March 1978

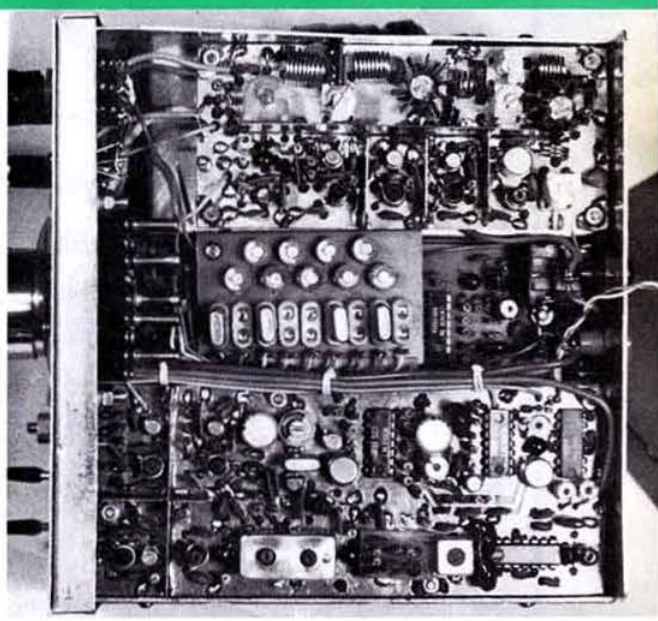
radio communication

journal of the Radio Society of Great Britain

IN THIS ISSUE

A 144MHz FM BLACK BOX

by J. R. HEY, G3TDZ



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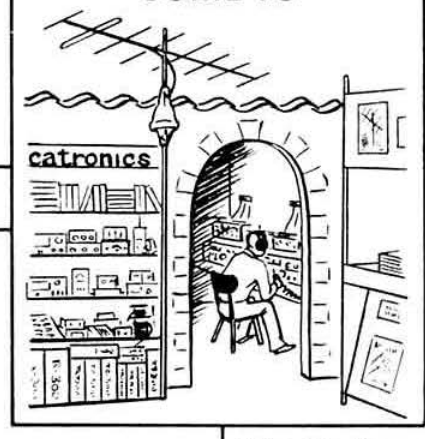

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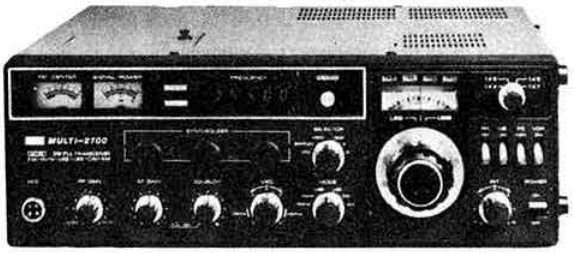

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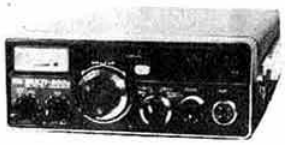
FDK

M800D 25 WATTS FM



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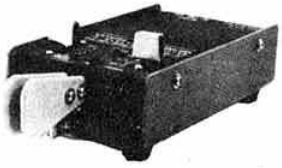

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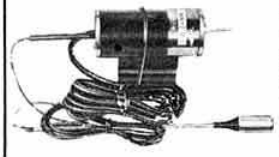
★ Space–Dash ratio adjust.

PRICE £29.95 inc. VAT



MM2025 MICROPHONE

★ High quality condenser mic.
★ Boom weighs 5 grams
★ Tx/Rx switch clips on gear lever
★ Matches most transceivers (ex. IC240)
★ Makes for safer driving
★ Matches 600–50K ohms

PRICE £19.95

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

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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

Access

WATERS & STANTON
ELECTRONICS

FDK SPECIAL OFFER!

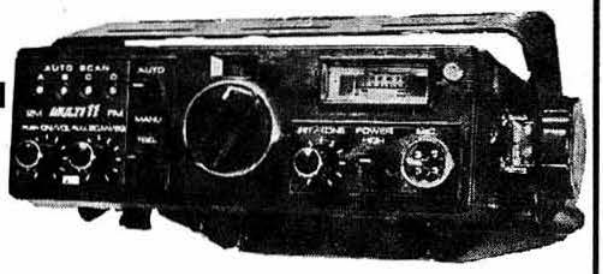
MULTI-II

23 CHANNELS + 4 AUTO-SCAN

LIST £209

OFFER PRICE £179 (inc. VAT)

(10 Channels Fitted)



2m FM TRANSCEIVER

Here it is. Your once in a life-time chance to make a big saving. These brand-new factory fresh transceivers have just arrived, and with Sterling becoming a little stronger, together with factory discounts, we have managed to trim £30 off the price—but this offer applies for a limited period only, so don't delay, order today!

Most of you will be familiar with the FDK Multi-II transceiver, famous for its highly sensitive receiver, 12 watts output and built-in auto-scan. Little wonder that so many have been sold and that our competitors are having to add auto-scan adaptors as options (Expensive!) Well for £179 we'll give you the lot including microphone, DC power leads, fuses, mic, English handbook, and a full 12-month guarantee. As sole agents, you have our assurance of fast service back-up and in-stock spare parts! And if £179 is still beyond your reach we'll be happy to quote you competitive credit terms. Deposit works out at £36 and repayments can be as little as £1.75 per week. (Full details below.) So you see, there really is no excuse for missing this amazing bargain!

FEATURES

★ 23 channels plus 4 autoscan priority.
★ Channels R3, R4, R5, R6, R7, S0, S20, S21, S22, S23 fitted.
★ 12 watts FM output with PA protection.
★ Receiver sensitivity. 3uv for 20db NQ.
★ Receiver fitted RF pre-amp.
★ Automatic tone-burst (but can be defeated).
★ 1 watt/12 watt power switch.
★ Remote vfo socket at rear.
★ Monitor switch for checking Tx frequency and modulations.
★ Wide/narrow FM switch.
★ S meter/centre-zero switch.
★ "channels fitted" dial illumination.
★ Receiver RIT control.
★ Anti-fade squelch control.
★ Receiver xtal filter.

CREDIT TERMS M-II deposit £36 Balance 12 months at £13.59 18 months at £9.63 24 months at £7.62

FILL IN THE COUPON BELOW OR CALL IN DURING NORMAL HOURS (SEE MAIN AD. ON PAGES 178/9)

WATERS & STANTON ELECTRONICS, 31 Spa Road, Hockley, Essex. Tel 03704 6835

Dear Sirs,

*1) Please rush me a Multi-II transceiver as above to be delivered within 48 hours of receiving my order. I enclose cheque/P O /cash for £179.

*2) Please rush me full details of Multi-II by return.

*3) Please rush me HP forms for Multi-II repayable over ..... months. I enclose cheque/PO/cash for £36 as deposit.

NAME ..... *Delete whichever is not applicable

ADDRESS .....

AMATEUR ELECTRONICS UK

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YOUR BEST BUY FOR YAESU MUSEN!

YAESU

AS DIRECT IMPORTERS WE OFFER YOU . . .

EX STOCK DELIVERY OF THE FRG-7 and FT-227R PICTURED HERE AS WITH ALL MAIN UNITS. ADD TO THIS A SECOND TO NONE AFTER-SALES SERVICE AND IF YOU'D LIKE TO SEE HOW COURTEOUS AND PROMPT OUR REPLIES TO YOUR ENQUIRIES ARE—WRITE TO US TODAY.

£2.50 FOR 25 PENCE!! 25 pence brings the latest Yaesu catalogue with our Credit Voucher for £2.50. A couple of stamps obtains the FT-227R, SWAN or ATLAS leaflets, used equipment list, or Digitex D110 Broadsheet.

DIGITEX D110 VDU

SEE DECEMBER'S ISSUE FOR FULL DETAILS OF THIS SUPERB UNIT WHICH IS ON PERMANENT DEMONSTRATION AT ALUM ROCK AND NOW MAY ALSO BE SEEN AT THE FOLLOWING STOCKISTS:

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HOW TO REACH US—PLEASE SEE LAST MONTH'S ADVERTISEMENT

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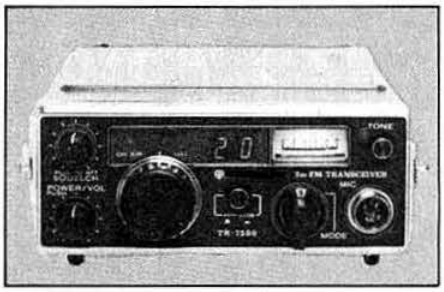


TR7500 The sensible one, £225 inc. VAT

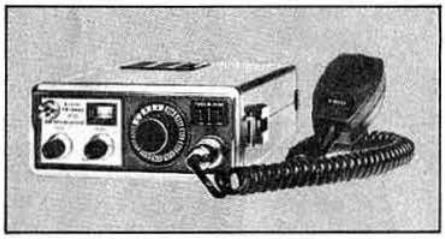
The TR7500 gives you the ultimate FM mobile rig. Full band coverage 144–146MHz in 80 channels at 25kHz spacing—and no programming or crystals due to the use of an advanced synthesiser. Dial indication is commonsense itself; if you want S20, simply turn the dial to 20; R7, turn to 7, no need to remember complicated frequency plans. If you are operating on a repeater and you wish to listen on the input frequency or operate reverse repeater, simply touch one switch; there is no knob twiddling involved. Should you need a 1·6MHz shift—that's also available on the synthesiser—but remember, you may qualify for the WACS Award (worked all cop shops!).

Potent performance in a package not much larger than the TR-2200 with 12 Watts transmitter output and better than 0·2μV sensitivity together with the unparalleled Trio quality and attention to detail make the TR7500 the *sensible* man's choice.

TS700G £426 inc. VAT (also including the matching VOX-3)

Say what you will, the TS700G set the standard for all other 2 metre all mode transceivers. A very high standard which has yet to be surpassed. Full 2 metre coverage, VFO or 22 crystal channels, all mode operation AM, FM, USB, LSB and CW. Mains or battery supply. Normal and reverse repeater facilities at the turn of a switch. Trio exclusive tuning fork access tone generator with fully auto tone burst. Best quality signal on the band thanks to TRIO design excellence in low intermod amplifiers. It's simply the best rig that you can buy, and it's backed by the combined reputations of TRIO and Lowe Electronics.

15 Watts output; 0·25 microvolt sensitivity; first class strong signal handling receiver; European standard selectivity. If you haven't yet handled the TS700G, rush to one of our branches and be prepared to be impressed. Send for full details now.

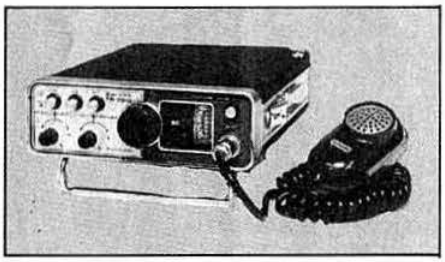


TR2200GX £139 (3 ch.) £169 (12 ch.) inc. VAT

This is the definitive 2 metre FM portable rig which has won praise from all over the world. Over 2W transmitter output with switched reduction to 400mW for local contacts. High gain receiver with double IF filtering at 10·7MHz and 455kHz for razor sharp selectivity.

The TR2200GX is supplied with all accessories including the battery charger for the optional Nicad battery pack, the removable telescopic antenna, the carrying case, the shoulder strap, external power lead, microphone and handbook. Fitted with 12 channels, the price is only **£169** inc. VAT. If you wish to start out at a lower price, we can supply the rig fitted 3 channels for only **£139**. With all its performance, the TR2200GX is a must for the portable operator. At the price, it has to be the best around. Just look around at the next rally and see how many operators are carrying them.

VB-2200GX matching 10 Watt amplifier, **£45** inc. VAT.

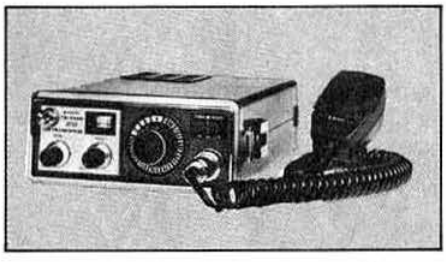


TR7010 £189 inc. VAT

Work real DX with ease on 2 metre SSB and CW. The TR7010 combines a high performance receiver with a 10 Watt transmitter and provides mobile or fixed station capability at low cost. Supplied ready to operate from 144·1–144·34MHz, the TR7010 covers all CW, SSB and beacon activity. 48 channels with 5kHz spacing plus VXO and RIT provide continuous coverage. Operation in any other part of the 2 metre band can be carried out by a simple crystal change and no re-alignment is required.

Single conversion using an IF of 10·7MHz with a first class crystal filter gives outstanding selectivity. Wide range amplifed AGC and newly developed FET devices in the RF and mixer stages allow maximum sensitivity to be used with freedom from overload due to adjacent signals. The single conversion transmitter using fully balanced mixers generates a beautifully clean signal with crisp audio quality.

Join the SSB gang and work real DX for **£189**. Send for full details now.



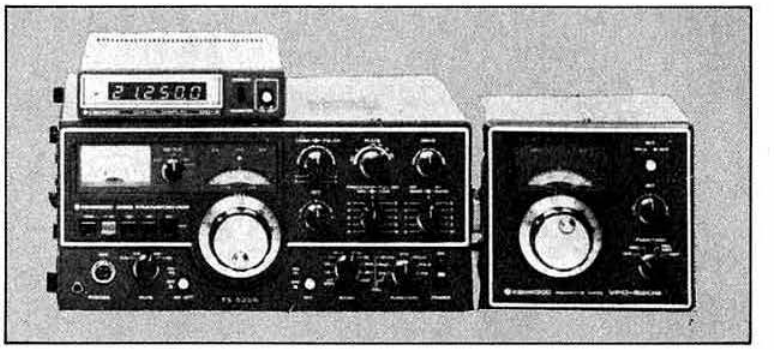
TR3200 £182 inc. VAT

The newest FM handy transceiver from the ever expanding TRIO range. Superb performance for the 70cm operator with all the advantages of portability and TRIO reliability. 12 channel capability in the range 432–436MHz with three channels fitted (SU8, 18, 20). Transmitter output switched 2W/400mW and incorporating the exclusive TRIO 1750Hz tuning fork access tone generator (does that mean you can ring for credit?) High gain 5/8 wave antenna for enhanced performance on transmit and receive. Supplied complete with all accessories as for the TR2200GX and including the all important battery charger.

We have just received the first shipment of the VB3200 10W amplifier for the TR3200. Rather more complex than the VB2200, the VB3200 also includes a switchable receive preamplifier. Price . . . **£95** inc. VAT. Send for details now.

SEND 50P IN STAMPS FOR COMPLETE CATALOGUE AND ANTENNA BOOK.

TRIO
TS-520S



The TS-520S is the logical development of the TS-520, the rig which has earned high praise from amateurs the world over. The TS-520S keeps the main design features which made the TS520 a success but has an uprated specification which includes full 160 metre coverage, 15MHz 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 3·5dB) and high gain (typically 18dB). The result is that the TS-520S has a receiver sensitivity better than 0·2μV for 10dB S+N/N ratio on all bands.

New speech processor
The TS-520S 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 TS-520S 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 TS-520S. The transceiver is also fitted with a 20dB attenuator selected by a convenient front pane push button.

AC power supply
The TS-520S 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 reply 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, 25kHz 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 at all times.

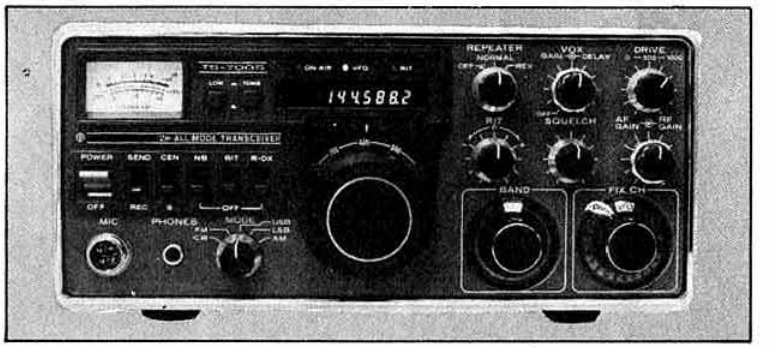
The DG-5 sits on top of your rig and shows the frequency in six large easy to read digits.

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

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

TS-520S £489 inc. VAT. DG-5 £132 inc. VAT

TRIO
TS-700S



The TS-700S, 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 100Hz 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 ratio sensitivity is around 0·15 μV on SSB and the 20dB quieting level is less than 0·2μV 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 it has to be the TS700S.

TS-700S £542 inc VAT

LOWE ELECTRONICS LTD **Head Office and Service Department 119 Cavendish Rd, Matlock, Derbyshire**
119 Cavendish Rd, Matlock, Derbyshire
Telephone: 9am to 9pm Matlock (0629) 2817 or 2430 Telex: 377482 Lowlec G
Southern Sales Peter, G3ZPB, Communications House, 20 Wallington Square, Wallington, Surrey. Tel: 01-669 6700.
Midland Sales Peter, G3XWX, Soho House, 362–364 Soho Road, Handsworth, Birmingham. Tel: 021-554 0708.
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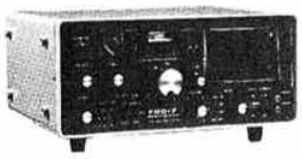

FRG7 Receiver 0·5-30MHz continuous
+12½% **£145.00**
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FT620B Transceiver 50-54MHz SSB/AM/CW 230V-12V ideal for transvertors
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FT227R Transceiver FM 144MHz 10W
Optically coupled synthesiser
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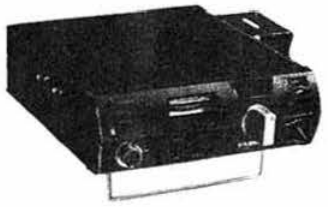

FT223 Transceiver FM 2m, 10W 3 prs
+12½% **£139.50**
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FV101B
External VFO
FT101 etc
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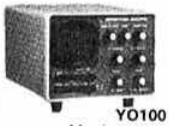

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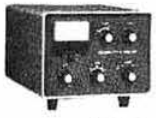

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BARCLAYCARD VISA

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 memorised 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 utilises 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 output 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,
Louth,
Lincolnshire LN11 0JH

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 colour brochure on the FT-901DM and other Yaesu products.

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Alum Rock,
Birmingham B8 3HX

South Midlands Communications Ltd,
S.M. House, Osborne Road,
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Electronics (UK) ltd

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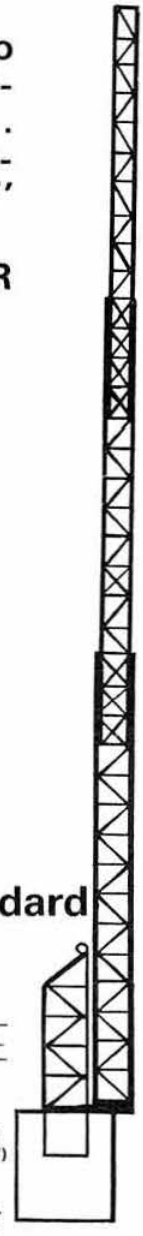
LEICESTER: May's Hi-Fi, Churchgate (Tel: 0533-58662). Mon-Sat 9-6pm; closed Thurs.



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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. (We measured a sensitivity of 0·1μv pd for 10dB sinad).
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

SUPERSCAN £77.63 inc. VAT (fitting £6.00 extra)

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 ▶

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.**

IC-215

£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) SHOP: Thanet Northern, Wombwell, Barnsley, S.Yorks. (0226) 756229

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THANET ELECTRONICS

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THANET FOR SERVICE

DAVE G4ELP

WITH THE TECHNICAL KNOWLEDGE AND EQUIPMENT TO SERVICE THEM PROPERLY BOTH BEFORE AND AFTER SALES

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

◄ Introducing "SLIM JIM" SJ2

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

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

The HF rig to beat them all, which will be available shortly 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 synthesized 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 built 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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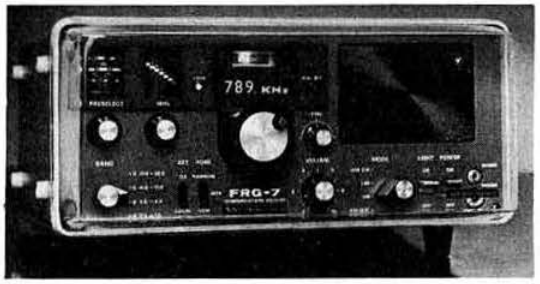

FRG-7 DIGITAL £180

LEE ELECTRONICS LTD

ESTABLISHED FOR MORE THAN TWO DECADES

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01-723 5521 CLOSED THURSDAYS

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FRG-7—DIGITAL DISPLAY

Yes. The world famous FRG-7 is now available with digital read-out fitted by Lee Electronics in place of kHz dial .. .. .. **Special Price £180** + VAT

For customers who already own FRG-7's we can supply the digital read-out complete with installation instructions .. .. **£37.00** + VAT

FRG-7 Digital **£180** .. .. FRG-7 with analogue dial **£145.00**

FRG-7 Perspex cover as illustrated **£3.50** All plus 12½% VAT

YAESU MUSEN PRICES (ALL AVAILABLE FOR IMMEDIATE DELIVERY)

FT301 T/RX 1-8-30. 100W 12V **£485**
FT301D Digital Readout '301 **£585**
FV301 External VFO **£65**
FP301 PSU/speaker P.O.A.
FT200B T/RX 3-5-30 P.O.A.
FP200B AC PSU/Speaker P.O.A.
FRG7 RX 5-30 cont. AC/DC **£145**

FRG7 Digital **£180**
FT221R 2m, "All mode" **£339**
FT227 10W, 400ch mobile, digital **£169.50**
FT223 T/RX 2m, FM23ch 12V **£139.50**
FR101D DeLuxe "S" BC, FM **£480**

FR101SD Digital Readout "S" **£387**
FR101DD Digital readout "D" **£480**
FT101E Transceiver **£429**
FL101 T.X. 1-8-30MHz 230V **£325**
FL2100B Linear 1-2kW PIP **£269**
FT101EE T/RX 1-8-30 AC/DC **£408**

YC500J 500MHz Counter 10 PPM **£210**
YC601 Dig. Display 101 & 401 **£110**
YO301 Monitor scope **£123.50**
YO100 Monitor 2 tone osc **£139**
SIG80R T/RX. 2m. FM 80 × 25kHz 12V **£195**

ALL + VAT 12½% EXCEPT MONITOR SCOPE, CLOCK, COUNTER, WATTMETER, + 8%

MICROWAVE MODULES DESPATCHED TO ANY PART OF THE WORLD POST FREE

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MMT432/28 Transverter **£97**
MMT432/285 with Oscar shift **£119**
MMT432/144 Transverter **£133**
MMT432/144R with 1·6MHz shift **£151**
MMP12/3 Power supply 12V, 3A stabilized **£50**

FREQUENCY COUNTERS
MMD 050/50MHz counter **£62**
MMD 050/500MHz counter **£79**
Divide by 10 prescaler, 500p **£25**

VARACTORS
MMV 1296, 23cm varactor **£33**

CONVERTERS
MCC70, 4m converter **£18**
MCC70/LO, 4m converter **£20**
MCC144, 2m converter **£18**
MCC144/LO 2m converter **£20**
MCC432, 70cm converter **£24**

ATV435/51 converter **£24**
MCC1296 converter 28 or 144MHz IF **£2**
All 2m converters can be supplied with IF outputs of 2–4–12–14–18–28MHz 70cm models with IF outputs of 28–14–18– or 144MHz.

ALL MICROWAVE MODELS SUBJECT TO VAT IN UK 8% ON FREQUENCY COUNTERS, ALL OTHER MODELS 12½%

A.S.P. MOBILE AND BASE STATION ANTENNAS

Asp201 ¼w 2m mobile **£3.25**
Asp2009 ⅝ 3dB 2m mobile **£5.95**
Asp629 ½w 3dB 2m mobile **£7.60**
Asp677 ⅝ 3dB 2m mobile **£13.50**

Asp393 ½w 3dB 2m mobile **£17**
Asp no hole boot mount **£3.70**
Asp magnetic mount **£8.95**
Asp cutter clip less cable **£3.85**

Asp E462 70cm 3dB mobile **£7.23**
Asp E667 70cm 3dB mobile **£16.90**
Asp A659 UK 70cm 5dB, base antenna **£19.00**

Special offer A.S.P. A680 U.K.
6dB 144/148MHz Co-linear
Power handling 350W. Length approx. 12ft. List **£51** special offer **£41.50**

ICOM RANGE
IC215 2m 8ch **£139**
IC215 2m 10ch (fitted 6 repeaters plus 4 simplex) **£144**
IC202 2m SSB **£152.00**
IC22A 10W mobile **£145**
IC240 10W mobile **£159.10**
IC245E 10W FM/SSB **£352**
IC211E 10W FM/SSB **£470**

All transceivers + 12½% VAT

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C146 2m H/held **£113.50**
C860 10W mobile **£130**
C828 10W mobile **£159**

KYOCUTO DIGITAL MODEL 2015
10W mobile 400ch Tx/rx **£245**

J-BEAM ANTENNAS
ALL MODELS IN STOCK

F.D.K. RANGE
Multi UI (UII) 70cm mobile **£221**
Multi 11·2m mobile **£184**
Multi 2700 Fm/ssb. Tx/rx **£435**

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2m with 13 BNC **£3.85** each
2m with ph 259 **£3.85** each
2m for IC215, Trio 2200 Gx, standard C146A **£3.25**
All + post 25p. + 12½% VAT.

ICOM ACCESSORIES
Extals S21 or S22 **£4.50 pr.**
ER Case 202/215 **£6.67**
Mobile Bracket 202/215 **£10.23**
Helical Antenna **£3.25**, p & p 25p

J.V.L. 6dB CO-LINEAR
DC grounded, low angle radiation pattern, fully adjustable for max gain and min SWR **£29.00** + £1.50 p & p
All above items + VAT 12½%

SPECIAL OFFER. Constant current Ni-Cad chargers. Adjustable charge rate for AA or C type Ni-Cads. Ideal for C202/215, C146A, Trio, etc. Price **£8.35** + 8% VAT. p & p 50p.

SUPER-SCAN

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 ±600kHz shift of TX frequency when repeater mode is selected ★ Large six digit display shows frequency to 5Kc/s ★ 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 unit. We can carry out the above modification if required—price **£6** inc VAT and return postage.

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FREE PARKING AT REAR OF SHOP

DIODES/ZENERS

1N914	100v	10mA	.05
1N4005	600v	1A	.08
1N4007	1000v	1A	.15
1N4148	75v	10mA	.05
1N753A	6.2v	z	.25
1N758A	10v	z	.25
1N759A	12v	z	.25
1N4733	5.1v	z	.25
1N5243	13v	z	.25
1N5244B	14v	z	.25
1N5245B	15v	z	.25

SOCKETS/BRIDGES

8-pin	pcb	.25	ww	.45
14-pin	pcb	.25	ww	.40
16-pin	pcb	.25	ww	.40
18-pin	pcb	.25	ww	.75
22-pin	pcb	.45	ww	1.25
24-pin	pcb	.35	ww	1.10
28-pin	pcb	.35	ww	1.45
40-pin	pcb	.50	ww	1.25
Molex pins .01		To-3 Sockets		.45
2 Amp Bridge		100-prv		1.20
25 Amp Bridge		200-prv		1.95

TRANSISTORS, LEDS, etc.

2N2222A	NPN (2N2222 Plastic .10)	.15
2N2907A	PNP	.15
2N3906	PNP (Plastic)	.10
2N3904	NPN (Plastic)	.10
2N3054	NPN	.35
2N3055	NPN 15A 60v	.50
T1P125	PNP Darlington	.35
LED Green, Red, Clear, Yellow		.15
D.L.747	7 seg 5/8" High com-anode	1.95
XAN72	7 seg com-anode (Red)	1.25
MAN71	7 seg com-anode (Red)	1.25
MAN3610	7 seg com-anode (Orange)	1.25
MAN82A	7 seg com-anode (Yellow)	1.25
MAN74A	7 seg com-cathode (Red)	1.50
FND359	7 seg com-cathode (Red)	1.25

C MOS

4000	.15
4001	.15
4002	.20
4004	3.95
4006	.95
4007	.35
4008	.95
4009	.45
4010	.45
4011	.20
4012	.20
4013	.40
4014	.95
4015	.90
4016	.35
4017	1.10
4018	1.10
4019	.50
4020	.85
4021	1.00
4022	.85
4023	.25
4024	.75
4025	.30
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	.45
4050	.45
4066	.95
4069	.40
4071	.35
4081	.70
4082	.45
MC14409	14.50
MC14419	4.85

— T T L —

7400	.15	7473	.25	74176	1.25	74H72	.45
7401	.15	7474	.30	74180	.75	74H101	.75
7402	.20	7475	.35	74181	2.25	74H103	.75
7403	.20	7476	.40	74182	.95	74H106	.95
7404	.15	7480	.55	74190	1.75		
7405	.25	7481	.75	74191	1.05	74L00	.25
7406	.35	7483	.95	74192	.75	74L02	.25
7407	.55	7485	.75	74193	.85	74L03	.30
7408	.25	7486	.25	74194	1.25	74L04	.30
7409	.15	7489	1.35	74195	.95	74L10	.30
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	.35	7493	.35	74221	1.00	74L51	.45
7414	1.10	7494	.75	74367	.85	74L55	.65
7416	.25	7495	.60			74L72	.45
7417	.40	7496	.80	75108A	.35	74L73	.40
7420	.15	74100	1.15	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	.85
7432	.30	74123	.55	74H00	.15		
7437	.30	74125	.45	74H01	.25	74S00	.35
7438	.35	74126	.35	74H04	.20	74S02	.35
7440	.25	74132	1.35	74H05	.20	74S03	.30
7441	1.15	74141	.90	74H08	.35	74S04	.30
7442	.45	74150	.85	74H10	.35	74S05	.35
7443	.65	74151	.65	74H11	.35	74S08	.35
7444	.45	74153	.75	74H15	.45	74S10	.35
7445	.65	74154	.95	74H20	.30	74S11	.35
7446	.95	74156	.95	74H21	.25	74S20	.35
7447	.95	74157	.65	74H22	.40	74S40	.20
7448	.65	74161	.85	74H30	.20	74S50	.20
7450	.25	74163	.85	74H40	.25	74S51	.25
7451	.25	74164	.60	74H50	.25	74S64	.20
7453	.20	74165	1.50	74H51	.25	74S74	.35
7454	.25	74166	1.35	74H52	.15	74S112	.60
7460	.40	74175	.80	74H53J	.25	74S114	.65
7470	.45			74H55	.20		
7472	.40						

74S133	.40	74LS123	1.00
74S140	.55	74LS151	.95
74S151	.30	74LS153	1.20
74S153	.35	74LS157	.85
74S157	.75	74LS164	1.90
74S158	.30	74LS367	.75
74S194	1.05	74LS368	.75
74S257 (8123)	1.05	74C04	.25
		74C151	2.25
74LS00	.25		
74LS01	.35		
74LS02	.35		
74LS04	.30		
74LS05	.45		
74LS08	.25		
74LS09	.35		
74LS10	.35		
74LS11	.35		
74LS20	.25		
74LS21	.25		
74LS22	.25		
74LS32	.40		
74LS37	.35		
74LS40	.45		
74LS42	1.10		
74LS51	.50		
74LS74	.65		
74LS86	.65		
74LS90	.95		
74LS93	.95		
74LS107	.85		

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LM309H	.65	LM339	.95	78L12	.75	LM747	1.10
LM309K (340K-5)	.85	7805 (340T5)	.95	78L15	.75	LM1307	1.25
LM310	1.15	LM340T12	1.00	78M05	.75	LM1458	.95
LM311D (Mini)	.75	LM340T15	1.00	LM373	2.95	LM3900	.50
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LM320K12	1.65	LM340K12	1.65	LM711	.45	NE556	.95
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8080AD	12.00
8T13	1.50
8T23	1.50
8T24	2.00
8T97	1.00
2107B-4, A	4.00
2708	11.50

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RADIO SOCIETY OF GREAT BRITAIN

35 Doughty Street, London WC1N 2AE
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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Region 16 Essex, Norfolk, Suffolk.
Region 17 Isle of Wight, Channel Islands, Dorset, Hampshire, Wiltshire.
Region 18 Cleveland, Durham, Northumberland, Tyne & Wear.
Region 19 Greater London north of River Thames, Hertfordshire.
Region 20 Avon, Gloucester, Somerset.

1978 RSGB Presidential Installation

Through the kind offices of the immediate past-President, Lord Wallace of Coslany, the RSGB Presidential Installation on 21 January was once again held this year in the Members' Dining Room of the House of Commons. Almost 200 members, wives and guests were present on this social occasion in its unique setting, and they spent an enjoyable evening with old friends, acquaintances and fellow members.

Dr Dain Evans, PhD, BSc, FIM, G3RPE, was installed as 44th President of the Society by the retiring President, Lord Wallace, in a formal, but lighthearted, interlude during the evening. In a witty speech, Lord Wallace introduced the new President and spoke of the enthusiasm with which Dain Evans had carried out his duties as executive vice-President in 1977, and of his services as a Council member and contributor to *Radio Communication* which had, he said, distinguished him as "Microwave Evans".

In reply, Dain Evans thanked the Society for the great honour it had bestowed on him, and he also thanked Lord Wallace for acting as host for the Installation. He went on to speak of the great benefit the Society had received from Lord Wallace's untiring efforts on its behalf, and which he felt sure would continue into the future.

Having himself been invested with his collar of office, the President then performed the pleasant task of presenting badges of office to Lord Wallace (PAST-PRESIDENT), Mr J. Bazley, G3HCT (EXECUTIVE VICE-PRESIDENT), who had been elected to that office at a Council meeting earlier in the day; Mr P. F. D. Cornish, FCA, G3COR (HONORARY TREASURER); Mr T. P. A. Douglas, MBE, AMIEE, G3BA (COUNCIL MEMBER), and Mr D. H. Adams, GW3VBP (COUNCIL MEMBER).

Guests of honour on this occasion were Marchesa Marconi and her daughter Princess Elettra Giovanelli, to whom the President extended a warm welcome and thanked them for gracing the event with their presence. As a memento of their visit he had the pleasure of presenting to Princess Elettra an RSGB badge for her young son Guglielmo, named after his famous grandfather, which bore the callsign GB3GGM (Guglielmo Giovanelli Marconi).

Among other official guests were several representatives of the Home Office, Institution of Electronic &

The President presenting badges of office to, l to r, Mr J. Bazley, G3HCT; Mr P. F. D. Cornish, G3COR, and Mr D. H. Adams, GW3VBP

Dain Evans greets new Council member Tom Douglas, G3BA

Under the portraits of famous parliamentarians, Mr R. Fox, left, and Mr A. N. Hammett, G3VWK, display the replica of Marconi's kite

Photos: **P. Jones, G3YLV**

Princess Elettra accepting the GB3GGM badge from the President

Council members B. O'Brien, G2AMV, and W. A. Scarr, G2WS, with Marchesa Marconi and Princess Elettra

Radio Engineers, General Electric Company, Independent Broadcasting Authority, and the City & Guilds Institute. Also present were Mr A. H. Hammett, G3VWK, of the Cornish Radio Amateur Club and Mr R. Fox, of the British Kite Flying Association, who reassembled in the Members' Dining Room the replica of Marconi's kite which had carried an antenna at the preceding week's commemoration at Poldhu, reported elsewhere in this issue. The kite carried the autographs of Marchesa Marconi and Princess Elettra.

