intermittent periods until after midnight. GM8NCM worked 23 stations and, as well as the usual auroral beacons, he also heard GB3CTC and OH6VHF (KW59f). GM4CXP worked SM1BSA (JR22e), and OZ6OL worked UR2RQT. The following uhf repeaters are now operational: GB3CH, GB3LI, GB3US; also the Grampian R7 vhf unit GB3GN.

Finally, thanks for all the letters and telephone calls. Send your vhf news to PO Box 49, Aberdeen AB9 8JA, or record it on the *4-2-70* telephone answering machine by ringing 0224 780347. □

RSGB NATIONAL VHF CONVENTION

Organized by the RSGB VHF Committee

The Winning Post, Whitton, Twickenham, Middx

Saturday 25 February 1978

Commencing 1100

- **One-day exhibition and lecture programme**
- **Saturday evening dance and buffet supper**

LECTURE PROGRAMME - WHITTON SCHOOL

1400

KEYNOTE ADDRESS

Dr Dain Evans, G3RPE, RSGB President

1420

	STREAM A Techniques	STREAM B Operational	STREAM C Microwaves
Chairman	Tom Douglas, G3BA	Ian White, G3SEK	Dain Evans, G3RPE
1430–1515	"Solid-state high-power amplifiers" Paul Widger, G8AGU	"Meteor scatter, basics" Chris Bartram, G4DGU	Lecture/demonstration "Oscillator-locking techniques'' Peter Tunbridge, G8DEK
1530–1615	"Advanced repeaters" Chris Morcom, G3VEH, and Hayden Bate, G8AMD	"Meteor scatter, advanced" Ian White, G3SEK, and Clive Penna, G3POI	"Getting started on 2·3 GHz" Charles Suckling, G3WDG
1630–1715	"Loop-quad Yagi antennas" Mike Walters, G3JVL	VHF Contests Committee open forum	General discussion on above subjects
1730–1800		Raffle draw	

the month on the air

John Allaway, G3FKM*

IT is now only 19 months until 24 September 1979—the day when WARC opens in Geneva. Much is still to be done, but a great deal of work has already been undertaken by national societies and by the International Amateur Radio Union. Readers are reminded that John Bazley, G3HCT, is the Society's IARU Information Officer and is able to put clubs in touch with speakers who are prepared to give talks on WARC and IARU matters.

Closing dates for MOTA during the rest of 1978 are likely to be as follows: April—8 March, May—7 April, June—5 May, July—3 June, August—28 June, September—11 August, October—9 September, November —29 September, December—4 November, and January 1979—2 December. It is hoped that this schedule will be followed but changes may need to be made for the writer's personal reasons and a regular check should be made of closing dates given at the end of each month's offering.

RNARS activity period

This will take place between 0800 24 March and 1800 2 April. Three stations will be operational, using the callsign GB3RN, from *HMS Belfast*, located in the Pool of London, and all contacts will be acknowledged by QSL card. Visitors are welcome during this period—the ship is well worth seeing and there is plenty to interest the whole family, this being the only surviving heavy cruiser of the Royal Navy. The ship is open to the public every day from 1100 to 1600 in winter, and from 1100 to 1800 in summer.

DX News

West Coast DX Bulletin records the fact that Walvis Bay (ZS3) now comes under the administration of the Republic of South Africa. The change took place on 1 December last; prior to that date, although the area was technically part of South Africa, it was controlled by SW Africa and, therefore, was not acceptable for separate DXCC status. It is not known what effect on this the recent changes will have. Present acceptance of Transkei and Bophuthatswana for DXCC credit seems unlikely. Earlier rumours that Southern Sudan (ST0) was to be accepted have since proved to have been premature. However, one certain change in the DXCC listing has been announced—the removal of credit for contacts with Geyser Reef wef 1 March 1978. This will mean that the total of countries listed will then be 318—45 previously listed having, by then, joined the "deleted" category.

Three stations active at the moment from Diego Garcia (Chagos Is) are WA4TWE/VQ9, WA6OXZ/VQ9 and WD9FCC/VQ9. Their time of operation is usually around 1200 to 1400 and they often work around 14,240kHz. The first two ask for QSLs via K5HWO (Box 306, Boise City, Okla, 73933, USA), and the last to K9GM (1233 MacArthur, Sheboygan, Wis, 53081, USA).

The present operator at ZS2MI (Marion Is) has been fairly regularly active around 14,210kHz from 0520 to 0600 at weekends.

A Polish polar scientific expedition will be in the S Shetland Is until the end of March. Their radio operator is SP2BHZ and he will be on the air, from their base "Base H Arctowski" on King George Is, using the special callsign HF0POL. Activity will be on cw and ssb and 750W power will be available. QSLs should go to the address in "QTH Corner".

Gerson Rissin, PY7APS, will be in Fernando de Noronha in April. He hopes to operate on all bands and will include Oscar. Willy Wilson, G3NUF, who was formerly VQ1GCD/VQ4IT/VQ8AQ, is now in the Falkland Is as VP8PM. He may be contacted at Box 397, Port Stanley. The prefix block P4A—P4Z has been allocated to the Netherlands Antilles.

It seems that amateur radio activity in Haiti is increasing rapidly. During a visit by the N Florida DX Group during the CQ WW DX contest, contact was made with a number of government officials, including the Minister of Communications. A favourable impression was given and the Haitian Amateur Radio Club was inaugurated; the HARC will assist visiting amateurs who wish to operate—USA amateurs are invited to send details one month before their arrival to Box 501, Port au Prince.

I8JN has a new address (see "QTH Corner"), and QSLs for FH0YL, J28AA, J28AD, J28AF, J28AH, TU4AM and 5Z4RT, should now be sent to it.

5R8AL often operates on 14MHz, starting about 1630, for one hour or so. He favours the 14,120—14,135kHz section. At around 1600 he often listens on 21,070 or 21,170kHz, and at weekends may be found on 28,050 or 28,550kHz at 1500. Equipment available consists of an HW100 transceiver with 3-el quad on 14MHz, 4-el Yagi on 21MHz, and 2-el quad on 28MHz. Dipoles are available for 7 and 3·5MHz.

ZL3NR/C on Chatham Is has been noted on 3,790kHz at about 0740. Signals into the UK have been quite good and several contacts have been made.

Jack Moss, formerly EL2DT, HS1WF and SV0WF, is now in Tangier and has just obtained the callsign CN8CX. He has a 14AVQ vertical antenna at the time of writing, but hopes to have a beam soon.

As mentioned in an earlier *MOTA*, the Iranian QSL Bureau is no longer functioning. In a letter to your scribe, Roger Western, EP2IA (G3SXW), says that cards for him should now be sent via W4YE.

G3RCA reports that he has been told by ZD8EW that ZD8RR is now a silent key. He sustained a heart attack at the age of 44 years.

From P29JS (also via G3RCA) the news has arrived that FW8AC is now active on 14MHz, and also that A51CG has been contacted on 14MHz ssb. Jim has applied for a VK9Y call to use during a visit to the Cocos Keeling Is during May, June and/or July.

WB4NFO is a Nepalese national and has been on the air from Kathmandu using the callsign 9N1NFO. On the day of the king's birthday he was to sign as 9N33, and those making contact with the special call are asked to send two QSLs—one to WB4NFO (which will be answered) and the

*10 Knightlow Road Birmingham B17 8QB.

other direct to the royal palace. This seems to be an excellent public relations exercise for amateur radio in Nepal.

Dxpeditions

It is possible that there may be an expedition to the Saudi-Arabia/Iraq Neutral Zone during February or March. The callsign used may be 8Z4X, and the intention is for at least one week's operation. The equipment to be taken consists of several transceivers, amplifiers, and vertical and beam antennas. All bands 3·5 to 28MHz will be activated. Callsigns of those planning the expedition include JY3ZH, JY5HH, JY5UB, JY5YJ, 9K2DJ, HZ1TA, OE6EEG and DJ9ZB. The last named will be in charge of QSLing.

According to the *West Coast DX Bulletin* there is a fresh rumour of pending activity on Clipperton Is. This time it is believed to be by some amateurs from Texas who will be going there during April. The writer feels that there may be some significance in the proposed date, and that the callsign may turn out to be FOOL! However, should the expedition be fact and not the inevitable myth, it will no doubt receive great advance publicity.

Top band news

GD4BEG feels that conditions have not been as good on 1·8MHz so far this winter as they were during the 1976-7 season. However, all continents have been worked during the past month, and ssb signals from all USA districts have been received—some at great signal strength.

CE0AE is now active on the band and looks for Europe every Tuesday and Friday at 0700—he transmits on 1,803 kHz and listens on 1,827kHz. It is believed that he contacted a PA0 station late in December. ZL2BT is active daily on 1,810kHz around 0700, and was worked on ssb also during December. KH6s are now allowed to use the 1,800-1,810kHz segment, and KH6CHC has been heard between 1600 and 1700, arriving via the long path. KL7GKY has both cw and ssb available and made a schedule with G3CWI, but no contact resulted. VP8PC is noted as active from 0400 on 1,812kHz, and VP8PL keeps a schedule with LU1DZ before 0500.

Note that ZL3GQ (and others) will be looking for European stations during the spring equinox period, particularly at sunrise and sunset times in New Zealand.

Some of the more interesting loggings have been: **0000** *C5AAD*. **0400** *FG0DYM/FS7*. **0500** *VE3ABG*, K1PBW (S9 + 30db), W1WCR, W3PHZ, K8CCV. **0600** *JA1PIG/PZ*, VE2CT, *VP2DD*, WD8DVP, *9H1CG*. **0700** LU1DZ, *VE5DX*, *VE5RG*, W8s CNL, MOA, W9s MAL, YF, W0s GYH, NFL. **0800** *LU1DZ*, N4s EA, JJ, W5YU, K6SE, W7DZO, *K0IS*, WB0s SSV, WE, K0ZK. **2100** *VK6HD*. **2200** LA7Y/EA8, *JA5DQH*.

News from overseas

On 22 May 1977 a group of ZL stations, including ZL3s KE, SX, BM and SW, began keeping a regular schedule on 28MHz. The number of participants increased rapidly and the "ZL3 Canterbury 10X Chapter" now meets every Sunday on 28,575kHz at 1000. The organization is a subsidiary of the International 10X Net of S California, and is dedicated to promoting the use of the 28MHz band. Overseas stations are very welcome to join in. A special award—the ZL3 Canterbury 10X Chapter Award—is available to any station (or listener) who acquires 10 points by hearing or contacting members. Their 10X numbers must be received and QSLs are not required. Contacts count one point normally, but if with "special" members they count two, and if with the president (ZL3KE) three points. Send list and NZ $1 to Dick McGrath, ZL3KE, 42 Lyndhurst Crescent, Christchurch 7, New Zealand.

Kostas Vassiliades, SV1IT, has been a member of RSGB since 1975. He has written to say that the first-ever radio amateur's examination in Greece was held in September 1977, and of 100 participants 70 passed (including SV1IT). Kostas uses a TS520, and has a TH3Jr beam for the hf bands and long wire for 7 and 3·5MHz.

QTH CORNER

A51CG	Box 1, Thimpu, Bhutan.
C5AL	R. L. Brooks, PO Box 860, Banjul, Gambia.
CN8CX	John Moss, PO Box 162, Tangier, Morocco.
EP2IA	via W4YE, 5441 Summit St, Centrillo, Va 22020, USA.
FB8XR	via F5VU, Jean Brunner, 86 Savigne, France.
FW8AC	BP 13, Wallis et Futuna Is.
ex-HC2YL	Darleen Magen, WD5FQX, 103 Lee Mar Dr, Hot Springs, Ark, 71901, USA.
HF0POL	N. Dolny, SP2BBD, ul Grzymaly Siedleckiego 9/30, 85-140 Bydgoszcz, Poland.
I8JN	G. Mauro, Via Tibererio 72-B, I-80124 Napoli, Italy.
N4VV/CE3	WA3NGS, Rosa Lamb, RFD 1, Whippoorwill Lane, White Plains, Md, 20695, USA.
TR8BR	BP 4776, Libreville, Gabon.
TR8RG	via DA1CZ, Achim Beil, Zugspitzstr 42, 8013 Gronsdorf, W Germany.
TR8RS	BP 33, Libreville, Gabon.
VE3HRS/TZ6	K. A. Stone, 2200 Roche Court, Nr 1208, Mississauga, Ont, Canada K1V 8P5.
ZF2AG	K8SWW, A. S. Geyer, 860 S Main St, Milford, Mich, 48042, USA.
ZF2AY	N8AA, J. S. Comella, 27241 Markberry Drive, Euclid, Ohio, 44132, USA.
ZF2AZ	W8TPS, R. W. Schoener, 1205 Lincoln Way NW, Massillion, Ohio, 44646, USA.
ZS1ANT	via ZS5NF, B. J. Nugent, 21 Isabel Beardmore Dr, Scottsville, Pietermaritzburg, Natal, 3201, Rep of S Africa.
9N1NFO	P. S. Rana, WB4NFO, 29 E Chapman St, Alexandria, Va, 22301, USA.

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

Contests

Ten-Ten Net QSO Party

0000 11 February to 2400 12 February.

28MHz only—only one contact per station. Exchange name, QTH and 10-10 membership number (if appropriate). Each contact counts one point, two if with member. Logs and membership applications should be sent to K5MRU, Grace Dunlap, Box 445, La Feria, Texas, 78559, USA (logs before 31 March).

The Common Market DX Contest

0600 to 2400 15 April (cw).

0600 to 2400 16 April (phone).

3·5 to 28MHz. Call "CQ CM". Single-operator all-band, low band (3·5 and 7MHz) and high bands (14, 21 and 28MHz); also multi-operator single-transmitter classes. Exchange RS/T plus serial number (from 001). Contacts with EEC stations count one point, with other Europeans two points, with others five points. Own country counts for multiplier credit only. The multiplier for EEC stations is DXCC countries worked on each band—a contact with ON4UB counts as an extra multiplier. Separate logs should be submitted for each band and should indicate date, time, numbers exchanged, points and multipliers claimed, and should be accompanied by a summary sheet containing a signed declaration that all rules and national radio regulations were observed. Entries must be posted before 1 June

to: ON4GO, Michel Le Bon, Chee de Wavre 1349, 1160 Brussels, Belgium. Listeners may compete and score five points for each complete QSO logged between an EEC and non-EEC station.

Awards

Sydney Novice Amateur Group Award

Awarded to those who have contacted 15 VK2N (novice) stations since 1 January 1977. Endorsements are available for mode or band (cw or ssb, 21 or 3·5MHz). Applicants must send a list stating callsigns, names, date, time and frequency of the stations worked and five IRCs for return airmail postage. Claims can be sent to E. Cornwell, VK2NEC, 2 Khartoum Av, Gordon, NSW, Australia 2072. Note that many Australian novice stations may be found on 21MHz in the 21,100—21,200kHz area. They also use 28,000—28,600kHz.

Scorpion Group Award

For contacting (or receiving) three members of the DX Scorpion Group of the Dominican Republic since 1 January 1971. Members include: HI8s CAB, CDS, CRO, EDS, EJH, EVA, FED, HAM, LC, LPC, SRH and MOG, and LPN was a member until his death in 1974. Send log details and QSLs to PO Box 1722, Santo Domingo, Dominican Republic, and enclose 10 IRCs.

Band reports

G3USF, who makes a special study of 28MHz beacon propagation, found that the results of monitoring the Cyprus and Mauritius beacons during the three autumn months were the best for any similar period since 1972. Records show that 28MHz was, in fact, open every day during October, November, and December for dx—with the exception of 28 October. *West Coast DX Bulletin* quotes the chief forecaster of the National Oceanic and Atmosphere Administration's space environment services centre as saying that he predicts a smoothed sunspot number of 154 at the peak of Cycle 21. This would make it the second highest in the past 100 years. The peak would be reached in the first half of 1980. Two of his colleagues have suggested that the ssn might reach 200, and this would be the highest ever known. Your scribe would like to believe either!

As is to be expected, the lf bands have been extremely interesting, and on 1·8MHz many USA phone signals have been heard at good signal strength. All continents have been worked from the UK. On 3·5MHz, Japanese stations have been recorded as early as 1500, as have ZLs; and, in the mornings, openings into the USA have continued until after 0900.

Many thanks to all who contributed to this part of *MOTA*, including the following: G2s CDT, DHV, HKU, G5JL, G6GH, G3CWI, GM3LYY, G3s RCA, UOL, GD4BEG, G4s EAN, EHQ, ETN, G8MFS, BRSs 17567, 25429, 31301, 33915, 36928 and 38934.

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

3·5MHz. 0000 EP2TY, 5H3KG, 9N1NFO. **0100** OX1HH, PJ8HX, UI8s, UK0AAB, VP9IR. **0700** D4CBS, FG7AN, HK0LE, VE4s, VE8MA, VP2LJ, VP2VJ, W6s, W7s, ZL3NR/C. **0800** W6s, K7RI, W9s, W0s. **0900** W5s, W9s, W0s. **1500** JA6BSM, ZLs 1AQO, 2BT, 3NR/C. **1700** YB5BIW, ZLs 2BT, 4AP, 4KE. **1900** EA8ET, JX9WT, JY4MB, 7X2HM. **2000** K1WW, JA4s CPL, KGR, UW0MF, 9K2DR. **2100** WB5LBJ/DU6, JAs 1KXY, 6BZI, 6GYG, TA2BK, YB0SI, OE6DK/YK. **2200** *AP2KS*, DU1REX, JA6BSM, TU2BK, 9L1SL/A, 9M2DW. **2300** W0MJ.

7MHz. 0800 *W6s, W7s, VE7s, ZLs.* **1900** CR9AJ. **2000** ZD9GG.

14MHz. 0000 CE3OE, JAs, KA6KN, W6s. **0100** VE3CQX/SU. **0800** KG6RT (QSL to W6IAE), VE3HRS/TZ6, VK9NI, VP8HZ/MM (G8AXB on I. D. Sinclair). **0900** *EA9B*, FK8CR, *HM1LO*, JT1AT, KC6MM, KL7s, ST0RK, VKs, VS5DA, ZLs. **1000** VR4DN. **1100** P29JS, TT8HV, **1200** CE3BSU, FG0DYM/FS7, VKs, VUs. **1400** VK6DY, YB0ACT (SM0GMG), ZL2ALY, 3C1X. **1500** H5FXT, J28BD, JAs, W6s, W7s, 8Q7AD. **1600** KL7TR, TR8BR, *XE*. **1700** FB8s, WE, XR, ZL, FH0BKZ, FO8s AQ, DO (LP), KH6BB, S79D. **1800** KH6OR, TJ2P (G4EDH), ZD9GG. **1900** FG0DDB/FS7, HK0CLS, KL7RA, 3B8DA. **2000** KC4AAC (QSL to K7ODK), VKs, SU1CR (Box 840, Cairo). **2100** TR8s RG, RS, VP8s. **2300** C5ABK, JAs.

21MHz. 0900 *A9XCE*, JAs, *KA6NN, ST0RK, ZL1AH*. **1000** JAs, *LUs, PYs, VKs*, VUs, *ZD8DO*, ZSs. **1100** H5IND, *PZ9AB*, ST2SA, 8Q7AD. **1200** FR7BE, JAs, PP7JQ/0 (Fernando de Noronha), VEs, VK3s, Ws. **1300** EP2TW (QSL to GI3HXV), VEs, VKs, Ws, *9K2EZ*. **1400** VEs, Ws, 3C1X, 3D6BP, 5L2WAC (EL), *5T5PG*. **1500** AP2TN, H5AWV, DK0GD/ST, VEs, Ws. **1600** FG0DYM/FS7 (QSL to W3HNK), *J3AAG*. **1700** H5FXT, 3D6BP. **1800** *FB8ZF*.

28MHz. 1000 9H1. **1100** *EA6, EA8, OZ, SM*, UA9FAJ, UB5, YB0ACP, ZD7PV. **1200** CN8CC, EA8EE, KP4s, *PZ, YV*. **1300** PJ2FR, VP2SZ. **1400** J28AM, *KV4*, LU, *PJ2VD*, PY2DMT, ZSs. **1500** *CX5RV*, H5FXT, KG4LH, KZ5JM, W1s—W4s, ZE, ZS.

Many thanks to all correspondents, and especially to the authors of the following for items obtained from their publications: *CQ Magazine* **(W1WY)**, the *Ex-G Radio Club* **(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 **April** issue to **reach G3FKM** by **8 March.**

HF PROPAGATION STUDY

Predicted HPFs (MHz × 10) for February 1978

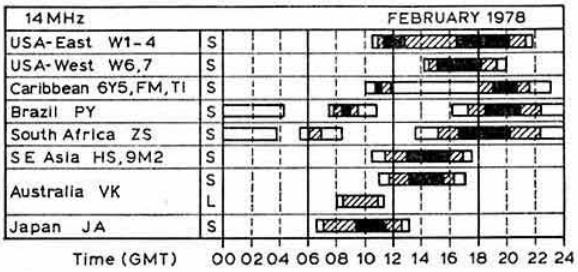
GMT →	00	02	04	06	08	10	12	14	16	18	20	22	24
Aden	158	144	134	225	350	373	346	341	326	235	186	164	158
Ascension	186	181	163	141	276	378	361	359	350	328	239	206	186
Bahrain	143	136	122	225	342	360	340	333	290	213	164	153	143
Bangkok	119	106	100	215	310	338	333	271	224	166	129	125	119
Barbados	168	158	144	131	139	201	335	338	335	314	242	188	168
Bermuda	143	134	126	114	108	159	301	322	314	293	234	173	143
Bogota	159	150	140	126	128	158	319	335	324	301	243	185	159
Buenos Aires	180	172	162	140	191	294	352	350	343	323	241	196	180
Cape Town	183	155	143	140	331	350	359	355	346	315	227	197	183
Colombo	138	128	116	232	326	357	332	326	277	200	155	145	138
Cyprus	134	128	116	173	309	342	323	314	291	211	163	143	134
Dakar	186	181	163	141	276	378	361	359	350	328	239	206	186
Denver	130	114	103	97	96	114	126	230	285	247	197	150	130
Fairbanks	134	124	114	111	134	147	150	162	164	181	155	152	134
Falklands	180	173	163	139	200	276	310	332	343	324	239	196	180
Gibraltar	107	101	94	84	167	232	234	229	223	192	139	111	107
Hong Kong	110	84	92	201	281	319	241	197	171	149	117	110	110
Honolulu	131	121	110	108	130	135	135	116	97	185	155	152	131
Iceland	92	83	69	72	107	178	213	210	197	161	115	91	92
Jamaica	143	134	126	116	111	161	275	323	315	295	233	176	143
Lagos	186	181	157	143	331	384	359	359	351	324	235	206	186
Las Palmas	158	150	140	124	211	315	326	317	310	281	209	164	158
Lima	171	163	154	136	152	147	342	342	336	319	243	190	171
Los Angeles	130	114	103	97	96	129	124	168	272	238	188	147	130
Malta	115	110	101	111	238	279	274	265	256	194	147	125	115
Mauritius	164	148	135	214	352	371	352	343	336	243	197	172	164
Mexico	134	117	107	101	101	148	168	301	301	272	214	159	134
Moscow	94	87	78	121	232	272	274	260	223	155	114	100	94
Nairobi	171	154	141	201	352	378	351	350	342	263	204	174	171
New Delhi	126	115	103	224	317	343	326	260	202	164	139	133	126
New York	138	126	115	103	101	121	244	304	301	275	213	162	138
Osaka	125	107	108	145	248	223	172	139	139	134	122	117	125
Perth	138	126	115	232	327	315	286	247	219	186	154	144	138
Rio de Janeiro	180	174	164	140	182	342	361	351	343	324	241	197	180
Salisbury	178	168	145	180	345	380	354	355	346	291	215	186	178
Seychelles	167	134	133	228	331	345	351	340	331	242	190	167	167
Singapore	126	115	103	224	317	343	336	313	248	172	139	133	126
Suva (s)	133	131	115	114	167	234	266	238	176	166	145	141	133
Suva (l)	190	182	162	134	239	228	202	187	159	224	238	208	190
Sydney (s)	110	84	92	201	281	275	230	228	204	158	117	110	110
Sydney (l)	172	163	157	135	164	211	159	152	143	154	205	190	172
Teheran	139	128	116	232	328	357	328	323	261	188	154	145	139
Vancouver	130	117	103	105	111	117	117	139	197	210	164	147	130
Wellington (s)	126	111	102	138	234	252	239	211	178	153	126	122	126
Wellington (l)	182	174	163	135	209	182	130	122	143	183	221	201	182

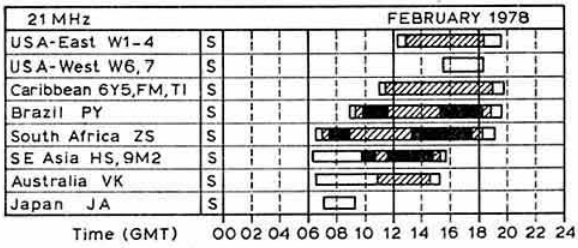
Bands recommended are those between hpf and half hpf.

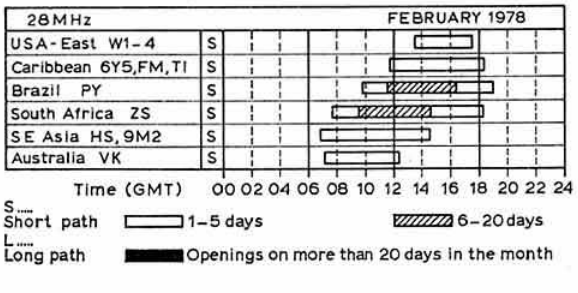
Propagation predictions

Winter conditions in the ionosphere come slowly to an end during February. Days lengthen and towards the end of the month **14** and **21MHz** will remain open longer than in previous months. Now solar activity is increasing, **28MHz** will be open more often. Conditions on **21MHz** will also improve compared with the previous months. The longer days will lead to an improvement on **14MHz** as far as dx is concerned, and the band will close about 2300gmt, towards the end of the month.

The main dx band during February will be **7MHz**, and partly **3·5MHz** during the hours from midnight to the early morning. DX on **7MHz** will be possible when the greater part of the path lies in darkness. Interruption of local traffic on **3·5MHz** must be expected during the latter half of the night.







NEW PRODUCTS

Contact cleaner

Eraser International Ltd now have available a new tool for general purpose cleaning and the cleaning of electrical contacts and surfaces. The E105 contact cleaner is suitable for a variety of cleaning applications, especially the cleaning of contacts and joints prior to soldering. The contact cleaner will also remove oxidation, rust, paint and many other forms of contamination from most known sufaces. The tool will not alter the physical properties of the surface cleaned.

The cleaning tool consists of a plastic body in which is mounted a stiff spun glass insert. The tool works on the principle of a propelling pencil and, as the exposed length of the spun glass insert wears, its length may be adjusted by a screw at the top of the tool. Refills are also available for this tool, making it economical to use.

The E105 contact cleaning tool sent as a sample performed well under test, and the result of application to a coin seemed to justify the makers' opinion of their product. The E105 is available direct from Eraser International Ltd, 2/3 Hampton Court Parade, E Molesey, Surrey KT8 9HB, at a cost of 98p including postage, packing and VAT.

PCB and label kit

The Photolab kit introduced by Mega Electronics Ltd is intended for the small-quantity production of PCBs, front panels and labels. It consists of an ultraviolet exposure unit, drafting aids, film, laminate sheets, trays, high-speed drill and all the required materials for the process. It will handle pcb up to 9 by 6in.

The Photolab kit costs £44.50 and is available from Mega Electronics Ltd, 9 Radwinter Road, Saffron Walden, Essex CB11 3HU. Tel Saffron Walden (0799) 21918.

RF noise bridge

MFJ Enterprises have a new rf noise bridge, model MFJ-202, that allows quick adjustment for maximum performance of any antenna, whether it be a single- or multi-band dipole, inverted-V, beam, vertical mobile whip or random system. It measures resonant frequency, radiation resistance, and reactance of these antennas, and indicates whether to shorten or lengthen the antenna for minimum swr over any portion of a band.

The MFJ rf noise bridge has a resistance range of 250Ω and a wide capacitance range of ± 150pF for reactance measurements. Included is a unique range extender that shunts large unknown impedances down to within the measuring range of the noise bridge. Besides measuring antenna characteristics, the noise bridge can be used to tune transmatches, adjust tuned circuits, measure inductance; and measure rf impedances of amplifiers, baluns, transformers, and other rf circuits. It can also be used to determine electrical length, velocity factor, and impedance of coaxial

cable. With a transmatch and dummy load, it can synthesize rf impedance for test purposes.

The MFJ-202 rf noise bridge is available for $49.95, plus $2.00 carriage, from MFJ Enterprises, PO Box 494, Mississippi State, MS 39762, USA.

your opinion

GB3LO
The Editor
Radio Communication

Sir—Following publication of the hoax letter concerning the future of GB3LO in the October 1977 issue of *Radio Communication*, I have now analysed the response it provoked. I received 30 letters, of which 27 expressed the view that GB3LO should be maintained and three that it should be closed down.

Of the response in favour of close down, one letter suggested, as an alternative, a mode change from phone to rtty, since: "although it could be rendered unusable by jamming; music, bad language, etc would not be re-broadcast for all to hear". Another reader advocating its close down, wrote a very comprehensive and clearly reasoned letter which put forward the view that: "no self-training in wireless telegraphy" takes place in repeater operation and "a whole new era of people have been attracted to vhf who are not interested in the traditional ham radio interests of dx working and experimentation with radio, but who simply want cb-type local communication with their friends around the town". The third letter against the continuation of GB3LO said: "I should like to see *all* vhf repeaters closed down but the uhf ones encouraged."

It is not easy to summarize objectively the views in the 27 letters against close-down, but it would be fair to say that the most commonly expressed view was "not to give way to a minority group of law breakers". One well-known and much-respected ex-President of the Society wrote: "I am dead against capitulation to hijackers, urban guerillas, blackmailers and any other law breakers, with whom I include the people who are responsible for the shambles on GB3LO . . . Please stick to your guns and keep the repeater working and try to get at least three more 2m repeaters for the London area."