QTC

amateur radio news

QSL Bureau—G3LAA-NZZ

Mr C. Henderson, G4FAM, has had to give up the position of sub-manager for the G3LAA-NZZ series for personal and business reasons, and he has been succeeded by Mr P. Farquhar, G4FYA, 95 Agnew Road, Fleetwood, Lancs FY7 7BJ.

"Digital frequency counter and timer"

The authors of this article, which was published in the March 1976 issue of *Radio Communication*, are still receiving enquiries regarding the supply of certain ics. They advise that the Motorola MC1016P, Motorola MC10131P and Signetics NE529K can be obtained from: Sales Dept, Lock Distribution, Neville Street, Oldham, Lancs OC9 6LF, at a cost of 55p, £1.83 and £1.34 respectively plus £1.10 for postage and packing, and plus 8 per cent VAT.

Sutton & Cheam RS dinner/dance

The 30th annual dinner and dance of the Sutton & Cheam Radio Society will take place at the Woodstock Hotel, Morden, Surrey, on 18 March 1978 at 6 for 6.30pm. The society is pleased to announce that Dr D. S. Evans, PhD, BSc, FIM, G3RPE, President of the RSGB, will be guest of honour.

Tickets at £5.50 may be obtained on application to Mr R. C. McDonald, G3DCZ, 60 Dudley Drive, Morden SM4 4RJ.

Radio Fraternity Lodge No 8040

Mr Maurice Pyle, G2BLA, was recently installed as master of the above lodge for 1978-9. The secretary is Mr S. Howard, G8TY.

A 144MHz fm black box

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

THE convenient ubiquitous oriental black box which has largely been responsible for the boost in 144MHz activity in recent years (in fact, perhaps the greatest single cause in the decline of a.m.) is slowly becoming a victim of our inflation. For those forced to seek a less-expensive means of joining the pack, and prepared to fish out their rusty old soldering iron (it's in the same drawer as the morse key by the way), a homebrew fm box is offered.

The receiver

No originality is claimed for either the receiver or transmitter; many constructors have circuit ideas of their own but find difficulty in translating these into practical nuts and bolts. A little help in suggesting a chassis form or printed circuit layout is all that is required. Inspection of the receiver rf circuitry will reveal many old favourites (Fig 1).

A dual-gate mosfet rf stage followed by a fet mixer take familiar lines, injection being developed from a bipolar overtone oscillator and tripler. In the prototype, 52MHz crystals were used only because some channels were to hand. There is a good argument for choosing the 44MHz series instead; component values for both are indicated in the components list and coil table.

A home-made i.f. transformer at 10·7MHz, consisting of two coils of only 16 turns at a suitable spacing, 0·45in, couples the mixer to the second mixer, a further fet. A single BC109 crystal oscillator operates at 11·155MHz to produce a 455kHz second i.f.

It will be agreed there are no problems so far. The 455kHz filter might, however, be less easy to obtain quickly, and a cheaper alternative and means of connection will be discussed later in the construction notes. The printed circuit has provision for either the Mu-Rata CFR-455 middle-class ladder filter, or the less expensive CFM-455 popular-class filter; these are widely employed in Japanese fm black boxes. Types CFM-455E, CFM-455F, CFR-455E or CFR-455F are recommended.

The main i.f. amplifier is designed around the popular TBA120 ic which has a built-in coincidence detector. Almost all G3TDZ designs have portability in their specification; unfortunately the TBA120, along with almost all similar devices, has a high current consumption. Siemens, however, produce a low-current version, the S-041-P, which only consumes about 6mA. These have to be ordered from Siemens agents.

* 8 Armley Grange Crescent, Leeds LS12 3QL

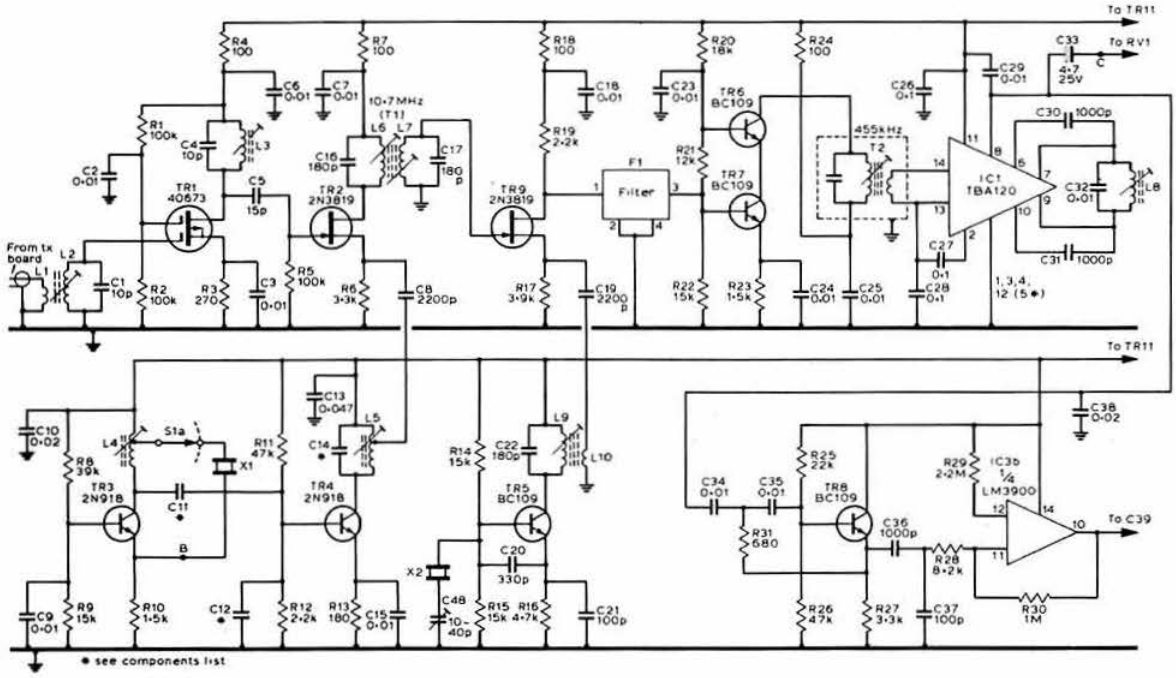


Fig 1. Receiver theoretical circuit rf sections

The TBA120 alone has insufficient gain for our purposes, being originally intended for bc service; an i.f. preamplifier is then required in front of the ic. Here again many ics offer themselves but likewise tend to have large current consumptions. A fet stage was tried but suffered periods of instability. The bipolar cascode amplifier finally adopted operates at only 2mA. A ready-made i.f. transformer bought for 6p from a very-well-known dealer at a mobile rally, and a common 10mm design, couples the i.f. preamplifier to the ic.

The quadrature circuit seems to cause most problems with amateur constructors; its design and Q determine the recovered audio from our narrow band deviation. In the Siemens manual, suggested values for nbfm are 81·5µH and 1,500pF, coupled with 220pF capacitors. A 130t coil was wound in three layers with 41swg wire, and the suggested circuit compared with one developed some years ago; a 12·23µH coil, only 50t of 30swg wire in two layers resonated with 0·01µF, with 1,000pF couplings [1]. The second circuit produced the greatest output with deviation to spare, and was easy to adjust; this then is adopted in the design.

The basic receiver requirements are completed by an LM380 audio power ic which has low quiescent current.

Where the audio is taken from the TBA120, prior to the volume control, a high-pass filter, TR8, separates the noise from wanted audio for driving the squelch circuitry.

It seemed a good idea to include a battery economizer circuit, and this by necessity becomes tied to the squelch (Fig 2). As switching is now demanded, one first considered ttl. The 12V standard already agreed upon precludes this, and cmos would seem a logical approach. Now it so happened that the junk box contained a copious supply of a form of bipolar quad op-amp, the LM3900, originally obtained for quite a different purpose—a disco! Unlike ordinary op-amps such as the 741, these rely on current for their input references rather than voltage, in a current mirror configuration. Briefly this means that if the current flowing into the inverting input equals the non-inverting input current, the output voltage floats half-way between positive and negative rails. The LM3900 then is well suited to single rail supply.

In this linear mode, either input may be used for summing and many circuits common in op-amp technique may be employed; a very high input resistance and low output resistance is an accommodating quality. An extreme condition arises when only one input is fed with current: depending upon which one is biased, the output either rises to full ht or falls to earth. It can easily be seen how the LM3900 is suited to either analogue or digital functions.

One section of IC3 is biased for linear amplification of the noise signal following the high-pass filter. The amplified noise is rectified by D1 (Fig 2) and the resultant

Receiver coil winding table

L1	1t link wound over L2 at lower end 24s pvc
L2, 3	4t 22swg TCu spaced ¼in
L4	For 44MHz crystals: 7t 22swg TCu tap one turn down For 52MHz crystals: 6t 22swg TCu tap one turn down
L5	Low side: 4t 22swg TCu High side: 3t 22swg TCu
L6, 7	16t 28–30swg enamel close wound
L8	50t 32–36swg enamel close wound over two layers
L9	15t 28–30swg enamel close wound
L10	3t 24–26swg wound over cold end of L9

All coils are wound on ⅜in Aladdin 8A-6259-02 and fitted with iron dust cores. Filter and i.f. transformers—see text.

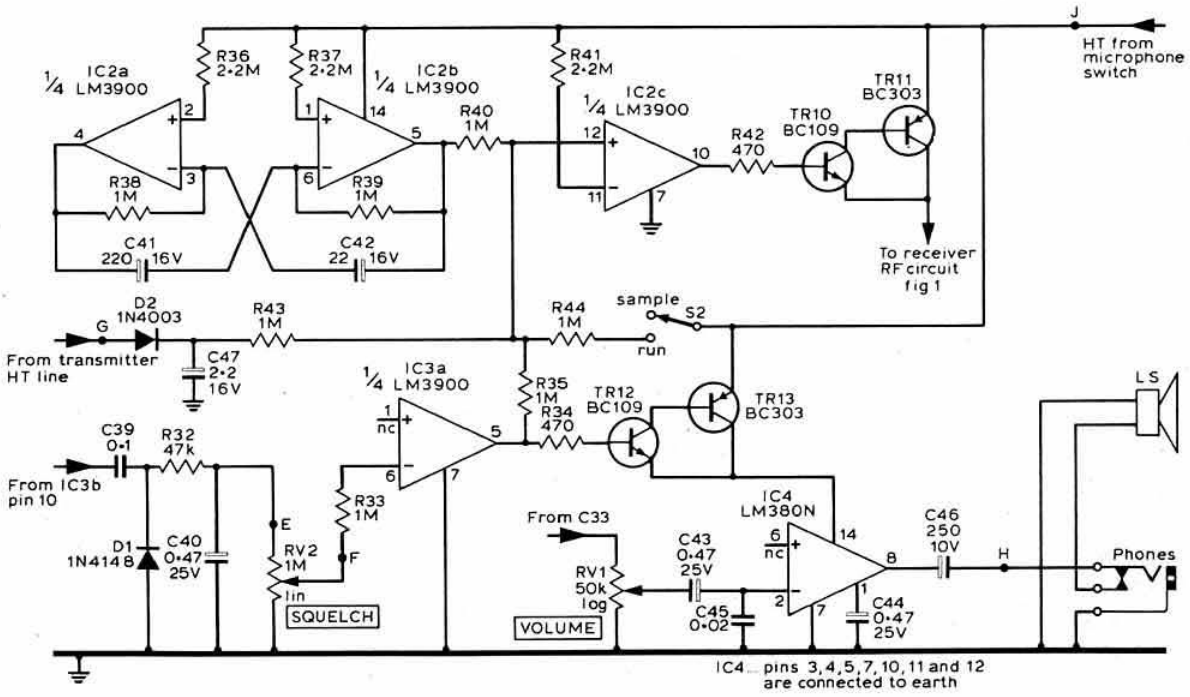


Fig 2. Receiver "logic" and af sections theoretical circuit

positive going voltage applied across the squelch control, RV2.

A further section of IC3 is connected as an inverting Schmitt trigger: where interstation noise is present, the voltage from the squelch control causes a current to flow into the inverting input, pin 6, via the series resistor R33. No bias is applied to the opposite input pin 1, and the resulting output is at earth or logic 0. However, when a signal is received the noise dies away: there is no bias available for pin 6 and the output rapidly switches to full ht, or logic 1. The switch now supplies current to the current amplifier TR12, TR13 which in turn powers the audio amplifier IC4. Instead of actual audio gating, the audio power amplifier is switched off when not required, a saving in battery power.

Two sections of IC2, another LM3900, form a free-running multivibrator or astable. The circuit will operate without any biasing but was found to be very ht conscious; linear biasing lowered its sensitivity to ht line variations. This forms the battery economizer timer circuit which is left running continuously with a 6:1 ratio. Its output on pin 5 feeds a further section of IC2 connected as a non-inverting Schmitt circuit. Here the inverting input pin 11 is permanently biased, which holds the output at logic 0. When the timer supplies current to the non-inverting input pin 12, the output pin 10 switches up to ht or logic 1, in turn allowing current amplifiers TR10 and TR11 to supply voltage to all the receiver rf circuitry.

Originally it seemed better to arrange that the timer latched up to a permanent ON state when required instead of having to employ a separate Schmitt trigger. As this would mean a further IMΩ connected to pin 6, the mark: space ratio would decrease to less than 3:1, and, as it will be seen, not one 1MΩ resistor but four are required to satisfy the various functions. The timer is therefore best left alone.

Only IC2 and the two current amplifiers connect to the manually switched ht line. As the timer turns on the receiver to sample the channel, absence of a signal holds off connection of ht to the audio stage. When a signal is present, not only is ht supplied to the af amplifier but the switching signal is applied to the non-inverting Schmitt. This holds the receiver in the ON state regardless of timer switching signal.

Receiver components list

C1, 4	10pF ceramic	IC1	TBA120
C2, 3, 6, 7, 9, 15, 18, 23, 24, 25, 29, 34, 35	0·01μF disc	IC2, 3	LM3900
		IC4	LM380N
		R1, 2, 5	100kΩ
		R3	270Ω
C5	15pF ceramic	R4, 7, 18, 24	100Ω
C8, 19	2,200pF ceramic	R6, 27	3·3kΩ
C10, 38	0·02μF disc	R8	39kΩ
C11	56pF or 47pF ceramic	R9, 14, 15, 22	15kΩ
C12	180pF or 150pF ceramic	R10, 23	1·5kΩ
		R11, 26, 32	47kΩ
C13	0·047μF disc	R12, 19	2·2kΩ
C14	15pF or 8·2pF ceramic	R13	180Ω
		R16	4·7kΩ
C16, 17, 22	180pF ceramic	R17	3·9kΩ
C20	330pF ceramic	R20	18kΩ
C21, 37	100pF ceramic	R21	12kΩ
C26, 27, 28, 39	0·1μF Mylar or polyester	R25	82kΩ
		R28	8·2kΩ
C30, 31, 36	1,000pF ceramic	R29, 36, 37, 41	2·2MΩ
C32	0·01μF Mylar or polyester	R30, 33, 35, 38, 39, 40, 43, 44	1MΩ
C33	4·7μF 25V electrolytic	R31	680Ω
C40, 43, 44	0·47μF 25V electrolytic	R34, 42	470Ω
C41	220μF 16V single ended ele	RV1	25kΩ or 50kΩ log
		RV2	1MΩ lin
C42	22μF 16V electrolytic	TR1	40673
		TR2, 9	2N3819
C45	0·02μF ceramic disc	TR3, 4	2N918
C46	250μF 10V single ended ele	TR5, 6, 7, 8, 10, 12	BC109
C47	2·2μF 16V electrolytic	TR11, 13	BC303
C48	10–40pF ceramic trimmer	The values of C11, 12 and 14 have been listed for use with either 44MHz crystals or 52MHz crystals respectively.	
D1	1N4148		
D2	1N4002		
F1	Filter		

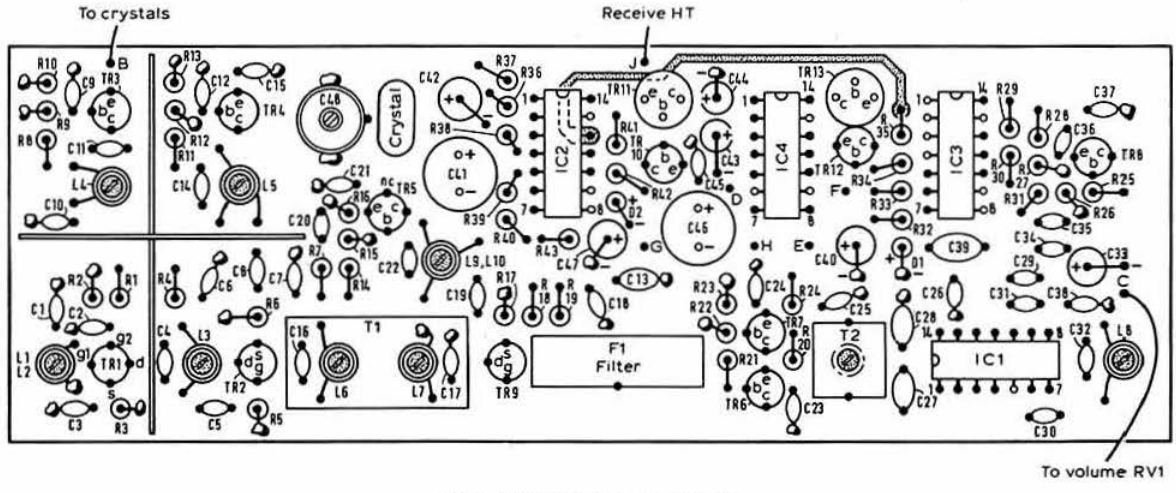


Fig 4. Receiver component plan

After a transmission period the receiver would return to sampling if the other station was not snappy with his ptt, and one might miss the first word or two. To prevent this, a diode and storage capacitor, D2 C47 fed from the transmitter ht line, hold the receiver open for a few seconds, long enough to allow the other station access.

One does not always require a battery-saver action when operating fixed or in a car. The front-panel switch S2 holds the receiver open by applying a further switching current to IC2 pin 12 through R44.

The receiver printed board and component layout are shown in Figs 3 and 4.

Printed circuit board artwork

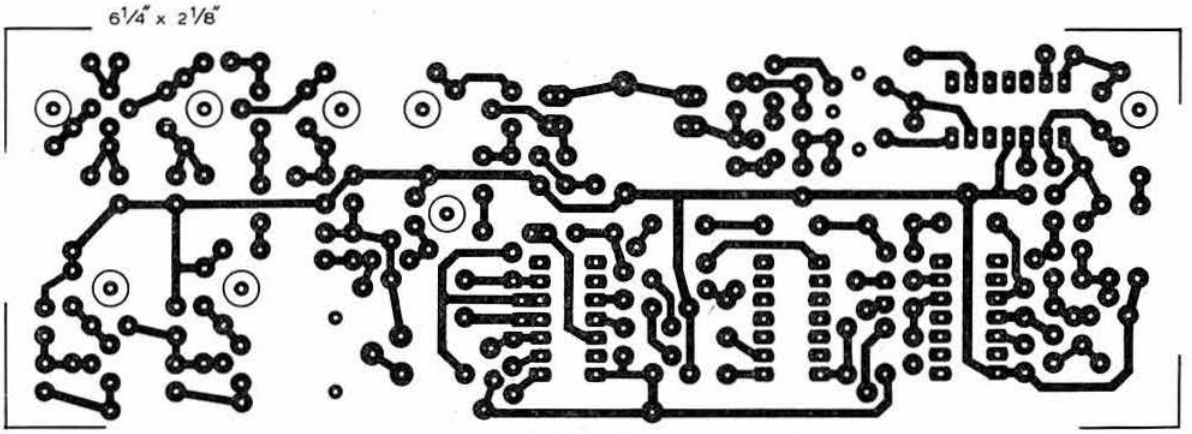


Fig 3. Receiver

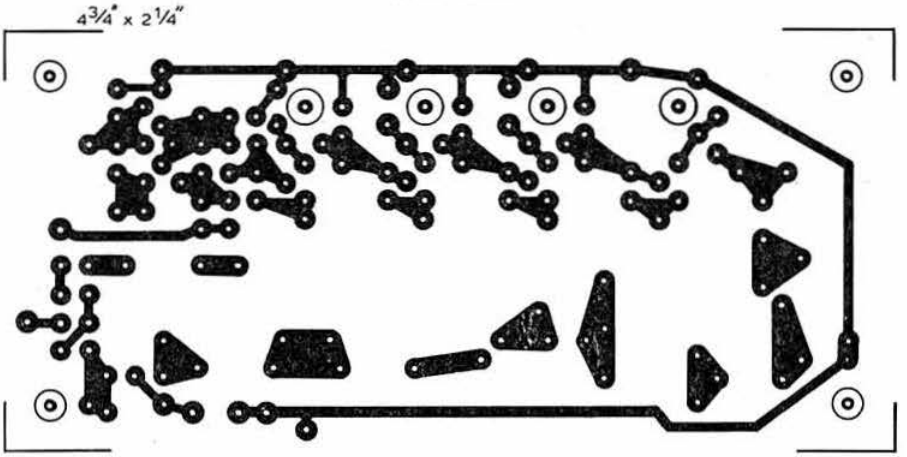


Fig 6. Transmitter

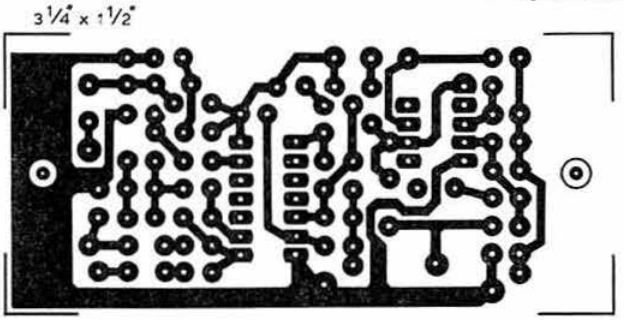


Fig 9. Transmitter audio section

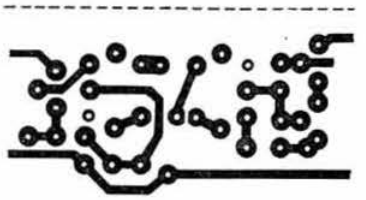


Fig 13. Modifications to Fig 3 for CFU455 filter

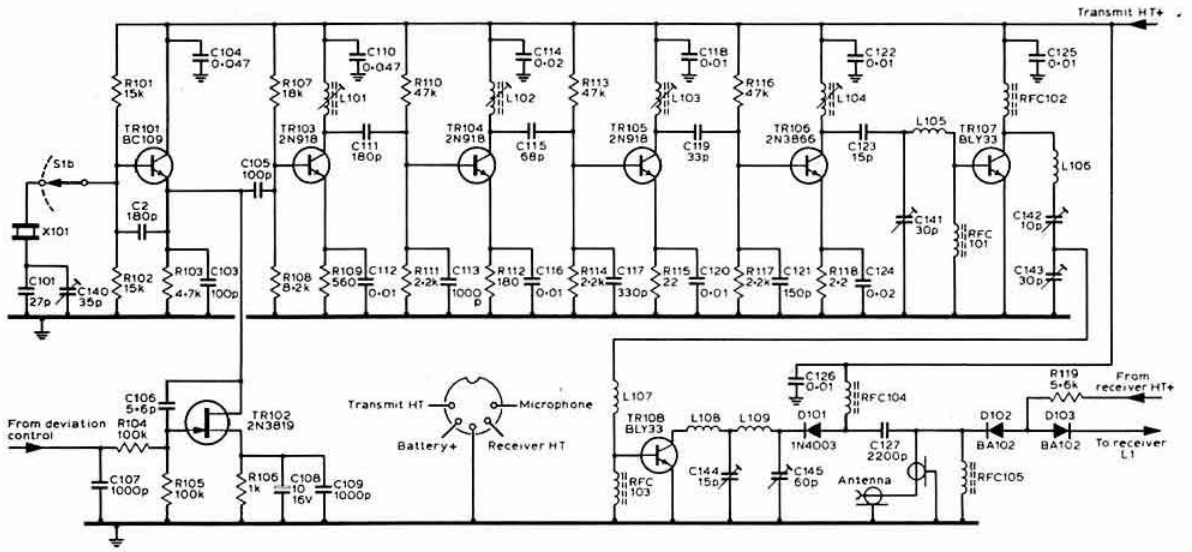


Fig 5. Transmitter rf and modulator section theoretical circuit

Transmitter coil winding table

L101	12t 26–28swg enamel close wound
L102	7t 22swg TCu spaced about $\frac{3}{8}$in
L103, 104	5t 22swg TCu spaced about $\frac{1}{4}$in
L105, 107	3t 20swg plain copper or enamel $\frac{1}{4}$in
L106	6t 20swg plain copper or enamel spaced to fit board
L108	8t 20swg plain copper or enamel spaced to fit board
L109	9t 20swg plain copper or enamel spaced to fit board

L101 to 104 are wound on $\frac{3}{16}$in Aladdin 8A-6259-02 and fitted with iron dust cores. Coils L105 to 109 are wound $\frac{1}{4}$in id self supporting.

RFC101	1t 28swg enamel
RFC102	2t 28swg enamel
RFC103	1t 26swg enamel
RFC104	2t 26swg enamel
RFC105, 106	3t 28swg enamel

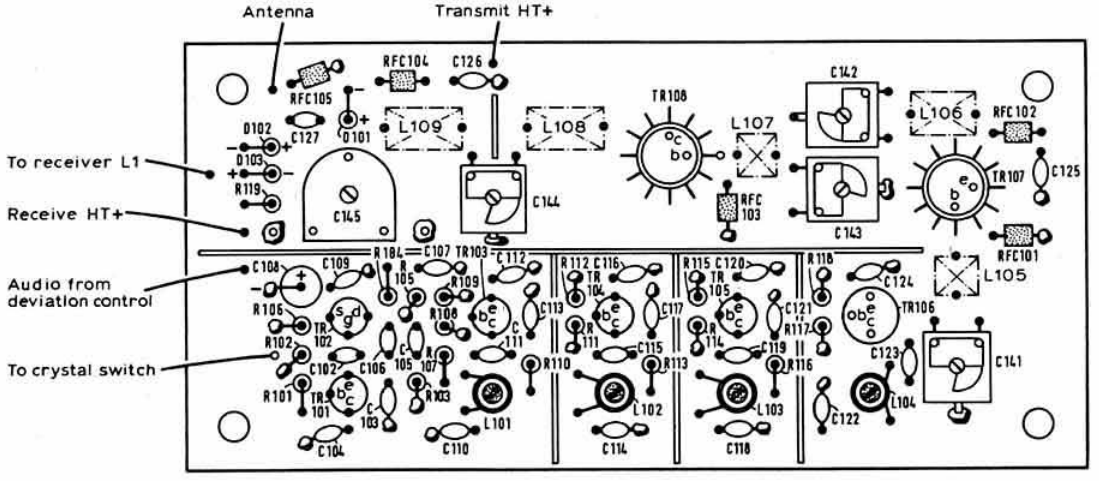
All RFCs are wound on FX1115 ferrite beads.

The transmitter

This project began with the lofty notion of synthesizing and combining the oscillator requirements of both transmitter and receiver. Breadboard lash-ups proved troublesome and pressure from other work rationed the available man-hours. After eight months with neither transmitter not receiver for any band, the project was shelved in favour of a more traditional design which could be thrown together in days (Fig 5). A local mobile rally occurring auspiciously was the source of most of the components and crystals.

While not unusual to most amateurs, this was the first G3TDZ vhf transmitter to start with a low frequency oscillator. A 12MHz Clapp circuit was chosen with the crystals selected by a further section of S1; S1b in Fig 5. It is necessary to include a crystal trimmer for each channel: C140 therefore is duplicated for the number of channels demanded with a fixed capacitor C101 of about 27pF, without which the transmitter can easily move up one whole channel.

Fig 7. Transmitter component plan



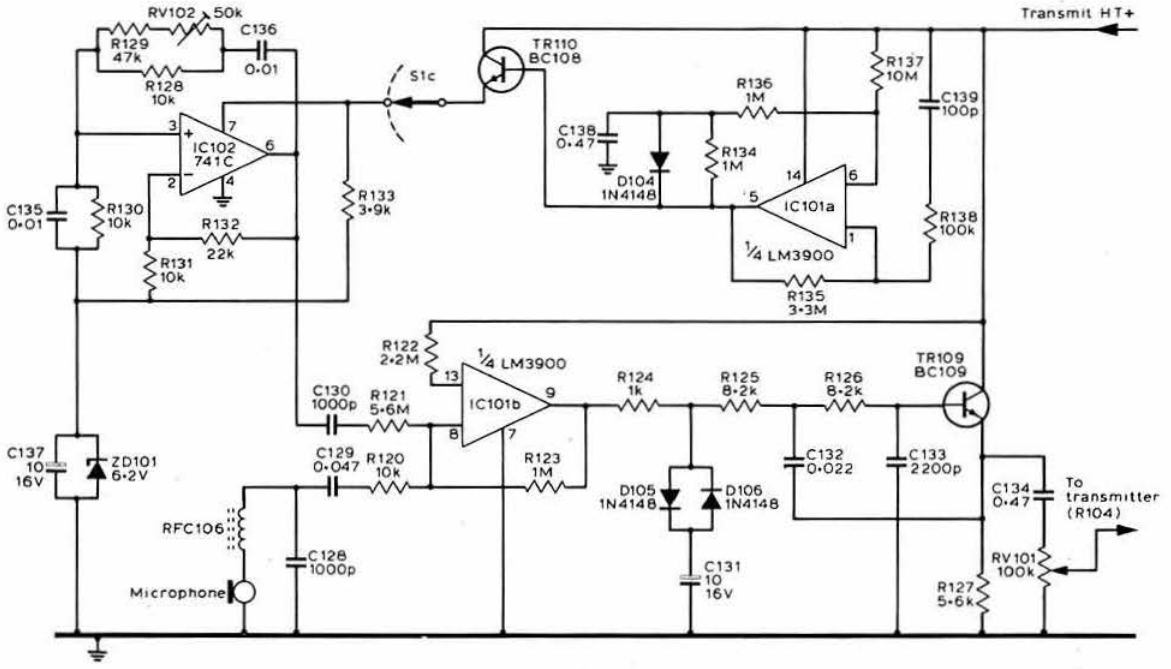


Fig 8. Transmitter audio section theoretical circuit

Because this type of oscillator produces only about 100mV output, an amplifier at fundamental frequency is necessary to lift the signal sufficiently for driving the Class C tripler. Accepting this, one now has the opportunity to include some variable reactance into the coupling elements to achieve phase modulation. Though treasured by so many amateurs, the varicap diode never seemed the best method of producing linear deviation; a reactance modulator using a fet in exactly the same way as the pentode of yesteryear is therefore employed [2]. With the values indicated in Fig 5, 600mV of audio produces about 6kHz deviation.

From TR103 onwards, the design follows familiar lines: a tripler TR104 to 36MHz; a doubler TR105 to 72MHz, both using 2N918; a doubler TR106, this time a 2N3866, to 145MHz. Capacitive divider networks form the interstage couplings up to the final doubler. By these and the tuned circuits in succeeding stages, harmonic rejection is excellent but the radiation of sub-harmonics from transistor transmitters can be a problem. When testing this design it was considered likely that traps and even a highpass filter might be necessary. Careful alignment with wavemeter checks proved it unnecessary but more will be said on this in the section on alignment.

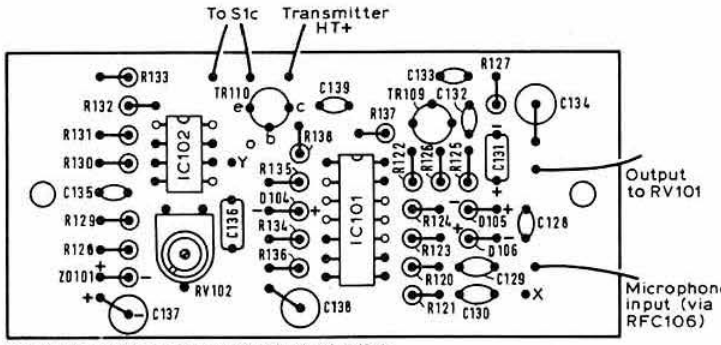
In the driver and pa stages, the tuned coupling takes a new form. Coils L101 to L104 have been wound on $\frac{3}{16}$in formers and slug tuned (Figs 6 and 7); L105 onward are self-supported coils of 20swg with tuning adjusted by air-spaced trimmers. The L-Pi output network acts as its own lowpass filter and has been found superior in earlier designs in the reduction of unwanted radiation. Those new to this type of network remark on the number of turns: eight in L108, and nine in L109.

The transmitter develops an actual rf output power of 1W and will load easily the normal low-impedance feeders, eg 50Ω and 75Ω.

The solid-state antenna switch, from a design first suggested by D. A. Tong, G4GMQ, some years ago for both receiver and transmitter [3], is located on the transmitter rf board. Separating these produced some curious effects in an earlier design! All RFCs are wound on FX1115 ferrite beads but the turns vary with application. See coil data.

Transmitter components list

C101	27pF plate	**C145**	60pF solid dielectric, Mullard
C102, 111	180pF plate	**D101**	1N4003
C103, 105	100pF plate	**D102, 103**	BA102
C104, 110	0·047μF disc	**R101, 102**	15kΩ
C106	5·6pF plate	**R103**	4·7kΩ
C107, 109, 113	1,000pF ceramic	**R104, 105**	100kΩ
C108	10μF 16V electrolytic	**R106**	1kΩ
		R107	18kΩ
		R108	8·2kΩ
C112, 116, 118, 120, 122, 125, 126	0·01μF disc	**R109**	560Ω
		R110, 113, 116	47kΩ
C114, 124	0·02μF disc	**R111, 114, 117**	2·2kΩ
C115	68pF plate	**R112**	180Ω
C117	330pF plate	**R115**	22Ω
C119	33pF plate	**R118**	2·2Ω
C121	150pF plate	**R119**	5·6kΩ
C123	15pF plate	**TR101**	BC109
C127	2,200pF plate	**TR102**	2N3819
C140	35pF disc trimmer	**TR103, 104, 105**	2N918
C141, 143	30pF air spaced Oxley	**TR106**	2N3866
C142	10pF air spaced Oxley	**TR107, 108**	BLY33
C144	15pF air spaced Oxley		



Points X and Y are connected by a wire link

Fig 10. Transmitter audio section component plan

The audio section

A separate pc board houses the transmitter's audio section (Figs 8, 9 and 10). As in the receiver, both the linear and digital qualities of the LM3900 are exploited. With phase modulation, fm pre-emphasis is unnecessary; however, some bass roll-off is provided by choice of C129, R120.

One section of IC101 is biased for linear operation with the gain set to 100 by R120, R123. RFC106 and C128 prevent rf from entering the speech channel. Fitted fundamentally as a deviation limiter, the simple amplitude clipper, together with the bass roll-off and followed by a low pass filter, produces very respectable modulation reports.