There was certainly very strong feeling along these lines expressed by a number of people. "One does not seek to close down motorways because some drivers travel dangerously at excessive speeds." "If GB3LO is closed down, you are admitting defeat and the jammers will have won!" "To give in to this type of semi-terrorist technique will eventually sound the death knell of all repeaters, including those in Phase 2."

There are a number of other points made by people who are against the closure of GB3LO. Some examples are: "To close down your repeater would be a loss to myself and others like me who do a lot of calls in London and find the assistance given for directions by many operators most helpful." "It forms an excellent means of establishing an initial contact and greatly increases the range of our rigs (in this case low-power 'handie-talkies')."

Incidentally, one writer who works in a London hospital mentioned the service repeaters can give to hospital patients who can operate through them from their beds, often on the ground floor of metal framed buildings.

The remarks in the fake letter concerning 70cm repeaters provoked a number of comments on the cost (to the individual amateur) of buying equipment for the 432MHz band. On the question of costs, one writer added as a PS: "Another reason for not closing down 'LO is that I have £7.50-worth of crystals that will be redundant." Another light-hearted (I assume!) ps was: ". . . or just give me the names and addresses of the jammers—I am 6ft 4in."

Again, my thanks to those who wrote. I honestly feel there is a substantial amount of support for the views I expressed in the November issue of *Radio Communication*.

J. D. Davis, G3PAQ

RAE
The Editor
Radio Communication

Sir—I cannot agree with Mr F. A. Fear (December) on the effectiveness of multiple-choice questions in the RAE. After a lifetime of radio and electronics, I am a newcomer to amateur radio but it was the article in your September issue that convinced me that I should sit the RAE as soon as possible, and before the change of format is adopted.

I have been for many years a member of the supervising board of examiners of my own professional institute, and I have frequently found that the ability of a candidate can be seen clearly from the presentation of his answer, even when with, say, a marking schedule, pass marks might not be obtained. With the multiple-choice question the examiner cannot be made aware of a logical choice lying behind what may be a "wrong" answer. It is a common experience with multiple-choice "intelligence tests" to arrive at a logical

alternative answer which is marked as incorrect because the examiner has failed to perceive the imperfections of the question.

It is my belief that the multiple-choice question is of benefit only to the examiner in marking a paper and is not to the benefit of the candidate unless he is permitted to mark his own paper before leaving the examination room!

C. W. Morle

HAM SPIRIT

The Editor
Radio Communication

Sir—As G3KTL's retort to my letter is exactly as I expected, my reaction is to ignore it. Too many know me as I am for his jibe to do me any harm. Its juxtaposition with F6BWF's letter, however, makes comment imperative.

Governments license us to operate on various bands and expect us to be mature enough to use them decently. That is all. National and international societies, in an effort to minimize the chaos of too-many chasing too-few frequencies, devise plans for various modes. They then depend upon "Ham spirit" for success. F6BWF asks "What is Ham spirit?"

In earlier days an "Amateurs Code of Conduct" (for which read Ham spirit) was formulated. I do not recall ever seeing it in a UK publication over the years but it might be opportune to publish it. The NZART does so regularly and I abstract some of it here. It has six paragraphs. They are headed as follows: The amateur is ... Gentlemanly, Loyal, Progressive, Friendly, Balanced, Patriotic. Under Gentlemanly appears: "He never knowingly uses the air for his own amusement in such a way as to lessen the pleasure of others."

The appalling behaviour to F6BWF is in direct contrast, but what to do about it is not easy to suggest. There is nothing illegal about operating anywhere in the allotted bands. Such people as those who actually insult people on the air in such a manner are unlikely to be impressed by normal decent reproach. It should also be remembered that UK amateurs who use the dx bands are continually subjected to interference from Continental stations, in many cases deliberate and illegal.

Conversely, there is no obligation on a gentleman to fight with kid gloves. If a man writes a letter to his Society for publication which seeks to destroy an amenity enjoyed by his fellow members in tones which owe everything to emotion and nothing to fact, he has no right to feel aggrieved if he finds the defence carries more firepower than he does.

In respect of letter selection, he might note that Ham spirit also prevents a correspondent from insinuating that the editor might be dishonest.

B. R. Meredith, G2CYV

A DELIGHTED YL

The Editor
Radio Communication

Sir—I was delighted to read the letter in your November issue from Kay Forbes, G4BFE, headed A SAD BUT HAPPY YL.

It is now 41 years since I became a licensed yl radio amateur and it is wonderful to know that Kay has found, after just a few years, the same quite unique friendly atmosphere within the world-wide hobby of amateur radio that I have always experienced. There are no barriers in our hobby: religious, racial, social or financial etc; and I feel that it would not be beneficial to anyone to create one, however small, between YLs and OMs, by the formation of a separate yl association in a small country like our own.

I would like to take this opportunity of saying "Thank you, gentlemen" for your courtesy throughout the years, and may all the licensed YLs enjoy their hobby as much as I do.

Constance Hall, G8LY

GE FOR ENGLAND

The Editor
Radio Communication

Sir—I have read and re-read G3NYA's letter in the October issue and I still cannot get what he is talking about.

Surely prefixes are intended to give information, ie to indicate the whereabouts of the transmitter. There is no shame in having either a one-letter or two-letter prefix, and the present system, for which I was largely responsible, seems to work very well. I just do not see the reasoning in adding an extra letter, just so that everyone has two!

I wonder how many of those who used the GE prefix have any idea of the hours and hours of extra work it caused the QSL Bureau, necessitating the sorting through many hundreds of cards each day with the *Call Book* just to make sure cards went to the right country.

I flew my Union Jack at the top of my mast with the best of them, so no disrespect to Her Majesty, but quite frankly the GE prefix was the most irresponsible innovation so far introduced into our otherwise simple and serviceable prefix system.

A. O. Milne, G2MI

SLOW MORSE TRANSMISSIONS

The Editor
Radio Communication

Sir—I would like to place on record my great appreciation to the organizer of the slow morse practice transmissions, Mr M. A. C. MacBrayne, and to G3RAF, G4DYF, GM3CRY, PA0AA and many others who have given me help, encouragement and advice over the last four years leading to the passing of the morse test.

Also I appeal to all operators to avoid interfering with these transmissions which mean so much to so many.

H. Luxton, G8GMI

obituaries

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

Mr K. Belam, G4BGC
Ken Belam, who died on 28 November 1977 aged 63, was mainly active on the hf bands, and made many friends through amateur radio. For the last few years he was secretary of the Isle of Wight RS.

Mr R. Blackburn, G3PYR
Ralph Blackburn, who died on 21 December 1977, was a well-known personality on top band for many years, particularly in the Midlands area. He was secretary of Solihull ARS, and his home-constructed equipment formed the nucleus of many portable and exhibition stations under that society's banner. He was also known for his success as an instructor of RAE and morse.

Mr L. Butler, G2BUL
Len Butler, who died on 28 April 1977 aged 63, had been a member of RSGB since 1933. He served for many years as a QSL Bureau sub-manager.

Mr W. C. Green, G3QG
Bill Green died on 17 December 1977, aged 78. He was a founder member, in 1946, of Luton & District RS, and later of the Dunstable Downs RC. He was active on 144MHz until a few days before his death.

Mr J. B. Kaye, G5BG
"JB" Kaye, who died on 20 December 1977 aged 75, was active exclusively on 144MHz a.m. for the last few years, and was well known for his ready assistance and lively wit.

Mr A. Latus, G3VX
Alec Latus died in November 1977 in his late seventies. He had a life-long interest in radio and, until his retirement, had a radio business in Preston. Active until his death, he was about to become operational again on vhf.

Mr T. A. Whiteley, G6QA
Arnold Whiteley, who died on 15 December 1977, had been licensed since 1928 and was mainly active on 3·5MHz.

We have also been advised of the deaths of:
Mr J. B. Atcheson, GM4JR, on 25 November 1977;
Mr J. Ayling, G3PNA, on 22 May 1977;
Mr J. Chapman, G3NUT, on 28 May 1977;
Mr A. Epton, BRS4298, on 8 December 1977;
Mr H. Keate, BRS35550, on 6 November 1977;
Mr F. H. Lamming, BRS30576, on 17 November 1977;
T. A. Rich, G5AZE, on 9 December 1977;
Mr A. G. Ryall, BRS2921;
Mr W. Vollkommer, W2HO, in July 1977.

IARU Region 1 Conference

WARC 79 and IARU

The eleventh conference of the IARU Region 1 division will take place at Miskolc-Tapolca in northern Hungary, commencing on 24 April 1978. With the approach of WARC 79, which will open at Geneva on 27 September 1979, the meeting has a particular and vital importance. Apart from mini-conferences which will take place in certain areas of Region 1, this will be the last occasion on which all the member societies of the region (now 46) will have the opportunity to meet and discuss the future of the amateur service.

While the votes of the national delegations present at WARC 79 will make the final decisions, they can be influenced by the proposals and attitudes of the amateur service, as put forward by the representatives of the national societies. To have any hope of achieving worthwhile results it is vital that the amateur service should be united internationally as never before. For WARC 79 to receive a series of fragmented frequency proposals would enable the easy rejection of our views. Let us not be under any delusions, there are countries where the amateur service is regarded with hostility and, at best, with intolerance, and does not receive the co-operation encountered in most countries of the Commonwealth.

Frequency proposals for all regions were published in a booklet generated by the International Working Group of the IARU in 1976 at a meeting in Geneva. These proposals have been used by national societies throughout the world as a basis for their own national submission to their administration. The precise proposals will vary to a small degree, as between different countries and regions, but for world-wide bands, such as 14, 21 and 28MHz, they will almost certainly be identical.

The time scale of preparations varies considerably between the 154 administrations who are members of the International Telecommunication Union. The USA FCC has already issued several "notices of enquiry", while in other countries there has yet to be any public comment. If the pattern of previous conferences is followed then it is likely that firm proposals will come from certain countries, while others are content to remain as relatively passive supporters. However, at this time almost all administrations are heavily involved in the consultations which will lead to the establishment of a national position. When the talking is over the finally agreed positions may be embodied in a series of proposals which must reach the ITU by May 1979. These will then be circulated to all the nations taking part in WARC 79. To those taking part in the conference the written proposals represent only the first stage of the long path of negotiation, leading to a hopefully favourable conclusion some 10 weeks later. The subject of conference negotiation is one which must be mastered by the IARU team at Geneva, and to which considerable effort must be devoted.

The Region 1 division of the IARU was formed in 1950 with a membership of 15 societies. The present total of 46 reflects the healthy state of the division, and this figure comprises almost half the total membership of IARU worldwide (99). The triennial conferences of the division have been the means whereby a great deal of co-operation has been achieved throughout the region. As an example, the hf and vhf bandplans, while not acceptable to all, have materially helped the orderly use and development of our bands, and have meant that Region 1 is not subject to mandatory bandplanning as found elsewhere. It was agreed at the Warsaw conference of 1975 that the major subject for discussion in Hungary in 1978 would be WARC 79. This will consist of a review of the present position, as it affects the amateur service, an examination of the proposals and the formulation of any desirable modifications to the original position.

Conference proceedings

At the time of writing, it seems likely that there will be at least 140 delegates to the conference. After an initial plenary meeting the conference will split into three main groups: Committee A—administrative and operational, dealing with bands below 30MHz and general administration matters; vhf/uhf questions will be considered by Committee B, which will undoubtedly create a microwave sub-group to deal with matters affecting bands above 1GHz; Committee C will deal with credentials and finance and, generally, has fewer meetings than either of the other two committees. In addition to the main meetings there will probably be small working groups, meeting outside normal conference hours, to deal with specialized subjects such as contests, direction finding, rtty and television.

Among the co-ordinators who will be reporting to the conference are Colin Thomas, G3PSM, who is in charge of the IARU Monitoring System. This is an essential activity in the period before WARC 79. One of the points that will be made to the conference is the unacceptably high level of intruder operation in what are designated "exclusive" amateur bands. In addition to the monthly notification of intruders, the IARUMS summaries will provide an instant indication of the level of this operation in any of our allocations.

The International Beacon Project, of which Alan Taylor, G3DME, is the co-ordinator, has expanded from a small number of European beacons to a world-wide coverage. These stations provide occupancy of one of our lesser-used bands, give instant propagation indication and are used to check computer-prepared predictions. S. Canivenc, F8SH, is the Region 1 vhf sporadic-E co-ordinator, and his work in the analysis of sporadic-E openings has been of the highest class, and papers originated by F8SH are to be considered by the CCIR at their forthcoming meetings in Geneva. Scientific output from the use of amateur bands is one of the best ways of ensuring future allocations.

Conference agenda items are backed by a large number of papers and it is likely that more than 90 will be circulated to delegates before the meeting opens. Subject headings are too numerous to mention, and substantial contributions have been made by DARC, RSGB and VERON.

Opening

The conference will commence on Monday 24 April, and the formal opening will be made by Mr R. E. Butler, deputy secretary-general of the ITU, who will have travelled from Geneva for the occasion. The IARU is honoured that an official at the centre of world telecommunications should attend its deliberations.

Region 1 organization

To support the activities already mentioned, Region 1 has a small secretariat and an executive committee, none of whose members is salaried. The present executive committee comprises: L.v d Nadort, PA0LOU, chairman; W. Nietyksza, SP5FM, vice-chairman; R. F. Stevens, G2BVN, secretary; K. W. Strom, SM6CPI, treasurer; J. Rottger, DJ3KR, H. Walcott Benjamin, EL2BA, and J. Znidarsic, YU3AA, members. This group meets at least annually and there is considerable informal contact between these meetings. In addition to maintaining contact with 46 member societies, the Region 1 organization publishes *Region 1 News* at four-monthly intervals, *WARC Newsletters* at intervals as required, and has accepted responsibility for the documents of the International Working Group. In the next two months these tasks will be augmented by the preparation and distribution of some 100,000 pieces of conference paper. The means to run the division is obtained by a contribution from member societies, based on an annual figure per licensed member. In 1963 the contribution was 50 Swiss centimes per member, from 1 January 1978 the figure was raised to 1 Swiss franc (mainly to pay for increased costs in connection with WARC 79) but hardly in step with modern inflationary trends. A wise decision of the original executive committee, to invest the region's funds in a Swiss account, has meant that the funds have appreciated against most European currencies. Reduced to national terms, it means that each licensed member of the RSGB pays less than 30p per year to support the Region 1 organization. Non-members are content to accept the benefits but contribute nothing.

RSGB representation

The Society's delegation will be led (as at Scheveningen and Warsaw) by Tim Hughes, G3GVV: he will be supported by the RSGB President, Dain Evans, G3RPE; John Allaway, G3FKM; Dennis Andrews, G3MXJ; John Bazley, G3HCT; and Ian White, G3SEK. Attending in their IARU capacities will be Colin Thomas, G3PSM, and Alan Taylor, G3DME.

A founder member of the IARU and of the Region 1 division, the RSGB will again participate actively in the conference. The Society has always made a significant contribution to the development of the amateur service in Region 1, and it is the intention that this should be continued.

The future

After the talking is over and the delegates have once again scattered throughout Europe and Africa, will the end result be a few sheets of paper recording the decisions of the meetings? To judge by past performance, and in view of impending events, the answer is no. By now each national society is well aware of its responsibilities for the coming years. The conference will show what modifications or additions are necessary to supplement work already in hand. The delegates have a particular task to impart their views of the proceedings, by reporting to the governing body of their national society, and by taking part in meetings and discussions. The president of

the IARU, Noel Eaton, VE3CJ, will be present at Miskolc-Tapolca, and he will no doubt consider the impact of Region 1 thoughts on the amateur service world-wide.

Let us not be fooled, the survival of the amateur service as we know it today can depend on the efforts made now by all of us; there is no opting out, each has a share of the responsibility.

See you on 14 or 144MHz in 1981.

G2BVN

council proceedings

A brief report of the Council meeting held on 19 November 1977

Present: Lord Wallace (President, in the Chair), Dr E. J. Allaway, Messrs A. M. Allan, D. J. Andrews, J. Anthony, P. Balestrini, Dr D. S. Evans, Messrs W. F. McGonigle, C. H. Parsons, D. M. Pratt, W. A. Scarr, R. F. Stevens, G. M. C. Stone, C. J. Thomas, (members of Council), G. R. Jessop (general manager/secretary), A. W. Hutchinson (editor), D. A. Evans (general manager designate), Mrs H. M. Allin (minutes secretary).

Apologies for absence were received from Messrs Bazley, Brown, O'Brien and D. M. Thomas.

Financial report

In the absence of the honorary treasurer, Mr Jessop reported that the figures for the last four months had continued the previous trend, resulting in a surplus of £11,648. Book sales and subscription figures were both above those budgetted.

Headquarters report

Mr Jessop said that a major problem at present was the lack of space at HQ for dealing with the large volume of books. Extending No 35 was not practical because of the drainage system at the rear of the building.

Mr Andrews queried the number of staff employed at HQ now compared with the number employed before installation of the data processor. Mr Jessop replied that there were approximately 16 members of staff at HQ and that less staff was now employed in the subscriptions section.

Mr C. Thomas wondered if the commercial side of HQ in book production and sales was expanding at the cost of membership. He felt that more people were resigning due to lack of response from HQ.

Membership and representation

It was resolved:

(i) to waive the subscriptions of four members;
(ii) to accept reduced subscriptions from nine members;
(iii) to grant affiliation to: Coventry Microwave Group, c/o University of Warwick ARS; Crawley Court Amateur Radio Group, IBA, Winchester; Dudley Amateur Radio Club, West Midlands; Foster Cambridge Amateur Radio Club, Cambs; Poole Radio Amateur Society; Turun Radiomatoorit ry, Finland; University College of London Amateur Radio & Electronics Club.
(iv) to approve the appointments of the following area representatives: Mr T. P. Hughes, GM3EDZ, Glasgow; and Mr A. Wills, GM8KMO, Grampian.

Repeaters

Mr Allan stated that he was repeatedly questioned about the jamming of GB3LO and he would appreciate answers to the following questions:

1. What measures had been taken in the past?
2. What measures were being taken now?
3. Was there any reason to expect current measures to be more successful?

Mr Stevens replied that the Society could not take independent action in this intolerable situation, as it had to rely on the efforts of the Post Office and Home Office. The Wireless Telegraphy Acts made prosecution difficult and, as GB3LO covered 2,000 square miles which had the greatest density of amateurs, the task was obviously an extremely difficult one, even though the jammers were known to the authorities.

Honorary membership

It was unanimously agreed to elect Mr A. O. Milne, G2MI, an honorary member of the Society.

Dr Allaway reported on a recommendation from the Finance & Staff Committee that Mr Milne be asked to choose a piece of equipment to be presented to him by the Society in recognition of his 38 years of service to the Society. The question of a token of appreciation to Mrs Milne was also discussed.

It was unanimously agreed to purchase a piece of equipment and a watch for presentation at the AGM.

"Radio Communication" printing

Council considered the recommendation put forward by the Technical & Publications Committee at its meeting on 2 November that the printing of the Society's journal be transferred to E. T. Heron & Co Ltd as soon as possible.

Mr Stevens referred to estimates received and said that there would be a saving of £3,700 per annum with Herons, and a better, faster service was anticipated.

It was unanimously agreed to accept the recommendation.

Committee minutes

Council received the minutes of the following committee meetings: Education (10.9.77), Finance & Staff (20.9.77, 13.10.77, 17.11.77), HF Contests (13.10.77), IARU Working Group (18.8.77, 20.10.77), Membership & Representation (8.9.77), Repeater Working Group (16.7.77, 13.8.77), Technical & Publications (7.9.77), Telecommunications Liaison (6.10.77), VHF (15.10.77).

Mr Pratt drew Council's attention to a letter he had sent to Mr R. J. Hughes, G3GVV, regarding the exclusion of valves from the RAE syllabus. A copy of this letter, together with Mr Hughes' reply, had been circulated to Council, and it was agreed that Mr Pratt should write again asking Mr Hughes to re-consider and for the matter to be raised again at the next meeting of the RAE Advisory Committee.

Dr Allaway reported on the recommendation of the Finance & Staff Committee that Mr D. Cornish, G3COR, be appointed honorary treasurer. Council unanimously agreed to invite Mr Cornish to become honorary treasurer.

Another recommendation from the Finance & Staff Committee, that a sum of money equal to that already contributed by members be sent to AMSAT UK for their Phase 3 satellite appeal, was agreed.

Mr Stevens drew Council's attention to the recommendation that the delegation to the Region 1 Conference 1978 should consist of a minimum of five members. This was approved.

Mr C. Thomas noted that several people had been convicted of setting fire to the Southampton repeater and, although only one person lost his licence, nothing had appeared about this in *Radio Communication*. After some discussion Mr Stevens confirmed that the Home Office had refused to give documentary evidence of such convictions and without these official reports nothing could be published by the Society.

The new terms of reference for the VHF and Microwave committees were approved by Council.

A recommendation that Council invite Dr I. White, G3SEK, to be vhf manager, (the appointment to take effect immediately) was agreed.

Expulsion of members

Mr C. Thomas raised the question of the expulsion from the Society of Mr P. A. Nicholson, G8LMD. After discussion it was agreed that a letter would be sent, by recorded delivery, asking G8LMD to appear before Council on 21 January 1978.

Zonal member for Wales

Dr Evans pointed out that no nomination had been submitted to replace Mr D. Thomas, whose Council service would terminate at the end of 1977. It was agreed to invite Mr D. H. Adams, GW3VBP, to fill this vacancy.

Votes of thanks

Dr Allaway proposed a vote of thanks to Mr Jessop for his services as general manager. This was endorsed by all present.

Dr Allaway then proposed a vote of thanks to Lord Wallace for the tolerance and goodwill he had shown throughout his presidency. Mr Stevens added that Lord Wallace's presence had helped the Society to acquire a sense of responsibility, to which the Home Office had responded in a positive manner.

contest news

2nd 1·8MHz Contest 1977 results

Conditions were good with plenty of European activity and, the HF Contests Committee is pleased to note, an increase in European entries. The final UK placings leave Kenneth Riddoch, GM3ZSP, as an odds-on favourite to win the Maitland Trophy in February's contest, to add to his success in this event. He made 152 contacts, taking in 55 counties and countries, using a Trio TS520 with a transverter to a half-wave dipole at 50ft.

G3VMW/A also made 152 contacts, including 52 bonuses, with an FT101E to an inverted-V at 150ft. G4AFS made 144 contacts in 54 counties/countries, using a KW Vespa and Drake R4B with a 180ft inverted-L at 70ft. Unfortunately, only one member licensed for less than a year entered the contest, Neil Braeman, G4FUP, who nevertheless made a creditable 49 contacts in 23 counties and countries.

The leading station in the overseas section, DL8WL, made contacts with 86 UK stations, representing 40 counties; it is a pity that more of these 86 did not submit logs as many were passing high serial numbers, including one or two over the 100 mark.

The comments in the logs suggest differences of opinion on the length of the contest and suggestions that the whole contest be brought forward an hour. Those who made no comment may like to drop a postcard giving their ideas to the adjudicator during the next few weeks. Finally, the HF Contests Committee gratefully acknowledges checklogs from DK5OS, G3USE, G3XYT and OK1DDS. *MH*

UK SECTION

Posn	Callsign	Points	Posn	Callsign	Points
1	GM3ZSP*	727	20	G3ZSU	508
2	G3VMW/A*	717	21	G3SSO	507 (G4BEZ)
3	G4AFS*	699	22	G3SJE	494
4	G4EHF	639	23	G3GC	482
5	G3YMC	617	24	G3SYF	481
6	G3XUD/A	615	25	G3ILO	461
7	G3JFF	607	26	G3OVL	427
8	G3PDL	602	27	G3WQK/A	412
9	G3SYM	598	28	G3SVW/A	397
10	G3XVF/A	568	29	GM3OXX/A	379
11	G3XSC	557	30	G2MJ	375
12	G3XTJ	554	31	G3TLF	365
13	G3TIR	551	32	G3YHV	350
14	GI3IVJ	544	33	G3BTO	287
15	G4FAM	541	34	G3YYF	263
16	G3RWL	534	35	G4FUP*	262
17	G3TLK	527	36	G3ZNH	246
18	GW3KOR	517	37	G3ULY	189
19	G4CWH	513	38	G3HJF	168

OVERSEAS SECTION

Posn	Callsign	Points	Posn	Callsign	Points
1	DJ8WL*	441	13	HB9AJU*	200
2	EI2BB*	376	14	F8VJ*	179
3	DK5PD*	375	15	OK2PAW	163
4	DJ6TK	361	16	F8EX	152
5	DJ9MH	353	17	PA0TA*	151
6	OK1DKW*	318	18	OL8CGI	146
7	DK3KD	307	19	OL6AUE	144
8	DK6PB	293	20	F3AT	140
9	EI9ONE	280 (EI3CP)	21	DK3AX	102
10	DJ3ZX	272	22	OK3CEI	101
11	DJ0YL	270	23	OK3KFO	100
12	OL8CGD*	242	24	OK3CSM	24

Late entry: DL1BU, claimed score 386 points.
* Certificate winners.

10GHz Cumulative Contest 1977 results

This contest, new to the calendar, attracted a large number of entries, indicating the high level of activity on this band. In all, some 46 stations were operational during the contest, and the fact that nearly half actually sent in logs must be an all-time record for any contest.

The majority of contacts were made over line-of-sight paths using fairly modest equipment. However, a significant number of contacts were established over non-optical paths, which reflects the progress which has been made, both in terms of equipment performance and utilization of low-loss modes of propagation.

Most contestants appeared to be happy with the rules, the main suggestions being that the contest periods could usefully start earlier and that the radius of the defined site could be increased. Both of these points will be borne in mind in the drafting of the rules for this year.

Congratulations to the winner, G3KSU/P, and the runner-up, GW4BRS/P, both of whom will receive certificates.

G3WDG

Posn	Callsign	Points	QSOs	Best dx	Km
1	G3KSU/P	2,342	36	GU3JHM/P	114
2	GW4BRS/P	2,121	29	G4CNV/P	133
3	GU3JHM/P	1,391	18	G8BCO/P	164
4	G4DDK/P	870	13	G8AXE/P	124
5	G8BCO/P	843	18	GU3JHM/P	164
6	G4CNV/P	812	10	GW4BRS/P	133
7	G3VPF/P	756	9	GW4BRS/P	133
8	G8ANZ/P	743	14	GW4BRS/P	81
9	G8BHH/P	480	8	G3TQF/P	95
*	G3WDG	457	12	G4DDK/P	102
10	GW3FYX/P	440	10	G4DDK/P	71
11	G8BDJ/P	408	11	G3KSU/P	73
12	G8AXE/P	402	8	G4DDK/P	124
13	G3TQF/P	375	6	G8BHH/P	95
14	G8ARH/P	273	5	G3KSU/P	81
15	G8GKV/P	250	8	G3KSU/P	73
16	G3TDX/P	206	4	G3TQF/P	74
17	G8JNI/P	204	7	G3KSU/P	86
18	G8FWA/P	176	3	G8BHH/P	95
19	GW8BXJ/P	66	2	G3WDG	42

* Adjudicator.

144/432MHz and SWL Contest rules

1600-1600gmt 4-5 March 1978.
***1600-0100 and 0700-1600gmt.**

This contest is timed to coincide with an IARU Region 1 event. Concurrent working of bands is not permitted and only one callsign is to be used. The following multipliers will apply: 144MHz × 1, 432MHz × 5.

There are four sections:

1. 144MHz Single-operator
2. 144MHz Multi-operator
3. 144/432MHz Single-operator
4. 144/432MHz Multi-operator

*Single-operator stations must break for **six hours**

All entries and checklogs to: VHF Contests Committee, c/o Mr R. Taylor, 12 The Rampart, Haddenham, Cambs.

The following general rules, published in *Radio Communication*, January 1978, will apply: 1, 2, 3, 5a, 6a, 7a, 8, 9a, 10a, 11-22.

Low Power Contest rules

1. The general rules for RSGB hf contests, published in the January 1978 issue of *Radio Communication*, will apply.

2. When. Sunday 9 April 1978. Entrants are permitted to operate for a total of eight hours between 0700 and 1700gmt, in two periods of their own choice, with a break of at least one hour between periods. The start and finish of each period must be shown in the entrants' logs.

3. Eligible entrants and sections. The contest is open to licensed amateurs in the UK and overseas. Entrants from the UK must be fully-paid-up members of the RSGB. The contest results will be separated into two sections: UK members and overseas entrants (including EI).

4. Contacts and contest exchanges. CW (A1) only in the 7 and 3·5MHz bands. Exchanges will consist of RST, serial number and power group of entrant, eg 579001/2W. Overseas entrants may only claim points for contacts with UK stations.

5. Scoring. All entrants will claim points for each completed contact in relation to the power used to make the contact, viz: 1W or less, 100 points; 2W maximum, 50 points; 5W maximum 25 points. (Entrants may use different powers during the duration of the contest but the power used for each completed QSO must be shown in the logs—see below.)

In addition to the points as above, all entrants may claim extra points for contacts with other QRP stations, by adding the points for the power group as received during the contact exchange. Thus,

an entrant running 1W contacting a station running 2W, may claim 150 points for the contact. No additional points may be claimed for a contact with a non-QRP station.

The points as shown above apply to contacts made on the 3·5MHz band. For completed contacts made on the 7MHz band a multiplier of two will apply. UK entrants may claim a further multiplier of two for all contacts on either band that are made with stations located outside of the UK call areas.

6. Logs and entries. Separate logs are required for each band. If only one band is used, this must be stated on the entry. Column 5 of the log sheet must be headed "Power Group Received", and Column 6 "My Power Group". Logs to be sent to: RSG BHF Contests Committee, c/o R. L. Glaisher, 279 Addiscombe Road, Croydon CR0 7HY.

7. Awards. The 1930 Committee Cup will be awarded to the winner of the UK section. The winner of the overseas section and the entrants placed second and third in each section will receive certificates.

HF National Field Day 1978 rules

1. The general rules for RSGB hf contests, published in the January 1978 issue of *Radio Communication*, will apply. The provisions of General Rule 6c are modified by Rule 10.

2. Applications. Each group intending to compete must submit an application on form HFC 10/78 to D. S. Booty, 139 Petersfield Avenue, Staines, Middx TW18 1DH, not later than 29 April 1978. Supplies of forms can be obtained from RSGB HQ, or direct from Mr Booty, on receipt of a stamped addressed envelope.