A second section of IC101 performs as a monostable for gating the access tone generator. It is triggered into operation by a pulse through the small capacitor C139 upon application of ht. The duration of the ON condition is set by C138, in this case 470ms.

A third wafer or set of contacts S1c connects the timer to the access tone generator as required for repeater channels. A separate 741, IC2, forms a Wien bridge oscillator which possesses good immunity to the effects of ht variation; its frequency can be set to exactly 1,750Hz by RV102, a small preset on the pc board (Fig 10). The high amplitude output from the tone oscillator is attenuated by the action of R121, a 5·6MΩ resistor working against R123.

Audio section components list

C128, 130	1,000pF ceramic
C129	0·047μF Mylar or polyester
C131, 137	10μF 16V electrolytic
C132	0·022μF Mylar or polyester
C133	2,200μF Mylar or polyester
C134	0·47μF 25V electrolytic
C135, 136	0·01μF Mylar or polyester
C138	0·47μF elect or tant
C139	100pF ceramic
D104, 105, 106	1N4148
IC101	LM3900
IC102	741C
R120, 128, 130, 131	10kΩ
R121	5·6MΩ
R122	2·2MΩ
R123, 134, 136	1MΩ
R124	1kΩ
R125, 126	8·2kΩ
R127	5·6kΩ
R129	47kΩ
R132	22kΩ
R133	3·9kΩ
R135	3·3MΩ
R137	10MΩ
R138	100kΩ
RV101	100kΩ log
RV102	50kΩ preset
TR109	BC109
TR110	BC108
ZD101	BZY88–C6V2

Construction

Experience with previous projects shows that only a few constructors intend building a complete instrument. For some it is the receiver which has something to offer, for others the transmitter. In this unit, three circuit boards are involved: there will certainly be someone somewhere who only requires the transmitter's audio board; half an hour on S22 and we all know their callsigns!

The receiver is housed on one printed board made from double-sided laminate. Fig 3 shows the underside; the upper side remains a continuous copper earth plate. Where components pass through holes to be soldered to underside conductor tracks, a clearance is made in the upper foil either by a small drill or by etching. There is one conductor track to be laid on the upper surface between pin 12 of IC2 and R35, see Fig 4. Where components connect to earth, their wires solder on to the upper foil.

The screens between rf, mixer and the oscillator stages, also the screen round L6 L7 forming T1, are made from a $\frac{1}{2}$in strip of tinplate soldered to the upper earth copper foil.

Not all the ic pins are connected: clearance should be made even if the underside contacts go nowhere. Those to which this applies are IC2 pins 8 and 9; IC3 pins 1,2,3,4, 8, 9 and 13; IC4 pins 6, 9 and 13. Some ic pins are soldered to the upper foil; their holes should be drilled but the upper copper not cleared around the pins, the pins being soldered directly to the foil. These are IC2 pin 7, IC3 pin 7, IC4 pins 3, 4, 5, 7, 10, 11 and 12. If a TBA120 is fitted for IC1, pins 1, 3, 4 and 12 are earthed as described, but pin 5 is left unearthed and disconnected, with copper clearance. If an S-041-P is fitted for IC1, pin 5 should be earthed along with 1, 3, 4 and 12.

Coils with a large number of turns, such as L6, 7, 8 and 9, are better wound and doped with cellulose varnish, then left to harden before fitting. The Aladdin formers make a tight fit into the $\frac{3}{16}$in holes but may be glued for extra strength. Where coils have only a few turns of a heavier gauge, such as L2 to L5, it is easier to fit the formers, wind the coils on, say, a $\frac{3}{16}$in drill shank, form the leads, then drop into place over the formers and solder.

No mention has yet been made of S1. The number of channels fitted is entirely up to the individual. In the prototype nine channels were provided for, but only four have crystals at the time of writing. Trimming is unnecessary once C48 is adjusted for one channel. Chassis mounting crystal sockets were fitted to a strip of metal,

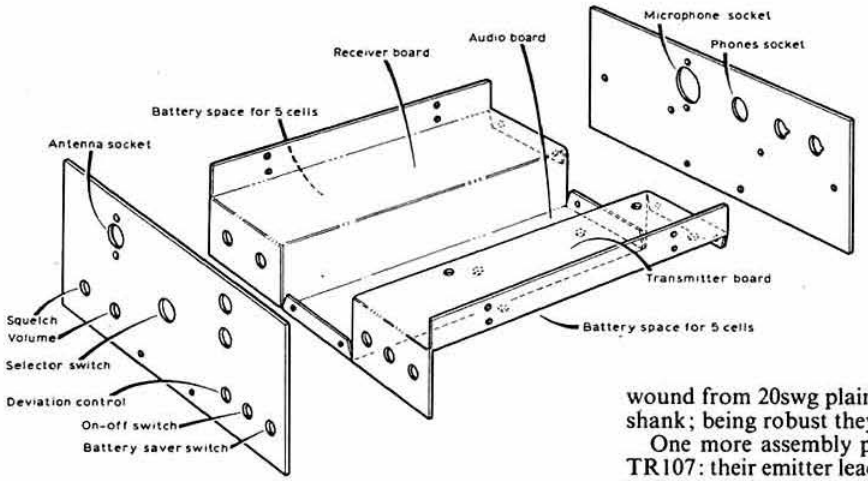


Fig 11. Basic chassis design

which in turn was mounted on spacers from the front panel. A miniature wafer switch from RS Components having three wafers, each single-pole 9-way, was acquired.

Two wires from the board connect to the crystal bank and its switch: one from the tap on L4 (one turn from the cold end), and one from point "B", the emitter of TR3.

A 2½in 8Ω speaker is fitted into the cabinet lid and connected via a switched phone jack—Cliff Products type S1BB. The volume control RV1, a 50kΩ log, and the squelch control RV2, a 1MΩ lin, both miniature types, are fitted into the front panel.

It was suggested earlier that as Mu-Rata filters might be difficult to obtain, it should be possible to fit one of the cheaper and readily available Toko range such as CFT, CFU or the new CFX. Fig 13 shows how it is possible to modify Fig 3 to accommodate the CFU-455 type filter. The area of circuit between TR9 and TR6, 7 is involved: only R19 is removed, all other components remain in their original positions. There is one addition, a 0·01μF disc ceramic capacitor connected from the new hole adjacent to R23 to earth. The Toko filters have proved highly successful in previous designs and there should be no reason why one should not perform equally as well in this application. There is one point: some filters come in various bandwidths—do not be tempted to fit a filter of too narrow response or performance soon suffers with fm.

The transmitter rf board, Fig 6, is again built on double-sided copper laminate but, unlike the receiver, the upper copper area is used entirely as an earth plate. It is advisable to clear round all the holes in the top foil before commencing assembly, except for the two holes, one either side of C145. Screens made from ½in tinplate strips are soldered to the upper surface as shown in Fig 7; start by fitting the long central screen, then add the three dividers left to right.

It is better to wind L101 externally, dope, then fit into the board when hard. Coils L102, 103 and 104, only having a few turns of open-spaced winding, may be wound on a $\frac{3}{16}$in drill shank, formed to shape, then lowered onto the previously fitted formers. The longer open-wound self-supporting coils L105 to L109 are wound from 20swg plain or enamelled wire on a ¼in drill shank; being robust they are easily fitted to the board.

One more assembly point is in regard to TR106 and TR107: their emitter leads should not be more than 2mm long yet soldered directly to the upper copper earth foil. By bending carefully 1mm from the header to form an "L", it is possible to gain sufficient access with an iron to achieve a good soldered joint. Be careful not to blob the case to the copper earth. Heat radiating clips are fitted to both transistors.

The transmitter audio board should present no problems, being built on single-sided board. Make sure the two ICs are fitted the correct way round (Fig 10).

The chassis

Amateur constructors tend to ponder at length over intricacies in circuit design, yet almost disregard the shape of the final product—which is why one sees so many homebrew rigs badly fitted into traditional flat pan chasses or diecast boxes. It is a difficult problem to "see" the finished article in advance. One must admit that almost all oriental black boxes look good; their glittering well-designed front panels completely steer one's attention away from what lies behind!

In Fig 11 a suggested chassis form is shown. The seemingly complicated central chassis member is redrawn more simply in Fig 12a where the unbent dimensions are indicated. When formed the chassis appears like a miniature railway station; by adding a simple front and rear plate, a sturdy chassis results. A common amateur mistake is to endeavour to force into shape a too-heavy gauge of metal such as 16swg aluminium. It is quite difficult to achieve a sharp bend when 18swg would be so much easier. There is a good argument for reducing to 20swg for internal chassis work where load bearing is not demanded.

The receiver board is mounted onto the left-hand platform and the transmitter rf board on the right (the down line), with the audio board down in the channel close to the rear plate. RFC6 connects between the board's input at C28, 29, and the DIN socket mounted in the rear plate.

A worthwhile hint is to solder 6BA nuts to the upper foil over each mounting hole, thereby making for easier manipulation of screws and spacers. On the chassis' underside, if holes are countersunk and appropriate screws used, possible damage to the batteries by screw heads will be prevented.

No outer case has been drawn. As a wrap-round case is a difficult task for the amateur, two halves or U-shaped shells are alternatives which only require simple bends. Their inner dimensions must be as Fig 12b and 12c. The lower shell would be a semi-permanent fixture retaining the battery packs. These are 10 U11 size cells, 1·6Ah or 1·8Ah depending on manufacturer; five cells wired in series and wrapped in a cardboard package fit under the two platforms.

A small 8Ω 2½in type loudspeaker is fitted into the upper chassis shell or lid, its magnet assembly entering the trough above the audio board. The two shells are retained by self-tapping screws into the side pieces (Fig 11). To the front of the audio board there should be ample room for the channel switch and the crystal banks. A suggested layout for the transmitter crystals with their trimmers is shown in Fig 14. In the working model a slotted piece of plastic was glued to one side of the channel, the crystal bank then being fitted in and retained at the other side by self-tapping screws to form a bridge. This enables easy access for adjusting fixed value capacitors C1 soldered across each trimmer.

The position of all sundry components is shown in Fig 11. For those who might question the siting of RV1, the deviation control on the front panel: it was for no better reason than some kind person presented a fine miniature panel mounting pot made by Allen Bradley. An ordinary control or pre-set may of course be mounted anywhere within, even its value is not too important, 10kΩ to 100kΩ will do nicely.

Alignment

There is little in the receiver alignment unfamiliar to constructors. Some form of rf indication, such as a one-turn pickup loop and meter or vvm, is useful in setting up

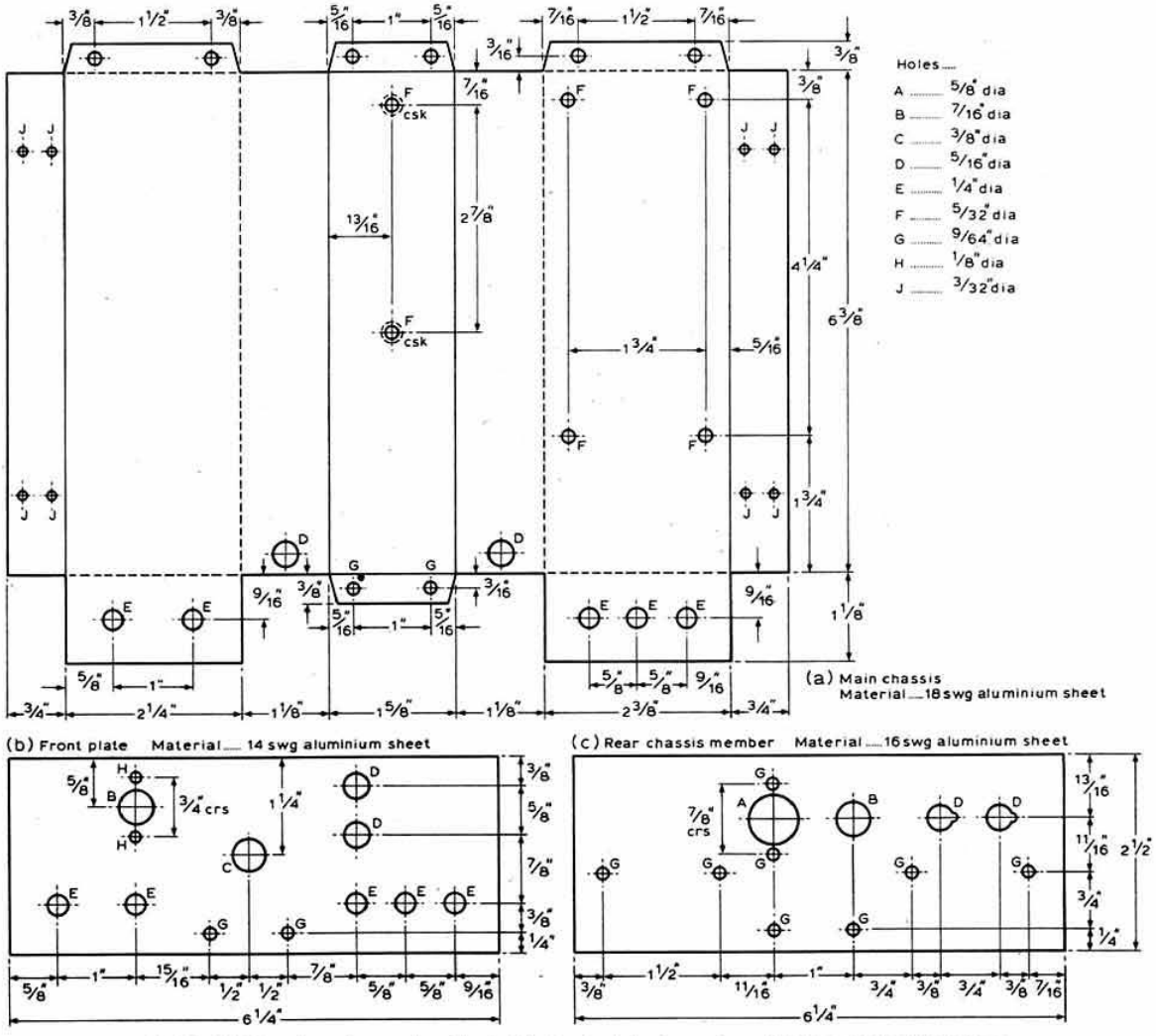


Fig 12. (a) Chassis main member blank. (b) Front plate dimensions. (c) Rear plate dimensions

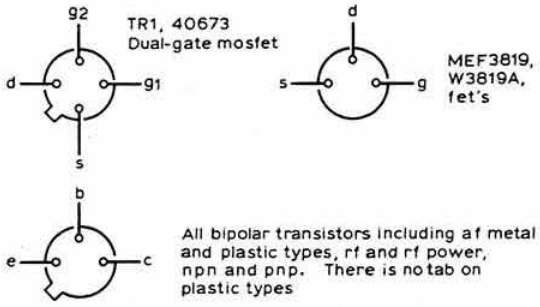


Fig 15. Transistor base connections

the crystal oscillator and multiplier, and the second oscillator TR5. The onset of oscillation in L4 is quite abrupt and will only be maintained over about one turn of the slug.

Discriminator alignment requires a signal generator set to 455kHz at −40dB applied to IC1 pin 14 through an isolation capacitor, and a vvm connected to pin 8. The voltage at pin 8 should be noted before signal is applied; a reading of about 7V can be expected. With signal now applied and L8 adjusted, the needle will deflect slowly one way, say up to 10V, then swing rapidly but linearly to the other extreme, about 4V, finally returning towards its original reading. The slug should be adjusted so that the needle reads mid-way between the two extremes; that is the original voltage, 7V in our example. The actual voltage will vary a little from ic to ic; the S-041-P will be about 5V. Any textbook will show this characteristic with its linear slope between the two readings.

Once the detector and T2 have been set up at exactly 455kHz and T1 peaked at 10·7MHz, all the other coils can be tuned for maximum output on either an actual station or the signal generator set to a known channel number. Once a station is received, C140 can be adjusted for accurate tuning and will not require further adjustment on other stations.

When aligning the transmitter a wavemeter, rf pick-up loop and indicator are essential. The oscillator will start without problem. Place loop over L101 and tune up for maximum; this will not be its final setting as further adjustment is required later. Place pick-up loop over L102

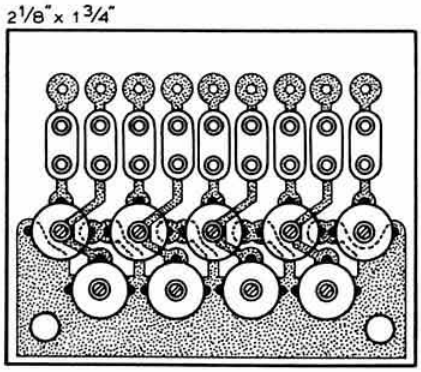


Fig 14. Transmitter crystal bank layout

and also pickup from wavemeter. As L102 is peaked for maximum, make very sure the frequency is actually 36MHz as false readings are possible. Bring L103 into line similarly at 72MHz, again checking for true frequency. Examine for output at 48MHz and 84MHz; the 36MHz and 72MHz selection is quite clear but easily mistaken.

Some form of load is now important if not already connected. An 8V or 12V 0·15A dial bulb mounted into a coaxial plug is a useful aid. Adjust L104 using pickup loop, then transfer to L106 and adjust C141 and L104 again. Move the loop to L108, adjusting C144 for some indication. All adjustments between L104 and C144, that is L104, C141, C142, C143 and C144, should be repeated over and over again as inter-electrode capacitances vary with increasing power; constant readjustment is necessary. By this time the bulb will have started to glow; adjust C145 for maximum brightness.

There are three more important final adjustments. Return to L102 and with the lightest coupling possible which will produce a full-scale indication on the wavemeter, adjust for 36MHz, watching the output on the bulb. Similarly carefully set L103 for 72MHz and then peak L104. These can now be regarded as set and one must reject the temptation to keep giving them a tweak. Replace the bulb with a load whose impedance is nearer to that expected in use. Some form of indication will be needed, so one may either feed a dummy 50Ω or 75Ω load via an swr bridge or feed an actual antenna set up in the shack where a field strength reading may be taken. Whichever method is adopted, tune C145 for greatest output, then re-peak C144 carefully for maximum. C141, 142 and 143 may be gently adjusted but use a well-insulated trimming tool to prevent stray pickup.

The final adjustment requires someone else's receiver. As L101 acts as a phasing control, linear modulation depends on its accurate setting, regardless of the deviation setting. It is simple to connect an oscilloscope to the other receiver loudspeaker and apply a sine wave to the microphone socket. Advance the deviation control to about half-way and observe the waveform. Carefully adjust the L101 slug either way. Although already peaked for maximum drive, there will be a fairly fine setting where the waveform is perfect, assuming the receiver is OK anyway; all other settings will produce little modulation and heavy distortion.

The crystal trimmer C140 will require setting for every channel where a crystal is fitted. If the other chap's receiver has an S-meter, the job becomes simpler.

As the audio circuit has a speech clipper, audio gain must not be mistaken for deviation. An oscilloscope check at the R124/R125 junction will show the onset of clipping from the microphone to be used. If gain adjustment is in fact necessary, this can only be done by changing R120. It is a good plan therefore to check the audio circuit before the rf board is connected or before fitting it into the chassis. It is not intended that the clipper be used as full speech processing but only as a safeguard against over-deviation when raising the voice etc. Deviation is set either with a deviation meter if available or against a known receiver. The deviation control is finally set to just short of full rotation. This completes the testing and alignment.

(Continued on page 211)

The AMSAT-Oscar D spacecraft

by PERRY KLEIN, W3PK and JOE KASSER, G3ZCZ

THE AMSAT-Oscar D, the next AMSAT spacecraft in the Oscar series, is a Phase 2-type satellite due for launch this month. It was built over the last two years by radio amateurs in the USA, Canada, West Germany and Japan, and is also the first spacecraft in which AMSAT, Project Oscar and the ARRL have joined together in building flight hardware.

AMSAT-Oscar D carries transponders for two modes of operation. There is a conventional 145·9MHz/29·4MHz Mode A transponder, and a new 145·9MHz/435·1MHz Mode J transponder; a similar frequency combination that was pioneered by Oscar 4 in 1966. Six channels of telemetry are provided to monitor the onbaord status of the spacecraft, which makes extensive use of parts left over from the Oscar 7 and Phase 3 programmes.

Mission objectives

The principal objective of AMSAT-Oscar D is the educational uses of a low-orbiting satellite. It is to provide a means for the use of such a satellite as an educational tool in schools or other educational institutions. Other objectives include the continuation of communications demonstrations by means of stations in the amateur-satellite service, of the feasibility of using satellites with small amateur terminals for "bush" communication, emergency communications, communication between medical centres and isolated areas, aeronautical, maritime and land mobile communications, direct satellite-to-home voice "broadcasting" to simple amateur receivers, and other similar applications. Further objectives are to demonstrate special operating techniques that enhance the usefulness of low orbits for these satellite applications, and to test the suitability of a new communications transponder frequency combination (Mode J) for small terminal users.

AMSAT-Oscar D will permit the continuation of the education programme, which began with Oscars 5, 6 and 7, over the next several years—the anticipated lifetime of AMSAT-Oscar D. Oscar satellites have begun to play an important role in a new approach to science education; used as remote laboratory tools, these satellites represent a pioneering utilization of an active space system in the classroom. Using inexpensive ground terminals in schools, students can gain first-hand experience in space science, and this type of direct, active involvement has relevance to the study of communications, astronomy, engineering, physics, mathematics and meteorology. The Oscar ground terminal puts at the disposal of the instructor and student an active satellite system as a resource for demonstration and experimentation.

Spacecraft description

AMSAT-Oscar D is a communication satellite in the AMSAT Phase 2 (low-orbit) series, designed to operate with small stations in the amateur-satellite service on a non-commercial basis. It contains two communications transponders and command and telemetry systems; is solar powered; weighs 60lb, and is a 15in rectangular solid 13in high. Its anticipated useful operating lifetime is three years.

Two types of communication transponder are aboard the spacecraft. Normally, only one transponder will be operated at a time because of spacecraft battery constraints.

145 to 29MHz transponder—"Mode A"

The Mode A transponder is similar to that on Oscar 7 and with the same frequency passband (input frequency passband of 145·85–145·95MHz, and output frequency passband between 29·40 and 29·50MHz). A 250mW telemetry beacon provides telemetry data in morse code at a frequency of 29·402MHz. Approximately −95dBm is required at the transponder input terminals for an output of 1W. This corresponds to an effective radiated power from the ground of 80W for a distance to the satellite of 1,200 miles and a polarization mismatch of 3dB. The transponder translation frequency (input frequency minus output frequency) is 116·458MHz. Thus the relationship between the uplink (f_u) and downlink (f_d) is as follows:

$$f_d = f_u - 116{\cdot}458 \pm \text{Doppler}$$

where both f_d and f_u are in megahertz.

For example, an uplink signal at 145·900MHz will produce a downlink signal from the transponder on 29·442MHz ± Doppler. As in the 145–29MHz transponders in Oscars 6 and 7, the passband is *not* inverted, and upper-sideband uplink signals become upper-sideband downlink signals. Output power is 1 to 2W.

Note that the downlink frequency will be slightly different (8kHz) to that of the equivalent Oscar 7 Mode A transponder that has an equivalent frequency relationship of:

$$f_d = f_u - 116{\cdot}450 \pm \text{Doppler}.$$

145 to 435MHz transponder–"Mode J"

The second transponder, constructed by members of the Japan AMSAT Association in Tokyo, uses a 145MHz input, 435MHz output combination which has not yet been flown in the AMSAT Phase 2 series. Note that a similar combination was used in the short-lived Oscar 4 satellite in 1966.

This transponder, designated Mode J, operates with an input frequency passband of 145·90–146·00MHz, and an output frequency passband of 435·10–435·20MHz. Power output is about 1–2W p.e.p. and the output passband

is *inverted*, ie upper-sideband uplink signals become lower-sideband downlink signals. The transponder translation frequency (input frequency plus output frequency) is 581·1MHz ± Doppler. Uplink sensitivity for 1W output is –105dBm*, corresponding to an eirp from the ground of 8W* for a distance to the satellite of 1,200 miles. Users should note the greatly improved sensitivity of this mode and keep their power down. A 100mW beacon carries telemetry at a frequency of 435·095MHz.

The relationship between the uplink (f_u) and downlink (f_d) is as follows:

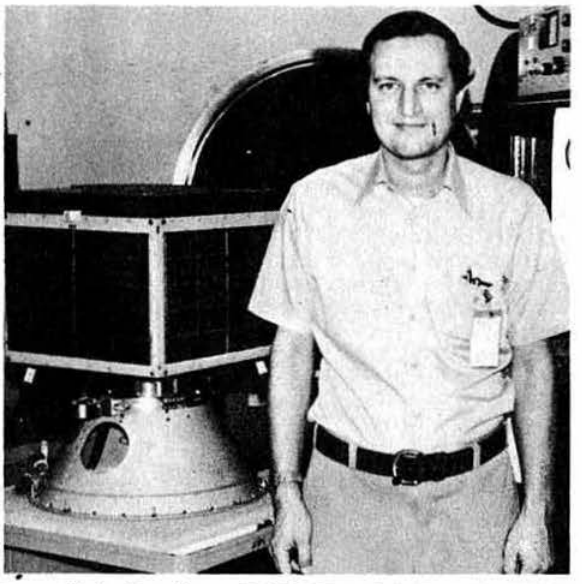
$f_d = 581{\cdot}1\text{MHz} - f_u \pm \text{Doppler}$

where both f_d and f_u are in megahertz.

Antenna system

Both the Mode A and Mode J transponders use the same receiving antenna, a canted turnstile comprised of four 19in lengths of ½in carpenter's rule fed by a hybrid and matching network so as to develop circular polarization. One port of the hybrid feeds the Mode A receiver such that left-hand circular polarization is required by users in the northern hemisphere, and right-hand circular polarization in the southern hemisphere. A second port of the hybrid is connected to the Mode J receiver such that right-hand circular polarization is required in the northern hemisphere, and left-hand circular polarization in the southern hemisphere. The antenna gain should approach 5dB in the –Z direction (ie toward the bottom of the satellite).

*Sensitivity may decrease by a factor of 10 (10dB) under different conditions of battery voltage and satellite operating temperature, so that at certain times as much as 80W may be required.



Perry Klein, President of AMSAT and dedicated satellite worker, with AMSAT-Oscar D

The Mode A 29MHz downlink antenna is a linearly-polarized dipole, oriented perpendicular to the stabilization magnet in the spacecraft as in Oscar 6 (but unlike Oscar 7, which has the 29MHz antenna parallel to the axis of the magnets).

The Mode J 435MHz downlink antenna is a simple monopole, linearly polarized, and located on the top of the spacecraft. Note that its location may result in some radiation shielding at high southern hemisphere latitudes.

Telecommand system

A five-function telecommand system of a new design is carried on AMSAT-Oscar D. The system is based on the best features of the Oscar 6 and 7 telecommand systems, and is designed to be virtually immune from noise and interference. The command functions are:

Mode "A" select (144 to 29MHz meter transponder ON);
Mode "J" select (144 to 435MHz transponder ON);
Mode "D" select (Recharge mode; both transponders OFF);
29MHz antenna deployment;
29MHz antenna reset.

Telemetry system

AMSAT-Oscar D contains a six-channel morse code telemetry system similar to the units flown in Oscars 6 and 7. Telemetry is sent at 20 words/min as three-digit numbers in morse code. CW emission is used in keying the Mode A or Mode J telemetry beacons, depending upon which transponder is in use. The six telemetry parameters are:

Ch1–Total solar array current $I_T = 7{\cdot}15$ (101-N)mA;
Ch 2–Battery charge-discharge current $I_{Bat} = 57$ (N-50)mA;
Ch 3–Battery voltage $V_B = 0{\cdot}1\,N + 8{\cdot}25V$;
Ch 4–Baseplate temperature $T_{bp} = 95{\cdot}8 - 1{\cdot}48\,N$ (°C);
Ch 5–Battery temperature $T_{Bat} = 95{\cdot}8 - 1{\cdot}48\,N$ (°C);
Ch 6–RF power out-Mode J $P_{JT} = 23N$ mW.

A sample telemetry frame would be: 120 255 380 451 551 620 HI 120. . .

Note that, unlike Oscar 6 and 7 telemetry, AMSAT-Oscar D has only one parameter per line (Oscars 6 and 7 had four). As a result, a complete telemetry frame is sent in approximately 20s.

Power system

The spacecraft contains solar panels on its four sides (along the +X, –X, +Y and –Y axes), and on the top (the +Z axis). No panels are contained on the bottom (–Z axis), since this is where the spacecraft attaches to the launch vehicle.

The solar cells, combined with a 12-cell, 6Ah rechargeable nickel-cadmium battery, should be adequate to power the spacecraft with a positive power budget in Mode A for several years, even considering solar cell degradation in the radiation environment. The power drain in Mode J, however, is somewhat larger, and so the Mode J transponder probably cannot be operated continuously.

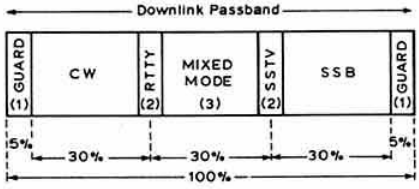
A battery charge regulator is also contained which converts from the 28–30V solar array voltage to the 14–16V required by the battery. It also tapers the charge rate so that the battery trickle-charges as the battery approaches full charge (as indicated by the battery voltage).

Stabilization system

Four permanent magnets located inside the spacecraft and aligned along the Z axis provide stabilization, as in Oscars 6 and 7. The polarity of the magnets is such that the top (+Z axis) of the spacecraft always points towards the magnetic North Pole of the earth. Hysteresis permalloy damping rods mounted behind the +X, −X, +Y and −Y solar panels are designed to reduce the spin of the spacecraft about the Z axis, functioning in a manner similar to a shorted transformer turn as it cuts the lines of flux of the earth's magnetic field. The premalloy rods were left over from Oscar 7, which successfully used the same type of stablization system.

THE SATELLITE BAND PLAN

This band plan has been adopted by the AMSAT board of directors as the recommended operational usage of the AMSAT-Oscar communication transponders. This conforms to the normal downlink usage of the Oscar 7 satellite over Europe. The plan allocates a percentage of the available radio frequency spectrum as seen on the downlink to different modes of communication. The relative amount of spectrum for each mode is thus the same for any transponder in any satellite. The allocations are as follows:



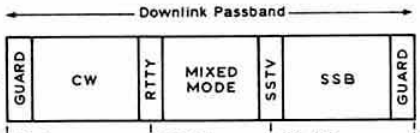
Notes:

(1) Guard area to avoid interference to beacons. These frequencies are available for emergency and bulletin stations.

(2) RTTY and sstv are placed at the edge of the cw and ssb passbands, conforming to their usage at hf where rtty is present within the cw space and sstv is transmitted in the ssb sub-band.

(3) Mixed mode area. This is recommended for crystal controlled stations, or by dxpedition stations, or anyone wishing to work both cw and ssb stations.

The plan is always based on percentages of the downlink passband. It applies to both inverting and non-inverting transponders. The allocations of frequency for Oscar 7 and AMSAT-Oscar D are as follows:



Mode A	29·4	29·435	29·465	29·5MHz
Mode B	145·925	145·94	145·96	145·975MHz
Mode J	435·1	435·135	435·165	435·2MHz

Note:

Mode A guard channels 5kHz non-inverting passband.
Mode B guard channels 2·5kHz inverting passband.
Mode J guard channels 5kHz inverting passband.

Telemetry interpretation

The most important telemetry channel that will affect operation decisions is Ch 3 (battery voltage). In Mode A the satellite should maintain a positive power budget so that there should not be a net discharge of the battery over an orbit average. Mode J operation, however, requires somewhat more power, which may result in a net discharge of the battery, especially under conditions of high transponder loading, and therefore it will be necessary for telemetry and telecommand stations to keep a close watch on the battery voltage so that action can be taken as necessary to command the satellite into Mode D (the recharge mode) before the battery discharges too far. Three cut-off levels are specified below:

Red level "A": (1·2V/cell) Ch 3 = 61 counts
Red level "B": (1·1V/cell) Ch 3 = 50 counts
Red level "C": (1·0V/cell) Ch 3 = 38 counts

Red level "A" should be used during the first year or so of the satellite's life as the cut-off point below which telecommand stations should command the satellite into Mode D for recharging. Later in its life, as the battery discharge characteristic curve changes, Red level "B" should be used, and Red level "C" should be used if there is evidence of deterioration of the battery, or if it is desired to recondition the battery.

Ch 1 (solar array current) provides an indication of whether the satellite is in the sun or eclipse (it should read in the nineties in counts when in eclipse.) Fluctuation in Ch 1 telemetry is the best indicator of the rate of spin of the satellite, along with observations of fading, particularly of the 435MHz Mode J downlink signal from the λ/4 435MHz monopole antenna.

Ch 2 (battery charge-discharge current) gives information on whether the battery is charging or discharging. A reading larger than 50 counts indicates that the battery is charging, while a reading of less than 50 counts means the battery is discharging. There is a 2s integration time associated with the current telemetered on this channel.

Launch interface and orbit

AMSAT-Oscar D is being launched from the NASA Western Test Range as a secondary ("piggyback") payload with the NASA Landsat-C earth resources technology satellite and the NASA PIX (Plasma Interaction Experiment). The spacecraft will be ejected from the second stage of the two-stage Thor-Delta 2910 launch vehicle 5120·6s after lift-off, at an approximate position of 78°N and 15°W. Programmed orbital parameters are:

Apogee: 577 statute miles;
Perigee: 549 statute miles;
Period: 103min;
Inclination: 99·0°;
Time of descending node: 0930am
(launch window from 0930–1000am).

The orbit is planned to be sun-synchronous, with passes repeating at the same time each day on a one-day cycle (as opposed to the two-day cycle of Oscars 6 and 7). The total power drain of the satellite can be determined by observing Ch 2 while it is in darkness (as indicated by Ch 1, which should read in the nineties in darkness).

Telemetry Chs 4 and 5 (baseplate temperature and battery temperature) should generally track within a few degrees (except perhaps in the first day or so after launch when the satellite has not yet stabilized at thermal equilibrium). Experience from Oscars 6 and 7 indicates that the battery can overcharge and overheat during periods of the year when the satellite sees the most sunlight. If this is the case, Ch 5 may exceed Ch 4 in temperature by 10°C, and action should be taken to reduce this overheating. This can be accomplished by keeping the satellite in Mode J to consume any extra charge current from the battery.

Ch 6 is a measure of the Mode J transponder 435MHz rf power output. Associated with the telemetered readings is an integration time of 2·5s, so that it is average power rather than peak power that is telemetered. There is no telemetry of the Mode A transponder. The Mode A transponder power consumption (largely determined by the pa current) can be measured by observing Ch 2 telemetry as noted above.

Operating schedule

Since the prime mission of AMSAT-Oscar D is to use the Mode A transponder for the ARRL Oscar educational programme in schools, the spacecraft may be left in Mode A during weekdays (Mondays to Fridays, USA time), and put in Mode J on weekends. Note that all communication should conform to the G3ZCZ band plan. Additionally, if not an excessive burden on the telecommand stations, evening orbits in the western hemisphere (morning orbits in the eastern hemisphere) can be switched to Mode J, battery permitting. In any case, all operation in Mode J will require careful monitoring of the battery charge level (as indicated from Ch 3 telemetry). The power budget may not support the Mode J transponder for full-time, continuous operation in this mode over an entire weekend.