3. When. From 1700gmt Saturday 3 June to 1700gmt Sunday 4 June 1978.

4. Eligible entrants. Any group of RSGB members within the prefix zones G, GD, GI, GJ, GM, GU and GW. NFD is a multi-operator contest.

5. Operation. Must be from a portable station, not located in a permanent building and not using a mains supply. No equipment or antennas may be installed on the site prior to 24 hours before the start of the contest. This does not apply to the storage of equipment.

6. Mode. CW(A1) only, in the 1·8, 3·5, 7, 14, 21 and 28MHz bands.

7. Sections.

(a) **Open section.** The station shall consist of a transceiver (or transmitter and receiver) with an additional receiver if desired, which may only be used for monitoring purposes. There is no restriction on the number or type of antennas, but the maximum height above ground must not exceed 60ft (18·5m).

(b) **Restricted section.** The station shall consist of a transceiver (or transmitter and receiver) with one antenna, which must be a single element such as a dipole, vertical, long wire, inverted-V etc, having not more than two elevated support points, and not exceeding 35ft (11·5m) above ground at its highest point.

Both sections. Stand-by equipment may be at hand, but not powered or connected in any way simultaneously with the main equipment. The presence on the site of additional amplifiers, or modified commercial equipment capable of excess power, may result in the entry being disallowed.

8. Scoring. Points will be scored as follows:

(a) Fixed stations in the British Isles	1 point
(b) Fixed stations in the rest of Europe, including Eire	2 points
(c) Fixed stations outside Europe	3 points
(d) Fixed stations in the British Commonwealth	6 points
(e) Portable and mobile stations in the British Isles	3 points
(f) Portable and mobile stations in the rest of Europe, including Eire	4 points
(g) Portable and mobile stations outside Europe	6 points
(h) Portable and mobile stations in the British Commonwealth	12 points

The contacts on 1·8MHz and 28MHz should be scored as above, and the totals multiplied by two to obtain the claimed score.

9. Group contacts. Points must not be claimed for contacts made by a competing station with members of its own group.

10. Entries. These are to be in accordance with the General Rule 6, with the following exceptions:

(a) The normal cover sheet will not be used. Special cover and summary sheets will be sent to the person responsible for the entry.

(b) Points must be totalled separately for each band.

(c) Logs must be sent to the RSGB HF Contests Committee, c/o M. Harrington, 123 Clensham Lane, Sutton, Surrey SM1 2ND, postmarked not later than 19 June 1978.

Entries sent direct to RSGB headquarters will not be accepted.

11. Trophies.

(a) The National Field Day Trophy, to the group in the Open section having the highest checked score.

(b) The Bristol Trophy, to the group in the Restricted section having the highest checked score.

(c) The Gravesend Trophy, to the group having the second highest checked score in the section with the largest number of entries.

(d) The Scottish NFD Trophy, to the Scottish group having the highest checked score.

(e) The Frank Hoosen Trophy, to the group having the highest checked score on the 14MHz band.

(f) Certificates of merit, to the groups having the highest checked scores on the 1·8, 3·5, 7, 21 and 28MHz bands.

12. Checklogs. While overseas stations are not eligible to enter NFD, checklogs are very welcome. A certificate will be awarded to the overseas station in each continent whose checklog shows the most points contributed to competitors.

13. Inspections. All stations are subject to inspection by nominated representatives of the HF Contests Committee. The inspector's brief will be to ensure that the rules and spirit of the contest are being observed. Should the inspector be unable to locate the site, due to inadequate or incorrect information given on the application form, the entry will be disallowed. In the event of a last minute change of site, it is the responsibility of the members of the group to make suitable arrangements for the inspector to find the new site.

BARTG Spring RTTY Contest 1978 rules

When. 0200gmt Saturday 25 March until 0200gmt Monday 27 March 1978.

The total contest period is 48 hours but not more than 30 hours of operation is permitted. Times spent in listening count as operating time. The 18-hour non-operating period can be taken at any time during the contest, but off periods may not be less than three hours at a time. Times on and off the air must be summarized on the log and score sheets.

Who. There will be separate categories for single operators, multi-operator stations and SWLs.

Bands. 3·5, 7, 14, 21 and 28MHz amateur bands.

Stations. Stations may not be contacted more than once on any one band, but additional contacts may be made with the same station if a different band is used.

Country status. ARRL Countries List and, in addition, each W/K, VE/VO and VK call area will be counted as a separate country. (But W/K, VE/VO and VK counted once only for QCA purposes.)

Messages. Messages exchanged will consist of:

a. Time gmt. This must consist of a full four-figure group. The use of the expression "Same" or "Same as yours" will not be acceptable.

b. RST and message number. The message number must consist of a three-figure group starting with 001 for the first contact made.

Points. a. All two-way rtty contacts with stations within one's own country will earn **two** points.

b. All two-way rtty contacts with stations outside one's own country will earn **10** points.

c. All stations will receive a bonus of 200 points per country worked including their own. *Note:* Any one country may be counted again if worked on another band but continents are counted once only.

d. *Note:* Proof of contact will be required in cases where the station worked does not appear on any other contest logs received, or the station worked does not submit a check log.

Scoring. a. Two-way exchange points times total countries worked.

b. Total country points times 200 times number of continents worked.

c. Add (a) and (b) together to obtain your final score.

Sample score

Exchange points (302) × Countries (10)	= 3,020
Country points (10) × 200 × Continents (3)	= 6,000
(a) and (b) added together to give a score of	9,020 points

Logs and score sheets. Use one sheet(s) for each band and indicate all rest periods. Logs to contain: date, time gmt, callsign of station worked, RST report and message number as sent, RST report and message number as received, exchange points claimed. The summary sheet should show the scoring, the times off the air and, in the case of multi-operator stations, the names and callsigns of all operators involved. All logs must be received by 31 May 1978 in order to qualify, and should be sent to: Ted Double, G8CDW, 89 Linden Gardens, Enfield, Middlesex EN1 4DX, England. Check logs to the same address.

The judges' decision will be final and no correspondence can be entered into in respect of incorrect or late entries. All logs will remain the property of the British Amateur Radio Teleprinter Group.

Certificates will be awarded to the leading stations in each of the three classes, the top stations in each continent and each W/K, VE/VO, VK call area. The final positions in the results table will be valid for entry in the "World Champion of RTTY" championship.

Additional notes. a. If a contestant manages to contact 25 or more different countries on two-way rtty during the contest, a claim may be made for the Quarter Century Award issued by the British Amateur Radio Teleprinter Group and for which a charge

of US$3 or 15 IRCs is made. Claims to be submitted with contest logs. Holders of existing QCA awards will automatically have any new countries added to their records.

b. If any contestant manages to contact stations on two-way rtty with all six continents and the BARTG contest manager receives a contest or check log from the operators in those six continents, a claim may be made for the WAC Award issued by the *RTTY Journal*. The necessary information will be sent to the *RTTY Journal* which will issue the WAC Award free of charge.

Extra note. There have been several changes to the rules for the contest for 1978.

a. Inclusion of VK call areas as separate countries.

b. Proof of contact as under points (d).

c. Summary sheets for multi-operator stations to show names and callsigns of all operators.

In view of this, it is important that only this copy of the rules be used, and copies of contest rules from previous years should NOT be used.

9th BARTG VHF RTTY Contest 1977 results

This contest was acclaimed by many of the British competing stations as "the best yet!" Entries from British stations have again increased. Congratulations to Alan Melia, G3NYK, and the Martlesham RS for taking G4BPO/A into first place with such a commanding lead.

Conditions on the Saturday evening allowed good dx QSOs, with DJ, ON, F, PA0, GI and GW all featuring in the logs of leading G stations. It was particularly rewarding to see a significant increase in activity from the north of England, and the entry from GI8HXY. Equipment used by the leading G stations was as follows: G4BPO/A: 150W to 2 × 10-el Yagi at 80ft, 7erp + Model 54, ST-6; G3PLX: 30W output to indoor antenna at sea level; G8AWN/A: TS700 + Belcom linear—50W output, 8-el Yagi at 50ft, 950ft asl; 7E printer, CV89 terminal unit.

The standard of log-keeping was generally high, particularly from the leading stations. A few entrants will find their scores have been adjusted to compensate for elastic rulers used when calculating distances!

Other British stations known to have been active during the contest include G3AJS, G3EFP, G3IUZ, G3MFJ, G3OUF, G3PEJ, G3PYB, G3RXQ, G3SGY, G3WIP, G3WTY, G3XTZ, G3YSG, G3YWM, GI4AHP, G4DEL, G4EGH, G4ERY, G4FEV, G4FZF, G4GEW, G8ASX, G8BIS, G8BJG, GM8BJJ, G8CJL, GI8DMX, G8DOD, G8ELV, G8GGI, G8HPU, G8HUE, G8INP, G8JNW, G8JUG, G8KAV, G8KNJ, G8LFZ, G8LGY, G8LIC, G8LNV, G8MEI and G8MJJ.

There was also considerable activity from West Germany and Holland, together with stations active from F, ON, SM, LA and YU.

UK SECTION

Posn	Callsign	144MHz	432MHz	Total	Contacts	Best dx(km)
1	G4BPO/A	363	—	363	45	563
2	G3PLX	197	—	197	30	602
3	G8AWN/A	191	—	191	24	355
4	G3UUP/P	181	—	181	41	365
5	G3OZF	132	—	132	35	365
6	G8FHX	129	—	129	37	372
7	G8IZU	102	—	102	24	290
8	G8ISI	100	—	100	18	635
9	GI8HXY	87	—	87	9	530
10	G3KRC	81	—	81	33	275
11	G3IIR	79	—	79	23	322
12	G4FRJ	77	—	77	23	324
13	G4AFQ	74	—	74	22	288
14	G3RED	62	—	62	14	208
15	G8CDL	59	—	59	23	130
16	G4EDR	55	—	55	7	269
17	G4EEV	44	1	45	9	280
18	G8FSL	44	—	44	20	122
19	G8LWY	40	—	40	18	176
20	GW8BXQ	39	—	39	3	427
21	G8IAT	31	—	31	5	305
22	G8GOJ	24	—	24	12	126
Disqualified—incomplete log information:						
	G8INP	63	—	63	29	260

W EUROPE (EXCLUDING UK)

1	DKIAQ	162	3	165	32	502
2	PA0YZ	81	—	81	12	340
3	PA0KMP	65	—	65	9	375
4	DC3OZ	50	3	53	19	245
5	HG5KDQ	20	—	20	2	279
6	OE1VKW	19	—	19	5	212
7	DJ2YE	10	—	10	4	141
8	LA7AJ	7	—	7	1	—
9	SM6EBM	1	—	1	1	40
Disqualified—incomplete log information:						
	PE0WSF	25	—	25	5	315

Contests calendar

4-5 March	144/432MHz and SWL (Rules in this issue)
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 (Rules in February issue)
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

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. Details from GW3WBU.

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 G8JML, tel Truro 78020.

6 August—RSGB National Mobile Rally, Woburn Abbey.

20 August—Preston Mobile Rally. Details later.

24 September—Harlow & DARS Mobile Rally, Netteswell Comprehensive School, Harlow. Details from G8FRG, 232 Pennymead, Harlow, tel 0279 32486.

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.

RSGB SLOW MORSE PRACTICE TRANSMISSIONS

These slow morse practice transmissions are sponsored by the RSGB. Alterations and additions to this list should be sent to the honorary organizer, Mr M. A. C. MacBrayne, G3KGU, 25 Purlieu Way, Theydon Bois, Essex.

Clock time	Callsign	MHz	Mode	Town
Sundays				
0900	G3LEQ	1·815	A1/A2	Knutsford, Cheshire
		144·250	A1/A3J	
		145·550	F2/F3	
0900	G3WNR	145·600 omni-direct	F2/F3	South Shields, T & W
1015	G3CGD	1·875	A1/A3	Cheltenham, Glos
1030	G3NPB	1·875	A1	St Ives, Cornwall
1100	G2FXA	1·900	A1/A3	Stockton-on-Tees
1130	G3BLS	1·920	A1/A3	Osney, Oxford
1200	G3H'/I	144·750 omni-direct	A2/A3	Stoke-on-Trent, Staffs
1230	GU4CHY	144·500 to north	A1/A3J	St Peter Port, CI
1500	G4EHW	144·250 to south-west	A1/A3J	Peterborough
1800	G3LEQ	1·950	A2/A3	Knutsford, Cheshire
		144·250	A1/A3J	
		145·250	F2/F3	
1815	G4DVZ	1·915	A1/A3J	Leeds, Yorks
Mondays				
1145	G3RAF	1·920	A2	Locking, Avon
		3·550	A2	
		145·250 omni-direct	A2 or F2	
1830	G3VBI	1·910	A1/A3	Goole, South Humberside
1830	G3LR	145·525	F2	Accrington, Lancs
	G3NCZ			Blackburn, Lancs
	G3ZQS		A2/A3J	Darwen, Lancs
1845	GM4CMI	3·550	A1/A3	Kirkwall, Orkney
1900	G3ZRZ	1·980	A1/A3	Blackpool, Lancs
1900	G4FKZ	3·575	A1/A3	Chadderton, Lancs
1900	G4BNV	144·170 horizontally to south-east	A1/A3J	Ottery St Mary, Devon
1930	G3RAF	1·920	A2	Locking, Avon
		3·550	A2	
		145·250 omni-direct	A2 or F2	
1930	G3ZYY	145·525 horizontally to south-west	F2/F3	Plymouth, Devon
1930	GI3SXG	144·110	A1/A3J	Newtownards, Co Down
2000	G3IBJ	1·910	A1/A3	Southampton, Hants
2000	G3XWZ	1·910	A1/A3J	Mansfield Notts
2000	GM4ELV	3·570		Arrochar, S/Clyde
2030	G3ASR/A	1·875	A1/A3J	Harrow, Middlesex
		144·175 omni-direct vertical	A1/A3J (lsb)	
2030	G3YMJ	1·975	A1/A3J	Harlow, Essex
2130	G3LQI	145·300	F2/F3	Lancing, Sussex
Tuesdays				
1145	G3RAF	1·920	A2	Locking, Avon
		3·550	A2	
		145·250 omni-direct	A2 or F2	
1830	G4BNA	3·590	A1	Swindon, Wilts
1830	G3LR	145·525	F2	Accrington, Lancs
	G3NCZ			Blackburn, Lancs
	G3ZQS		A2/A3J	Darwen, Lancs
1845	GM3CCK	3·550	A1/A3J	Kirkwall, Orkney
1930	G3RAF	1·920	A2	Locking, Avon
		3·550	A2	
		145·250 omni-direct	A2 or F2	
2000	G3IQF	1·875	A1/A3	Marlow, Bucks
2000	G4AEU	1·910	A1/A3	Southampton, Hants
2000	G4EZA	145·525 omni-direct vertical	F2/F3	Colchester, Essex
2030	G3IRM	1·975	A1/A3	Bury St Edmunds, Suffolk
2030	G4FFC	145·575 to south	F2/F3	Pertenhall, Beds
2045	G4AEU	145·550 omni-direct vertical	F2/F3	Southampton, Hants
2200	G3AWL	144·110 to south	A1/A3J	Peterlee, Co Durham

Clock time	Callsign	MHz	Mode	Town
Wednesdays				
1145	G3RAF	1·920	A2	Locking, Avon
		3·550	A2	
		145·250 omni-direct	A2 or F2	
1830	G3LR	145·525	F2	Accrington, Lancs
	G3NCZ			Blackburn, Lancs
	G3ZQS		A2/A3J	Darwen, Lancs
1845	GM3IBU	3·550	A1/A3/A3J	Kirkwall, Orkney
1900	G3ULY	1·826	A1/A3J	Culgaith, Cumbria
1900	G4FKZ	3·575	A1/A3	Chadderton, Lancs
1930	G3RAF	1·920	A2	Locking, Avon
		3·550	A2	
		145·250 omni-direct	A2 or F2	
1930	G3ZYY	145·525	F2/F3	Plymouth, Devon
2000	G8QU	1·970	A1	London N22
2000	G3BPE	1·975	A1/A3	Bexley, Kent
2000	G3SWP	144·200 omni-direct	A2/A3J	Doncaster, South Yorks
2000	GM4DSZ	144·230 to south-south-west	A1/A3J	Aberdeen
2015	G3WVJ	1·845	A1/A3	Staines, Middlesex
2100	G3HVI	144·750 omni-direct	A2/A3	Stoke-on-Trent, Staffs
2130	G3VWL	144·160	A1/A3J	Worthing, Sussex
Thursdays				
1145	G3RAF	1·920	A2	Locking, Avon
		3·550	A2	
		145·250 omni-direct	A2 or F2	
1830	G4BNA	3·590	A1	Swindon, Wilts
1830	G3NC	1·968	A1	Swindon, Wilts
1830	G3LR	145·525	F2	Accrington, Lancs
	G3NCZ			Blackburn, Lancs
	G3ZQS		A2/A3J	Darwen, Lancs
1845	GM3MTS	3·550	A1/A3J	Kirkwall, Orkney
1900	G3BLS	1·920	A1/A3	Osney, Oxford
1930	G3RAF	1·920	A2	Locking, Avon
		3·550	A2	
		145·250 omni-direct	A2 or F2	
1930 (1st and 3rd weeks of month only.)	G3ASR/A	1·875	A1	Harrow, Middlesex
		144·175 omni-direct vertical	A1/A3J (lsb)	
1930	G3ZRZ	1·980	A1/A3	Blackpool, Lancs
1930	G3ZYY	145·525	F2/F3	Plymouth, Devon
2030	G3KGU	1·915	A1/A3	Theydon Bois, Essex
2130	G3LQI	145·300	F2/F3	Lancing, Sussex
Fridays				
1145	G3RAF	1·920	A2	Locking, Avon
		3·550	A2	
		145·250 omni-direct	A2 or F2	
1830	G4CRI	3·525	A1	Helston, Cornwall
1830	G3LR	145·525	F2	Accrington, Lancs
	G3NCZ			Blackburn, Lancs
	G3ZQS		A2/A3J	Darwen, Lancs
1845	GM3UII	3·550	A1/A3J	Dounby, Orkney
1900	G3NPB	1·875	A1	St Ives, Cornwall
1900	GU4CHY	144·500 to north	A1/A3J	St Peter Port, CI
1900	G4FKZ	3·575	A1/A3	Chadderton, Lancs
1930	G3PQF	144·360 to north-east	F2/F3	Farnborough, Hants
1930	G3RAF	1·920	A2	Locking, Avon
		3·550	A2	
		145·250 omni-direct	A2 or F2	
2130	G3VWL	144·160	A1/A3J	Worthing, Sussex
2200	G3AWL	144·110 to south	A1/A3J	Peterlee, Co Durham
Saturdays				
0930	G2FNK	1·930	A1/A3J	Staines, Middlesex
1145	G3RAF	1·920	A2	Locking, Avon
		3·550	A2	
		145·250 omni-direct	A2 or F2	

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

KW2000B, comp with psu, manual and Shure mic, exc cond, £190. G3ZZD, QTHR. Tel Tunbridge Wells 34117.

Liner 2 fitted PA3 preamp, mobile mount, orig packing, in exc cond, £115, or may consider mobile fm rig 2m/70cm. G8AJM, QTHR. Tel Reading (0734) 64903, after 6.30pm or weekends.

Icom IC-22, fitted R3, 5, 6, 7, S0, 20, 22, 23, vgc, boxed, all accessories, £110. G3VJG, 38 Southwood Lane, London N6. Tel 01-340 5659, evenings.

DX33 antenna, good cond, one year old, going mono, £45. *Wanted:* P60 std or h/d Versatower. GM3WOJ, QTHR. Tel Dumfries 5080.

Pye Cambridge AM10B, fitted S20, S21, S22, S23, S24, R6, Garex discriminator board, mod record, used as base stn, £35. G8MSJ, QTHR. Tel 0279 812300.

Yaesu FT2F 144MHz fm tx/rx, 10/1W bracket, manual, orig packing, R3-R7, S0, S17, S20-22, 144·48, 144·60, 144·95, vgc, comp, £100. Liner 2 ssb tx/rx, preamp, manual, p/mic, £110 ono. Hallicrafters S27 vhf rx, 28-144MHz, £30. G8LVM, QTHR. Tel 0509 67309, evenings.

Yaesu FR50B, FL50B 50W hf ssb/cw tx, 80-10, vgc, rx 160-10, ideal 1st stn, £160 ono. Also Storno Viscount 2m tx/rx, £25. Prefer buyers collect. *Wanted:* FTDX401 FTDX560. Why? G4DRS, QTHR. Tel Silsoe (0525) 60478, evenings/weekends.

Trio QR666 gen cov rx, fitted fm tuner, accessories, full manuals, immac, £125 ono. 4m Vanguard 70·26, 70·375, comp mobile set up control gear, mic, spkr, λ/4 whip, full manual, immac, £25. Steve Webb. Tel Crawley 28787, ext 340, wkg hours.

Trio TS 700G and matching vox unit, four months old and hardly used, offers over £320. Also Trio JR 310 with 10AZ mechanical filter, very good cond, offers please. Carr or collect. Redfern, G4CLN. Tel 05304 5735.

Trio 2200GX mint, 6ch, nicads, all extras, £120. Garex 2-mobile, 6ch, £75. Unused Heathkit 10-18U oscilloscope, £40. Tel Northampton 52650.

MF455 10CK filter, two xtals, £15. 23cm long Yagi, quad loop type, new, £12. SSTV tube 5FP7, £7. Tel Andy, 01-504 4942.

Datong frequency agile filter FL1, £35. Prefer buyer collects. G3FZG, QTHR. Tel Penketh 2403.

KW Valiant, cw/a.m., ac psu, D104 mic, on stand, manual, command receiver 10m and 160m only, 12V 300/600V psu for mobile working, all in perf cond, £45, no offers. Buyer collects. G5VS, QTHR. Tel Maidenhead 25637.

Telford TC10 2m tx, all modes, a.m., fm, cw, vfo, 10W, £75. G4FWG, QTHR. Tel Crowborough 2272, evenings.

Heath HW101, SB102 ssb and cw filters, homebrew psu, £175. SB200 linear, exc cond, £250 ono. GM4AWA, QTHR. Tel (office) Perth (0738) 21241 extn 238.

TS700, late model, perf cond, £275. 8-el Yagi, £5. G8KNO. Tel Taunton 2782.

Xtals for ladder filter experiments, etc: 8·95MHz HC18U, £1 ea, four at 75p ea, ten at 60p ea; some 5·000MHz HC6U still available, £1 ea. Send sae with remittance and order to Richard Bowell, 16 Margarite Way, Wickford, Essex SS12 0ER.

HRO MX, 5 coils, psu, cct diagram, cct description, Seloso vfo (unused) in part-constructed tx with metal cabinet, TT21 valve etc, homebrew top-band a.m./cw tx; reason for disposal gone FT101E; reasonable offers please. G3PDE, QTHR. Tel 04215 65135.

Stolle 2010 ant, rotator with rotator support bearing, as new, £35. G4CJY, QTHR. Tel 0494 30018.

Drake TR4 RV4 AC4 plus Electro Voice mic, £425 ovno. Yaesu FT200 FP200 incl new spare final valves, £250 ono. Heath SB401 SB301, Heath spkr, £275 ono. G3YDX. Tel 01-432 5432, office.

Valradio D24/200S transverter, provides 200W 240V 50Hz sine wave from 24V battery, exc cond and in wkg order, £110. Buyer collects, Kingston Upon Thames area. Tel 01-942 1230.

HQ1 Minibeam, £30. Buyer collects. Heath HW12A 80m tx/rx with HP13 dc psu, £80. *Wanted:* Recent comp years *QST*, *73* mag, *Ham Radio Magazine*. Kelman, G4BVC. 61 The Fairway, Oadby, Leicester. Tel Leicester 708585.

Drake TR3 tx/rx, RV3 vfo, spkr, ac psu, dc psu, all fittings for mobile operation, spare pa valves, in daily use, £265. Owner buying new Drake. Tel 0474 4694.

FR50B, 160m to 10m plus 2m converter, xtal calibrator, £80. Heathkit OS-2 oscilloscope, £10. HT psu 600V 200mA 6·3V ac 22V ac, £10 ono. Brimar DG13-47 crt, base, unused, £25. PSU 115V input 24V 20A output, £5. GM8JYZ, QTHR. Tel Tealing 313.

Oscilloscope, dual trace type C1-16, dc-5MHz, comp with leads, service and instruction manual, £35 no offers. Buyer collects. H. Hull, 12 Gillway Lane, Tamworth, Staffs B79 8PL. Tel Tamworth 58529, anytime.

IC202, 3 xtals, nicads, h/b charger; 640 linear, psu, (h/b); SS 35W linear (h/b, 12V); 4-el quad with feeder; 20ft portable mast; £210 the lot. Consider separating and will deliver 40 miles. G4AZA, QTHR. Tel Oxford 730745, evenings and weekends.

Marconi Mk3 comp tv camera system, space needed urgently, £50 ono. Will transport. M. Loach, 87 Bath Street, Abingdon, Oxon. Tel Abingdon (0235) 20005.

Antenna, 2m 8XY, £10 (collect). MHW602 25W pa module, new, £25. 10·7MHz ±3·75kHz ITT 024DD filter, £15. 0-30V psu, £8. HW202 tx/rx xtalled, £125. HA202 pa, £30 ono. GW8JOJ, 12 Black Barn Lane, Usk, Gwent.

Eddystone 888A exc cond, manual, etc; FRG7, as new, manual; Garex 2m converter; audio filter kit; Junkers key, as new; best reasonable cash offer. Buyer collects. *Wanted:* JR310 manual, or hire for copying; 88mH toroid. G3FK, QTHR. Tel Breamore 436.

IC22A, 10 good channels, toneburst, £110. KW2000B, immac inside and out, £210. Deliver reasonable distance. Cragg. Tel Dunstable (0582) 600358.

IC22A, comp, in orig box, xtal t/b R2-R7, S0, S20-S24, £130. Star-phone M5 70cm fm mobile, all fittings, 5ch, xtals SU8 RB2-RB14, xtal t/b, £80. Can arrange delivery. G3VZV, QTHR. Tel Whipsnade 872848.

Hartley d/b oscilloscope, type 13A comprehensive impressive, £25. Collect. Speech processor transistor USA, £5. SW bridge pwr/swr two meters (new), £5. B44 tx/rx, 4m, £5. Collect. Field indicator RF40 1MHz-250MHz, £3. G3OSH. Tel Ilminster 3349, evenings.

23cm cavity wavemeter, 850-1,320MHz, calibration chart, £12. Atronics CR101 code reader, alpha/numeric display from audio (see adverts in *Ham Radio Magazine*), £145, post at cost. Enquiries, sae please. G6QI, QTHR. Tel 0326 240546.

Multi 2700, as new, £375. Sig gen, TS510/U (HP608D), exc cond, £200. Prefer buyer collects. G8AJB, QTHR. Tel 061-624 4115.

Storno CQL662 uhf fm mobile tx/rx, in vgc, control box wiring harness, antenna, toneburst, xtalled for RB4, RB6, SU8, RB10, RB14, 6W rf output, £105. G3KLF. Tel Ipswich (0473) 310442, evenings or weekends.

Eddystone 680X, works but needs new valves and tweaking, £40 ono. Codar AT5, fixed and mobile psus, £30 ono. G4GKB. Tel Warwick (0926) 43868, 5-6pm.

Garrard SP25 Mk3 deck, plinth and cartridge, £25. Army surplus gear: headphones (high impedance), £1; carbon mics ptt, 75p; keys, 50p; 12-way (19 set) connectors, 25p. Many octal valves, sae list. TW 2m communicator, £40. Emsac Nuvistor 2m converter (28MHz i.f.), mains psu, £15. Class D wavemeter (6V ac), £8. Celestion 8Ω spkrs: 10in, £6; 8in, £5. Buyers collect or carr extra. G4BIX, QTHR.

FR400SDX, in carton, £175. KW Vespa Mk2, psu in matching case, £70. Panda Cub, 40W, £20. Eddystone 740, Codar preselector Q-multiplier, £45. Pye base, on 144MHz, cased, £15. G3KDQ, QTHR. Tel Blidworth 3293.

Pair 6146, £4.50. New Reslo ribbon mic, £16. Muirhead sm dial 50/1 reduction. 2m xtals 8MHz+ and 38·66, £1 ea. Tiger 2m converter, Nuvistor front end, £15. Meters, state wants. G3KH, 133 Station Road, Cropston, Leicester LE7 7HH.

TR3200, vgc, xtalled all repeater, 3 simplex, rev RB14, nicads, £150 ono, or would exch if helps. Storno Viscounts, low band, c/w control boxes and cables, £15 ea. Pair PF1s xtalled RB14 rx, helical antenna £28. Liner 2, vgc switched 144 or 28·5MHz o/p, £115 ono. G8GHZ, QTHR. Tel Northampton 61794.

Kokusai MF455-10CK mechanical filter, template screen, full fitting instructions, brand-new, tested, £13.50 incl p & p. GW3WSU, QTHR.

Yaesu twins FLDX400/FRDX400, incl 2m conv, mint cond, orig cartons, manuals, spare final tubes, must sacrifice, £395. G3LMH, QTHR. Tel 0962 881644.

HW202, toneburst, fitted xtals S0, 20, 22, 144·60 PI LO, mounting bracket, £95, carr paid. G3STJ, QTHR. Tel Billericay 54472.

Rtty comp UT4, assembled with all components, 26 ics, two FIFOs and UART, all socketed, two pcbs, comp psu, metal case, nine switches, meter etc on front, circuit description, not wkg, who will gamble at £35, post paid? G3RDG. Tel 01-455 8831.

FT101E, cw filter, spare drivers and PAs, dust cover, mint cond, will incl multi-mobile whip, 80, 20, 15, 10, price £390. Consider pt/exch for camera, plus lens suitable for atv. G4AQY, on behalf of G3YPK. Tel 01-858 1448, evenings.

Codar AT5, ac psu, mic, vgc, £30. Atlanta ssb tx/rx, psu, Shure mic, handbook, fb cond, £180. Both ono. Buyer collects, Hants/Berks border. G3LUG. Tel Silchester 700027, after 7pm.