In any event, details of the operational modes of the satellite will be announced by AMSAT in the *AMSAT Newsletter*, and late updates on the AMSAT nets.

AMSAT-Oscar D will operate in a 560-statute mile orbit, ie at just over half the altitude of the 910-statute mile orbit of Oscar 7. Thus, communication ranges will be different. The usable time on an overhead pass will be about 18min instead of the 22min provided by Oscar 7, and the horizon range will be 2,000 miles instead of the 2,450 miles of Oscar 7. This means, for example, that transatlantic communication will still be possible but not as often as with Oscar 7.

Keeping track of this satellite is going to be much simpler than for Oscar 7. It will come into range at the same time each day (more or less), and the overhead descending node pass is planned for 0930am local time.

Credits

AMSAT-Oscar D as a spacecraft was built primarily because the Phase 3 spacecraft would not be available until 1979. By stretching its resources almost to the limit, AMSAT has been able to work on both the Phase 3 spacecraft (with lots of publicity) and AMSAT-Oscar D (with hardly any). It is impossible to single out for mention all those who contributed to the construction of the spacecraft, but a few calls can be listed as follows:

JAMSAT – Mode J transponder: JA1ANG, JA1CBL, JG1CDM, JA1VDV, JA1JHF, JR1SWB.
AMSAT – Mode A transponder: WA4DGU, W3PK.
Morse code telemetry system: W5CAY, WA4DGU.
Telecommand system: W3GEY, WA3LND, WA3ZCE, W3HUC, W3ITO, K1RT/WA1JZC.
Antenna and antenna deployment module: W3GEY, W3HUC, W3ITO, K1RT, WA3LND.
Power system: DJ4ZC, JA1TUR, JF1DMQ, K1RT, W3HQ.
Structure and module containers: K6GSJ and Project Oscar, K1JX/WA1JLD, K1RT, WA4DGU, VE3DPB, W3HSO. WB0GIM, Henry Smith, David Vanderbeke.
Cables and wiring: Marie Marr.
Engineering drafting: WB4GIB. □

A 144MHz fm black box

(Continued from page 207)

Criticism

While transmission reports have been most favourable, the rig has been taken to task over a few points. First, the antenna socket is fitted into the front panel and the microphone socket into the rear, the opposite to black boxes from Japan. This unit was originally intended as a truly portable set for taking on hikes etc. Slung around the neck in the most comfortable position for walking demands the antenna uppermost and the mic cable to the rear. If anyone would rather have the other position, then by all means swap the two sockets around.

The battery saver sampling rate is much slower than some commercial transceivers; 1s in every 6. Due to the ics chosen, there is a finite warm-up time of almost 1s. If the timer operated any faster, the receiver would never "know" when it was on. In actual fact, for mobile and home station use the battery saver is unlikely to be used, its main function being only to provide an indication when one was over the radio horizon on long walks. The fact that one might miss the first 4s of someone's transmission matters little when the set has to be retrieved from one's back pack. When in constant demand, the override switch would be thrown.

The final point also concerns this same problem. If the station being worked fades momentarily, the receiver might drop out and go into its timing sequence, thus one might miss a few words. By the addition of a diode (any silicon general-purpose diode will do) connected between IC4 pin 14 and C47, the receiver will remain on for a few seconds in the same way as when the transmitter is used. This overcomes the problems outlined above. Should a constructor not wish to have the battery economizer circuit, IC2 and all associated components may be omitted.

References

[1] "Consumer integrated circuits in amateur design", J. R. Hey. *Radio Communication* September 1972.
[2] P. R. Keller, BSc, AMIEE. *VHF Radio Handbook*, p34.
[3] "Electronic switching in amateur radio equipment", D. A. Tong, BSc, PhD, G4GMQ. *Radio Communication* July 1972. □

EQUIPMENT REVIEW

The Robot Model 400 slow-scan television scan converter

by P. BURNETT, G4BLL*

WITH present state-of-the-art slow-scan technology (within a realistic price bracket) this unit must represent every slow-scanner's dream, and after using the instrument extensively the reviewer is no exception.

The unit, which is smaller than the now discontinued 70 range of monitors, follows the usual Robot standard of excellence with regard to performance and mechanical construction. Apart from the power supply, front and rear panel controls and sockets, all circuitry is located on one plug-in double-sided glass-fibre pcb. The usual video source inputs (tape, radio, camera and auxilliary) are provided, and a most useful built-in grey-scale generator is also available.

The 400 performs the scan conversion in both directions: ie, sstv out from a fast-scan camera, video tape-recorder or the demodulator stages of a tv receiver (the manual carries a warning with regard to the danger of connecting the unit to a tv receiver which is not isolated from the mains), and it will display received sstv pictures on a fast-scan monitor or domestic tv receiver from a radio or audio tape-recorder source. If a normal domestic tv receiver is used, the signal can be fed into the video amplifier—a switched plug and socket arrangement may be used so that the video detector output is automatically disconnected when the plug is inserted. (Once again note the warning above; if unsure, use a mains isolation transformer.) Alternatively a uhf modulator may be used to route the signal via the antenna socket, thus avoiding

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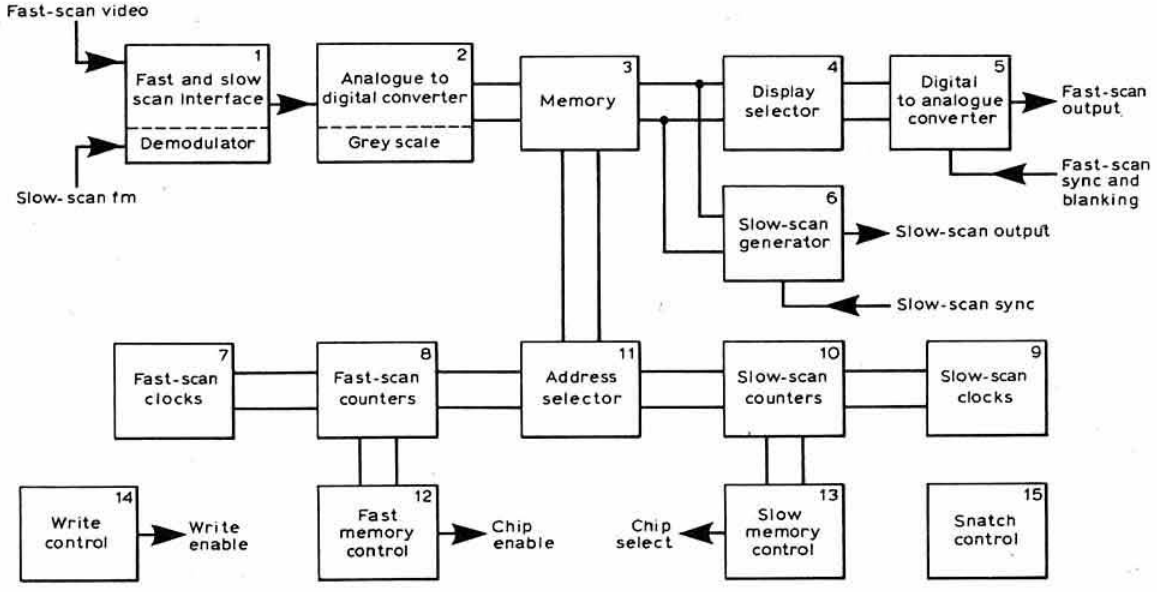


Fig 1. Robot 400 block diagram

any internal modifications to the tv set—a suitable unit is available from Aero & General Supplies Ltd, price £18.

All switching is included for full station control, and any of the above sources of video may be routed to modulate the transmitter. A further useful additional function is the ability to "freeze" an incoming sstv picture and retransmit it back to the originating station—undeniable proof of reception!

Operation

One of the problems encountered when using the unit for the first time is the multiplicity of variables from camera, converter, monitor and receiver controls, and one variable can partially compensate for the incorrect setting of another which would otherwise result in a non-optimum picture display or video transmission.

To alleviate this problem there is a built-in four-bar grey-scale generator which is used to set the monitor brightness and contrast controls correctly. The grey-scale may then be recorded and replayed to set the RECEIVE contrast and brightness controls, which should be adjusted to match the original grey-scale display. Once set, these controls should not be re-adjusted, other than to compensate for poor video swing on a received signal. The SNATCH brightness and contrast controls are set by feeding in a signal from a correctly adjusted camera, and setting for best picture quality.

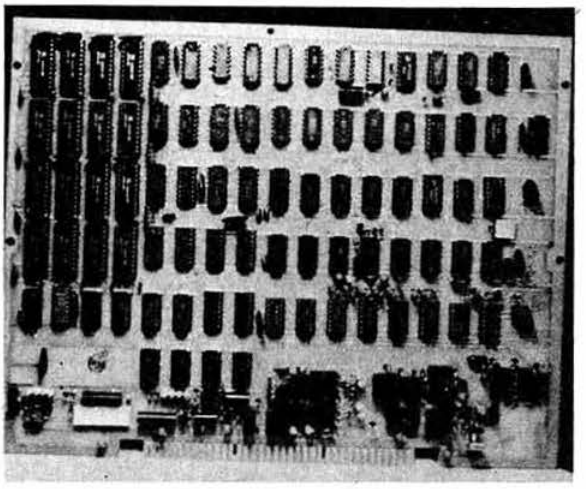
Correct adjustment of all contrast and brightness controls will minimize digital contouring, which is most evident in uniform (low contrast) areas of a picture, such as forehead or cheeks, which can also be greatly affected by incorrect lighting. Once the controls are set, the picture may be frozen in the memory by switching to MEMORY and pressing the SNATCH button, or simply by allowing a new picture to be "grabbed" at the start of each 8s frame. The last eight lines are used to display the grey-scale, which greatly facilitates correct receiver tuning and adjustment of the picture at the receiving station.

For received signals the Robot 400 does not include a tuning indicator for sync. One has to tune for solid blacks and whites, but with a constant brightness picture it is surprisingly easy to achieve correct tuning without the aid of a led indicator. Received pictures may be stored in the memory by switching the memory input switch to HOLD. The captured picture may then be re-transmitted or recorded on tape. The width control allows adjustment for the reception of different standards (15Hz American or 16⅔Hz British line rate) to completely fill the raster.

For transmission the Robot 400 may be fed into the transmitter via the microphone socket, or into the "patch" socket with transceivers such as the FT101E; either way the transmitter is still controlled by the ptt switch. An input level control is provided to set the correct level of audio drive. The transmit select switch incorporates a reverse position which produces a black/white reversal for special effects with callsigns or cartoons.

Circuit description

The fundamental requirement of any slow-to-fast converter is a picture storage memory capable of retaining over 65,000 "bits" of information. The 400 utilises 16–4k (4,096)–bit RAMS to achieve this. The memory chips used



Top view of pcb. The memory bank is shown top-left

are not fast enough, individually, to display a fast-scan picture; but this is overcome by multiplexing, which is simply arranging for the start of a memory cycle before the previous one is completed. Thus, the total operation is faster than the sum of the individual chips.

The block diagram is shown in Fig 1, and the following is a brief description of the major circuit functions:

(1) Slow-scan demodulator and fast- or slow-scan interface circuitry. Fast- or slow-scan selected for input to the memory.

(2) The analog signal is converted to a 4-bit binary (gray-code) signal. A digital grey-scale is generated and superimposed on the bottom 16 lines of the picture.

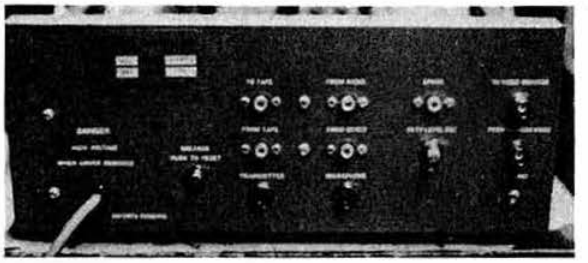
(3) The memory stores the digital information.

(4) A digital switch selects either memory output or analog/digital converter output. When the fast-scan input is selected for display on the monitor, one actually sees a picture which has been processed through the a/d and d/a converters and stored in the memory.

(5) Digital to analog converter, sync and blanking signals.

(6) Slow-scan generator. Signals are converted into fm slow-scan video. A latch stores the picture information between memory reads.

(7) Fast-scan timing. Includes a free-running oscillator, which is synchronized by the horizontal sync pulses stripped from the camera video, and a crystal-controlled oscillator which reads the memory for display.



Rear panel of Robot 400

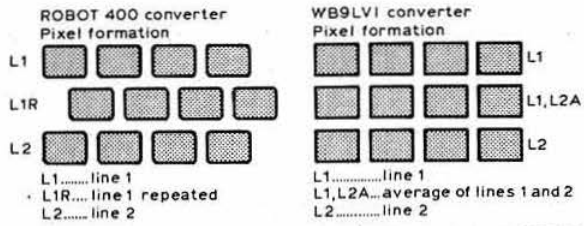


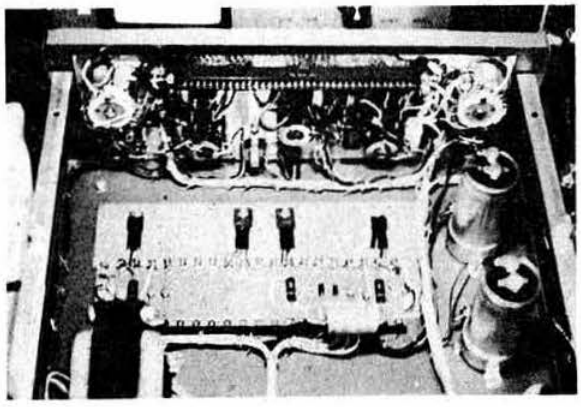
Fig 2. Pixel formations of the Robot 400 and the WB9LVI converter

(8) Fast-scan counters. The binary output of the counters are used to:
(a) address the memory;
(b) multiplex the memory;
(c) generate fast-scan sync signals;
(d) generate memory control signals.
(9) Similar to (7) but in slow-scan.
(10) Slow-scan counters.
(11) Address selector routes address from the fast- or slow-scan counters to the memory.
(12 and 13) Memory control functions.
(14) Write control signals.
(15) Snatch timing of a fast-scan picture into the memory.

Comparison of performance with WB9LVI converter

Thanks are due to G3TKR for allowing the Robot 400 to be tested alongside his home-built WB9LVI converter, and to G3UEU and G3TFF for their valued assistance in carrying out the comparison. Those readers familiar with the WB9LVI converter will know that the process of storage and conversion is basically similar to that of the 400, except that it utilises 64 1,024-bit shift-registers for the memory and incorporates line and pixel averaging to overcome contouring (painting by numbers effect) obtained with digitally-processed pictures.

The same sstv signal was fed into both units simultaneously and displayed on similar-size monitors (ideally it would have been better to use identical monitors to remove at least one variable). However, after extensive tests using various picture formats it was agreed that the quality of picture reproduction from both units was excellent, with preference in favour of the 400.



Interior view with pcb removed

TECHNICAL DETAILS

	INPUT
Fast-scan video	625 lines 1V pp white positive into 1kΩ. Positive or random interlace.
Slow-scan video	Signal amplitude 20mV–1V into 10kΩ. Minimum signal-to-noise ratio 6dB for clear pictures.
Standards	White 2,300Hz. Black 1,500Hz. Sync 1,200Hz Sync-pulse widths: 6ms horizontal, 66ms vertical.
	OUTPUT
Fast-scan video	Standard tv video signal 1·4pp white positive into 75Ω.
Slow-scan video	Accepted sstv modulation 1,200Hz to 2,300Hz fm 2V pp (max) into 1kΩ load. Line rate 15Hz in 60Hz countries, 16⅔Hz in 50Hz countries.
Power consumption	33W.
Voltage input	105–125V ac 60Hz. 210–250V ac 50 Hz.
Dimensions	Width 12½in, depth 11¾in, height 6in.
Weight	12lb.
Construction	All aluminium chassis and case, solid-state circuitry on one glass epoxy pcb, 19 transistors, 77 ICs 16–4k RAMS.

This speaks very highly of the Robot 400, which does not incorporate line averaging but simply repeats each line twice to obtain the 256-line read-out. The Robot manual, which is very comprehensive, chronicles how tests were carried out by an independent panel of observers who ultimately judged the "unprocessed" picture to be better. In theory, line averaging, ie inserting new pixels by averaging along the line (to produce 256 pixels), and line to line should produce a better picture. In the reviewer's opinion, the Robot 400 manages to get round this by the simple expedient of displacing or delaying the start of the repeated line as shown in Fig 2.

Conclusions

The Robot 400 is the only commercially-made scan converter available for amateur use in this country, and comes from a company with the highest reputation in the slow-scan field. It can be recommended to both the newcomer to sstv and the experienced operator. It is worth noting here that the observed apparent quality of a "quantized" picture can be greatly improved by the simple expedient of viewing the screen from a sensible distance. Using one of the popular 9in monitors, the viewing distance should not be less than 6ft.

With any piece of electronic equipment, one can always list desirable modifications. In the case of the 400 the only really worthwhile modification, which at this time is applicable to all scan converters, is an increased memory size to give more brightness levels—but at the present cost per bit such a modification would price the unit off the market. Larger memories will become a financial reality in the future.

Acknowledgement

The model reviewed was supplied by the sole importers, Aero & General Supplies, Nanaimo House, 32 Rufford Avenue, Bramcote, Nottingham NG9 3JH, who gave every assistance in making the model available to the reviewer for an extended period despite customer pressure for delivery of every unit available. □

swl news

Bob Treacher, BRS32525 *

A limited mail

Due to the late arrival of the January issue of *Radio Communication*, this month's offering is very much a case of what your scribe heard! Only two letters have been received; one from a new correspondent, E. C. Adams, BRS39674, and the other from John Holmes, BRS38934. The former comments on broadcast reception from a newly-constructed HAE one-valve receiver. As a complete novice to the hobby, a great deal of pleasure was obtained when excellent signals were received from many short-wave stations in Europe.

On the other hand, John has applied for planning permission to erect a tri-band beam. The results will be awaited with interest. He has also heard many AA callsigns. These are being used by Americans simply because W, K, WA etc callsigns have been totally used up. A first W6 on 3·5MHz is his best dx this time around, plus GD4BEG on 1·8MHz. John also comments on the number of amateurs, especially on 1·8MHz, who fail to send their callsigns even after 15min of a QSO.

This bad practice is not only a breach of licensing conditions but may cause many listeners who hear it to feel that they can adopt this procedure when they obtain their own licences. This, surely, is no way to keep our bands in good order. Hopefully, it may not be too late for some people to make a New Year resolution and, thus, make our bands that much more pleasant both to work and listen on.

3·5MHz dxing

No feature written by your scribe is ever complete without special mention of what some describe as the radio operator's nightmare. The 3·5MHz band—commonly known as "75" in the USA—is always at its best in the early months of the year, and particularly in the time up to which G-land reverts back to bst. It is during this period that conditions are just right for inter-continental working on the band. For those who are new to the 3·5MHz dx game, dx traffic is possible when the greater part of the path lies in darkness, and it is a fact that the best times for dx are during the periods shortly before and shortly after sunset and sunrise.

An example would be the path between G and ZL. Sunrise in G corresponds with sunset in ZL and vice-versa, therefore dx QSOs between them should be at their best between 0800 and 0830 and 1715 and 1745 in, say, mid-January. The Scandinavians have dx capabilities during much of the day at this time of year, of course, because they have a much greater period of darkness than the remainder of Europe. It is, therefore, possible for SMs, OHs etc to work the dx at 1300 or 1400.

The early part of January was disappointing for dx. It seemed as though the band was only open to the USA during the mornings, and the evening sessions tended to provide excellent conditions to Japan, but very little else. However, around the middle of January the band became very much better, with dx signals really strong from some quarters. Some of the more notable dx stations heard were: Asia – CR9, DU, 9K2, A4, YB, YK and AP2; Central and South America – 6Y5, FM7, VP2V, ZF1, HH9, TI, C6, 8P6 and CO; Pacific – ZL, VK, KG6, KH6 and ZL3/C; Africa – D4, 5Z4, 5U7 and 5T5. Over 30 W6/W7 stations were also heard, mainly between 0700 and 0900. As a result of the improvement in conditions it was more than possible for 100 countries to be logged on 3·5MHz during January alone.

DX news

It is rumoured that several rare dxpeditions are on the cards for the end of March/early April. The most intriguing is the intended expedition by a group of French amateurs who intend to activate Clipperton Is, FO8. It is understood that they will be disappointed if they do not make 20,000 QSOs during their eight-day stay. If they do amass this number, it will be an enormous job for the unlucky guy that acts as QSL manager!

The second rumoured expedition is to Aves Is, YV0, the Island of Birds. Aves Is lies some 800km north of the Venezuelan mainland and is only 50 by 600m in size, and only 3m above sea level, which means it can be overrun by the sea during heavy storms. It can be seen, therefore, how treacherous this expedition could be.

The third rumour concerns some activity from 8Z4 by a group of Middle-East operators. As can be imagined, all three would certainly be a tremendous bonus to all who may be lucky enough to hear or work them.

The tables

For obvious reasons, no table scores appear this month. The 1978 table will appear for the first time in the April issue. It should be remembered that the guidelines set out in the January issue should be adhered to in submitting scores. The All-time list will also appear in April, providing there are sufficient changes to warrant its appearance.

Finale

We hope there will be a bumper mail for the **May** issue. Comments, to your scribe's QTH, by **23 March.** □

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technical topics

Pat Hawker, G3VA

A RECENT article on reliability suggested that too many designers of electronic equipment regard reliability calculations as unnecessary, indeed bordering on the "black arts". Such calculations are based on statistical probabilities and everybody has heard of "lies, damned lies and statistics". It is of course possible to admire the impeccable logic of reliability calculations without accepting the final "mean time to failure" figures. Long ago the reliability experts convinced me that if I could build equipment that had no soldered joints and no electrolytic capacitors it might keep working, if only long enough to prove that nowadays it is is not always component reliability that matters in practice, but that fellow Murphy and his confounded laws.

Reliability in practice

Personally I find that many, if not most, of my electronic failures are self-induced. I drop things (usually multimeters or essential tiny nuts); I switch on before I have checked everything twice; I break very thin wires; I get the polarity wrong; I try and get away with that temporary hook-up with bare wire. In other words, I suffer from "finger trouble" and the insane optimism that I can improve things with a bit more tweaking, or do not need to look up the pin connections; or that, against all laws of gravity, it is quite safe to balance that instrument on the edge of that cabinet.

So, I suspect, do many other amateurs—which is perhaps why there is continuing disbelief in reliability calculations. One does not find insurance people basing their actuary calculations on estimating the potential life of all the various individual bits and pieces that make up the complicated human body, but rather from studying what happens (on average) to the *system*, accidents and all. This is not to say that we cannot still learn a lot from studying component failure rates and identifying the weak points of a design, noting particularly the way that many components become far less reliable when the operating temperature of the equipment is high. Indeed the added importance of "accidents" is a tribute to the greater reliability of individual components. And gradually we are learning (sometimes the hard way) that in the world of semiconductors "preventive maintenance" is *out*—if a piece of equipment is working within specification, leave it alone: there is nothing as lethal as a test probe!

Self-oscillating direct-conversion detector

There is a phrase that, while accurate enough in many fields, can be highly subversive when applied unthinkingly to amateur radio: "you get what you pay for". It carries the implication that high-cost equipment will always out-perform the low- or medium-cost approach. Yet low costs can often provide very adequate results, although sometimes on fewer bands or fewer modes. Unfortunately newcomers are increasingly gaining the impression that an amateur station now demands an investment of many hundreds of pounds.

Such a view, for instance, overlooks the second-hand market and "Members Ads" which can still turn up old but well-built equipment that is often capable of excellent cw operation and may frequently be modified for use on other modes, including dsbsc and sometimes ssb. There is also still the modest rig that can be home-constructed without demanding high skills; the continued interest in direct-conversion receivers (and even the regenerative "straight" approach) shows that quite effective receivers capable of coping with modern band conditions *can* still be put together for just a few pounds.

Lionel Sear, G3PPT, has been investigating a novel approach to direct-conversion that even eliminates the need for the usual vfo/buffer stages; this was the result of reading an item in *Elector*, July/August 1977, p72. This described a self-oscillating ssb product detector based on a dual-gate mosfet. G3PPT thought that this basic idea might well have possibilities as a complete direct-conversion demodulator/oscillator, and he put together the receiver outlined in Fig 1. This gave full loudspeaker output and, in spite of the absence of "single-signal" reception, has been found, G3PPT writes, "to give a very good account of itself against my main station SB101".

Rather surprisingly for a non-balanced mosfet demodulator, G3PPT has found this arrangement remarkably free from the vice of so many direct-conversion receivers: direct demodulation of strong broadcast a.m. stations.

He also finds that, like the Russian anti-parallel diode-pair demodulator (*TT* April, July 1977), it works well on

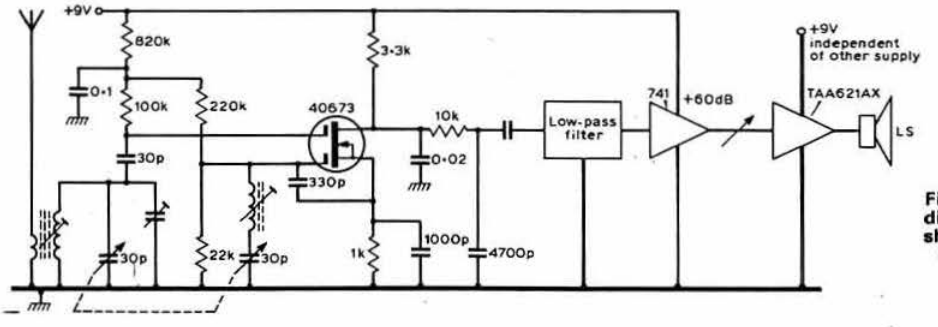

Fig 1. Outline of the G3PPT direct-conversion receiver showing details of the self-oscillating mosfet detector

harmonics of the oscillator frequency. The high input impedance of the mosfet preserves the Q of the input circuit so that either fundamental or harmonic reception is possible without excessive spurious response in the alternative mode. G3PPT does not comment on the stability of the oscillator but this has evidently proved sufficiently good, at least on the lower frequency hf bands.

G3PPT draws attention to this self-oscillating demodulator as an idea suitable for further investigation rather than as part of a complete receiver design; for this reason full component details are not listed. The basic arrangement may also be of interest for its original application as a fixed frequency ssb product detector.

PA0ZR's audio phase meter

A novel test unit for the accurate adjustment of 90° broadband audio phase-shift networks, such as those used in phasing-type ssb generators or demodulators, has been developed by Anjo Eenhoorn, PA0ZR and published originally in Dick Rollema's "Reflecties door PA0SE" in *Electron* December 1977. PA0SE has very kindly made an English translation of the original notes.

This is an instrument (Fig 2) that makes it a simple matter to adjust an audio phase-shift network for optimum results on the basis of direct measurements rather than the conventional indirect technique of trying to check the accuracy of the network by measuring the sideband suppression. The network is fed from an audio generator with tones of variable frequency, and the outputs from the two branches of the network are fed to inputs 1 and 2, respectively, of the instrument. The sine-wave input signals are converted into square waves by means of type 709 op-amps. Frequency compensation in the op-amp feedback is selected so that the zero crossings of the square waves coincide as nearly as possible with those of the original sine waves.

The two square-wave signals are fed to a type 74LS86 exclusive-OR gate. When the square waves are in phase the output (pin 6) remains "low" all the time; when they are in exact antiphase, pin 6 remains "high". In intermediate situations a square-wave signal appears at the output (pin 6). Should the two square-wave signals have a phase difference of exactly 90°, then the square-wave output signal would be symmetrical (ie exactly 50 per cent duty cycle).

The circuit arrangement is such that the meter can be made to deflect to exactly half-scale for a symmetrical output signal. With the component values shown (total resistance in the meter circuit about 2,000Ω and a 100μA fsd meter) a deviation of plus or minus 5° from 90° causes the meter to indicate either zero or full deflection.

After construction, the pre-set potentiometer (RV1) requires adjustment, but this is quite simple: with only one sine-wave input signal it is adjusted so that the pointer of the meter is at mid-scale.

It should be noted that harmonic content in the signal from the audio generator will falsify the result. PA0ZR has found that one per cent harmonic distortion in the generator output will cause an error of about 1° in the measurements made with the test instrument. However, it is relatively simple to determine whether the harmonic distortion is excessive: with only one input signal connected (as when adjusting RV1) the generator is varied over the frequency range of interest (ie typically 250 to 3,500Hz). If during this procedure the meter deviates from mid-scale, then it indicates the presence of harmonics and also indicates, by the magnitude of the deviations, the approximate degree of accuracy that can be expected from the instrument.

Fading and the ionosphere

Every amateur who operates on hf relies on the ionosphere, yet only a minority take a serious interest in the way that the ionized layers interact on their signals. This is true not only of the amateur but also of many professional communication engineers, as pointed out in an article "Diversity reception of telegraph signals" by J. P. R. Gorries in *Communication & Broadcasting* Autumn 1977. The author is concerned particularly with the effects of propagation on information-bearing sky-wave transmissions and the factors involved in choice of antennas for diversity working.

Very few amateurs, of course, use diversity; partly because they believe (wrongly) that this requires large, widely-spaced antennas, forgetting that polarization

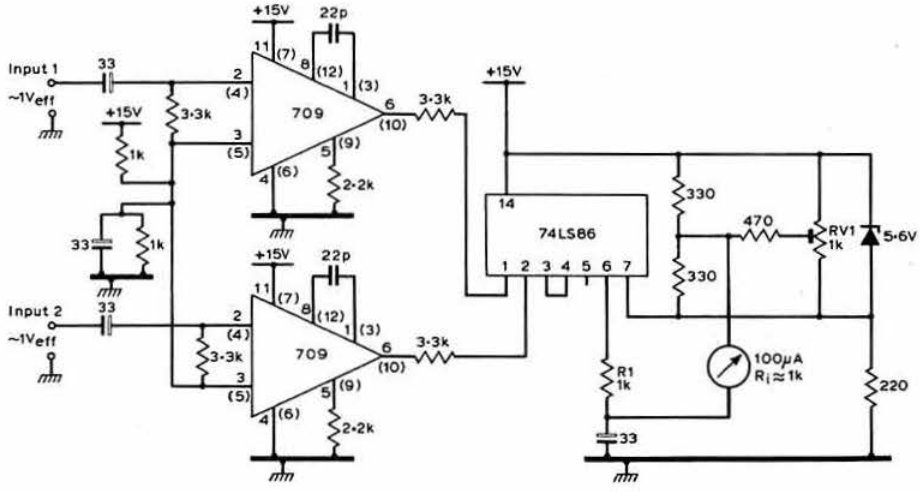

Fig 2. PA0ZR's audio phase meter which facilitates the setting up and adjustment of audio phase-shift networks. The pin numbers for the 709 op-amps are for the round (TO-5) type, but the figures given in brackets are for the dual-in-line type of device. Components ±10 per cent

diversity at a single site can be extremely effective. Nevertheless, diversity reception of any type does call for more complex receiving equipment and is unlikely ever to be used by many amateurs. However, the article does include very useful notes on a number of fundamental aspects of hf propagation and the usual causes of long-term and short-term fading: these notes are summarized briefly below.

Energy loss from a sky-wave signal due solely to *path distance* is proportional to the square of the distance and is constant (ie what is usually known as the inverse-square law).

Deviative absorption loss occurs in the process of bending the path of the wave-front; it is usually negligible compared with other losses (although becoming significant on multi-hop paths).

Non-deviative absorption loss occurs as the wave-front passes through comparatively dense layers which are insufficiently ionized to cause reflection. This loss varies fairly slowly with time of day, season etc. (Note it is largely this loss that amateurs associate with "conditions" and, provided the path is "open", tends to be determined largely by the state of the D layer—*G3VA*.)

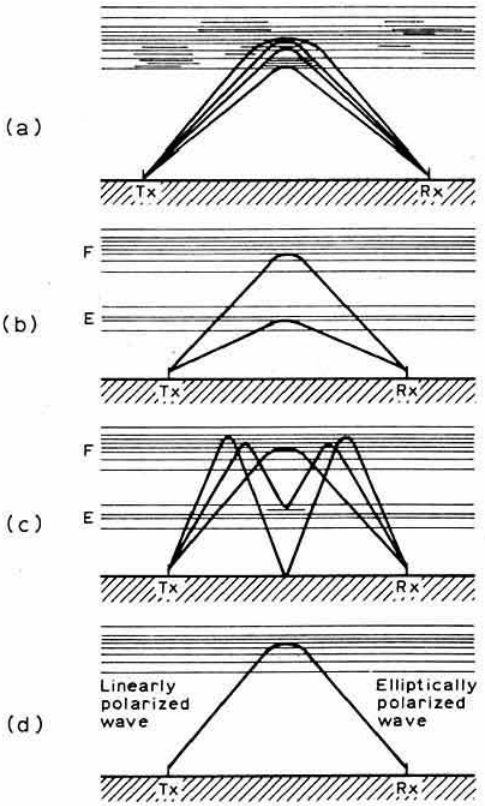

Fig 3. Showing the modes of propagation that give rise to interference-type fading or fading due to polarization rotation. (a) Inhomogeneity of the reflecting layer providing multiple reflections of the same transmission; (b) simultaneous arrival of signals reflected from the E and F layers; (c) Simultaneous arrival of signals propagated along different paths, including single and double hop with and without intermediate ground reflection points; (d) polarization rotation during propagation that results in elliptical polarized wave

More rapid fluctuations (usually not amenable to diversity techniques) can occur, often around dawn or dusk, due to the short-term maximum usable frequency (muf) oscillating about its changing median value (ie, in effect, signals going quite rapidly into and out of "skip").

None of the above effects accounts for the forms of "fading" that we associate with hf transmissions. These are basically due to the "interference patterns" caused by simultaneous arrival of two more signals of varying phase/amplitude differences or due to the polarization coupling losses associated with constantly changing polarization of the downcoming signals, as indicated in Fig 3, and summarized below.

(a) Single-path interference fading due to reflecting layer inhomogeneity. A signal reflected by the ionosphere is no longer a simple coherent wave-front. The many inconsistencies within the reflecting layer mean that signals return to earth over many slightly different and often varying paths. Although the total signal collected by an antenna may remain substantially the same, the amplitude and phase of the detected field in the plane of the antenna will vary with the relative phase of the components. The signal components may combine additively or may result in partial cancellation. The result is a pattern of widely differing field strengths at closely spaced locations, continuously scintillating.

(b and c) Multi-mode and multi-hop fading. More regular patterns occur when two or three signals arrive with distinctively different path lengths, interacting at the point of reception. For example, hf signals often arrive simultaneously from different layers, or from combinations of multi-hop paths that include or do not include intermediate ground reflection points. If the different paths result in signals of widely different signal strengths then the degree of fading will be *lower*, since the weaker signals cannot then "cancel" the stronger signal.