Yaesu FR50B, 10-160m rx, xtal calib, exc cond, operating handbook, two spkrs, £70; 28-144MHz converter, suits above, £10; both £78. Kirkland, 83 Hyndland Road, Glasgow G12 9JE. Tel 041-339 5256.

TS820, cw filter, dc psu, matching spkr, mint, £700. FT101E, cw filter, mint, £395. FT75, both psus, 15 xtals, £160. Sony ICF5900W, fm, medium, three short-wave bands, xtal calibrator, bfo, £55. FV101B, mint, £50. G4DPN, QTHR. Tel 01-640 3618.

Valves, brand-new, boxed; 4CX250B, £8 ea; QQVO6-40M, £5 ea; 829B, £5 ea. AR88D, £35. FM/D AM25B comp, fitted S0, S20, S21, S23, R6, R7, £47. AM25B, lb, no control gear, £10. 2m filter, £4. FT221R with dust cover, as new, boxed, £300 ono. FM/D AM25B comp, fitted PA3, S0, S20, S21, S23, R6, R7, £47. Rolleiflex camera, plate back, Pentaprism, Rolleinars, six filters, 16 adapter, w/angle lens, etc, £150 ono. G8LGC, QTHR. Tel 0454 314700.

Multi 2000FDK, ssb, fm, cw, 144 to 148, mains or 12V dc, 400ch, plus vxo, as new cond, £200. G4BQF, QTHR. Tel Canvey Island 62394.

My Europa, straight swop for low power transverter. Tew. Tel 01-648 5895.

FT620B, 6m tx/rx, fitted a.m. filter, full 4MHz coverage, ideal as vhf/uhf driver, £200. Tel Rugby (0788) 890517, evenings.

Ideal dx QTH, highest SE England, 840ft asl, quiet, 30 miles London, fast trains Victoria, house and separate bungalow with corridor access, surrounded National Trust and farmland, extensive views, £55,000. G2YP, QTHR. Tel Dorking 730 327.

B40 ex-Navy gen cov rx, good wkg order, some mods, product detector, S-meter, 240V with circuits, £15. Elderly Ferrograph 2-speed tape recorder, wkg but needs attention, £8. Buyer to collect evenings or weekends. C. Cleverly, G8NJC, 32 Cornwall Crescent, Devizes, Wilts.

AR88D, homebrew fm tx, psu, vfo, Micro Modules 28 i.f. all in super cond, £100. Buyer collects. Class D wavemeter, mains supply, £10. Tradpiper gdo TE15, £12. G4ESA, QTHR. Tel Portsmouth 28688.

Heathkit HM-11U swr meter, 160-2m, £5. Heathkit service oscilloscope OS-2, factory built 2Hz to 3MHz, £20. Both mint. G8GAG, QTHR. Tel Stratford-upon-Avon 4718, evenings and weekends.

Heathkit SW717 gen cov rx, in good cond, £35. Roddy Evans, 93 Balallan, Isle of Lewis.

Hallicrafter Super Skyrider (SX17), good wkg cond, orig but fitted 240V auto transformer, manual, offers? HRO, 8 coils, incl bandspreads 175kHz to 30MHz, front end 6BA6/6BE6, otherwise orig, manual, £25. G2QY, QTHR. Tel Cheltenham 20105.

FT401, 560W, fitted cw filter, 80-10m, with SP401 spkr, manual, £245. B24 Minibeam, 10, 15, 20m, 2-el, £35. G4BGY, QTHR. Tel 01-777 9061, evenings.

Three-bedroom semi, in pleasant city of York, garage, gardens, full central heating, purpose-built brick shack 14ft by 7 ft, 40ft Versatower/greenhouse, £13,500 ono. G3PHJ, 9 Bracken Hill, Osbaldwick, York. Tel York 55624.

Trio 9R59DS gen cov rx with orig box, plus Philips spkr, £40. Salter, 27 Fern Road, Aller Park, Newton Abbot, Devon.

Telomast, 50ft, full rigging kit, two months old, planning permission refused, £65 ono. Three 2in Dural scaffold poles making 40ft, two Jaybeam couplers, £20 ono. D. C. Andrews, G4CWB, 28 Brunswick Drive, Harrogate, North Yorks. Tel Harrogate 504373.

Teletypes and vdus: Olivetti ASC11, asr terminal RS232, £250. Ferranti modern vdus, £100. Sagem Electronic 5-level printer, £75. Litton ASC11 high-speed teletype, 30cps, keyboard, £250. Litton cpu with drum store, all ttl, £120. G4FNY. Tel 049 47 4483.

Hammarlund HQ180, matching spkr, auto-clock-timer, manual, etc. absolutely mint, £185. Roller coaster, £5. AR88 gear train assembly, c/w flywheel, £9. Both brand-new and boxed. Postage extra. *Wanted:* R274B, R483, or R220/URR and HRO5T. G3GUU, QTHR. Tel Brock 40387.

TS520; SB650; Multi 11; ECM5B; HM102; HM2102; E-Zee match; Panda Cub RFA 80W mobile, 2m; 444 mic; HFW1 tv/fm gen; 6004/PG Colourmatch gen; IT12 Hustler 80/40 ant; mobile 70cm 5/8 ant, mag mount; cable; etc, offers. G3BKL, QTHR. Tel Winterslow 862489 or Salisbury 5382, daytime.

Unimat SL Universal Modelmakers' lathe, comp with three jaw and drill chuck, face plate etc, ideal for small turning, milling and drilling work, genuine reason for selling, £110 ono. Free, GW8NPN, 15 Violet Grove, Rhyl, Clwyd, N Wales. Tel Rhyl 53201.

Icom IC22, fitted five simplex, three repeater channels, toneburst, etc, £110. Yaesu FL2100, new valves, £195. FV101B, £40. SMC monitor 'scope, £65. Pye Cambridge, dash mount, a.m./fm tunable rx, four tx channels, £40. GW4BIQ, QTHR. Tel 044128 3245.

Antenna switch, 10-way, £5. CSE top band tx, solid state, needs attention, £10. SSB filter MFJ, Eddystone 680 rx, offers invited or consider exch Tribander beam. G4EGN, QTHR. Tel 0869 40609.

SB102 plus HP23 and SB600 spkr; also partly completed 2m transverter, switched from SB102 and built in SB600 spkr cabinet; Heathkit dynamic mic; £220 ono. Buyer collects. J. D. Beacon, G3YLA, 35 Coley Hill, Reading. Tel 52840 evenings.

KW2000B, ac psu, vgc, manual, spare set valves incl 6146Bs (worth £16), £205. Poss deliver southern counties. Orchard, G3TTC, 5 Hurst Close (off Chantry Road), Chessington, Surrey KT9 1XE.

Standard C828 plus vfo, manuals, in orig packing, £180. Ridgeway Watt 50MHz 5-digit counter, £60. AM25B Vanguard, wkg on 2m, £15. G3THF, QTHR. Tel Orpington 26802.

7200G, fully xtalled, ten repeater channels, S15 thro' S24, S32, S0, S8, mic, mobile mount, etc, going multi-mode, suit SE coast stn, £180, incl carr. G8AUL, QTHR. Tel Brighouse (0484) 712719, after 6pm and weekends.

Two ITT Starphones: one 5ch on 145 144·6, £60; other single ch, mod to 5ch, £50. PSU sleeve to convert to main stn, £15. Ultra Cub, R4 and S22, needs case, £15. G3ROO. Tel Dover 821588.

Arac 102 2m/10m a.m./fm/ssb rx, as new, ideal for use with Datong up-converter, incl delivery within 60 miles of Manchester, £80. Scott, G8HIW, 141 Grove Lane, Hale, Altrincham, Cheshire WA15 8LR.

Manual for R-220/URR vhf rx; also spare parts or comp rx; Davenset 24V battery charger model EL24/20, recently sold surplus; valves, 6688, 7077; URM/26 sig gen; sensitive 500MHz prescaler; like to hear from R-220/URR owner. Fletcher. Tel Nottingham (0602) 397446, rev charges.

2m gear, matching ssb exciter, linear 40W p.e.p. 6-40/A pa, vfo, hybrid transistor valve, homebrew, pro finish, £50 ono. Microwave Modules 5W a.m. transistor tx, fitted 144·7, 6ch. G4AMK, QTHR. Tel 0664 2755, or work 0533 23382.

Yaesu FLDX400 tx and FRDX400 rx, 2m and 4m converters built in, perf as new cond electrically and mechanically, regret will not separate, £399. G3KLF, QTHR. Tel Ipswich (0473) 310442, evenings or weekends.

QQVO6/40As gold-p pins, as new, £7. New large roller coasters, £6; smaller type, £4.50. 50Ω small encased dummy loads, ok for 10W C type plug, £2. Westminster fm pa module, ¼ to 1W input, 10W at 2m, 13·8V, £15. Ten turn dials, £1. SN72710s, new, 25p. Carr extra. G8ENI, QTHR. Tel Cheslyn Hay (0922) 415374.

AR88 rx, 540kHz to 32MHz, mains operation, spkr, manual, good cond, £30. Microwave Modules 2m converter, 28-30 output, plus mains 12V psu, sold only with AR88, £20. Delivery 100 miles arranged. G8JLM, QTHR. Tel Hitchin 733058.

Versatower, 40ft, two section, tiltover, galvanized painted, twin safety winches; also TR44 rotor; offers. G2HJV, QTHR. Tel Leamington Spa 25395.

FT200B, FP200B, all 10m, £240. Jaybeam, 2m 6-el quad, £11. YP150 dummy load wattmeter, £25. All in exc cond. Buyer collects. G3LRP, QTHR.

Uniden 2030 2m fm tx/rx, 11ch fitted, toneburst, tx switchable 10W or 1W, ¼ whip thrown in, £120. FR400 160m to 2m, £150. G-whip 160, 80, 20, 15, 10, plus base, £14. Carr extra. GW4AEC, QTHR. Tel Portmadoc 2295.

Collins 75A2 rx, £60. Homebrew ssb tx, 80, 20, 15, 10, 898 dial, Kokusai mech filter, requires two 6146s, £40, shipment at cost. G3XXE, "Pinewood", South Brent, Devon. Tel 03647 2167, pm.

Mosley TA-33JR 3-el beam, 10, 15, 20, with pole and coaxial cable, good cond, £33 ono. G4FQE, QTHR. Tel Rochdale 32730.

KW2000E, good cond, matching ac psu and spkr unit, £280. KW107 atu/swr unit, vgc, £75. Shure 444 mic, £12. G4CSG, QTHR.

Sommerkamp FT277 (FT101) tx/rx, ext vfo, cw filter, fan, ac/dc, Datong rf clipper, manuals, makers' cartons, unmarked, vgc, £350 ono. G4DDW, QTHR. Tel Lutterworth (045 55) 2599.

Stolle rotator 2010, £20. Microwave Modules 23cm-2m converter, £22. 2m fm transistor 250mW tx, S20, 22 and R6, £12. Liner 2, matching psu, £10. Transformer 240V in, 12·6V 2A, 0-500-600-800V at 30mA, 200V at 100mA, £20. 2m 10-el beam, £5. Sherratt, 32 Springfield Way, Cranfield, Beds.

"PW" 1966-71, *PE* 1965-8, *SWM* 1967-8, *PT* 1965, free to clear. G8FLL, QTHR.

Kelvin Hughes marine vhf radiotelephone (Foreland), 25W output; xtalled on 26-27-16-14-13-12-9-8-6, good wkg order, manual, £200. *Wanted:* 4CX250B with bases, also blower. LG300 plus psu and mod. GM3UCI, QTHR. Tel Carluke 70914.

Sig gen, af and rf, 100kHz-300MHz, 3 years old, recalibrated, £35. Six tv games, with gun, £20. Brand-new USA Rolls-Royce of calculators, Berkley scientific, cost £79, sell £20. ICF5900W portable a.m./fm/ssb rx, 5 bands, xtal marker, MHz and kHz dial spread, mains AE Hamgear tuner, £50. P. Turner. Tel Thetford 61648, or 0842 2484, 9am to 5pm.

Trio TR7010, new May 1977, mint, boxed, Q4/2m ant and 30ft UR67 cable, £150. G4GIX. Tel Godalming 29283.

Trio TS510 tx/rx, PS510, matching remote vfo 5D, ssb/cw filters, vgc, £195. Will sell vfo 5D separately if req'd. Also low band Storno Viscount, self-contained, semi-portable, vgc, no xtals, £18. GM3TBV, QTHR. Tel Blairgowrie 2520.

Trio TS510, cw filter, £150. Datong clipper, £30. TTC swr bridge, £6. LPF, £2. 144MHz transverter, int psu, £35. 2m 10-el, £6. 70cm 46-el, £6. Approx 200 *Rad Comms*, £9. All carr extra. SAE sale list. G3ZMD, QTHR. Tel Luton 38729.

Pocketphone nicads (new), xtals SU8, £10. Stereo cassette deck kit, trans, VU-meters, circuits, no case, £25. 8-track car stereo, £10. Copal digital clock, £6. 7FP7 tube, £9. Viscount electronic organ, with Leslie (sae details), £520. G3WDI, QTHR. Tel Lowestoft 63216.

Solartron CD 568 oscilloscope, gen purpose single beam 4in tube, dc to 10MHz with accurate X-Y calibration facility, comp with manual and spares, perf wkg cond, £35 ono. Collection/delivery by arrangement at cost. GM3OFT, QTHR. Tel 041-956 0441, evenings.

FT101E, mint, new filter, £385. *Wanted:* FT200, ext vfo, 250B bases. GM3WOJ, QTHR.

WANTED

Oscilloscope required, repairable considered if tube ok, and manual; also Heathkit Mohican rx or similar. GM8FHV, QTHR. Tel 0228 72593, mornings.

Collins KWM2 power unit type 516-F2; Spanish Linguaphone course; 12AVQ or similar vertical antenna. GW3EJR, QTHR. Tel 0239 2331.

Clare-Pendar KB5 Murray coded rtty keyboard, your price paid. G3RRA, QTHR. Tel 0276 25040.

2m fm rx module type RX25B, with or without xtals. G4EMK, QTHR.

For the Wireless Museum: loan of 30-line Televisor and HMV "dog" Nipper; also pre-war mags, cats, mags, amateur tx, rx, components, valves, spkrs. Collection arranged. Details please to curator, G3KPO, QTHR. Tel Shanklin 2586.

Solartron: data for Solarscope AD557 No 38772, copy and return; also buy CT436 mains or battery psu, will consider comp u/s 'scope with ok psu. Please help. GW2HCJ, QTHR. Tel 076674 637.

FT220 or IC201 tx/rx, mint cond. G3PDT, QTHR. Tel 021-454 1825.

Manual for CR100/B28 for disillusioned swl. *For sale:* CR70A; Q-mult, mains powered, will sell separate; PR40; all Codar, £25 or exch reasonable gen cov rx. Buyer collects. Help! H. N. Graham, "Smarts Well", Mereworth, Nr Maidstone, Kent.

Rotator suitable for hf beam, comp with control unit. G4ESF, QTHR. Tel 0872 862601.

Ex-RAF high resistance headphones, ref 10A/12443, any cond as long as screw-on earpiece covers in tact. G3BGJ, QTHR.

Heathkit; or KW Q-mult on 455kHz; or Q-mult coil for 455kHz. G8IBY. Tel Rugby 811295.