(d) Polarization rotation fading. An effect of ionospheric reflection is the transfer of some energy from the radiated wave-front polarization to a reflected wave-front orthogonally polarized. What this means is that if your signal reaches the layer horizontally polarized, the downcoming signal will be partly vertically polarized so that in practice the signal at the receiving antenna is likely to be *elliptically* polarized, with its major/minor axis ratio continuously rotating and its major axis tilt constantly varying. It is for this reason that many books misleadingly suggest that a downcoming signal can be regarded as randomly polarized. In practice a dipole or any antenna that is sensitive to field polarization gives an output signal which fluctuates as the field polarization rotates, even though there is a constant total field strength.

The cloudy, patchy ionosphere

Several of the points mentioned above are seldom appreciated by hf operators: for instance, that while the "muf" of the F or E layers usually determines whether a particular path is open or closed, the strength of the signal may be determined much lower, often in the D layer; or alternatively by whether "multi-hop" signals have arrived via conventional intermediate ground reflection points or by some form of reflection or entrapment between layers.

Again we often think of a "layer" as a fairly consistent zone, forgetting the importance of "travelling ionospheric disturbances". These daytime, wave-like disturbances or variations in electron density, usually moving between 1–10km/min, produce a number of effects on hf communication, including marked variations in amplitude, Doppler shift and direction of arrival of the signals.

A recent paper that shows vividly the way signals arrive over different paths, often with different Doppler shifts, is "Measurement of the elevation angles of arrival of multicomponent hf skywaves" by Dr R. H. Clarke and D. V. Tibble (*Proc IEE*, Vol 125, No 1, January 1978, pp17–24). This indicates the way that components of the same hf transmission often arrive simultaneously at different vertical angles. The paper is based on measurements made using eight horizontal loop antennas (diameter 1·5m) equally spaced up a 73·6m wooden tower at Blakehill, Wilts.

Where signals arrive with comparable strengths the result is interference fading of about 15dB, with typical fading periods of a few seconds for F-mode echoes and tens of seconds for sporadic-E mode transmissions. The authors note that Es-mode transmissions frequently comprise discrete specular components and that "this is further evidence that the sporadic-E layer has a patchy horizontal structure with isolated clouds of enhanced ionization, each contributing to the reflection process", as well as noting that "travelling ionospheric disturbances propagating through the F region may be responsible for the multiple F-layer reflections".

Thus it is now increasingly accepted that several of the ionospheric layers are both patchy and cloudy. One suspects that it is the existence of clouds of enhanced ionization that accounts for the common phenomenon (on 21MHz and above) where a band remains open over quite long periods to just one, quite small, region, so that one often seems to work a succession of stations in or near the same town, with few other stations audible.

Visual cw and loss of hearing

The special value of amateur radio to the handicapped has been long recognized; over the years, for example, many ingenious aids have been developed to help blind amateurs make effective use of their equipment. Rather surprisingly, however, very few ideas have been suggested to help those with substantial or profound loss of hearing. It might, indeed, seem unlikely that this unfortunately quite-large section of the community *could* benefit from a medium that depends principally on audible communication. Yet this is misleading. Headphones enable many people with quite severe hearing loss to take a full part in the hobby without any other special aids. Or again, rtty with machine printers or visual display units presents no special operational problems even to the profoundly deaf, and such techniques can now be extended to the display of not only machine codes, but also cw on video screens or with simpler light-emitting diode matrices.

But rtty and electronic character displays, even the simplest, tend to increase costs considerably and are not altogether ideal systems for a handicapped beginner, though some machine-telegraphy enthusiasts might not agree with me. But few would disagree with the view that a basically simpler technique is to present incoming cw as "vibration" to a touch-sensor, or as "light" to a low-inertia light display.

In *Break-in* (September 1977) Vern Rule, ZL1VP, points out that the eye has a shorter perceptual response time than sensing by touch the vibrations of a loudspeaker cone or diaphragm. He comes up with the add-on light converter arrangement shown in Fig 4. The circuit is broadly peaked for an input tone of about 750Hz and rejects what ZL1VP describes as "the surprisingly high level of hum found in some communications receivers". This filtering also means that the system can be used in the presence of considerable interference, static, etc, despite the loss of the adjustable beat note that helps the amateur who listens to the signals.

To assist accurate tuning and identification of signals, ZL1VP recommends the use of a cheap oscilloscope set up to monitor the output of the receiver. He writes:

"If the oscilloscope is adjusted to display 10 sine-wave patterns of 750Hz, cw plus other modes (a.m., ssb, rtty and QRN) can be easily identified. At maximum output level a signal barely audible from a loudspeaker will give reasonable output to the light-emitting diodes."

While it is, of course, difficult for those of us fortunate enough to be able to listen to signals to determine exactly how useful such systems would be for those who have to learn to use them in earnest, it does seem reasonable to suggest that a sound-to-light converter of this type could prove an effective means of first learning the code and then using it "on air" no matter how complete the hearing loss. Without an oscilloscope as a tuning aid, it might prove possible to use a touch-sensor as a preliminary tuning guide, and with the 750Hz resonant filter circuit it would be advisable to use a receiver with a low tuning rate.

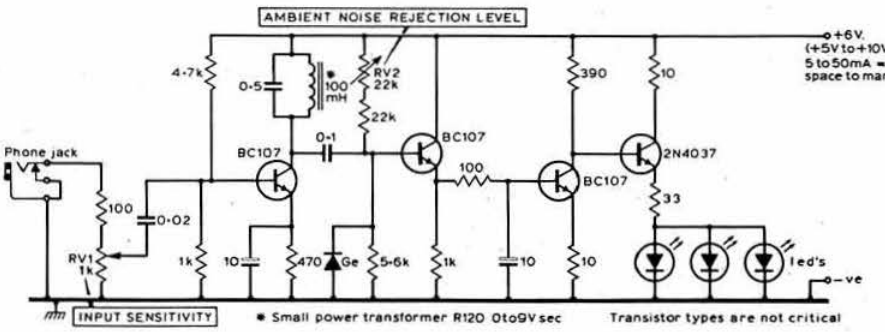

Fig 4. Sound-to-light converter that provides "visual cw" for persons having profound loss of hearing not amenable to normal use of headphones

Presumably, even with a low-inertia led display, a finite limit to receiving speed would be imposed by persistence of vision, but this should not be apparent at normal operating speeds. It may be that in future other forms of transducers will be developed, for instance feeding electrical impulses directly into the nervous system. But, for the present, a light converter might well provide a practical and economical technique for a deaf amateur.

TVI/BCI statistics

Annually, for almost a decade, I have commented on the radio interference reports issued by the Home Office Directorate of Radio Technology and compiled from investigation of viewer and listener complaints by the Post Office Radio Service. While, unfortunately, the statistics seldom become available until about a year after the period concerned, they do underline the long-term trends and represent the only official guide to the incidence of tvi/bci. The latest statistics (for 1976) differ in a number of ways from the previous reports in listing more categories of interference sources, making direct comparisons with previous years more difficult.

However, amateurs have every reason to be pleased at these changes since, to quote the report, "fewer complaints have been recorded as being caused by radio transmitters, and more complaints as being due to spurious responses of receivers. Over a number of years an anomalous situation has developed in which a number of complaints of interference were recorded as being caused by transmitters, although the transmitters were not at fault, and the complaint was due to insufficient immunity of the receiving equipment. This anomaly has been removed under the new system of recording information." Additionally, interference specifically ascribed to amateur stations is now recorded in two separate categories: (a) due to fundamental radiation; and (b) due to harmonic radiation.

Looking at the report as a whole, the number of complaints continues to fall quite rapidly on television, but is tending to rise significantly on radio. These trends appear to be due principally to the continuing changeover of viewers to reception on uhf (bands 4, 5), the better coverage of the tv networks as the "gaps" are gradually filled in, and a general revival of interest in radio listening.

Total complaints are now down to 42,395 (−4·73 per cent). Television complaints were 27,723 (−15·66 per cent) made up of 21,057 (−2·2 per cent) on uhf and 6,666 (−41·17 per cent) on vhf. The radio complaints at 13,322 were up by a massive 32·15 per cent, but this is partly accounted for by the separate listing of mf and lf complaints, previously lumped together: 8,247 complaints represent mf and lf; 5,075 (+24·6 per cent) vhf/fm. Note that if one complainant suffers interference on several bands, this is counted as *several* complaints. The total number of complainants was 36,937 representing 42,395 complaints. Of these, 14,653 were traced to specified sources of interference, no less than 18,954 were due to conditions at the receiving site (inadequate antennas, faulty receivers, poor immunity etc) and 8,788 were unidentified.

Of the identified sources of interference, domestic contact devices (eg thermostats) is the major specified cause of interference (6,388 complaints). In comparison, low-power motors in domestic appliances accounted for 959 complaints, industrial contact equipment 1,220, high-voltage (ac 1-100kV) distribution lines 404, fluorescent lamps 292, and tv time-base radiation 228 plus 196 due to time-base parasitic oscillation radiation. But the complete list is now a very long one with some industrial equipment, such as plastic-seam welders, wood-glue driers, microwave cookers, semi-conductor control equipment (eg thyristor light dimmers) etc, all contributing unwanted interference. Incidentally the old bugbear "ignition" is now down to a modest 141 cases. Unfortunately, of course, radiation sufficiently strong to ruin dx reception but not sufficient to interfere with reception of the qualifying local broadcast stations, is not reflected in these statistics.

Finally, what about "amateur stations" as a cause of interference? The new system brings the total down to a modest 151 for "fundamental" radiation and only 36 for "harmonic" radiation. This highly satisfactory total of only 187, from 144 sources compares with 1,000-plus in the years to 1973 (as high as 1,442 in 1969) and 785 in the last year of the old system (1975). The two categories break down as follows:

Type	LW	MW	Band 2 vhf/fm	Band 1 vhf tv
Fundamental	8	6	27	6
Harmonic	1	—	2	5

Type	Band 3 vhf tv	Bands 4-5 uhf tv	LMR mobile	Total
Fundamental	4	96	4	151
Harmonic	2	23	3	36

It is a little puzzling how harmonics from an amateur station can be the cause of interference to long-wave reception, but perhaps we should not quibble. There is no doubt, however, that the new system is of tremendous benefit to amateurs.

Simple two-way signalling system

In introducing a simple party-line intercom system (*TT* December 1976) I noted that a need often exists for strictly non-dx communication between an amateur's shack and his domestic environment—if only to let the operator know that he is wanted on the telephone, to eat a meal, or to do the washing up, etc. Further, it is very useful to be able to acknowledge receipt of the "message", particularly if you are in the middle of a contact and cannot take immediate action.

For such purposes almost any crude signalling system—with bell, buzzer or bulb—can be effective, particularly with a simple "code". However, even the

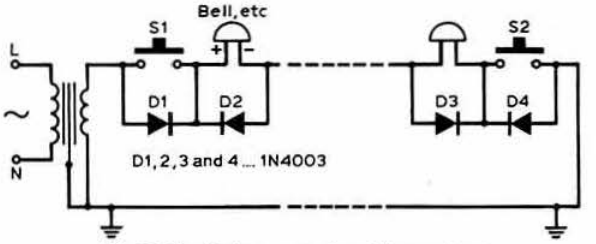

Fig 5. Simple two-way signalling system

crudest systems tend to involve batteries at both ends, three-core leads, etc.

In *Practical Electronics* January 1978, L. O. Green shows how a few diodes can greatly simplify matters, Fig 5, permitting the use of a single low-cost bell transformer and two-core cable (or a single wire with earth returns). Explanation seems superfluous.

Printed circuit board tips

In *Amateur Radio* October 1977, Bruce L. McCubbin, VK3SO offers a number of tips he has found useful in the construction of printed circuit boards. He notes, for instance, that ordinary mineral turpentine will remove Dalo inks much better than the resist remover supplied in many of the kits.

When drawing a board with a Dalo pen he finds that small bubbles can appear and that sometimes, during etching, the ink will part company with the copper it is supposed to be protecting. He suggests that both these problems can be largely obviated by thoroughly cleaning the copper and then *lightly* etching the entire surface of the board *before* drawing the tracks; a slightly etched surface, he finds, holds the resist ink much better than a shiny copper surface.

Where integrated circuits are to be mounted on a pcb he finds it difficult to draw individual pads. Instead he uses a piece of commercially made ic mounting as a template, carefully pricking through the holes with a sharp scriber and then applying a solid bar of resist ink along the marks. When the ink is dry, he carefully scratches it away from between the pads, leaving them nicely square.

Finally, he notes that making PCBs means that one often finishes up with small off-cuts of apparently little use. However, these can be used to make nameplates. Carefully letter them as required, etch in the usual way and attach to the equipment; with care, VK3SO states, these can be made to look quite professional.

Assorted cookies

From *QST* (December 1977) by Tom Bracket, K0JFN: "An old trick for soldering to aluminium is to place a drop of oil on the aluminium and then scratch the metal with a knife or other sharp instrument until the area to be soldered is shiny. Apply a soldering iron and resin-cored solder. After the solder has taken, wipe the oil from the surface. A very neat solder base should then appear."

A cheap source of antenna wire is copper-clad steel wire which (in the USA) is available in half-mile reels for about $23 (less than 1c/ft) from farm supply stores. This type of wire is used by farmers for electric fences and is usually about 18awg, but is of greater strength than 18awg copper wire. ARRL notes that after several years of exposure to the weather, copper-clad wire tends to become pitted in various spots, so the wire should be examined every two or three years.

A cheap form of hf rhombic antenna has been described by J. Gregg Stephenson, W2OBX. Living near woodland, he just drapes the 250ft legs of the antenna over trees and finds it works well, has no deep nulls off sides, and shows no significant difference in performance between summer and winter.

What has been described as a "super cheap 7MHz cw transmitter with sidetone monitor" has been reprinted in *Old Man* from *73* magazine: Fig 6. It originated from WB4CTC, provides an rf output of about 250mW and its cost should be under $5. Most QRP operation in the UK seems to be on 3·5MHz, although one hears some very low power Continental stations on 7MHz during daylight. However, there is no reason why the little rig should not be adapted for 3·5MHz with appropriate changes to the component values. □

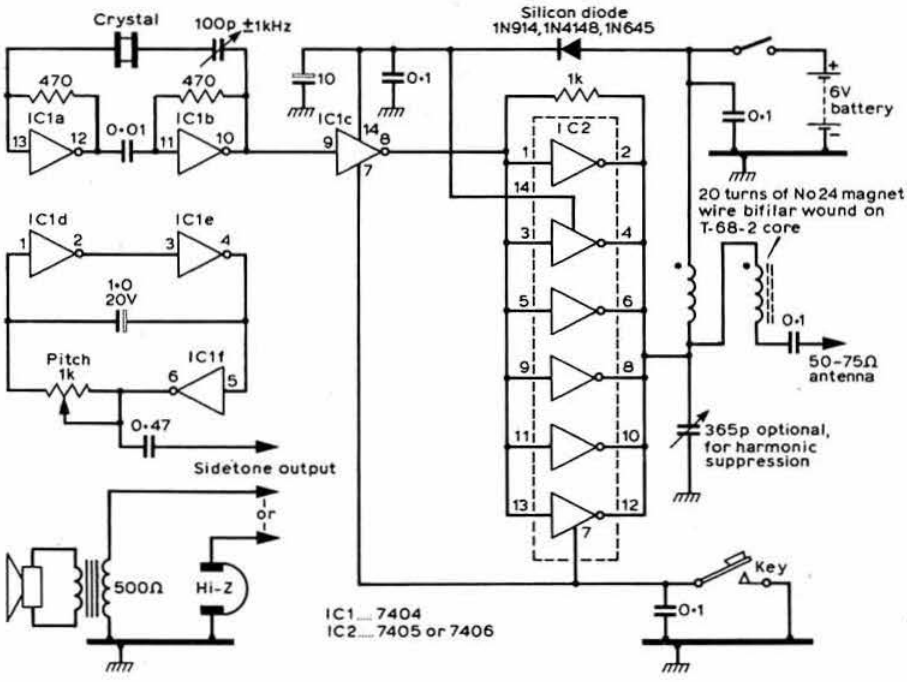

Fig 6. WB4CTC's "super-cheap" low-power 7MHz cw transmitter with sidetone monitor, providing about 250mW rf output

microwaves

Charles Suckling, G3WDG *

1·3GHz news

G4DGU (ZL24E) reports that he is now operational from his home QTH on 1·3GHz. His equipment is of a fairly advanced nature, and consists of a parametric mixer, driven by 3W at 576MHz and 750mW at 144MHz, which produces 1·1W of cw/ssb at 1,296MHz. This is amplified by two 2C39A stages to produce 40W. The antenna is a pair of G3JVL loop-Yagis at 36ft agl. On the receive side, G4DGU uses an NEC57835 transistor preamplifier with a measured noise figure of just under 3dB. During his first five days of operation with this equipment, G4DGU worked G3KMS, G3TFQ, G8GP, G6XM, G3JXN, G8EVU, G3AUS and G3LQR.

The equipment described above is, of course, capable of contacts using tropospheric scatter propagation, and G4DGU is keen to carry out tests with similarly equipped stations. G4DGU considers that it would be worth adopting the 432MHz moonbounce operating procedures for tropo-scatter tests at extreme ranges, ie accurately timed transmitting and receiving periods lasting for 2·5min. During the first 2min of a transmitting period, a station would send the callsigns only, the reports being sent during the last 30s. This would ensure that, under the weak fluttery signal conditions usually experienced using this mode of propagation, the receiving operator would know when to be listening for what information, and when it was his turn to transmit. It should be pointed out that a similar procedure was used during the series of tests between G3KAC (Bristol) and PA0SSB some years ago, and was found to be most useful. Needless to say, accurate antenna alignment and frequency setting are also required if such tests are to be successful. The writer would be pleased to receive any comments on this idea.

Another station newly active from home on 1·3GHz and looking for contacts is GM8FFX (Aberdeen). GM8FFX also reports that the proposed 1·3GHz beacon for Edinburgh is now awaiting a licence. It has been built by GM8BJF and GM4DIJ, and is at present undergoing soak tests on a dummy load.

New 1·3GHz beacon

On 17 December the new 1·3GHz beacon GB3MLE became operational on its nominal frequency of 1,296·93MHz. It is located on Emley Moor and generates 50W erp. The antenna is a corner reflector, beaming SE. Within a few days of switching on, the beacon had been heard by G8EVU (Southend), G3BNL (Bushey), G3COJ (High Wycombe), G3AUS (Newton Abbot) and G8DDK (Luton). These reports indicate that the beacon will have a wide coverage area and should, therefore, be a most useful indication of propagation conditions. Further reception reports will be most welcome.

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10GHz news

G3JHM (Four Marks) has supplied details of some interesting tests carried out by himself, G3JVL and G8BDJ. On 14 January he heard G3JVL (Hayling Island) over the 40km path between their homes, which contains a 500ft obstruction. Signals were 2dB above noise in a 400kHz bandwidth. G3JHM was using an 18in dish and an 8·5dB noise figure receiver, and G3JVL was running 6W output from a twt into a flyswatter antenna, equivalent in gain to a 24in dish, at 40ft agl. The calculated loss involved with the obstruction is approximately 60dB. It is worth noting that if narrow-band equipment had been in use, then signals could have been obtained using only 60mW of transmitter power!

In a second test, using similar equipment, operating portable from a site near Brighton, G3JHM and G8BDJ heard signals from G3JVL 5dB above noise over an obstructed 63km path.

G3JHM also reports increasing interest in 10GHz in northern France. F1DPC/P and F1DRR/P (Paris) recently completed an initial contact over 1km. F5ZA (St Brieuc), F3LP (Le Havre) and F1ABA (Amiens) are now active on the band, with F1CFD (Rennes) nearly operational.

3·4 and 5·7GHz activity periods

In view of the increasing activity on 3·4 and 5·7GHz, the Microwave Committee has decided to organize two activity periods for these bands during 1978, on 30 April and 10 September, between 0900 and 1700gmt. Each period will encompass both bands. The writer is prepared to organize an information sheet service for these tests, similar to that which proved so valuable for the 10GHz cumulative contest last year. This will enable participating stations to know who else will be operational. Anyone intending to be active during these periods is asked to please send in details of their equipment, proposed sites (including NGR), and preferred talkback frequencies, together with an sae, to arrive no later than 10 days before each event.

The use of a klystron as an rf preamplifier

An old reference came to hand recently which the writer still finds intriguing. The paper describes the use of a 2K25 klystron as an rf amplifier at 10GHz, and this apparently can have a surprising performance: the value quoted was a bandwidth of 20MHz, a gain of 14dB and a noise figure of 5dB. The klystron was mounted on a length of waveguide fitted with matching screws at each end, and with a coaxial shorting plunger located beneath the klystron probe. It would be interesting to hear if any readers had experience of this technique. The paper is given in *Electronics* 8 January, 1960, pp56–7.

Calculating equipment performance

One of the attractive features of operation at microwave frequencies is that it is, in some cases, possible to compute, with a fair degree of accuracy, the expected signal-to-noise ratio for a given set of equipment over a particular path. This type of calculation is often termed a "link-budget", and normally considers the entire transmitting-receiving system, together with the path

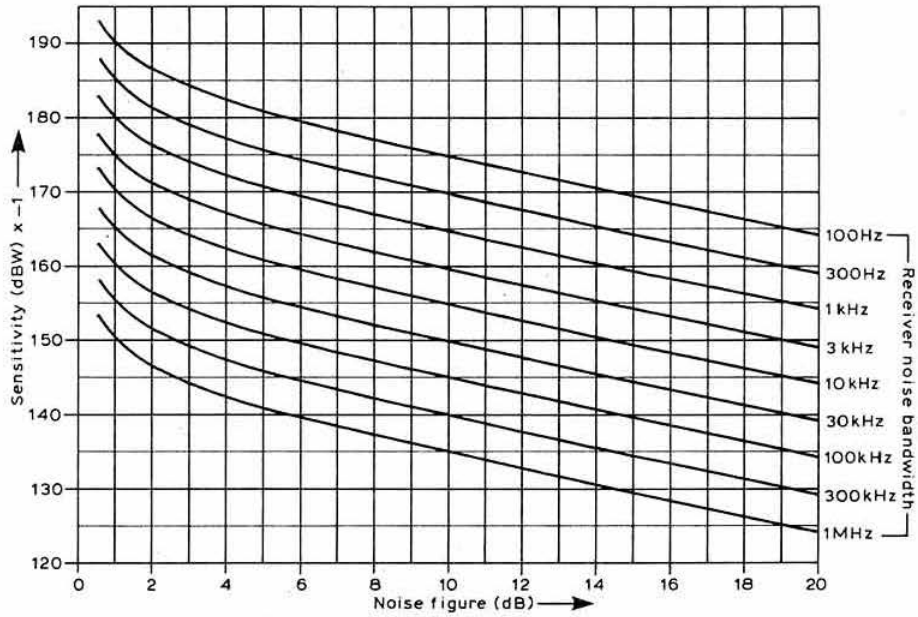

Fig 1. Receiver sensitivity as a function of its noise figure and bandwidth

loss, in one calculation to predict the signal-to-noise ratio. This is a somewhat clumsy method for amateurs, who are usually more interested in the "path loss capability" of their equipment. The discussion below describes a method whereby two single parameters are determined to quantify the overall performance of the equipment.

The first parameter is the transmitted effective isotropic radiated power (eirp), expressed in decibels, which is the sum of the transmitter power, in decibels relative to 1W (dBW), and the gain of the transmitting antenna (in decibels relative to an isotropic radiator), less any feeder loss. For example, the eirp of a 30mW transmitter feeding a 25dB antenna would be +9·8dB, being the sum of 10 log (0·03) and +25.

The second parameter will be referred to as the "effective receiver sensitivity" (ers). This is not a commonly-used term in considerations of link-budgets, and so will be explained below in some detail.

In common with the eirp of a transmitter, the effective receiver sensitivity of a receiving system is the sum of two terms expressed in decibels. The first is the receiving antenna gain, less any feeder loss, and the second is the receiver sensitivity. The latter represents the amount of signal in decibels relative to 1W required at the input of the receiver to produce a signal-to-noise ratio of unity. Thus a signal which is 20dB stronger than the receiver sensitivity will produce a signal-to-noise ratio of 20dB. Normally the receiver sensitivity, when expressed in decibels relative to 1W, is a large negative number. However, in our calculations a change of sign is made, so that larger positive numbers relate to more sensitive systems. When expressed as a positive number the receiver sensitivity represents the hypothetical signal-to-noise ratio which would be obtained with an input of 1W to the receiver.

The receiver sensitivity is limited by the noise output from the receiver under no-signal conditions, which is equal to kTB, where k is Boltzmann's constant ($1{\cdot}38 \times 10^{-23}$ $WK^{-1}Hz^{-1}$), T is the receiver noise temperature related to the noise figure nf by the equation nf = 10 log (T/290 + 1), and B is the receiver bandwidth in hertz. Fig 1 shows the receiver sensitivity in decibels relative to 1W, after allowing for the change of sign mentioned above, as a function of noise figure and bandwidth of the receiver. For example, the sensitivity of a receiver possessing a noise figure of 10dB and a bandwidth of 300kHz is 140dBW, and the ers of this receiver when connected to an antenna of 30dB gain by a feeder with a loss of 2dB is 140 + 30 − 2 = 168dB.

It should be noted that in this example the receiver has been considered to possess a particular noise figure, and its sensitivity was calculated from this. The ers was then determined by adding the antenna gain and subtracting the feeder loss. This treatment is accurate enough for most purposes, but becomes inadequate with very low noise receivers, such as those used in moonbounce or tropospheric scatter systems on the lower microwave bands. It is hoped to describe a more exact method at a later date.

The way in which the eirp and ers are used in practice is simply to add the eirp of the transmitting system to the ers of the receiving equipment to obtain the path loss capability of the system as a whole. With the equipment described above, the path loss capability is equal to 168 (receiver) + 9·8 (transmitter) = 177·8dB, If this equipment were placed at either end of a line-of-sight path 150km long on 5·7GHz (which has a loss of 149·8dB), the signal-to-noise ratio would be 177·8 − 149·8 = +28dB.

This signal-to-noise ratio is strictly the carrier-to-noise ratio present before the final detector. Some detectors have a threshold, below which the audible signal-to-noise ratio is somewhat worse than the carrier-to-noise ratio.

(Continued on page 228)

4-2-70

Graham Knight, GM8FFX*

Repeater groups of the month

The Northampton 432MHz repeater, GB3NH, has been operating on RB14 since October and is serving the Wellingborough, Kettering and Daventry communities. There is no GB3NH repeater group as such, the repeater was manufactured and installed by members of the **Northampton Radio Club** who will continue to be responsible for the maintenance of this Phase 2 unit. Two antennas are used with 30ft of vertical separation—four stacked dipoles are used for receive and a special glassfibre encapsulated colinear is used for transmit. Three cavities are used in each antenna line to ensure there is no desense on receive despite the close proximity of several very high power transmitters. The Northampton RC meets every Thursday at the King's Thorpe Community Centre, Northampton, and users of GB3NH are invited to attend and meet the repeater builders. Further details can be obtained from the club secretary, Brian Steen, G8LHR, 60 John Gray Road, Great Doddington, Wellingborough.

Under the guidance of project manager Maurice Hately, GM3HAT, members of the **Grampian Repeater Group** installed GB3GN (R7) and switched it into service on 7 January. This second Scottish vhf repeater is sited at the IBA transmitting station at Durris near Aberdeen. The vertical dipole antennas are at heights of 300 and 400ft above ground—the IBA site itself is more than 1,000ft asl. Although licensed for 40W output, the present power is 20W input and gives good coverage over the Grampian Region. Two filters are incorporated to ensure that the high sensitivity of the Trio receive board is actually used—results indicate a very low level of desense. The present logic (on loan from the GB3TW group) allows 60s of transmission before time-out: GM4BYT is presently engaged in making the group's own logic to designs provided by GM3SAN of the GB3CS group. Many amateurs in the north have expressed their thanks to Norman Hendry, GM8CBQ, and Findlay Baxter, GM3VEY, for the many hours they spent working on the various sections of the repeater, thus ensuring GB3GN went on the air on the promised date. Further details of the Grampian Repeater Group can be obtained from the secretary, A. Jones, GM8HGD, 41 Skerry Drive, Peterhead, Aberdeenshire.

The **North Western Repeater Group** was formed for the purpose of providing a 144MHz repeater to serve the East Lancashire area. Much of the pioneering work was carried out by the group's present chairman, G4BLH, with initial operation of GB3RF taking place from a school in Colne. The group started out with a valve repeater and a logic system built by G8HEB. Despite dreadful weather conditions in December 1976, the antennas were erected at GB3RF's present site at Hameldon Hill near Burnley. Many of the group's younger members were involved in moving the equipment and setting it up at the new site. Two folded-dipole antennas are used for transmit and receive, with a separation of 60ft. A solid-state transmitter is now used and is proving to be very reliable.

This group has two applications in for Phase 3 units. GB3FC is proposed to serve the community on the Fylde coast, and GB3PF is the callsign requested for a repeater to serve East Lancashire on 432MHz. Sites and equipment are available for both, only licences are awaited. The group has 190 members, and regular meetings are held on the third Thursday of each month at the Globe Bowling Club, Willows Lane, Accrington. The meetings, which start at 8pm, are very well attended and are more social than formal—perhaps this is because the premises are also licensed. Prospective members and visitors are always welcome, and further details of this go-ahead group can be obtained from the secretary, Howard Aspinall, G3RXH (of top-band fame), "Adare", Raikeswood Crescent, Skipton, North Yorkshire.

Single-sideband repeater proposed

The RSGB has received a single-sideband repeater proposal for the 144MHz band from the amateur group at Sheffield University. News of this proposal has spread like wildfire and it is obvious that this proposal will generate a great deal of discussion. As this is a new concept for a British repeater, details taken from the proposal are printed below.

The proposal is published purely for information, and in no way represents the current policy of the VHF Committee, but comments on it are invited.

Proposal for a 144MHz "in band" experimental single-sideband talkthrough station.

Purpose. The existing 144MHz repeater service uses 25kHz-channelling fm; the current specification for the commercial bands, low band through to high band, is 12·5kHz spacing (a.m. and fm). For several years amateurs on vhf have shown the practicability of narrow-bandwidth ssb transmissions for both fixed stations and mobiles, and it must be only a matter of time before the commercials are forced to adopt this system due to demand on the frequency spectrum. Now, therefore, seems an appropriate time to lead the way and demonstrate the feasibility (or otherwise) of a 5kHz-channelling ssb repeater, which in commercial terms would represent a base station capable of talkthrough operation. For the amateur, the repeater would bring all the benefits of the existing fm machines to ssb, and with careful planning the fm and ssb networks could be made to complement each other.

Equipment. This is primarily an experimental project and as such it is envisaged that the majority of the equipment will be designed and constructed at the University of Sheffield, some as project material for final-year students. All the frequencies will be derived from a master oscillator, with a free-running stability/accuracy of 1 part in 10^8, which will normally be locked to a standard signal (MSF or Droitwich), giving a stability of 1 part in 10^{11}.

Receiver specifications.

Sensitivity: better than 0·5μV for 10dB s+n/n ratio, usb.

Spurious responses: better than 60dB.

*PO Box 49, Aberdeen AB9 8JA

I.F. bandwidth: not less than 3kHz at −6dB;
not greater than 5kHz at −60dB.
AGC: output maintained within 3dB over 100dB signal range.

Transmitter specification.

Power output: 15W p.e.p. upper sideband.
Carrier suppression: better than 50dB.
Sideband suppression: better than 40dB.
Spurious radiation: less than −60dB.
Audio bandwidth: 300Hz to 3·3kHz at −6dB, better than −50dB at 5kHz.

The receiver and transmitter bandwidths are deliberately slightly wider than the current amateur specifications to improve the clarity of individual voice/equipment combinations.

Control. The station will be controlled by a GB3HH mk3 logic box, which is designed to work with equipment using an automatic toneburst, ie it is tone (and audio) accessed, tone re-accessed. As an additional feature, during the re-access period and callsign (high or low level), reduced carrier of the order of −10dB will be introduced to aid tuning. This facility will possibly be removed after a time as the users become more expert with the system.

Site. The station will be located in an equipment room, part of which has been allocated to the Department of Electronic Engineering, on top of the University of Sheffield's Metallurgy Tower. The 70MHz beacon GB3SU was located there for several years before it was moved to its present site at Harpur Hill. There is a possibility that, at a later date, a request may be made to move the station to a much better site 1,400ft asl to the north-west of Sheffield.

Antenna. As with GB3HH and GB3NA, it is hoped to use single antenna working, with a similar set of duplexing cavities. It is hoped to erect a three-half-waves-in-phase colinear, but circumstances may dictate the use of a simple groundplane or dipole, or even two separate antennas.

Frequencies. For maximum compatability with existing equipment the input/output spacing must be 600kHz, preferably transmitting high. Because this repeater will set a precedent, there will have to be much discussion between various interested parties before a frequency can finally be allocated. However, if the 5kHz channels from 144·000MHz to 144·995MHz are designated SS0 to SS199 (simplex) similar to the fm "S" channels, then a possible slot for ssb repeaters would be SS30–SS39 (144·150 to 144·195MHz) output, SS150–SS159 (144·750 to 144·795MHz) input, designated RS30–RS39, again similar to the fm "R" channels. This sort of allocation seems more and more appropriate anyway, with the ever increasing use of stepped, synthesized equipment.

It is therefore requested: Frequency RS35 (144·175MHz output to 144·775MHz input), callsign GB3SF.

If this repeater is licensed, Tony Whitaker, G3RKL, expects the mobile coverage to be similar to that of GB3US, the Sheffield 432MHz repeater on RB0. Tony does expect the fixed station range to be far more extensive, judging from the reception reports received by the group when GB3SU was operational from the same site at the University.

Tony Whitaker and the Sheffield University Group have been responsible for planning, building and maintaining beacons and repeaters which have been of great benefit to vhf operators in general. It will be interesting to record in these pages any reactions to their latest proposal.

Repeaters in the pipeline

The Perth Repeater Group (GB3PR) hopes to complete negotiations soon for a site near Perth for this vhf application. The case for a vhf repeater at Perth is strengthened by the fact that GB3GN is now on the air from near Aberdeen but is not giving coverage into Dundee, Perth or Kirriemuir. Information on this project is available from Ron Grant, GM4DQJ, 31 Stormont Park, Scone, Perth.

The very active Glenrothes & District Amateur Radio Club has applied under Phase 3 for GB3FE on RB6 to be located at Leslie in Fife. Colinear antennas are planned and the repeater should serve the Kirkcaldy and Leslie communities. Dave Dalrymple, GM3OLK, 278 High Street, Leslie, can provide further details.

Richard Constantine, G3UGF, reports delays in finding a suitable site for the Phase 2 432MHz repeater GB3WY. Tests from close-to-home Soil Hill have been most encouraging and a start has been made on making the equipment for this West Yorkshire uhf repeater.

A proposed repeater on vhf for the Island of Mull was mentioned briefly last month, and the tentative callsign of GB3HI has been allocated. A 1,300ft asl site near Craignure seems suitable, and initial tests indicate a coverage extending to Fort William and Largs. Further information about this project can be obtained by contacting GM3RFA, 3 Sutherland Avenue, Fort William, Inverness-shire.

Ian McKechnie, GM8DOX, attended the recent open meeting of the Repeater Working Group at the Wirral (full details next month). There he outlined the plans for GB3OH, another Phase 3 unit on RB4, which is to be located on the Ochil Hills near Stirling. The site is 450ft asl and the repeater will cover the Stirling/Falkirk area if licensed. Further information on this group is obtainable from GM8MEY, 53 Dumyat Drive, Falkirk.

FM frequencies

Kris Partridge, G8AUU, is concerned at the continued simplex use of 145·0 and 433·2MHz, particularly by stations in the London area. Kris makes the valid point that 145·0MHz is the internationally agreed input frequency for R0 repeaters. There are dozens of Continental repeaters using R0 and it only takes a slight lift in conditions for the British stations to cause problems to our European neighbours. The VHF Committee discussed this problem last year and agreed to recommend that all UK stations avoid using 145·0MHz for simplex contacts.

There also seems to be a growing tendency for some fm operators to conduct simplex QSOs on 144·480, 144·400 or even 144·350MHz—all three frequencies which are in the exclusive ssb and cw section of the bandplan. It is to be regretted that some manufacturers are supplying equipment for fm-only use which is fitted with these frequencies. However, some determined ssb operators seem to be resisting the influx of fm by making maximum use of these frequencies.

During the recent lift in 432MHz conditions to the Continent, many fm stations were heard calling on 432·2MHz, to no avail. Most Swedish, German and Dutch fm operators use 433·5MHz as a calling frequency, moving to either 433·525 or 433·550MHz once a contact

has been established. GM8CBQ, in Aberdeen, recently worked a station in Sweden on 433·550MHz using just 2W of fm from a hand-portable rig.

Some operators are concerned that Channel R2 has been mentioned in connection with a tentative British repeater proposal. R2 has until now been kept clear, as dx repeaters use this frequency; most would prefer that Britain kept clear of 145·650MHz. During good conditions DB0DX can be heard and accessed from Britain. This dx repeater runs 200W output and automatically selects horizontal or vertical beam antennas for transmission by switching to the polarity of the received signal. GM4GLD and GM8BZX often work through this repeater and report that the antennas at DB0DX are 3,000ft asl at a mountain site near Frankfurt. Another correspondent on this topic is Phil Coull, G3XVY, but he suggests Britain should have a dx repeater similar to those on the Continent.

Meteor scatter

Alistair Simpson, GM8NCM, will be operating on meteor scatter from OY and TF on the Glenrothes Club expedition to the Faroe Islands and Iceland in August. Fellow expeditionaries GM3OLK and GM3YOR are hoping there will be room for Alistair to take his new Nag144 linear amplifier on the trip. G3POI, G3SEK and G4DGU are already in the queue for skeds. Further details of this most interesting expedition will be published in *4-2-70* as soon as the dates are finalized.

Clive Penna, G3POI, at Sevenoaks in Kent, continues to have almost weekly contacts via random meteors with SM3BIU in northern Sweden. Any operator who has not yet heard signals via ms should simply tune his receiver to a beacon frequency, eg DL0PR on 144·910MHz; pings of signals from Germany will quickly be heard, and another amateur will soon be joining the ranks of the meteor scatter enthusiasts.

Fast-scan on 432MHz

The release of a video module on to the commercial market has created an upsurge of interest in 625-line high-definition television transmission. Charles Shearer, GM8LVG, is one of several operators in the Lossiemouth and Elgin areas to use this interesting new device. The video module connects between the video output of a standard 625-line television camera and provides a 28MHz signal suitable for feeding the input of many standard 28/432MHz transverters. GM8LVG also uses a Polar Electronics EDL432P linear amplifier and gets about 20W of video to feed his 88-el antenna. This particular amplifier, which uses a 2C39 valve and has a built-in power supply, seems to be very popular in Scotland; David Taylor, GM8ARV, in Edinburgh, and Jimmy Anderson, GM3KXM, in Glasgow, both use the same linear for their fast-scan transmissions.

The latest copy of *CQ-TV*, the excellent journal of the British Amateur Television Club, contains a first-class test card which even has space for a callsign. The magazine has many technical articles and also gives details of the new CQ-TV Award which is available to any fast-scan television operator, whether they are members of BATC or not. The magazine reports that F6BQH and F2XO are active on 432MHz fast-scan and are looking for UK contacts. Membership enquiries for BATC are handled by G8GQS of 13 Church Street, Gainsborough, Lincolnshire.

GM8FFX is now equipped for 625-line television and runs 40W to an 88-el Parabeam. Skeds would be welcomed from stations on the east coast, particularly from those who had S9 plus signals on sideband last year but have now converted to television.

Auroral reports

Solar activity was extremely high at the beginning of the year, with Cable and Wireless reporting a major solar radio noise storm on 3 January. This was associated with 13 separate sunspots which were first noticed on 27 December. Thirteen auroras have occurred in the 27 days following this report, and these events took place on 28, 29 and 30 December and on 3, 4, 6, 9, 13, 16, 17, 18 and 23 January. The longest opening occurred on 4 January, being first noticed by GM4AOR in Edinburgh at 1215gmt, with Ken himself still being a good auroral signal in Aberdeen a full 12 hours later. The shortest opening was a brief 15min affair around midnight on 23 January when only GB3LER and SK4MPI could be heard.

The 4 January event was most interesting, with continuous auroral signals being copied at Aberdeen from 1230 until 2140gmt and then signals waxed and waned for a further four hours. Alistair Simpson, GM8NCM, at Kirkcaldy, took a few minutes off from working dx stations at 1325 to check the beam headings for the various beacons which could be heard aurorally on 144MHz. GB3LER peaked at 010°, DL0PR (040°), GB3VHF (020°), GB3GI (020°), SK7VHF (045°) and OH6VHF (045°). A similar test at 1407gmt gave these beam headings: GB3LER (010°), GB3VHF (045°), GB3CTC (010°), GB3NEE (020°) and OH6VHF (030°).

Bryn Llewellyn, G4DEZ, at Didcot in Oxfordshire, was a most consistent signal throughout the event and could still be worked via the aurora from Aberdeen at 0022gmt—at a time when even GB3LER could not be heard. During the period 2130 until 0030gmt Scottish stations found they could still work each other, and the occasional GI and LA, with many QSOs taking place at times when no beacon at all could be heard via the aurora. There were two strange 5min periods at 2150 and 2245gmt when the only beacon to be heard aurorally was GB3CTC on a 005° beam heading. Exactly why only the Cornish beacon could be heard has been the source of much discussion among GM amateurs—please forward any theories to *4–2–70* for publication.

Some excellent dx was worked during the 4 January event, with many stations all over Britain taking part. Outstanding signals at Aberdeen were those from G8NEY (Somerset), G8LYH (Liverpool), G8OFQ (Lincoln), G8EQV (Bristol), GW3ZBB (Abergavenny), G3FPK (Purley), EI6AS (Dublin), DC2OC, SM1BSA (Gotland Island), SM7DEZ and many LA stations. G3ZIG and OZ6OL both worked UR2RQT in Estonia on cw.

Many stations in the south think that the northern GMs are lucky to be able to participate in many auroras which are not even heard across the border. They will be heartened to know that GM8FFX spent from 2358 until 0315gmt on the night of 23 January listening to GB3LER

and SK4MPI at strengths varying up to S3, but despite careful tuning of the bottom 350kHz of 144MHz failed completely to hear a single station.

A full report on all the 1977 auroral sightings and how they match up with radio events is being prepared from information supplied by RSGB members and the British Astronomical Society. This will be published in a future issue of *Radio Communication*.

Channel numbers

Quite a number of new operators have written in to *4-2-70* saying they are perplexed by channel numbers like R7 and SU20, and for their benefit the frequencies of the most commonly used fm channels are given below.

144MHz simplex

S10—145·250MHz	
S11—145·275MHz	
S12—145·300MHz	
S13—145·325MHz	
S14—145·350MHz	
S15—145·375MHz	
S16—145·400MHz	
S17—145·425MHz	
S18—145·450MHz	
S19—145·475MHz	
S20—145·500MHz	
S21—145·525MHz	
S22—145·550MHz	
S23—145·575MHz	

144MHz repeaters

Input	Output
R0—145·000MHz	145·600MHz
R1—145·025MHz	145·625MHz
R2—145·050MHz	145·650MHz
R3—145·075MHz	145·675MHz
R4—145·100MHz	145·700MHz
R5—145·125MHz	145·725MHz
R6—145·150MHz	145·750MHz
R7—145·175MHz	145·775MHz
R8—145·200MHz	145·800MHz
R9—145·225MHz	145·825MHz

432MHz simplex

SU15—433·375MHz
SU16—433·400MHz
SU17—433·425MHz
SU18—433·450MHz
SU19—433·475MHz
SU20—433·500MHz
SU21—433·525MHz
SU22—433·550MHz

432MHz repeaters

Input	Output
RB0—434·600MHz	433·000MHz
RB2—434·650MHz	433·050MHz
RB4—434·700MHz	433·100MHz
RB6—434·750MHz	433·150MHz
RB10—434·850MHz	433·250MHz
RB14—434·950MHz	433·350MHz

It will be noted that Britain follows the Continental system on 144MHz, with all the repeater inputs 600kHz below their output frequencies, but has a unique system for the 432MHz repeaters with the input frequencies 1·6MHz higher than the output. Most Continental uhf repeaters have the input frequency 1·6MHz lower than the output, and some countries still retain a 7·6MHz separation system. A detailed study of the Continental systems appears in the *International VHF FM Guide* by G8AUU and G3UHK, available from RSGB Publications (Sales).

Moonbounce

The Harwell and D ARS has had to curtail its moonbounce activities on 144MHz as its 680ft rhombic antenna had to come down when the farmer wanted his field back. Ian White, G3SEK, says it took quite a while to walk from one end to the other of the antenna, and in response to several enquiries he confirms that terminating resistors were not used in the design. It is possible that the Harwell Club may be able to erect the moonbounce antenna again after harvesting time, but member G4DGU would like to put up a pair of rhombics next time.

Douglas Parker, G4DZU, of Leeds, has been receiving 144MHz moonbounce signals from SM7BAE and W7FU on his large 56-el array made up from four carefully spaced and phased 14-el Parabeams.

Dave Price, GW4CQT, reports having heard some 432MHz moonbounce signals, but he is now busy rearranging the feed system to his bay of eight 12-el homemade quads. One of the stations Dave heard was Aki Munezuka, JA1VDV, who uses a 20ft dish and a K2RIW type linear amplifier. JA1VDV was, of course, one of the stations worked on 432MHz by Peter Blair, G3LTF, for his Worked All Continents moonbounce award. Clive Penna, G3POI, is also engaged in planning an antenna with moonbounce capability for 144MHz and is thinking of using a large number of the Tonna F9FT 16-el Yagis.

Awards

The latest recipient of the 144MHz Transmitting Award is Arthur Bryant, G3ITV, of Brentwood, Essex, who used cw for 30 of the 49 contacts submitted. Awards manager Jack Hum, G5UM, has endorsed certificate No 511 accordingly, and Arthur's policy of "winkling them out" on the key has certainly paid off. Proving once again the benefits of cw in weak signal conditions, and enabling Arthur to complete contacts which would have been impossible on any other mode.

Looking back on the records for 1977, G5UM finds that no fewer than 11 Seniors for 432MHz were issued last year, thus reflecting the greatly increased cw and ssb activity at the low end of the band, and complementing the upsurge of fm and through-repeater contacts in the upper 2MHz. G8AYY from Birmingham, is the latest station to send cards to G5UM confirming contacts in nine countries and 40 counties and thus gaining 432MHz Senior Certificate No 43.

Many stations are near to being able to claim further Supreme Awards; Alan Scott, G4BYP, in Liverpool, needs just one more country on 144MHz. A few other vhf operators are also in the position of needing just one or two cards, and some are even resorting to sending four IRCs with their "Pse QSL" requests to Continental stations.

Three Musketeers Award

Kevin Packard took the RAE along with his father and cousin in 1975. They all passed first time and received the consecutive callsigns G8MLO, G8MLP and G8MLQ. All three live in Belvedere, Kent, just 200 yards apart. Local stations kept mixing up the correct callsigns for Kevin, Andy and Don and dubbed them the three musketeers. The Three Musketeers Award can be claimed free of charge by working all three stations.

VHF records

Swiss vhf manager Bernard Zweifel, HB9RO, kindly writes with a list of "firsts" established with stations in Switzerland.

144MHz

HB9IV—G6OU on 12 September 1953
HB1IV—GW2ADZ on 13 September 1953
HB1RG—GM3HLH/A on 4 August 1957
HB9RG—GI3GXP on 7 October 1960
HB9QQ/P—GC2TR on 21 September 1966
HB9RO/P—GC2FCZ on 5 September 1971

432MHz

HB9RG—G3LQR on 11 September 1966
HB9AMH/P—GD2HDZ on 26 October 1975
HB9AMH/P—GW8AWS/P on 26 October 1975
HB9AMH/P—GI8HXY on 26 October 1975
HB9AMH/P—GM8FFX on 26 October 1975

The vhf awards manager, G5UM, has sent a questionnaire to all members believed to have established a "farthest" or "longest". It asks for complete details of any record-breaking contacts. Anyone who thinks he has established a record on any band, from 70MHz downwards, but has not received a questionnaire from G5UM, should write to him for a copy. When all the information has been received and documented it will be forwarded to SM5AGM, the IARU records co-ordinator for Europe.

New "Callbook"

As well as all the latest and up-to-date callsigns, names and addresses, the new 1978 edition of the *RSGB Amateur Radio Call Book* also includes details of the vhf bandplans, RSGB beacons and repeaters. It is also good to see a list of 81 overseas vhf/uhf beacons being included for the first time. The new 1978 *Callbook* is available from RSGB Publications (Sales), and judging by the quantities already sold it is once again proving to be "a must" for vhf operators.

Teletype

Sandy Morton, GM8BJJ, regularly puts out rtty calls on 144·600MHz and gets replies even though he operates from the Isle of Cumbrae, near Bute. Contacts are often made with GI8HXY in Belfast and EI4CB in Dublin, but GM8BJJ has still to work his first G station on 144MHz rtty. Sandy says he still likes his Creed 7B machine and is still not converted to video displays—they do not sound the same and the copy disappears off the top of the screen! GM8BJJ would welcome skeds with G stations and can be contacted at 6 Mount Stuart Street, Millport, Isle of Cumbrae.

The grapevine

EI5CD busy experimenting with diversity reception of uhf television using dish antennas . . . EI9Q now has a Nag 144 linear plus a pair of phased six-element beams at 75ft . . . G3ZIG worked UR2, OK1 and HB9 in the first week of 1978 . . . Following the fourth collapse of his thin 50ft tower, GM3ZBE has purchased a heavy-duty 80ft Versatower . . . Long ago Sam Harris, W1FZJ, said "If your antenna stayed up all last winter it wasn't big enough" . . . G4FRX assisting both G4DGK and G3OSS with parts for their high-power 432MHz amplifiers . . . G3WSN now has a 1kW licence for ms . . . G8JEF back from Germany again where he says he was fascinated by the happenings on cb . . . Many repeater personalities and even the odd pirate spotted at the recent open Repeater Working Group meeting at the Wirral . . . GW8CFQ is now GW4GSS—*G*reat *S*trong *S*ignal—Ray can now go down among the cw stations without fear of comments in the grapevine . . . .

Late news

Roger Hargreaves, G3OHH, at Mow Cop, found conditions good for the 70MHz contest; of the 70 stations worked, G4CXL at Weybridge and GU3HFN were the most outstanding signals. The Guernsey Amateur Radio Society report their best contact in the contest was with

REAL DX 1978

70MHz aurora	G3TYE-G3ZSS	320km
70MHz tropo	GM3WOJ-GU3HFN	590km
144MHz tropo	GM8MBP-DF5GX/P	1,300km
144MHz ms	GM8NCM-SM3BIU	1,340km
144MHz aurora	G3ZIG-UR2RQT	1,800km
432MHz tropo	GW4GSS-DF3OH	1,150km

GM3WOJ/P near the Island of Scares, a distance of 590km—the best this year so far. Many letters received about the Scouts pictured on the cover of December's *Radio Communication*—most writers hope they all had their first-aid badges in view of the open transmitter. Further auroras occurred on 24, 29, 31 January and on 1 February. GI8KIA and GI4AAI(WO39c) were good signals with GM8NCM at 1500gmt on 29 January. GM3DZB worked 10 LA and SM stations on cw during the aurora on 31 January. A visual aurora was noticed by GM3ZBE at 2100gmt on 2 February but no radio signals were heard. Richard Staples, G8MME, is planning a full-power expedition to the Shetland Islands between 3 and 17 June—for skeds write to 3 Willow Close, Lymm, Cheshire.

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. □

MICROWAVES

(Continued from page 223)

This threshold value should be subtracted from the carrier-to-noise ratio calculated above to obtain the final signal-to-noise ratio. For cw/ssb detectors this threshold is 0dB, while for envelope detectors, as used for a.m. detection, it is 2·6dB. For fm detectors, the threshold value is 10dB.

In future *Microwaves*, it is intended to cover the losses of various types of propagation path, such as line-of-sight, tropospheric scatter and obstructed paths, which together with the above information should form a complete guide to the calculation of equipment performance over different types of paths.

Microwave components

UHF Developments (Bedford), which is run by G8FMG and G4FEV, can now supply a wide range of microwave components. These include not only the basics such as various waveguides and flanges, mixer diodes, coaxial cables and fittings, but also complete assemblies in WG16 for 10GHz. These include Gunn oscillators, adjustable shorts, mixer cavities, directional couplers, wavemeters and antennas. An sae to their address at 6 Whitelodge Close, Kempston, Beds MK24 7ED, will bring details.

Another supplier of components is, of course, Hamvel, "High Peak", Telegraph Lane, Four Marks, Alton, Hants GU34 5AW. An sae will also produce their list, which now includes a 2·3GHz version of the popular G3JVL loop-Yagi antenna. □

the month on the air

John Allaway, G3FKM *

ONE of the fascinating aspects of amateur radio communication is the way in which unpredicted events occur. Not all is known about propagation, and an incident reported by G3WNI is of considerable interest. It seems that on 14 December, between 0745 and 0815, G3WNI was operating /M south of Oxford. He was in contact with four other G stations on 3·8MHz ssb—one located as far north as Carlisle. In due course he received a listener report from WA1VHX in Hopedale who had heard the contact at considerable signal strength on a rather indifferent receiver, and who was using only an 8ft piece of wire for an antenna! An ice storm was raging in Hopedale at the time.

Photographs suitable for reproduction in *MOTA* would be very much appreciated. They should preferably be black and white prints, and every effort will be made to return them to their owners if this is desired.

DX news

I2FGP is believed to be in Iraq, working on the installation of a radio network. He has a licence for this purpose, and will apply for an amateur licence. He has with him a small transmitter, crystal controlled on 14,051kHz.

West Coast DX Bulletin mentions a poll taken by JH1VRQ and JA0CUV among Japanese dxers to establish the most-needed countries. They received 256 replies and the order of rarity was as follows: (1) VP8—S Sandwich, (2) 3Y—Bouvet Is, (3) FO8—Clipperton Is, (4) YI—Iraq, (5) 8Z4—Neutral Zone, (6) China, (7) VS9K—Kamaran Is, (8) ZA—Albania, (9) HK0—Malpelo Is, and (10) PY0—St Peter & Paul Rocks.

SM6PF, who was acting as QSL manager for the recent operation by SM6CSB as 3C1X, died in mid-January. There may be some delay in processing 3C1X QSL card requests, and it is suggested that any further correspondence should be routed to SM3CXS or via the Swedish QSL Bureau.

The ITU has issued the prefix block P5A to P9Z to the People's Democratic Republic of Korea.

Two QSL directories have been drawn to the attention of the writer recently. One is the *QSL Manager Directory* by DJ9ZB. This consists of 38 pages of A4 size which lists details of QSL routes for over 2,000 stations. It costs US $3, post free, from Franz Langner, Carl Kistner Str 19, D-7800 Freiburg, W Germany. The other is produced by JH1HWN and is called the *QSL Bible*. This covers the period 1973 to 1977 and lists 3,500 QSL managers and addresses on 91 pages. This costs US $5 and is obtainable from JH1HWN, 5-2236-33 Iriya, Zama-city, Kanagawa, Japan.

QSL routes for contacts with HZ1AB often cause problems. It is suggested that those for contacts with non-W/VE operators should be sent to DJ9ZB. However, those with operator Jack should not be QSLd at all—he does not want QSL but will QSL all contacts via the bureaux. Operator John asks for cards direct to HZ1AB, APO 09616, New York, NY, USA, and operator Bill for cards (with sase) to be sent to K8PYD.

Three autonomous regions in Italy now have special distinguishing prefixes: Trentino–Alto Adige is IN3, Friuli-Venezia Giulia is IV3, and the Aosta Valley IX1. It is understood that the possibility of separate DXCC status for these areas is being investigated.

VE4VV will be using the special callsign XM4X during the WPX contest, and VB4ITU will be on the air during ITU week (in May). VO3CC was a special station celebrating the 75th anniversary of Marconi's first UK–USA transatlantic radio signal, as were EI0MFT, VX1CR and KM1CC. The CG6 prefix will be used by VE6 stations within a radius of 50 miles of Edmonton—this to mark the holding of the Commonwealth Games in that city. TA1HY has been heard using the callsign YM1HY.

ZK2AU has been heard on 14MHz cw—he asks for QSLs via W6TR. FW8AC is Gil, formerly TR8GB, and has been reported to favour the 14,120kHz area around 0900. He expects to be there for three years. Tom Christian, VR6TC, is sometimes to be found around 14,224kHz from 1730 on Fridays. KX6BU will leave the Marshall Is soon and has applied for a VR3 licence. He will have a beam and 100ft tower available, with dipoles for the lower frequencies.

FB8XR may sometimes be found on Saturdays on 14,280kHz after 1600, and FB8WE has been noted around 14,225kHz at the same time on various days. VK0JV should be active by now—he is located on the mainland of Antarctica.

A51CG is often on 14,164kHz from 1130. He seems to move up or down the band by up to 10kHz. A51RG seems to prefer 21MHz cw and to be found around 1200 between 21,010 and 21,020kHz.

F8US has notified GM3LYY that FB8ZF's call is being pirated. There will, however, be a genuine FB8ZF on the bands during 1978. FB8ZM was due to come on the air at the end of January—he has a KWM2 with 500W linear and 2-el beam. His QSLs will be sent out by W4LZZ. W4LZZ himself was due in the Sudan last month and may have been heard as ST2ZZ.

A Caribbean net meets on 14,175kHz at 1030 daily. The net controller is 8P6AH.

News from overseas

Many readers will remember Bryan Bisley—formerly EP2BG, MP4BDA, MP4DAC, MP4MAB, MP4QAO, MP4TAE, VQ4IO, ZC4BB (and holder of many other calls in the past). He now holds the callsigns G3OFI and EI5AI, but is actually using his current VE3JPQ call as he is living in Canada! Bryan makes a plea for readers to be reminded that the 28MHz band extends *below* 28,500kHz. There are large numbers of Canadian and Caribbean stations—many of them expatriate Gs—who would like to have the opportunity to work into the

*10 Knightlow Road, Birmingham B17 8QB.

British Isles but are unable to overcome the "wall of noise" in the USA band. Certainly when the band opens up this spring it will be a good idea to do a little searching below 28,500kHz.

A release by the Novosti Press Agency of Moscow draws attention to Georgi Rumyantsev, UA1DZ, who has been licensed since he was 17 and operates from his 14th-storey flat in Leningrad. He is a radio engineer and speaks fluent English and has collected over 75,000 QSLs to date. One of his interests is radio direction finding and he has won at least one European championship. Keen to extend his contacts he has asked for publicity to be given to the fact that he is scanning the band for British CQs.

Hans Loow, SM0BYD, has taken over the duties of QSL manager for Tom Carlsson, 9K2EX, who uses a Drake 4C line and an SSB220 linear. His antennas consist of a TH6 beam for 14, 21 and 28MHz, a λ/4 vertical for 7MHz, and "2 × 20m dipoles" for 3·5MHz. Incidentally, Hans himself is very interested in music as well as in amateur radio, and he would be pleased to hear from anyone who would like to correspond and exchange music. His address will be found in "QTH Corner".

Sanna Keita, ORS39103, has written to say that he has now received his transmitting licence and holds the callsign C5AAE. He hopes to be on the air by mid-March on all the hf bands. His favourites being 1·8, 7, 14 and 28MHz. Sanna's picture appeared in December 1977 *MOTA*.

Dxpeditions

It seems likely that the pessimistic view taken by your scribe of the rumour of an expedition to Clipperton Is may have been unjustified. At the time of writing, a number of operators have been named—they include F5II, F6AQO, F6ARC, F6BBJ, F6BFH, F9IE, F9JS, HB9AEE and HB9AHL. The party expects to fly to the west coast of the USA on 8 March, and their voyage to the island should take some 6 to 10 days. It is hoped that the operation will cover the CQ WW WPX Contest on the weekend of 25-26 March.

It is believed that Baruch, 4Z4TT, who travelled around in the Pacific last year, will be back in that area this spring, and that he may operate from ZK2 (Niue) on this occasion.

A group of Canadian amateurs is planning a visit to St Paul Is (in the Gulf of St Lawrence), and will probably go there late in May or early in June.

West Coast DX Bulletin notes that there is little possibility of any activity from the S Sandwich Is this year. Transport was not available and the Antarctic summer is now over. However, both VP8 and LU amateurs are interested in making such a trip and perhaps there may be better luck next "season".

DX'press mentions a recent contact with YV5CEP in which plans for an expedition to Aves Is were detailed. This should take place between 20 and 25 March, the callsign should be YV0AA, and frequencies given were 3,525, 7,025, 14,025, 14,190, 21,025 and 28,025kHz. Presumably ssb frequencies on bands other than 14MHz would be the usual dxpedition spots. The same news source also mentioned the fact that the projected 8Z4 expedition might be delayed and may not take place until May or June.

Welcome

The following overseas amateurs have recently joined the Society: CT1GM, DF2NC, DJ9BV, DL7DO, HB9AWP, LA1FH, PA0BDW, SM4AIQ, SM4HSD, VE3BZA, VE6BFE, VE6MI, VE7BFB, VK3ZVG, VK5ZDH, K2SCI, WA9RLU and ZS6BQD.

Contests

The Helvetia 22 Contest

1500 8 April to 1700 9 April.

All bands 1·8 to 30MHz, cw-cw, phone-phone (not mixed modes). Exchange RS/T plus serial number of contact (from 001). Swiss stations will indicate their canton by a two-letter suffix. Each contact with a Swiss station counts three points, and each station may be worked once on each band—either on cw or phone. The final score is the QSO points multiplied by the number of cantons worked on each band added together. Canton abbreviations are: AG, AR, BE, BS, FR, GE, GL, GR, LU, NE, SG, SH, SO, SZ, TG, TI, UR, VD, VS, ZG, ZH.

Logs must be postmarked not later than 30 days after the contest and should be sent to: TM USKA, HB9AHA, im Moos, 5707 Seengen, Switzerland.

The PACC Contest

1200 29 April to 1800 30 April.

1·8 to 30MHz, cw and ssb (no cross-mode). Single-operator, multi-operator and listener sections. Exchange RS/T and serial number (starting from 001). PA stations will indicate their province by a two-letter suffix—GR, FR, DR, OV, GD, UT, YP, NH, ZH, ZL, NB and LB. Each contact with a Netherlands station counts one point, and a station may be contacted once per band—on either mode but not both. The multiplier is the number of provinces worked on each band added together (maximum 12 × 6 = 72). Final score is total QSO points multiplied by this. Logs should be accompanied by a signed declaration and show how the score was arrived at. Please use a multiplier column and indicate in this only if a new multiplier is claimed. Listeners should record PA stations and exchanges sent and received. Send logs before 15 June to: VERON Contest Manager, PA0DIN, Schoustraat 15, Nymegen 6805, Netherlands. Please use the following frequencies: (cw) 3,525–3,585, 7,010–7,040, 14,025–14,085, 21,040–21,100, 28,050–28,100kHz, and (phone) 3,650–3,750, 7,040–7,100, 14,150–14,300, 21,150–21,300 and 28,200–28,700kHz.

The CQ WW WPX Contest

0000 25 March to 2400 26 March.

All bands 1·8 to 28MHz. Two-way ssb only. Categories are single-operator all band single-band, and multi-operator multi-band. There is also a multi-operator multi-transmitter section in which one signal may be transmitted simultaneously on each band. Note that in the single-operator category only 30 hours' operation is permitted. The rest period may be taken in up to five parts and must be indicated in the log. Entrants should exchange RS and serial QSO number (from 001). Multi-transmitter stations should use separate numbers for each band. Contacts between stations in different continents count three points on 14, 21 and 28MHz, and six on 7, 3·5 and 1·8MHz. Those between stations in the same

QTH CORNER

A9XCD	PO Box 144, Manama, Bahrain.
C31NE	H. Jansen, 24 Rue de L'Eglise, F-57140 Woippy, France.
C31PJ	GM3WBZ, D. H. Facer, 35 Myretown Gate, Alva, Clackmannanshire.
C5AAE	Mr S. Keita, Banjulnding, W/Division, Kombo, The Gambia.
C5ABK	(QSOs after 2.2.78) via G3LQP, 11 Fircroft Close, Tilehurst, Reading, Berks RG3 6LJ.
FB8XS	via F5VU, Jean Brunner, Savigne, F-86400 Civray, France.
FB8YF	via F6DZL, C. Jaehn, 6 Rue d'Istambul, F-67000 Strasbourg, France.
J28AY	via F6ETO, M. Bourez, 34 Batiment "Alsaca", Cite la Conte, F-11000 Carcassonne, France.
J28AZ	PO Box 136, Djibouti, Rep of Djibouti.
KM1CC	via W1GAY, Box 637, Dukes County, Vineyard Haven, Mass, 02568, USA.
OK2BFP/D2A	via OK2TT, J. Hedrich, Cihlarska 7, 78901 Zabreh Na Morave, okr Sumperk, Czechoslovakia.
OZ QSL Bureau	(new) B. W. Nielsen OZ7BW, Solbjerghedevej 76, 8355—Ny Solbjerg, Denmark.
P29AC	via F6CYL, Ann C. Koloboff, 3 Rue de L'Etang, F-78430 Louveciennes, France.
PY7AAI/0	Via PY7AZQ, Fred Souto Maior, Rua Alameida Belo 241-Apt 302, 53000 Olinda, PE, Brazil.
S79D	via N4NW, T. Gregory, 1252 Norview, Norfolk, Va, 23512, USA.
TR8RS	via WA8OWU, G. Amerigulan, 16703 Sussex, Detroit, Mich, 48235, USA.
VE3JPQ	Bryan A. Bisley, 1333 Bloor St E—Nr 1606, Mississauga, Ont, L4Y 3T6, Canada.
VO3CC	Via VO1AA, PO Box 1226, St Johns, Newfoundland, Canada.
VP2VEH	via G4CZJ, J. B. Jenkins, 18 Valley Road, Blandford Camp, Blandford Forum, Dorset.
VR1AV	via JE1ZNT, S. Wachi, 2-7-14 Shakugii-dai, Nerima-ku, Tokyo 177, Japan.
ZK2AU	via W6TR, C. H. Cannon Sr, 2631 Barcells Av, Sta Clara, Calif, 95051, USA.
9K2EX	via SM0BYD, Hans R. Loow, Sturevagen 48A/1, S-191 76 Sollentuna, Sweden.

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

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continent count one and two respectively, but note that only multiplier credit may be claimed for contacts with one's own country. A station may be worked on each band for points, and the multiplier is the total number of different prefixes contacted—note that each counts once only however many bands it may have been worked on. A prefix is considered to be the two/three letter/number combination which forms the first part of the call. Final score is QSO points multiplied by prefix total. Logs should indicate time, numbers sent and received, an indication if new prefix, and points claimed. They should be checked for duplicate contacts and a prefix check list should also be submitted. Enclose summary sheet and post before 10 May to: CQ WPX SSB Contest Committee, 14 Vanderventer Av, Port Washington, NY, 11050, USA. A small supply of log forms and summary sheets is available from G3FKM (sase please).

A special **QRP section** is being run in this contest for stations running not more than 5W output. QRP must be clearly indicated on the summary sheet, and special QRP winners certificates will be awarded.

The Five Centuries of Las Palmas Contest

0000 19 March to 2400 28 March

This contest is to celebrate the 500th anniversary of the foundation of Las Palmas which falls on 24 June 1978. During the period all participating stations from Gran Canaria will use the EA0 prefix. All licensed amateurs and listeners may enter, and all bands 3·5 to 28MHz as well as 144MHz may be used. CW, ssb, fm, or rtty may be used, and the object is to contact as many EA0s as possible. Entrants must exchange signal strength and serial number of contact (from 001). Each contact with an EA0 counts one point, with EA0URE two points. Contacts on cw, rtty, and by mobile stations count two points. Each EA0 station may be contacted once per band per day. A special diploma will be awarded to those in Europe and the American continent (excluding Spain, Portugal, France and Italy who need 50 points) who acquire 25 points. Those in other areas need only 15. Listeners scoring is the same. The top station in each continent will receive a medal, and the station with the highest score will receive a prize of a week's trip for two to Las Palmas during the period 21 to 28 June. (NB. A note in the rules received by your scribe says "this prize will be granted only to that station belonging to the continent which has achieved most points among all participating continents"). Each participant should send a list of claimed contacts to: EA8URE, PO Box 860, Las Palmas de Gran Canaria. This should indicate date, time, band, mode, contacted station, sent and received numbers, and should be posted to arrive by 30 April.

Results of the **1977 French Contest** have been received. In the cw section **G3ESF** scored 67,186 points, G3BTO 45,120, G8DI 9,124, and G2WQ 7,903. Top in the phone section was **G3TJW** with 34,872 points, G4BAH 29,123, G3UFY 23,612, and G4BUO 4,662 also entered.

Awards

The Helvetia 22 Award

For proven contacts with all 22 Swiss cantons. Any mode or band. This very attractive certificate is free but a few IRCs for postage would be appreciated. Send QSLs to: Walter Blattner, HB9ALF, Post Box 450, CH 6601 Locarno, Switzerland.

The PACC Award

For confirmed contact with 100 stations in the Netherlands. Applicants who take part in the PACC Contest may claim credit for stations worked without confirmation provided that they submit a contest entry. Send in a certified list of QSLs (plus PACC contact details if appropriate) and seven IRCs to the contest manager (see "Contests"). Note that credit for contest QSOs may be claimed for a period of two years. Additional stickers are issued for PACC-200, PACC-300 etc.

The 4th Reggio Calabria Spring Award

For acquiring five points by contacting stations in Reggio Calabria town between 0000 8 April and 2400 16 April. Any band/mode may be used and the same station may be contacted on different bands and modes, and also on different days. Each contact counts five points. Points in excess of five will go towards prizes consisting of cups, plaques, medals etc. Note that contacts with the special "jolly" stations count three points. Listeners may also take part. A log summary, 10 IRCs, and a QSL for each callsign contacted must be sent to: ARI Section, PO Box 120, 89100 Reggio Calabria, Italy, to arrive no later than 15 May.