School cadet force, eager to extend its radio activities to vhf frequencies, wishes to purchase tx/rx or tx suitable to work on 70MHz plus, reasonable price offered; also circuit diagrams for wavemeter Class D No 1 Mk2T, for copying and return. J. R. Thomas, Bournemouth School, East Way, Bournemouth BH8 9PY. Tel 0202 512609, or 0202 517243 after 6pm.

FV50B vfo for FT75, good price paid. G4BYV, J. Tye, "Inter-nos" Swanton Morley, Dereham, Norfolk NR20 4NU. Tel Swanton Morley 539.

DX100U or KW Vanguard with 160 tx; B40D, BRT400 or similar rx; 1,750kHz xtal; 1MHz HC6U xtal. G3IUV, QTHR. Tel 0272 692995.

Ex-RAF air publication *AP1186*, covering R1082, T1083; buy or borrow. Strong, 58 Napier Road, Ashford, Middx. Tel Sunbury 87913.

FT75B, plus ac/dc psu, in wkg cond. G3ZQJ, QTHR.

Solartron CT436 'scope psu transformer or dc power unit plug-in; data on Solarscope AD557, copy or purchase. GW2HCJ, QTHR. Tel 076674 637.

Electroniques i.f. amplifier module 455KC Mk2 or later, with all gen. G3KRH, QTHR. Tel 01-455 5039.

Name and address of any company which undertakes rewinds of transformers. G3LOL, QTHR.

Urgent: details of mods to increase output power of Hammarlund HX50 tx to 180-200W, p.e.p. o/p; expenses paid of course. G4DAN, QTHR. Tel 0245 421031.

Storno Viscount tx/rx, wkg on 2m, must have control box, cable, etc. Also vfo 30G for Trio rig. Contact Alan Brown, 169 Lindores Drive, East Kilbride, Glasgow. Tel 035 52 21071.

Any info on 0633-193179 oscilloscope, urgent; unit believed manufactured by Plessey 1970, possibly ex-RAF. Also remote vfo for KW Atlanta, 18AVTWB, compact low-band a.m. portable tx/rx, Datong FL1; why? GI4BDR, QTHR. Tel 064885 261.

Urgent, Remscope instruction manual; also manual for Cossor 1049 'scope; buy or borrow for week, will send deposit, all exs refunded. J. Reed, 158 Uttoxeter Road, Mickleover, Derby. Tel Derby 42424 ext 236, Mon-Fri 9am-4pm.

More cw contacts between 3550 and 3600kHz; more Ham spirit; more observance of IARU bandplan; how low have we got when foreign ops have to tell us to behave. See "Your Opinion" letter, *Rad Comm*, Dec 1977 p961. G2CAS, QTHR.

Urgent: ssb tx or tx/rx, KW Viceroy 2000A/B or similar, Yaesu FL50B or why? Cash waiting private buyer. Palmer, G4FMO, 124 Woodside, Ashby-De-La-Zouch. Tel 05304 3973.

Viceroy Mk4, extra half lattice filter; also manual; state cond and price; can collect 70 mile radius of Manchester. G3SNM, 113 Town Lane, Denton, Manchester M34 2DF. Tel 061-320 8156.

Avo valve tester CT160, or Avo valve characteristic meter (Mk4) plus data manual, must be in good wkg cond, comp, reasonably priced. Taylor, G3UCT, 27 Glen Road, Fleet, Hants. Tel Fleet (02514) 6998.

Xtal HC6/U 12077·5 for KW2000; pick-up arm for Philips stereo record player GC028, GA228. *For Sale:* 600kHz B7G xtal, 50p; 15250kHz B7G, 75p; 2000·00 HC6U, £1. DX40 mains transformer, £3. Five 6BH6s, £1. G3MBL, QTHR. Tel 01-445 4321.

HRO, any model, your price paid. Circuit ITT AM7 Starphone, to borrow. All letters answered. GM8MLH, "Alt-na-Feidh", Dalmally, Argyll PA33 1AA.

Class D Mk1 wavemeter, manual, (small model), must be accurate and smart appearance, for amateur use, prefer modified for ac mains. Also want old radio magazines, period 1922-39, also catalogues. Norman Richardson, 2 Edna Road, Maidstone, Kent ME14 2QJ.

FV200 ext vfo for use with FT200; also Liner 2, early model (top range); price and details to G8LAE, 10 St Andrews Close, Old Windsor, Berks SL4 2QU. Tel Windsor 62166.

Bird mod 43, 4112 or 4H250. DFM TF2431 or Racal 9913, must be in good cond. *For sale*: Large "OO" railway and Denshi electronic kit, for callers only. G3GYE, "Westmoors", Trezelah, Penzance, Cornwall.

KW500 linear amp; also 2m fm rig, such as Pye Cambridge Vanguard, etc, and FT200 plus FP200. G3JYJ, QTHR. Tel 01-764 2744, between 10am and 4pm.

Redifon ssb gen/demodulator module, type 6202A for GR410 ssb tx/rx; W/S Canadian No 29, comp; CT160 valve tester and R209 Mk2, both in exc wkg cond. G3UCT, 27 Glen Road, Fleet, Hants. Tel Fleet (02514) 6998.

Solartron CT436 oscilloscope mains transformer, part no WTB 165764, or comp'scope for spares. Tel 0723 870684.

Heathkit DX100 or Codar AT5; also Kelvin Hughes Mk9 bubble sextant. EI2CR, QTHR. Tel Dublin 503281.

Vidicon 1in yoke for Philips colour camera EL8500, part no 4822 168 00693, yoke made by Fernseh. Desperate, your price paid. Also Pye Mk7 image orthicon camera head, any cond considered. *For sale:* Quantity of tv equipment, please enquire. Brian, G8GQS. Tel Gainsborough 3940, night, 2802, day.

Bird Thruline 43 pads, any cond; frequency counter to 500MHz; test equipment; AR22 rotator only; driven reflector traps TA33. Barnes G3AOS, QTHR. Tel 061-980 2415.

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.

CATALOGUES RECEIVED

Siliconix

The latest publication from Siliconix is a 30-page shortform catalogue giving detailed product information, including cross-reference data for both FETs and ICs. The catalogue lists the latest vmos power FETs designed to supersede bipolar transistors in power and hf switching applications. Copies of the shortform catalogues are available from Siliconix Ltd, Morriston, Swansea SA6 6NE.

Heathkit

The latest catalogue dated Christmas 1977 provides details of a number of new kits, including a new series of low-cost high-performance test equipment, a digital electronic alarm clock, and a microprocessor self-instructional course. Full details of the large range of amateur equipment and accessories are also to be found in the new catalogue. Copies may be obtained from Heath (Gloucester) Ltd, Gloucester GL2 6EE, or by personal callers at the London showroom, 233 Tottenham Court Road, London W1P 9AE. (Tel 01-636 7349).

MEMBERS' AD ORDER FORM

FOR SALE ☐ WANTED ☐ (Tick as appropriate)

- **See Members' Ads page for conditions of acceptance.**
- **Not more than 40 words, including name, address, etc.**
- **Do not forget 75p remittance plus wrapper.**
- **Please write in block capitals, or type.**
- **Use correct address**

Licensed members are asked to use their callsign and QTHR, meaning that their address in the current call book is correct. BRS and A members will, of course, have to provide their name and address.

I enclose cheque/PO for **75p** to cover the cost of this advertisement.

Signed .....

Date .....

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TS820 HF Transceiver	£645.00
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TS520S HF Transceiver	£489.00
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TS700G VHF Transceiver all modes	£426.00
TR7200G FM Mobile Transceiver	£189.00
TR7010 SSB VHF Mobile Transceiver	£189.00
TR2200GX Portable FM Transceiver	£139.00
TR8300 70cm FM Transceiver	£227.00
TR3200 70cm Portable Transceiver	£182.00
PS5 Power supply/Digital clock	£58.00
R559D Receiver CW/SSB/AM/FM	£403.00
Speakers, crystals, microphones etc	

YAESU

FRG7 Solid State general coverage receiver	£162.00
FR101D Receiver	£436.00
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ATLAS

210X Transceiver	£445.00
215X Transceiver	£455.00
220-CS AC power unit console	£118.12

BARLOW WADLEY

XCR30 Solid State Receiver	£150.00
XCR30 Solid state receiver with FM	£170.00

OMEGA

TE-701 Antenna Noise Bridge to 30MHz	£23.76
TE-701 Antenna Noise Bridge to 300MHz	£29.70

DRAKE

R4C Receiver	£495.00
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TR4CW Transceiver	£562.00
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12AVQ 10-15-20m Vertical Antenna	£39.93
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18AVT/WB 10 through 80m Vertical	£81.45
TH2MK3 2 Element Tribander Beam	£117.56
TH3MK3 3 Element Tribander Beam	£167.52
BN86 Balun	£13.13

JAYBEAM

5Y/2M 5 Element Yagi	£7.70
8Y/2M 8 Element Yagi	£10.00
10Y/2M 10 Element Yagi	£21.31
PBM14/2M 14 Element Parabeam	£31.16
5XY/2M 5 Element Crossed Yagi	£14.97
8XY/2M 8 Element Crossed Yagi	£19.21
10XY/2M 10 Element Crossed Yagi	£26.32
Q4/2M 4 Element Quad	£16.31
Q6/2M 6 Element Quad	£21.71
D5/2M 5 over 5 Slot fed Yagi	£13.61
D8/2M 8 over 9 Slot fed Yagi	£18.22
MBM48/70 70cm Multibeam	£21.65
MBM88/70 70cm Multibeam	£28.96
12XY/70 70cm 12 lement crossed	£29.70
C5/2M Colinear	£30.93
C8/70cm Co Linear	£39.37
D15 1296 23cm antenna	£23.06

ACCESSORIES

Single meter SWR wall mounting	£9.50
Single meter SWR desk type	£9.50
Twin SWR meter desk type	£10.50
3 way antenna switch	£5.50
6 way antenna switch	£16.85
Antenna insulators	18p
EK150 Katsumi Electronic keyers	£60.75
HyMound Morse Keys	£8.10
Junkers Heavy duty morse keys	£29.85
Bauer single paddle	£10.85
Twin keying paddles	£15.76
SWL Tuning Unites 550kHz to 30MHz	£23.00
SWL Tuning Unites 2-30MHz	£17.50
Nye King 312-001 Morse Keys	£6.75
Standard Morse Keys	£3.00
HP3A High Pass Filter	£3.00
LP30 Low Pass Filter	£3.00

SECONDHAND EQUIPMENT (in stock going to press)

Belcom Liner 2 Transceiver	£120.00
Comtek 2M Linear Amplifier	£100.00
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FROM NORTH. Leave M6 at Junction 6 (Spaghetti) and follow left fork down to traffic island beneath motorway complex. Take third turning off to Lichfield. One mile further on follow A4040 to the right and within 100 yds. veer again to the right, approximately one mile further on brings you to the Fox & Goose. Turn right and see preceding directions.

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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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/S16 ..	b	b	b	b	b	b	b	b	b	b	b	b	b	b
145·500/S20 ..	a	a	a	a	a	a	a	a	a	a	a	a	a	c
145·525/S21 ..	a	a	a	a	c	a	a	a	b	a	a	b	a	b
145·550/S22 ..	a	a	a	a	c	a	a	a	b	a	a	b	a	b
145·575/S23 ..	a	a	a	a	c	a	a	a	b	a	a	b	a	b
145·600/S24 ..	a	a	a	a	c	a	a	a	b	a	a	b	a	b
145·650/R2R ..	b	b	b	a	b	b	a	b	b	a	a	b	a	b
145·675/R3R ..	b	b	b	a	b	b	a	b	b	a	a	b	a	b
145·700/R4R ..	b	b	b	a	b	b	a	b	b	a	a	b	a	b
145·725/R5R ..	b	b	b	a	b	b	a	b	b	a	a	b	a	b
145·750/R6R ..	b	b	b	a	b	b	a	b	b	a	a	b	a	b
145·775/R7R ..	b	b	b	a	b	b	a	b	b	a	a	b	a	b
145·800/R8R ..	a	a	a	a	a	a	a	a	b	a	a	b	a	c
145·95 ..	a	b	a	a	b	b	b	b	b	a	b	b	b	b

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4018	1.10
4019	.60
4020	.85
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4023	.25
4024	.75
4025	.35
4026	1.95
4027	.50
4028	.95
4030	.35
4033	1.50
4034	2.45
4035	1.25
4040	1.35
4041	.69
4042	.95
4043	.95
4044	.95
4046	1.75
4049	.70
4050	.50
4066	.95
4069	.40
4071	.35
4081	.70
4082	.45

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7402	.20	7475	.35	74181	2.25	74H103	.75
7403	.20	7476	.30	74182	.95	74H106	.95
7404	.15	7480	.55	74190	1.75		
7405	.25	7481	.75	74191	1.35	74L00	.35
7406	.35	7483	.95	74192	1.65	74L02	.35
7407	.55	7485	.95	74193	.85	74L03	.30
7408	.25	7486	.30	74194	1.25	74L04	.35
7409	.15	7489	1.35	74195	.95	74L10	.35
7410	.10	7490	.55	74196	1.25	74L20	.35
7411	.25	7491	.95	74197	1.25	74L30	.45
7412	.30	7492	.95	74198	2.35	74L47	1.95
7413	.45	7493	.40	74221	1.00	74L51	.45
7414	1.10	7494	1.25	74367	.85	74L55	.65
7416	.25	7495	.60			74L72	.45
7417	.40	7496	.80	75108A	.35	74L73	.40
7420	.15	74100	1.85	75110	.35	74L74	.45
7426	.30	74107	.35	75491	.50	74L75	.55
7427	.45	74121	.35	75492	.50	74L93	.55
7430	.15	74122	.55			74L123	.55
7432	.30	74123	.55	74H00	.25		
7437	.35	74125	.45	74H01	.25	74S00	.55
7438	.35	74126	.35	74H04	.25	74S02	.55
7440	.25	74132	1.35	74H05	.25	74S03	.30
7441	1.15	74141	1.00	74H08	.35	74S04	.35
7442	.45	74150	.85	74H10	.35	74S05	.35
7443	.85	74151	.75	74H11	.25	74S08	.35
7444	.45	74153	.95	74H15	.30	74S10	.35
7445	.65	74154	1.05	74H20	.30	74S11	.35
7446	.95	74156	.95	74H21	.25	74S20	.35
7447	.95	74157	.65	74H22	.40	74S40	.25
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7450	.25	74163	.95	74H40	.25	74S51	.45
7451	.25	74164	.60	74H50	.25	74S64	.25
7453	.20	74165	1.50	74H51	.25	74S74	.40
7454	.25	74166	1.35	74H52	.15	74S112	.90
7460	.40	74175	.80	74H53J	.25	74S114	1.30
7470	.45			74H55	.25		
7472	.40						

74S133	.45
74S140	.75
74S151	.35
74S153	.35
74S157	.80
74S158	.35
74S194	1.05
74S257 (8123)	.25
74LS00	.35
74LS01	.35
74LS02	.35
74LS04	.35
74LS05	.45
74LS08	.35
74LS09	.35
74LS10	.35
74LS11	.35
74LS20	.35
74LS21	.25
74LS22	.25
74LS32	.40
74LS37	.35
74LS40	.45
74LS42	1.10
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