Band reports

Although a considerable amount of dx has been recorded on 1·8MHz during the period under review, generally conditions on the band have been poor due to the high level of auroral activity. A summary of 21 and 28MHz conditions has been received from G8KG who says that 1978 got off to a good start with the solar flux figures rising into the 120's on 31 December—equivalent to a sunspot number of 70. This remained for about 10 days, some disturbed, and 28MHz was open to N America for 12 days in the first half of January, sometimes into the mid-west. Towards the end of the month the flux was rising again and openings occurred to the USA between 26 and 31 January. The 21MHz band opened into the USA every day that month, often into the west coast, and the long path into JA, VK and ZL was good on most days. The 14MHz band seems to have been its usual reliable self, and unusual conditions were noted by your scribe on 2 February when there was propagation into the east coast USA at 0700.

Many thanks to the following for providing the information used in compiling this part of the column: G2AMV, G2HKU, G3HB, G5JL, G6GH, G8KG; G3s CWI, KSH, LPS and OUL; GM3LYY; G4s EAN, EHQ, FAM, FIE and FTF; G8MFS, SP3AGE; and BRSs 17567, 31301 and 33915.

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

1·8MHz. 0000 *KV4FZ.* **0100** *G8NF/W4.* **0600** HK0BKX, *PY1RO,* VE2CT, *W8LBM, K5RC.* **0700** *W4EV/VP9,* K1PBW, *W4PZV, W9MAL, W0NFL.* **2100** *VK6HD.* **2200** *VK6HD, 4X4NJ.* **2300** *C5AAD, LA7Y/EA8, K1PBW.*

3·5MHz. 0000 *EP2SV,* VP2VEH (QSL to G4CZJ), VP5EE, XE2AX, 9N1NFO. **0100** FM7WE, PJ8HX, TI5EWL. **0200** *K4WJR, VE1QJ.* **0400** *VP2M.* **0500** FG7BA. **0700** C6ACM (QSL to WB5RLD), *KM1CC,* W6PVB, WB7BES (Idaho). **1700** UK9AAN, OE6DK/YK, ZLs 2BT, 4KE. **1800** JA4CIB, JH0BQU. **1900** JY4NB, UA9CBO, *VK3,* ZB2DV, *ZC4IO,* 9M2XK, 9N1NFO. **2000** JA, VO3CC, *9K2DR.* **2100** OY5J, 5T5CJ, 5U7BA, 9G1JX. **2200** JA1KXY, JA2NOW.

7MHz. 0000 *FM7AV,* FY7BC, *HC2AO, J3AAG, VP8OO, 8P6s GO, JB.* **0100** *WA4UAZ/HC1* (QSL to WA4QMQ), *TA1ZB.* **0200** *PY7AAI/0, ZD8TM, 6W8EX.* **0700** *CM, HI, JE1GWP, VE6/VE7, W5/W7, ZL.* **0800** *KL7AG. P29MO,* XE1KP, 7X5AB. **0900** *EA9EO, JAs, UK0LAK, VK.* **1000** *JA9APS, N5VV* (N Mex), *W6, N7AZ* (Ariz), *K7EC* (Nev). **1100** *W6, K0FX* (Colo). **1800** *JH1VRQ, VU2NRS.* **1900** *DL1RK/3A.* **2100** *KV4CI.* **2200** ZB2I.

14MHz. 0100 C5ABK, KC4AAD, W6. **0700** W2ACW. **0800** JA, VK, ZL, 3D2UP. **0900** P29AJ, 5V4GR (Box 330, Lome). **1000** *EP2IA, PY7AAI/0,* TR8BL, VK8, VP8PM. **1100** KL7AI, YK1AA. **1200** VP5BS, VS6HG. **1300** S79CP. **1400** AP2JL, PZ9AC. **1500** A7XAH, CO2FRC, W6/W7. **1600** *ST0RK,* N7UT (Utah), VK6, 3B8DA, 5T5KJ. **1700** FH0BKZ, KH6BB, KL7IAK, TR8BA, W1-W0. **1800** *FP8JP, KH6CD,* ZD8TM, ZL. **1900** 5H3JR. **2100** TJ2P, *VK,* ZD9GG. **2300** W6/W7.

21MHz. 0900 AP2TN, *EP2VM,* JA, KX6DC, *UA0YAD,* ZL. **1000** D4CBS, *FR7BP,* KG6JIH, YM1HY, ZL3RB. **1100** ST0RK, VK, *9M8.* **1200** A9XCD, EP2TY (QSL to JR3WRG), TJ1AA. **1300** *PY7AAI/0,* VP8PL. **1400** VE7CQX/SU (QSL to VE1RU), 5U7AS. **1500** FG7AB, *FG0DYM/FS* (QSL to W3HNK), YB0ACH, 5N2NAS. **1600** *LA7Y/EA8, W6/W7,* 9L1AP. **1700** *HC, OX3AC* (QSL to OZ5DX), ZS2MI. **1800** W6/W7, 3B8CV. **1900** CE, *CO,* LU, PY, TJ, *TR8,* ZD8. **2200** VP8PV, ZD8KG.

28MHz. 0900 UA6, UB, ZS3, *4U1ITU,* 7P8BE. **1000** *J28AO,* 3B8CV, 5N2NAS. **1100** KG6JIH, UA9FGC, ZD7PV, 5T5, 9K2DR. **1200** PJ2FR, VP2AZB, ZE2JV, 9H. **1300** FM, K4UWH, KP4, KV4, VK, VP2LEU. **1500** FG, HI, KZ5RV, LU, PY, VO, 3B8CV. **1600** VP9, W1-W4, W5, W8-W0. **1700** VE, W1-W0, VP8HA, XE, YV. **1800** CE, CX, F, KP4, W7HYW (Wyo), VE2FU, VP8NX, W0RTZ (Colo). **1900** K0UF (Neb).

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

Please send all items for **April** issue **to reach G3FKM** no later than **8 March**, and for **May** issue by **7 April**.

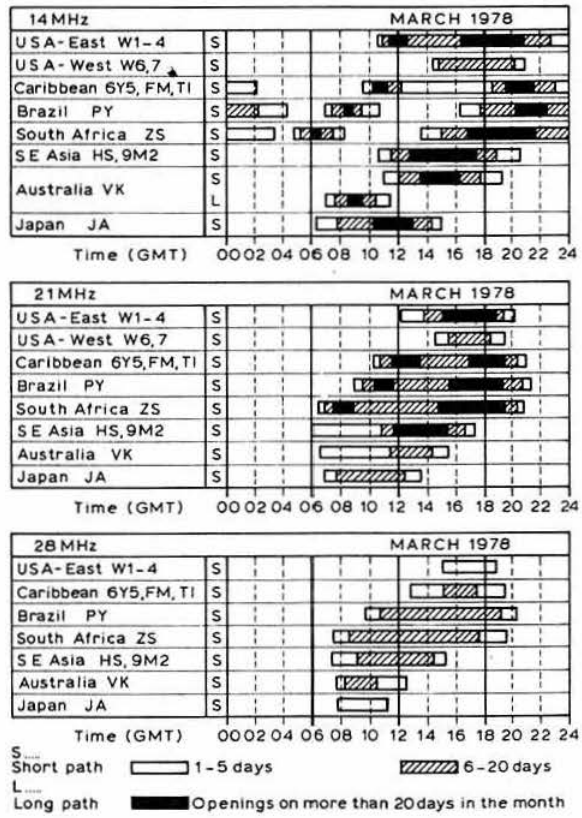
Propagation predictions

During March the MUFs are almost equally divided between the northern and southern hemispheres as the spring equinox approaches. If the expected level of solar activity predicted for this month occurs, North America will be heard on a few days on **28MHz**. If the solar activity is really high, even western North America will come through. Central and South America, Africa, South-East Asia and Australia will be heard relatively frequently on this band. Traffic on **21MHz** is still not certain to all continents, especially not to western North America, Australia and East Asia.

All continents will be heard on **14MHz**, but chances of dx via the indirect path will be very small at the time of the equinox. An exception is traffic with Australia via the indirect path; this will often be more favourable than the direct path. Traffic with Hawaii will be possible on **14MHz** from about 0700 to 0930gmt and from 1700 to 2000gmt. As the path lies across the North Pole and through the polar light zone, this traffic will frequently be interrupted by static.

On **7MHz** dx will also be possible when the longer part of the path lies in darkness. Eastern North America will be heard on this band from about 2200gmt (about the same time as 14MHz will close to this area) until shortly after sunrise. The most favourable time will be from between midnight and 0500gmt. From about 0300 to 0600gmt it may be possible to work western North America and, under very favourable conditions, Hawaii and Alaska from about 0430 to 0600gmt.

The east coast of the USA will possibly be heard on **3·5MHz** from about midnight to 0500gmt. During the latter half of the night local traffic will be interrupted repeatedly by the dead zone. At the present time this should be advantageous to dx traffic with North America.



HF propagation study

Predicted HPFs (MHz x 10) for March 1978

GMT =	00	02	04	06	08	10	12	14	16	18	20	22	24
Aden	168	163	158	267	354	373	369	354	337	275	213	180	168
Ascension	197	191	178	167	301	359	383	376	360	350	293	219	197
Bahrain	158	153	153	262	341	357	354	340	324	247	197	168	158
Bangkok	126	121	150	246	300	321	321	312	288	228	162	140	126
Barbados	167	159	145	124	152	242	322	331	317	318	288	216	167
Bermuda	148	139	126	112	112	195	285	294	294	294	272	208	148
Bogota	161	152	139	117	152	173	312	328	313	310	285	216	161
Buenos Aires	186	180	168	145	192	282	355	357	341	333	296	216	186
Cape Town	190	186	141	202	341	379	388	369	357	336	267	209	190
Colombo	153	143	157	262	337	348	346	332	314	242	186	163	153
Cyprus	152	144	131	224	307	331	327	318	304	248	190	159	152
Dakar	197	191	178	167	303	359	383	376	359	350	293	218	197
Denver	134	108	105	106	105	112	163	224	248	247	229	173	134
Fairbanks	147	140	130	138	168	172	181	187	201	202	176	167	147
Falklands	188	182	172	152	185	291	359	361	345	335	294	216	188
Gibraltar	106	105	93	101	178	219	229	229	219	208	169	126	106
Hong Kong	116	111	149	230	275	295	303	235	197	188	138	129	116
Honolulu	147	140	128	131	159	176	163	154	172	208	197	157	147
Iceland	83	78	78	83	133	171	192	188	186	176	144	100	83
Jamaica	147	139	128	112	136	167	288	299	295	296	272	205	147
Lagos	199	191	173	185	329	374	390	382	365	350	284	213	199
Las Palmas	159	157	143	135	239	301	322	321	304	298	248	187	159
Lima	173	166	150	130	182	162	327	340	327	322	293	216	173
Los Angeles	138	121	112	112	111	112	116	211	242	242	216	163	138
Malta	129	125	106	153	233	266	270	266	257	229	177	138	129
Mauritius	173	164	159	262	355	375	376	361	341	293	221	186	173
Mexico	130	114	106	105	130	140	199	272	272	272	247	190	130
Moscow	101	96	94	173	225	252	260	255	249	204	141	119	101
Nairobi	180	173	157	249	355	380	382	365	347	310	242	188	180
New Delhi	138	129	153	252	315	331	331	318	243	197	168	149	138
New York	134	119	112	112	112	153	242	265	272	272	252	188	134
Osaka	125	115	135	194	244	260	223	177	162	153	136	134	125
Perth	152	141	157	260	333	341	303	249	238	211	183	163	152
Rio de Janeiro	188	183	173	152	177	332	361	361	345	336	296	218	188
Salisbury	188	182	161	235	355	388	390	376	359	326	256	191	188
Seychelles	172	176	159	265	355	375	371	359	341	285	215	182	172
Singapore	138	129	153	252	315	331	331	318	300	233	168	149	138
Suva (s)	143	143	140	158	205	224	238	233	180	177	155	149	143
Suva (l)	200	187	177	177	249	229	215	188	173	208	312	215	200
Sydney (s)	116	112	145	230	275	281	252	241	216	191	138	129	116
Sydney (l)	174	167	154	134	201	187	158	141	130	143	227	214	174
Teheran	153	143	157	262	337	348	346	332	310	234	183	163	153
Vancouver	141	138	121	125	125	116	129	163	185	202	190	159	141
Wellington (s)	130	116	138	187	237	247	260	219	194	176	136	136	130
Wellington (l)	190	182	173	153	196	157	125	124	117	177	237	216	190

Bands recommended are those between hpf and half hpf

obituaries

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

Mr T. Almond, G2FST
Tom Almond, who died on 29 June 1977, was active on all bands 160 through 10m, and was a staunch supporter of his local RSGB group. He was particularly well known on the local top band nets.

Mr G. A. Briggs
Gilbert Briggs died on 11 January, aged 87. During the "depression" Bradford RS organized a competition for the best moving coil speaker and Mr Briggs gained first place with his prototype Wharfdale unit. Subsequent publicity led to an order being received for a gross of the speakers, at a time when Mr Briggs had only one part-time employee; his enterprise, however, involved the employment of thousands and the entertainment of millions.

Mr J. Davis, G5XY
Jack Davis died on 10 January, aged 65. He was first licensed in 1936 and, except for short periods, remained active on the hf bands until his death. He was a member of the RNARS.

Mr A. C. Edwards, G6XJ
Arthur Edwards, who died on 12 January, was operational until his death, his main interests being cw on the dx bands and skeds with many friends overseas. He held VK and ZL calls. Mr Edwards was founder and director of the Eddystone Radio Company and was known world-wide as "Eddy"(stone) Edwards. He made his first WAC in 1929.

Mr F. Hoare, G2DP
Fredric Hoare, who died on 12 January, was involved with many of the Society's activities and clubs including SRCC, PRCC and CARC. He was active for many years on 20, 10 and, more recently, 2m.

Mr J. Lambert, G3TA
Jack Lambert, who died on 8 January in his sixties, was one of the original "two letter call" experimenters. Licensed for 40 years, he was widely known on the 2m and 160m bands and for his assistance to younger people with an interest in amateur radio.

Mr G. A. Lambourne, G2DQI
Mr Lambourne, who died on 28 December 1977, aged 57, was a treasurer of the Worthing & DARC for several years.

Mr W. Launder, G3FHI
Mr Launder died on 14 January. He was a founder member of Torbay ARS in 1947, and remained a member until his death.

Mr M. C. Locke, G3NKE
Bill Locke, who died on 2 January, was the RSGB Area Representative for Cornwall. He was associated with the Cornish RAC since its inception, serving for many years as president, chairman, vice-chairman and, latterly, pro. He was a life member of the club, and had held his callsign since 1959.

Mr L. Osborne, G4CHV
Laurence Osborne, who died on 1 February, was the chairman of Horsham ARC. He was active on hf and vhf, and was building 10GHz gear just prior to his death. Before moving to Horsham, Mr Osborne was a member of the Sutton & Cheam ARS.

Mr R. Rafferty, G4FIY
Roy Rafferty, recently ZD8RR, died on 3 December 1977 on Ascension Is, S Atlantic. (He should not be confused with Ron Roden, former holder of the callsign ZD8RR.)

We have also been advised of the deaths of:
Mr A. D. M. Kelly, G8DDQ;
Mr H. Naylor, G3AKO.

Presentation of a plaque mounted with a QQVO 6/40 pa valve ex-GB3TW to Roger Jones, G3YMK, by members of the Tyne & Wear Repeater Group last November. G3YMK was technical manager during the setting up of GB3TW and received the award in recognition of his work before leaving the north-east to join the IBA in London. Left to right: G8BGU, G8DST, G3YMK, G4DOB and G2BCY

Marconi 75th anniversary celebrations at Poldhu, Cornwall

by B. BODY, G8JML*

Eighteen months ago the Radio Club of Barnstaple, Massachusetts, approached the RSGB on behalf of the American Radio Relay League, seeking its co-operation in celebrating the 75th anniversary of the first two-way radio transmission between the USA and Europe. The transmission on the night of 18 January 1903 took place between Marconi stations at Cape Cod, Massachusetts, and Poldhu in Cornwall, and consisted of an exchange of messages between the then Heads of State. To celebrate the event, the Barnstaple club proposed to establish station KM1CC at Cape Cod, and the Cornish Radio Amateur Club agreed to establish a similar station, GB3MSA, at Poldhu.

The Cornish station, set up in the sun lounge of the Poldhu Hotel, some 100m from the original Marconi site, was manned by shifts of operators from the Cornish Radio Amateur Club, supplemented by visiting licence holders and operated simultaneously on three frequencies in the 3·5, 7, 14, 21, 28 and 144MHz bands from 1200 on 14 January to 1215 on 21 January.

Antennas used included a TA33 for 14, 21 and 28MHz; inverted dipoles for 3·5 and 7MHz, and a Ringo ranger colinear dipole and a 10-over-10 Yagi for 144MHz. They were carried on three 60ft sectional tubular masts erected in the grounds of the hotel. Despite gale-force winds experienced during the week, antenna serviceability was such that the continuous operation on three bands simultaneously was never in jeopardy. Rigs in use were loaned by members of the club and included an FT-101 for the kite station, an HW-100 for 3·5MHz, SB301 receiver, SB401 transmitter, and SB200 linear for 7, 14 and 21MHz. the 144MHz band was covered with an FT-101, transverter and 400W homebrew linear for ssb, and an FT-211E and Belcom 1007 for fm. All were trouble free, and it is interesting to note that the SB301, SB401 and SB200 were in use continuously for the whole period of seven days. Due to last-minute sickness it was not possible to establish the planned rtty station.

A display of photographs and historic items in the foyer of the hotel attracted considerable interest. These included the hotel register containing Marconi's signature, recording one of his many stays at the hotel while visiting the Marconi station.

The Marchesa Marconi, (Marconi's widow) and his daughter, the Princess Elettra, travelled from their home in Rome, and, together with Sir Arnold Weinstock and some 70 or so distinguished visitors, were guests of the directors of the Poldhu Hotel Company at a luncheon to celebrate the occasion. The amateur radio movement was represented by, from the RSGB, President Dr Dain Evans, G3RPE, and George Jessop, G6JP; and, from the Cornish Radio Amateur Club, the president, Gordon Nicholas, G3XTE; chairman David Blackford, G3NPB, and Bert Hammett, G3VWK, who did much of the organizational work over many months.

The station was officially opened by Marchesa Marconi, who stayed in the hotel until Thursday, and spent many hours in the station, accompanied by her daughter, taking part in the activities and talking to visitors. The station had many hundreds of visitors from all over the country during the week. They ranged from amateurs who stayed in the hotel for a few days or came for a few hours to operate, using the GB3MSA call, to parties of school children armed with note pads and pencils intent on gleaning material for a project. Included were members of the public who showed great interest in both the exhibition and the working of the station.

The world-wide interest in the station is reflected in the publicity the event received and the large number of countries worked. The largest number of contacts was on 3·5MHz, with over 2,000 contacts in 36 countries. There were 23 contacts in seven countries on 7MHz, 300 contacts in 20 countries on 21MHz, and 650 contacts in 51 countries on 14MHz. Unfortunately the week did not coincide with an opening on 144MHz and the 550 contacts were mostly in the UK and France. Some 102 of the contacts made on Saturday and Sunday on 3·5MHz were made with an FT-101 working into a long-wire antenna carried by a replica of the kite used by Marconi at St Johns, Newfoundland. The replica was made, and flown from the site of the Marconi station, by members of the British Kite Flying Association. On Saturday, when the kite was being wound in, the offshore wind dropped and the kite fell on to the rocks below the 200ft cliffs. A rescue operation using a French war kite as a crane was successful in recovering the casualty ready for service again the next day. Regular listeners to the GB2RS news bulletins will know that the news was read from GB3MSA on Sunday the 15th; newsreader G8ML travelled from Cheltenham to spend the week joining in the station's activities.

G8ML reading the GB2RS news bulletin from GB3MSA. *Photo:* **B. Body, G8JML**

At an early stage in the planning of the event the possibility of re-enacting the original inaugural messages by an exchange of messages between the present-day Heads of State was explored. An invitation to HM The Queen to provide a message to be sent over the link to KM1CC for President Carter was declined, one consideration being given as the unwillingness of the Home Office to waive the prohibition of the passing of third-party messages by amateur stations. The FCC appears to have waived the restriction on this important occasion. The refusal on the part of the Home Office attracted considerable publicity and resulted in a written question to the Home Secretary in the House of Commons.

Messages from President Carter, President Leone of Italy, and Gioia Marconi Braga, Marconi's daughter by his first wife, were transmitted from KM1CC in the A2 mode with 240Hz modulation in the early hours of Thursday 19 January. The first transmission was at 0100 and lasted 45 min. It was repeated at 0300 and 0500, but reception conditions at Poldhu were so bad that it proved impossible to copy the complete message before the bands closed. Contact was re-established with KM1CC later in the day and the remainder of the messages copied. The assistance given to Poldhu by W stations, and the discipline shown by operators throughout the world while the messages were being sent was greatly appreciated.

The message from the President of The United States

Seventy-five years ago a new era of international communications was heralded in by an historic exchange of messages across the Atlantic. On January 18th, 1903, President Theodore Roosevelt first used the Marconi wireless to send the following message to Edward the Seventh of England from a station on Cape Cod:

"In taking advantage of the wonderful triumph of scientific research and ingenuity which has been achieved in perfecting a system of wireless telegraphy, I extend on behalf of the American people most cordial greetings and good wishes to you and the people of the British Empire."

Edward the Seventh replied via the Poldhu Station in Cornwall, England:

"I thank you most sincerely for the kind message which I have just received from you through Marconi's transatlantic wireless telegraphy. I sincerely reciprocate in the name of the people of the British Empire the cordial greetings and friendly sentiments expressed by you on behalf of the American nation and I heartily wish you and your country every possible prosperity."

That exchange marked a milestone in the history of communications. Since then we have built on the invention of the distinguished Italian physicist, Guglielmo Marconi, and others, a global communications system that allows instant contact, not only between Heads of State, but peoples of all nations. In recalling that historic message, it is fitting that we commemorate the event both with gratitude for the way in which science and engineering have helped to unite us and with fervent hopes that such communications will serve the future course of peace and human progress everywhere.

—Jimmy Carter, President of The United States.

*Penolver, Scarcewater Vean, St Clement, Truro, Cornwall.

Princess Elettra, Marchesa Marconi and RSGB President Dain Evans, G3RPE, with members of the British Kite Flying Association who built the replica of Marconi's kite.
Photo: **J. Farrar, G3UCQ**

The message from the President of the Republic of Italy

On the occasion of the seventy-fifth anniversary of the first transmission of a radio telegraphic message by Guglielmo Marconi between the United States and Europe, I recall with admiration this great Italian's inventive capabilities and enthusiasm, which have given a new dimension to contacts between men of every continent by achieving a decisive step forward for science. All over the world, radio amateurs participate in this new dimension and, with the same enthusiasm, have created among themselves a close network of contacts. To this network is owed daily the saving of human lives, both on land and on sea, as well as the progressive deepening of a sense of solidarity which overcomes all boundaries and which strengthens the hope for a better future.

—Giovanni Leone, President of the Republic of Italy.

The message from Gioia Marconi Braga

At the beginning of our century Thomas Edison remarked, "I would like to meet that young man who had the monumental audacity to attempt and succeed in jumping an electrical wave across the Atlantic."

He was referring, of course, to my father Guglielmo Marconi, who was in his twenties then. So you see, what is taken for granted by so many of us today was an incredible feat of human ingenuity 75 years ago.

It is good for us to remember the faith, the vision and the unwavering perseverence of those early pioneers. It is fitting to salute radio amateurs all over the world on this occasion. My father was always very close to them, sharing their ideas, their problems and their achievements. To one young man who was showing him how he had put together his own set, and in answer to his deprecating remarks about his work not being too good because, after all, he was only an amateur, my father replied, "Don't forget, young man, that I too am only an amateur."

I think that we all owe a debt of gratitude for the services radio amateurs have rendered unselfishly to mankind on so many occasions, and in so many different ways, more dramatically in times of emergency. But more consistently from day to day in just keeping watch over the waves of the air.

The magic of radio endures in their hearts. We are reminded of it because of them.

—Gioia Marconi Braga.

The week was an unforgettable experience for all who took part, and the Cornish Amateur Radio Club would like to thank most sincerely all those whose efforts combined to make the event the success it was.

your opinion

VHF ANTENNA POLARIZATION

The Editor
Radio Communication

Sir—With reference to the letter from G3MMW in the December issue of *Radio Communication*, I can but whole-heartedly agree with his comments on the polarization of antennas on the 144MHz and 432MHz bands. In my own situation, one beam antenna for 144MHz is acceptable with the neighbouring residents, while two beams or even a crossed Yagi would probably cause some discontent.

The other point which must be borne in mind is the cost factor. The erection of two antennas, where one, given standard polarization, would do the job just as effectively, both for fm and ssb, seems a little on the extravagant side. I feel, as G3MMW, that vertical polarization would be the most practical.

C. J. Coker, G4FCN

The Editor
Radio Communication

Sir—I read with interest Mr Ilbury's letter re the polarization of antennas for vhf working, and would like to point out that there has always been a standard, ie horizontal. It is only since the introduction of repeaters that vertical polarization has come in.

As a 2m dx operator I would find mounting my 14-el Parabeam in a vertical position impossible, and would not be prepared to settle for a smaller beam just for the sake of mobile operators whom I very rarely work with anyway.

Anyway, most fixed stations who do work local contacts use cross-polarized antennas with which they switch polarization, or wire for circular polarization—which is even better since signals from mobiles can be pretty randomly polarized after being reflected off various roadside objects.

There are certain advantages in having one polarization for local and another for dx working anyway, since a dx operator is less likely to be QRMd by a local mobile with a whip than one with a halo.

No, since gravity pulls downward my mast is vertical, and since my mast is vertical my antenna is horizontal and until gravity starts pulling sideways it's stopping that way!

G. M. Pheasant, G4BPY

VHF NFD POWER LIMIT

The Editor
Radio Communication

Sir—Please do not place a power limit on this contest, for the following very good reasons.

(1) Regardless of power, the "richest" person or club will always have an advantage on equipment and site, so that other things being equal, one will continue to see the same sorts of results.

(2) Power is no substitute for operating expertise and organizational prowess, and it is really this that separates the better stations from the others.

(3) Very few people use the legal limit anyway, so the mythical "reduction in QRM"is unlikely to occur. (Ever thought of looking at your own receiver front end?)

(4) If you do not like the rules, you do not have to play the game—there are plenty of other contests, including the very popular QRP Contest, and if you do not want to drag generators to the top of your local mountain, enter a fixed station contest.

(5) Regardless of the hobby, be it motor-racing, fishing or stamp collecting, all attempts to make everybody equal is bound to failure, there will always be somebody more equal than the others!

A. Oakley, G8IWA

club news

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

Items of news and dates of forthcoming events should reach RRs by 23 March for the May issue.

Club secretaries are QTHR unless otherwise stated.

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

Ainsdale (AARC)—Thursdays fortnightly, 9 and 23 March, 6 and 20 April. Ainsdale Scout Headquarters. For details please contact G2CUZ.

Blackburn (East Lancs ARC)—First Thursday in each month. 7.30pm. YMCA. Blackburn. Sec G4DGR.

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

Bolton (B&DARS)—Main meeting on first Wednesday in each month with informal meetings on third Wednesday, 8pm. Bolton Recreation Club, Kensington Place, Bolton. Sec G4FSN.

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

Bury (BRS)—14 March (Meet your RR, Bill Furness, G3SMM), 30 March (Granada studio visit), 11 April (Basic facsimile), 9 May (Microprocessor developments). Meetings Tuesdays, 7.45pm. Mosses Youth and Community Centre, Cecil Street, Bury. Club station on the air, and beginners'/intermediate morse most Tuesdays. Details from G4FQE, tel Rochdale 32730.

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

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

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

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

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

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

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

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

Liverpool University (UoLARS)—Meetings each lunchtime. Visitors from the Polytechnic and other colleges most welcome. Club shack, Reilly Building. Club active on top to two, G3OUL/G8JUL. Sec Geoff Plucknett, G4FKA, UoL, Guild of Undergraduates, 2 Bedford Street North, Liverpool L7 7BD.

Manchester (M&DARS)—Wednesdays, 7.30pm. 203 Droylsden Road, Newton Heath. Club call G3HOX is active on hf and vhf. Sec G8IYX.

Manchester (South Manchester RC)—10 March ("The versatility of direct conversion—a low-cost transceiver for 80m" by R. V. Heaton, G3JIS), 17 March (Mini df), 24 March (Club closed), 31 March (Discussion and preparation for Belle Vue exhibition), 7 April (Homebrew equipment competition), 14 April ("RTTY" by R. P. Harrison, G8DVR), 21 April ("Satellite communications" by J. D. Wood, G8GHO), 28 April ("Wide band amplifiers" by P. G. Torry, G3SMT), 8pm. Sale Moor Community Centre, Norris Road, Sale. Informal meetings Monday evenings. "Greeba", Shady Lane, Baguley. Particulars of club activities from sec G3VIW, tel 061-973 3355.

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

Manchester (UMISTRS)—Please note change of name to University of Manchester Institute of Science and Technology Radio Society. Every weekday at 12.15pm and Wednesdays at 8pm. Morse classes held each lunchtime. The bar, UMIST Union. Prospective members please contact R. Napper, G4FXU, UMIST RS c/o UMIST Union, PO Box 88, Sackville Street, Manchester. G3CXX/G8FOT is alive and active on all bands top to ten and two.

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

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

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

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

Stockport (SRS)—8 March ("Capacitors" by G3NUQ and "Delta loop antenna" by G3JHK), 22 March (Pre-exhibition arrangements), 12 April (Films), 26 April (Surplus gear sale), 8pm. "Blossoms Hotel", Buxton Road, Stockport. Sec G3FYE. New members and visitors always welcome.

Thornton Cleveleys (TCARS)—First and third Wednesdays in each month, 8pm; morse practise from 7.30pm. St John Ambulance Hall, Fleetwood Road North (next to "Gardner's Arms"), Thornton. Details from sec G8MKQ.

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

Warrington (W&DARS)—Tuesdays, 7.45pm. Grappenhall Community Centre, Bellhouse Lane, Grappenhall, Warrington. Sec G3MMD, tel Lymm 3533.

Wigan (W&DARS)—First and third Wednesdays in each month. Poolstock Cricket Club, Keats Avenue, Poolstock. Sec G4EII.

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

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

REGION 2—RR R. C. Andreang, G4CMT, 6 Beech Avenue, Bilton, Hull, Humberside.

Barnsley (B&DARS)—Fourth Friday in each month, 7.30pm. "King George Hotel", Peel Street, Barnsley. Sec G3LRP.

Bradford University (UBURS)—Thursdays, 7.30pm. N10, University Main Building, Richmond Road. Come and see the 2 metre station, G8IIW. Details from G8GOV.

Denby Dale (DD&DARS)—Wednesdays, 7.30pm. Pie Hall, Denby Dale. Sec G3FQH. Visitors always welcome.

Goole (G&DARS)—Fridays, 7.30pm (during school term only). Goole Grammar School. Details from chairman G3VBI.

Halifax (Northern Heights ARS)—7.45pm. "Peat Pitts Inn", Ogden, Halifax (four miles north of Halifax town hall). Sec G3MDW.

Harrogate (Harrogate & Knaresborough RS)—First Monday in each month, 7pm. College of Adult Education, Victoria Avenue, Harrogate. Sec J. Douglas, 15 Pannal Ash Drive, Harrogate HG2 0JA.

Hornsea (HARS)—Wednesdays, 8pm. Rear of "Victoria Hotel", Hornsea (facing Hornsea Mere). Sec G4CHH.

Hull (H&DARS)—Fridays, 7.30pm. "Dorchester Hotel", Beverley Road, Hull. Sec G3LZQ.

Hull (HUR&ES)—Fridays, 1pm. Room 313B, Union Building. All amateurs invited. Enquiries to G4FVP.

Leeds (White Rose RR)—Wednesdays, 7.30pm. (Lectures start 8pm). Sec G4DZI.

Leeds (LUUARS)—Tuesdays, 8pm. Union Annexe (second floor), Woodhouse Lane. All new students welcome. Sec G4CNG, QTHR, or at "E" block, Lupton Flats, Alma Road, Leeds 6, during term.

Otley (OR&ES)—Tuesdays, 8pm. 14 Back of Court House Street, Otley. Sec G8DFZ.

Scarborough (SARS)—New night. Mondays, 7.30pm. Scarborough Technical College, Scalby Road, Scarborough. Sec G3RTN, pro Charles Whitaker, 1 Ryefield Close, Eastfield, Scarborough.

Sheffield University (SU&PRS)—Wednesdays in term, 1pm. "Red Deer", off Main Street. Details G4BXN.

Polytechnic—This club must expand this year if the Students' Union is to continue financial support. Details G4CYA, QTHR, tel Sheffield 303030.

Sheffield (Association of Sheffield ARCs)—Mondays, 7.45pm (first Monday in each month, during term). This group meets to bring

WHITE ROSE RADIO SOCIETY ANNUAL DINNER

Photos: P. Thacker, G8NOT

Lady members of the White Rose RS. Left to right: Mrs G. K. Tong, G8ENO, xyl of G4GMQ; Mrs B. J. Clegg, G3VQH, xyl of G3FQH; Mrs H. Denby, G4GYL, xyl of G3FCW; Mrs D. Hughes, G4EZI, xyl of G4DZI; Mrs E. Lennox, G8NVO, xyl of G8NVP

The "White Rose Minstrels", otherwise "The Committee", entertain the guests. Left to right: white-stick operator R. D. Armitage, G3ZSA, playing accordion; S. Sefton, G3ZBA; C. J. Thomas, G3PSM; G. Denby, G3FCW, president; A. Kessler, G4DXA, treasurer; T. Beaumont, G4DVZ; R. Hughes, G4DZI, secretary

together the smaller clubs in the area and to provide a joint newsletter. Details G4CUW, QTHR, tel Sheffield 363927.
Sheffield (ARS)—Third Monday in each month, 8pm. "Sheaf House Hotel".
Wakefield (W&DARS)—7.30pm. Ines Road School, Wakefield. Sec G3WWF.
York (YARS)—7 March (Visit to Mansion House, York), 10 March (Talk by Lowe Electronics), May (Talk by Raynet representative), 7.30pm. United Services Clubroom, 61 Micklegate, York. Sec G3WVO. Visitors always welcome.

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

Birmingham (Birmingham University RS)—Tuesdays during term, RAE classes fortnightly, 7pm. Students' Union. Sec G4CKK. Meetings followed by tour of real ale establishments. Club stations G3IUB and G8IUB.
Birmingham (Midland ARS)—21 March ("Radio astronomy" by Dr D. Sears), 18 and 23 April ("Rally–Drayton Manor Park"), 8pm. Room 110, University of Aston, Gosta Green, Birmingham. 2 May (Construction and club station), 7pm. Brasshouse Centre, off Broad Street, Birmingham. Sec G8BHE.
Birmingham (Slade RS)—Alternate Fridays commencing 17 March, 8pm. The Committee Room, Church House, Erdington, Birmingham. Sec G4FGF.
Birmingham (South Birmingham RS)—Thursdays (HF night on the air), Fridays (Construction and morse classes), 7.30pm. 5 April, 3 May, 8pm. Hampstead House, Fairfax Road, West Heath, Birmingham B31 3QY. Sec G8KPA.
Bromsgrove (B&DARC)—10 March, 14 April, 8pm. Avoncroft Art Centre, Bromsgrove. Sec G4GBE.
Burton-on-Trent (BonT&DARS)—Wednesdays, 8pm. Stapenhill Institute, Main Street, Stapenhill, Burton-on-Trent. Sec G3ACR.
Cannock Chase (CCARS)—First Thursday in each month (Business meeting), other Thursdays (HF and vhf club stations, natternights, morse classes, talks etc), 9pm. Bridgtown Social Club, Walsall Road, Cannock. Sec G8MWE. Visitors welcome.
Coventry (CARS)—10 March (Cheese and wine party), 17 March (Night on the air), 24 March (No meeting), 31 March (VHF night on the air), 7 and 14 April (Construction of the club project—a crystal marker oscillator), 21 April (Radio direction finding practise event), 28 April (Night on the air), 5 May, 8pm. Baden Powell House, 121 St Nicholas Street, Radford, Coventry. Sec Dave Parker, G8OMB, 41 Brookdale Road, Nuneaton CV10 0BL.
Coventry Technical College (CTCARS)—Mondays and Thursdays, 7pm. Winfray Annexe of the college. Sec G8ISJ.
Coventry (University of Warwick ARS)—Wednesdays during term, 7pm. Cryfield Farm, University of Warwick. Talk-in on S20, or contact G4BXI or G4CDW, Hurst Flat 40, Cryfield Village, University of Warwick.
Dudley (DARC)—14 March (Surplus sale), 28 March, 11 and 25 April, 9 May, 7.45pm. Central Library, Dudley. Sec Norman Rock, 28 Conway Close, High Acres, Kingswinford, Brierley Hill, DY6 8PT.
Hereford (HARS)—17 March ("Propagation"—tape/slide lecture), 7 April ("Radio in Japanese pow camps" by Tom Douglas, G3BA), 21 April, 5 May, 8pm. Civil Defence HQ, Gaol Street, Hereford. Sec G4CNY.
Kidderminster (K&DARS)—Alternate Wednesdays commencing 15 March, 8pm. Youth Centre, Bromsgrove Street, Kidderminster. Sec G4CTU.
Lichfield (Chad RC)—Alternate Wednesdays commencing 15 March, 8pm. The Naval Club, Burton Old Road, Lichfield. Sec G4ESK.
Mid-Warwickshire (MWARS)—First and third Mondays in each month, 8pm. 61 Emscote Road, Warwick. Sec G8CXL.
Redditch (RRC)—Second and fourth Thursdays in each month, 8pm. WRVS Centre, Salop Road, Redditch. Sec G3EVT.
Shrewsbury (Salop ARS)—Thursdays, 7.30pm. "Albert Hotel", Smithfield Road, Shrewsbury. Sec G3VZG. New members welcome.
Solihull (SARS)—21 March ("Keys I have used" by Ray Dobdinson, G3RGD), 18 April, 7.30pm. "Manor House", High Street, Solihull. Sec G4AEJ.
Stoke-on-Trent (SonTARS)—Thursdays, 7.30pm. 2a Racecourse Road, Oakhill, Stoke-on-Trent. Sec G4CWN.
Stoke-on-Trent (North Staffs ARS)—First and third Mondays in each month (Lectures, etc), other Mondays (Natternights, Raynet and club station G4BEM), 7.30pm. Harold Clowes Community Centre, off Dawlish Road, Bentilee, Stoke-on-Trent. Sec G8CMR. New members welcome.
Stourbridge (StARS)—Informals on the first Tuesday in each month, 9pm. "Shrubbery Cottage" public house, Heath Lane, Oldswinford, Stourbridge. 20 March (AGM), 3 April (Construction and morse evening), 17 April, 7.45pm. Longlands School, Brook Street, Stourbridge. Sec G4CLX.
Stratford-upon-Avon (SuponA&DARC)—Meetings to be arranged in March and April (dates to be decided). Youth Hostel, Alveston. Sec G4EXR, tel Stratford 5638, weekends only. New members welcome.
Sutton Coldfield (SCRS)—Second and fourth Mondays in each month, 7.30pm. Central Youth HQ, Clifton Road, Sutton Coldfield. Sec G8KRW.
Tamworth (TARS)—Second and fourth Mondays in each month. Indoor Sports Centre, Corporation Street, Tamworth. Sec G4EUF. New members welcome.

Telford (T&DARS)—8 March (Natternight and G3ZME on the air), 15, 22 and 29 March, 5 April (AGM), 12, 19 and 26 April, 3 May, 7.30pm. Phoenix Centre, Webb Crescent, Dawley. Sec G8MXS, tel Much Wenlock 357. Visitors welcome.
Willenhall (W&DARS)—Alternate Wednesdays. Morse classes available at the end of each meeting. "Three Crowns", Stafford Street, Willenhall. G3YHN xyl.
Wolverhampton (WARS)—13 March (Natternight), 27 March (No meeting), 3 April ("Radio in Japanese pow camps" by Tom Douglas, G3BA), 10 April (Natternight), 17 April (Surplus sale), 1 May (No meeting), 8 May (Home-built gear competition), 8pm. "Neachells Cottage", Danescourt Road, Stockwell End, Tettenhall, Wolverhampton WV9 9PH. Sec G8EDG.
Worcester (W&DARC)—3 April (Annual construction contest), 8 May ("World Administrative Radio Conference" by Dr John Allaway, G3FKM), 8pm. "Old Pheasant", New Street, Worcester. Sec G3TQD.

REGION 4—RR T. Darn, G3FGY, 20 Mount Pleasant, Ripley, Derbys DE5 3HE.

Derby (D&DARS)—8 March (Film show), 15 March (QRP talk and demonstration by G3URU), 22 March (AGM), 29 March (RSGB tape/slide lecture), 5 April (Surplus sale), 12 April (Social natternight), 19 April (Film show), 26 April (tba), 7.30pm. 119 Green Lane, Derby. Morse classes Tuesdays and Fridays, 7pm, when arranged.
Derby (NHARG)—Fridays, 7.30pm. Nunsfield House, Boulton Lane, Alvaston, Derby.
Grimsby (GARC)—First and third Thursdays in each month, 8pm. 16 March (Visit to the *Evening Telegraph*, if possible), 30 March (Films). Alexandra Club, Cleethorpes.
Leicester (LRS)—Mondays, 7.30pm. Club House, Gilross Estate Cottage, off Groby Road, Leicester.
Loughborough (LSARC)—Thursdays, 7.30pm. Students' Union, Edward Herbert Building, Loughborough University, Ashby Road, Loughborough. Sec G8KSZ.
Mansfield (MARS)—First Friday in each month, 7.30pm. "New Inn", Westgate, Mansfield.
Matlock (Derwent Valley ARS)—First Monday in each month, 7.30pm. "The Royal Oak", Tansley, Nr Matlock. The Matlock club has had a very successful first year, and a good programme has been arranged for 1978. Sec G8LVO.
Melton Mowbray (MMARS)—17 March (The other man's job, "Wood" by A. Scudamore, G3YEV), 21 April ("First aid and electric shock" by A. Bass, accident prevention officer, and H. Cox of the St John Ambulance Brigade), 7.30pm. St John Ambulance Hall, Ashfordby Hill, Melton Mowbray.
Nottingham (ARCON)—Thursdays, 7.30pm. Sherwood Community Centre, Mansfield Road, Nottingham.
Nottingham University (NURC)—Tuesdays. Contact R. Dixon, G4BVY, c/o Students' Union, Nottingham University.

The city of Derby is "twinned" with the German city of Osnabrück and, after an initial contact earlier last year, members of Derby & D ARS paid an "official" visit to Osnabrück Radio Society last September. They received a very warm welcome and much hospitality from local radio amateurs, who arranged several interesting visits for their guests.

Probably the highlight of the visit was a reception given for them at Osnabrück Town Hall by the Burgermeister, and the photograph shows, left to right: Richard Buckby, G3VGW, vice-chairman; Burgermeister Hartmut Lause; Ludwig Wagner, DL1WZ; Jenny Shardlow, G4EYM, sec; Klaus Distelhorst, DK9BG, Osnabrück RC sec, and Tom Darn, G3FGY, chairman, at this event. *Photo:* **G3SZJ**

Scunthorpe (SARC)—Technical lectures, demonstrations, etc, Tuesdays, 7.30pm; morse class approximately 9pm. RAE class, Thursdays, 7.30pm. 14 March (RSGB film show, talk and discussion with J. Anthony, G3KQF, and T. Darn, G3FGY, zonal manager and regional representative respectively; also RSGB bookstall. Come and let us have your views).

REGION 5—RR P. F. Chilcott, G4BBA, 258 Coneygree Road, Peterborough PE2 8LR.

Bedford (B&DARC)—Wednesdays, 8pm. Ravensden. Sec G4FFC.
Cambridge (C&DARC)—Fridays, 7.30pm. Air Training HQ, Newmarket Road. Sec G4BAO.
Cambridge (CUWS)—Tuesdays fortnightly during full term. Details from sec G8KTJ, Queens' College.
Corby (CTCARG)—Mondays, 7.30pm. Corby Technical College. Clubhouse and GB3CI in grounds.
Dunstable (DDRC)—Fridays, 8pm. Chews House, 77 High Street South. Sec G3HJF.
March (M&DRAS)—Tuesdays, 7.30pm. 2 Grays Lane. Sec G8GNE.
Northampton (NRC)—9 March (Test equipment), 30 March (Wine and cheese evening), 27 April ("SSTV" by G3KLU). Thursdays, 8pm. Kingsthorpe Community Centre, Thornton Park, Kingsthorpe. Sec G8LHR. New members especially welcome at new shack.
Peterborough (GPARC)—Fourth Thursday in each month, 7.30pm. Southfields Junior School. Sec G4FDF.
Peterborough (PR&ES)—Third Friday in each month, 7.30pm. Scout Hut, Occupation Road. Sec G3EEL.
Shefford (S&DARS)—20 April (RSGB etc with RR G4BBA). Thursdays, 8pm. Church Hall. Sec G8HHO.

REGION 6—RR F. S. G. Rose, 84 Cock Lane, High Wycombe, Bucks HP13 7EA.

Banbury (BARS)—First Friday in each month, 7.30pm. The General Foods Sports and Social Club, Spriceball Park, Banbury. Sec S. L. Terry, G8OCT, tel Banbury 4769.
Bracknell (BARC)—Mondays, 8pm. Coopers Hill Centre (adjacent to station). Please contact sec G3YMC for meeting details.
Burnham Beeches (BBRC)—First Monday in each month, 8pm. Hedgerly Scout HQ. Sec Peter Flynn, tel Farnham Common 2609.
High Wycombe (Chiltern ARC)—Please contact sec G4FRL, tel Kingston Blount 52006, for next meeting details.
Maidenhead (M&DARS)—Please contact G3WKX for details of next meeting.
Milton Keynes—For meeting details ring G3THC, tel Milton Keynes 316730.
Newbury (N&DARS)—First Monday in each month, 7.30pm. Newbury College of Further Education, Oxford Road, Newbury. Sec G4EEE.
Oxford (O&DARS)—Second and fourth Wednesdays in each month, 7.30pm. Civil Service Sports Club, Marston Road, Oxford. Sec G4BHR.
Oxford University (OURS)—Please contact sec M. Evans, G8LTE, Worcester College, Oxford, for meeting details.

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

At a meeting of affiliated society representatives and area representatives on 12 January it was suggested that, because of the apparently unstoppable misuse of the London repeater GB3LO, Council should be pressed to use the RSGB's power as licensee to close it down. It was decided to find out if this was what members living in Region 7 wanted, and to decide at the next meeting on 13 April. Affiliated societies will, therefore, be consulting their members. RSGB members *not* members of an affiliated society should send their views direct to their area representative, if they have one, or to the regional representative.

Area representatives are: Mr G. Cluer, G4AVV, 24 Patterson Road, Upper Norwood, London SE19 2LD (Norwood and South London, ie Southwark, Lambeth and Lewisham); Mr J. Korndorffer, G2DMR, 19 Park Road, Banstead, Surrey SM7 3BY (Surrey districts of Epsom and Ewell, Mole Valley, Reigate and Banstead and Tandridge; London boroughs of Sutton and Croydon); Mr R. Hewes, G3TDR, 24 Brightside Avenue, Laleham, Staines, Middlesex (Surrey districts of Guildford, Waverley, Surrey Heath, Woking, Spelthorne, Runneymede and Elmbridge; London boroughs of Kingston, Richmond, Merton and Wandsworth).

Addiscombe (AARC)—Tuesdays, 9pm. "Spreadeagle", Portland Road, South Norwood. Sec G3SJX.
Ashford (Echelford ARS)—13 March ("World-wide commercial communications" by A. Keech, G4BOX), 30 March ("Reminiscences of spark transmitters" by V. Rubeck, G4DMO), 10 April (AGM), 27 April ("Third-method ssb" by M. Funnell, G3YQW), 7.30 for 8pm. The Hall, St Martin's Court, Kingston Crescent, Ashford, Middx. Sec G3TDR, tel Staines 56513.
Bexley Heath (North Kent RS)—Second and fourth Thursdays in each month, 8pm. St Mary's Institute, 2 North Cray Road, Bexley. Sec G4ARQ.
Coulsdon (CATS)—First Thursday in each month, 7.30 for 8pm. 10th Purley Scout Hall, Chipstead Valley Road, Coulsdon. Third Monday in each month, 7.30 for 8pm. 1st Purley Scout Hall, Purley Park Road, Purley. Sec G8KDQ, tel 668 3963.
Cray Valley (CVRS)—First and third Thursdays in each month, 8pm. Christchurch Centre, High Street, Eltham, London SE9. Sec G4FUG.
Croydon (Surrey Radio Contact Club)—First and third Wednesdays in each month, 7.30 for 8pm. TS "Terra Nova", 34 The Waldrons, Croydon. Sec G3FWR, tel 01-657 3258.
Crystal Palace (CP&DRS)—Third Saturday in each month, 8pm. Emmanuel Church Hall, Barry Road, East Dulwich. Sec G3FZL, tel 699 6940.
Guildford (G&DRS)—Second and fourth Fridays in each month. Model Engineers HQ, Stoke Park, Guildford. Sec G4BHQ, tel Guildford 76375.
Guildford (University of Surrey E&ARS)—Informal meetings, lunchtimes during term. Lower Bar, Union House. G8AHK is active on vhf, and G3IGQ on hf. Skeds and QSOs always welcome. Sec G8MLO tel Guildford 71261
Kingston (K&DARS)—Second Wednesday in each month, 8.15pm. Berrylands Scouts and Guides HQ, Stirling Walk, Raeburn Avenue, Surbiton. Sec G4APG, tel 399 8113.
New Cross (Clifton ARS)—Fridays, 8pm. 225 New Cross Road, London SE14. Details from R. A. Hinton, 42 Sutcliffe Road, Welling.
Reigate (RATS)—21 March ("Waveform synthesis" by D. Pedder, G3LFX), 18 April (AGM), 8pm. Constitutional Centre, Warwick Road, Redhill. First Tuesday in each month, 8pm (Natternights). "Marquis of Granby", Hooley Lane, Redhill. Sec G3XSZ.
Sutton and Cheam (S&CRS)—16 March ("Function of the Intruder Watch" by G5XB), 20 April (AGM and discussion on club matters). Sutton College of Liberal Arts, Cheam Road, Sutton. Further meetings at Ray's Social Club, London Road, North Cheam. Sec G2DMR.
Thames Ditton (Thames Valley ARTS)—First Tuesday in each month. Giggs Hill Green Library, Giggs Hill Road, Thames Ditton. Sec G3ZNW.
Wimbledon (W&DRAS)—Second and last Fridays in each month, 8pm. St John Ambulance HQ, 124 Kingston Road, Wimbledon SW19. Sec G3XTC, tel 01-644 3968.

REGION 8—RR D. N. T. Williams, G3MDO, "Seletar", New House Lane, Thanington, Canterbury, Kent.
Brighton (B&DRS)—8pm, prompt. Catholic Church Hall, Bristol Road, Brighton. Details from N. Hewitt, G8JFT.
Burgess Hill (Mid-Sussex ARS)—7.45pm. Marle Place, Burgess Hill. Details of future events from G3PEQ.
Canterbury (East Kent RS)—Details of future events from sec G8GHH.
Chichester (C&DARC)—First Tuesday and third Thursday in each month. Lancastrian Boys School. Details from G4ETU, tel 0243 88069.
Crawley (CARC)—United Reform Church Hall, Ifield, Crawley. Details from G3MGL.
Dartford (DHDFC)—Second Friday in each month. Scout House, Broomfield, Dartford. Details from Jeanette Maggs, 25 Leybridge Court, Eltham Road, Lee, London SE12.
Dover (South East Kent YMCA ARC)—Wednesdays. Details from G8KEN.
Eastbourne (Southdown ARS)—Further details from sec G8CVV, pro G3LFZ.
Gravesend (GRSGBG)—Mondays, 7.30pm. "Windmill Tavern", Shrubbery Road, Gravesend.
Hastings (HERC)/(ITT(H)S&AC)—Details of future events of both units from G8DNO.
Horsham (HARC)—First Wednesday in each month. Civil Defence HQ, Moons Lane, Brighton Road, Horsham. Details of future events from G3NPF.
Maidstone (MYMCAARS)—First and third Fridays in each month, devoted to the beginner, RAE class and morse tuition, 7.30pm. Alternate Fridays, a wide range of lectures and use of club shack. Melrose Close, Loose. Details from G8KMX, tel Maidstone 61792.
Medway (MARTS)—Details of events and venue from G4EVY.
Ramsgate (Kent Coast ARC)—Details of meetings from G4DTA.
Tunbridge Wells (West Kent ARC)—Details of future events from sec G4DYF.
Worthing (W&DARC)—Tuesdays, 8pm. Adult Education Centre, Union Place, Worthing. Details from G8MSQ.
Kent Repeater Group—Details of membership from G3XDV.
Sussex Repeater Group—Information from G8HVV.

REGION 9—RR H. W. Leonard, G4UZ, 4 Start Bay Park, Strete, Dartmouth TQ6 0RY.
Camborne (Cornish RAC)—First Thursday in each month. 6 April (AGM), 7.30pm. SWEB Clubroom, Pool, Camborne. Cornish net each weekday 10am on 3·715MHz, and on Sundays 11am on 3·692MHz. Details from H. Adcock, tel Cockwells 562. Visitors always welcome at club meetings.
Exeter (EARS)—Second Monday in each month, 7.30pm. Community Centre, St Davids Hill, Exeter. Details from G3HMY.
Newquay (N&DARS)—Alternate Wednesdays, 7.45pm. Treviglas School, Newquay. Details from G8GOR, tel Newquay 4168.
North Devon (NDRC)—Second Wednesday in each month at QTH of G4CG, fourth Wednesday at QTH of G2FKO. Full details from G4CG.
Plymouth (PRC)—Meetings now held in the TAVR building, Lambhay Hill, The Hoe, Plymouth, (near the Citadel). 6 and 20 March, 3 and 17 April, and every alternate Monday thereafter, 7.30pm. Visitors welcome.
Saltash (S&DARC)—First and third Fridays in each month, 7.30pm. Burraton Toc-H Hall, Saltash. Sec G8LLR, tel Plymouth 771135.

Mr H. W. Leonard, G4UZ, RR for Region 9, was the guest of Saltash & D ARC in December, and drew the prize-winners in the club's Christmas raffle. He is shown here, left, with Trevor Pinch, G4ETP, club chairman and promoter of the raffle

Torbay (TARS)—Fridays, with special meeting on last Saturday of each month. 25 March (No meeting), 1 April ("Confessions of a coach driver"), 29 April (AGM), 7.30pm. Rear of 94 Belgrave Road, Torquay. Torbay net weekdays 3·756–3·764MHz, Mondays to Fridays 10.30am, Saturdays 9.30am. Full details from G3UIQ, tel Newton Abbot 3025. Visitors to club meetings most welcome.

REGION 10—RR R. G. Barrett, GW8HEZ, 23 Carshalton Road, Beddau, Pontypridd, Glam.
Barry (BCoERS)—Thursdays, 8pm. Barry Rugby Football Club, Reservoir Road, Barry. Details from sec S. N. Lloyd Hughes, GW8NVN, 1 Min y Mor, Barry.
Blackwood (BARS)—Fridays, 7pm. Oakdale Community Centre, Oakdale, Blackwood. Details from GW4BLE, 10 Llanthewy Road, Newport, Gwent.
Bridgend (Glamorgan VHF/UHF Group)—Second Wednesday in each month, 7.30pm. NCB Social Club, Tondu, Bridgend. Details from sec GW4BDV.
Cardiff (CRSGB)—Second Monday in each month, 7.30pm. "Pantmawr Inn", Pantmawr Estate, Cardiff. Details from sec GW3VOW.
Merthyr (Hoover ARS)—Mondays, 7.30pm. Hoover Social Club, Pentrebach, Merthyr. Details from GW3RNC.
Newport (NARC)—Mondays, 7pm. Adult Educational Settlement, Brynglas Road, Newport. Details from sec GW8MER.

Pembroke (PRSGBG)—Last Friday in each month, 7.30pm. Defensible Barracks, Pembroke Dock, Dyfed. Details from sec GW3XJQ.
Pontypool (PRSGBG)—Tuesdays, 7pm. Education Settlement, Park Hill Road, Pontypool. Details from GW3JBH.
Port Talbot (British Steel Corporation ARS)—Thursdays, 7.30pm. BSC Sports and Social Club, Margam. Details from GW4ESV.
Rhondda (RARS)—Every other Thursday, 7.20pm. Transport Employees' Club, Porth. Details from GW3PHH.
Sully (S&DSWC)—Mondays, fortnightly, 7pm. Sully Bowls and Social Club, 58 South Road, Sully. Details from sec GW8JHF.
Swansea (SARC)—Tuesdays fortnightly, 8pm. "Commercial Inn", Killay. Details from sec GW8CMA.
Swansea (University College of Swansea RS)—Mondays, 7.30pm. Room 801, Applied Science Building. Details from sec J. Morris, 1 Hadland Terrace, West Cross, Swansea, tel 68675.

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

Rhyl (R&DARC)—It is regretted that this club has been closed until further notice.
Conway Valley (CVARC)—Second Thursday in each month, 7.45pm. The Quarry Offices, Llanddulas.
Bangor (UCNWARS)—Thursdays, 7.30pm. Small lecture theatre, School of Engineering Science, Dean Street, Bangor.

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

Aberdeen (ARS)—Friday evenings. The Cowdray Club premises, 5 Fonthill Road, Aberdeen. Sec GM4BKV.
Dundee (Kingsway Technical College ARC)—Wednesdays, 6.30pm. Kingsway Technical College. Programme details from sec GM4FLP.
Grampian Repeater Group—The temporary repeater on R7 from Durris Hill now operating. New members to the group will be welcome. Membership £2 per year. Details from sec GM8HGD.
Inverness (Technical College ARC)—Every second Wednesday, 6.45pm. Room C30. Sec W. Lee, 36 Old Mill Road, Inverness.
Lerwick (ARC)—Wednesday evenings. Annsbrae House. Sec GM3HTH.
Moray Firth (MFARS)—Wednesdays, Elgin Technical College. Further details from sec GM8LHE.
Perth (P&DARG)—Wednesdays, 7pm. Perth Technical College. Details from sec GM4DQJ. The club is considering a repeater for the Perth district and intends to submit proposals in the very near future.

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

Berwick upon Tweed (Border ARS)—First and third Fridays in each month, 7.30pm. Roxburgh Hotel, Berwick upon Tweed. Details from sec GM8IIO.
Dunfermline (DARS)—Second Wednesday in each month, 7.30pm. CCTV Studio, Pittencreiff School, Maitland Street, Dunfermline. Details from sec GM3MGX, tel Limekilns 313.
Edinburgh (E&DARC)—Tuesdays, 7.30pm. City Observatory, Calton Hill, Edinburgh. Details from sec GM8MJV, tel 031-663 2033.
Edinburgh (Leith Nautical College ARC)—First and third Thursdays in each month, 7.30pm. Leith Nautical College, Milton Road East, Edinburgh 15.
Edinburgh (Lothians RS)—Second and fourth Thursdays in each month, 7.30pm. Adult Education Centre, Riddles Court, High Street, Edinburgh. Details from sec GM4BYF, tel 031-447 3201.
Glenrothes (G&DARC)—Third Sunday and every Wednesday in each month, 7.30pm. Old Nursery School, Provosts Land, Douglas Road, Leslie, Fife. Details from sec GM4BRM.
It is also believed that clubs meet at Heriot Watt University, St Andrews University and Ferranti (Edinburgh), but no details are available.

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

Ayr (AARG)—Every second Sunday evening commencing 8 January. Community Centre, 24 Wellington Square, Ayr. Details from sec GM3THI.
Greenock (G&DARC)—Tuesdays and Fridays, 7.30pm. 22 Inverkip Street, Greenock. Details from sec GM3LYI.
Motherwell (Mid-Lanark ARS)—Wrangholm Hall, Community Centre, Jerviston Street, Motherwell. Details from sec GM8FHK, tel Motherwell 66581.
Glasgow (West of Scotland ARC)—16 March (Phone Patch Live), 30 March, 7.30pm. Details from sec GM4FDM.

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

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

REGION 16—RR*(Post vacant)*

Following information is latest received.

Bury St Edmunds—Second Monday in each month, 7.30pm. Details from J. Munro, 29 Angel Hill, Bury St Edmunds.
Chelmsford (CARS)—First Tuesday in each month, 7.30pm. Marconi College, Arbour Lane, Chelmsford. Details from R. Brocks, 30 Rowan Drive, Heybridge, Maldon.
Colchester (CRA)—Wednesdays, 7.30pm. 114 Ipswich Road, Colchester (above Candor Motors). Details from G3YAI.
Great Yarmouth (GYRS)—Last Thursday in each month. 67 Southdown Road, Great Yarmouth. Details from G3NHU.
Harlow (H&DRS)—Tuesdays, 8pm. Mark Hall Barn, First Avenue, Harlow. Details from G3WUX.
Ipswich (IRC)—Wednesdays fortnightly. Ranelagh Road School, Ipswich.
Loughton (L&DRS)—Loughton Hall, Rectory Lane, Loughton. Details of meetings from G8DZH, tel 01-508 3434.
Lowestoft (L&DARC)—Fridays, 7.30pm. Morse class every Tuesday. YMCA, Park Road, Lowestoft.
Martlesham (MRS)—First Wednesday in each month, 7.30pm. Details from M. Appleby, PO Research Centre, Martlesham, Ipswich.
Norwich (Norfolk ARC)—Wednesdays.
Norwich (U of East Anglia R&EC)—Details from G3IOR.
Southend (S&DRS)—Fortnightly, 8pm. Church Hall, Sir Walter Rayleigh Drive, Rayleigh, Essex. Contact sec G3YOA.
Vange (VARS)—Thursdays, 8pm. Youth Hall, Barstable Tenants' Community Association, Long Riding, Basildon. Details from Mrs D. Thompson, 10 Feering Row, Basildon SS14 1TE.

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

Basingstoke (BARC)—First Saturday and third Wednesday in each month, 7.30pm. Chineham House, Popley, Basingstoke. Sec G3CBU.
Basingstoke (UK FM Group Southern)—First Wednesday in each month. Chineham House, Popley, Basingstoke. Details from sec Mrs J. Payne, tel Aldershot 26108.
Bournemouth (Wessex ARG)—First and third Fridays in each month, 7.30pm. Dolphin Hotel (club room), Holdenhurst Road, Bournemouth. Sec G4EMN, tel Bournemouth 20027.
Chippenham (C&DARC)—Tuesdays, 7.30pm. Sheldon School, Hardenhuish Lane, Chippenham. Sec G8BXG.
Fareham (F&DARC)—Wednesdays, 7.30pm. Porchester Community Centre, Room 9. Sec D. Thompson, tel Fareham 2799.
Farnborough (F&DRS)—Second and fourth Wednesdays in each month, 7.30pm. Railway Enthusiasts' Club, Access Road, off Hawley Lane, Farnborough. Sec G3TMQ, 103 Hawley Lane, Farnborough.

Guernsey (GARS)—Tuesdays and Fridays, 8pm. Details from sec GU8ITE, PO Box 100, St Peter Port, Guernsey.
Horndean (H&DARC)—Second Thursday in each month, 7.30pm. Merchiston Hall, Horndean. Net Sundays, 6.30pm. 21·40MHz. Sec G4CHQ.
Jersey (JARS)—Sundays, 10.30am, and Fridays, 8pm. Le Hocq Tower, St Clement, Jersey. Sec Mary McTaggart, 19 Parade Road, St Helier.
Poole (PRAS)—Last Friday in each month, 7.30pm. Poole Technical College. Sec Graham Tizzard, tel Poole 4641 ext 34.
Portsmouth (P&DRC)—Wednesdays, 7.30pm. Portsmouth Community Centre, Malins Road, Buckland, Portsmouth. Sec G3CNO.
Salisbury (SR&ES)—Tuesdays, 7.30pm. Salisbury Activity Centre, Wilton Road. Sec G3FIX.
Southampton University (SUARC)—Tuesday evenings. Also informal meetings every lunchtime in the clubroom, Old Union Building. Sec D. Price, Chemistry Dept.
Southampton (SRSGBG)—First Monday in each month, Lanchester Building, Southampton University; Wednesdays, the clubroom, Kent Road; both at 7.30pm. AR G4COM.
South Dorset (SDRS)—7.30pm. Lecture Hall, South Dorset Technical College, Newstead Road, Weymouth. Details from G3YWG.
Swindon (SD&ARC)—Alternate Wednesdays, 7.45pm. Clubroom above "Coldharbour" public house, Blunsdon, just north of Swindon. Sec G8KWC.
Winchester (WARC)—First and third Fridays in each month, 7.30pm. Antrim House, St Cross Road, Winchester. Contact G4BKE.

REGION 18—RR *(Post vacant)*
Durham (DUARS)—Alternate Wednesdays during term. Physics Dept, Durham University. All local amateurs are welcome to join. Talk-in by G4DUR on R5 or S20 before all meetings.
Easington (EAR&EC)—Tuesdays and Thursdays, 7.30pm. Easington Village Workmen's Club. RAE and morse tuition if required (the club has a good RAE pass record). ATV can be received on 625 lines. The club is now equipped with an hf transceiver as well as other gear. Sec G4COI.
Great Lumley (GLAR&EC)—Alternate Wednesdays, 7.30pm. Great Lumley Community Centre. Sec G8JLQ. Assistance with RAE and morse if required.
Hartlepool (HRC)—Mondays, 7.30pm. Methodist Church Hall, Grange Road. Sec G3NWU.
Middlesbrough (Post Office ARC)—All amateurs welcome, but first contact sec G8CDP.
Middlesbrough (Teesside Repeater Group)—Last Tuesday in each month, 7.30pm. 196 Marton Road, Middlesbrough, Cleveland. All amateurs and SWLs invited but first contact sec G8MBK.
Morpeth (Northumbria RC)—Now meets Thursdays. British Legion premises, Gambois, near Blyth. Sec G4AVO.
Newcastle upon Tyne (Tyne & Wear Repeater Group)—First Wednesday in each month. Arts Common Room, University of Newcastle. Open to all amateurs and SWLs. Sec G4DOB, tel Newcastle 744444.
South Shields (SS&DRS)—Fridays, 7.30pm. Trinity House, Old and new members welcome. Sec G8BQF, 67 Lauderdale Avenue.
Tyneside (TRS)—Mondays, 8pm. The Community Centre, Vine Street, Wallsend. Sec Alex Frazer, 35 Percy Street, Tynemouth.
RR18. Owing to recent illness, Peter Fay, G3AKG, has been compelled to resign. He thanks all clubs and individuals in the region who have helped him in the past, and he hopes that a new (and younger) member will be appointed in the very near future.

REGION 19—RR *(Post vacant)*
Following information is latest received.
Acton, Brentford & Chiswick (ABCRC)—21 March (Tape lecture with slides), 18 April ("Antenna impedance bridge" by G3CCD), 7.30pm. Chiswick Trades and Social Club, 66 High Road, Chiswick. Sec G3GEH, tel 01-992 3778.
Barking (BR&ES)—Mondays (Construction), Wednesdays (CCTV techniques), Thursdays (Informal). Morse classes Tuesdays, 7.30pm. Westbury Recreation Centre, Westbury School, Ripple Road, Barking, Essex. Sec N. Dowsett, 44 St Anne's, Barking.
Cheshunt (CDRC)—New premises—Church Room, Church Lane, Wormley, Herts. Wednesdays, 8pm.
Chingford (Silverton RC)—Fridays, 7.30pm. Friday Hill House, Simmonds Lane, Chingford E4. Sec G4AJA, tel 01-529 2282. Visitors very welcome.
Ealing (EDARS)—Tuesdays, 8pm. Northfield Community Centre, Northcroft Road, London NW13. Sec G8KPN, tel 01-997 5947. Newcomers and old-timers very welcome.
East London RSGB Group—Details from sec J. B. Bundock, G4CJQ, tel 01-524 3169.
Edgware (E&DRS)—Second and fourth Thursdays in the month, 8pm. Watling Community Centre, 145 Orange Hill Road, Burnt Oak, Edgware. Sec G4BZY, tel 01-952 2495.
Harrow (RSH)—Fridays, 8–10pm. Roxeth Community Centre, Scott Crescent, West Harrow, Middx. For details of meetings please contact sec G4FBK, tel 01-864 1412.
Havering (H&DARC)—Wednesdays, 8pm. British Legion Club, Western Road, Romford.
Holloway (Grafton RS)—7.30pm. Holloway Institute, Archway Annexe, Highgate Hill, London N19. Sec G3ZKE.
Ilford (IRSGBG)—Thursdays, 8pm. 50 Mortlake Road, Ilford. Details from D. T. Sapworth, G3YMW.
Northolt (British Airways European Division ARS)—First Monday in each month. Trident Club, Western Avenue, Northolt, Middlesex. This club is open to non-BA employees by invitation. Contact G3TLG for details. Civil Aviation Sunday net 1100–1200gmt on 3·68MHz, listen for G3NAF or G3BEA.
Shelburne (SRC)—Wednesdays, 7pm–9pm (Electronics for beginners); Thursdays, 7pm–9pm (Club evenings). Shelburne Youth Centre, Hornsey Road, London N4.
Southgate (SRC)—Second Thursday in each month, 7.45pm. March ("TVI"), April (Second-hand equipment sale). The Scout Hut, Wilson Street, Winchmore Hill Green, London N21. Sec G8EWG, tel 01-440 7353.
South Kensington (Baden Powell House Scout ARG)—Third Tuesday in each month, 8pm. Baden Powell House, Queensgate, South Kensington.
St Albans (Verulam ARC)—Main meetings fourth Thursday in each month. 23 March (Special event: G3PAO Memorial Lecture, "The AMSAT-Oscar programme" by J. A. Gowen, G3IOR), 27 April ("A beginners' guide to the oscilloscope" by B. Curant of Tektronix UK Ltd), 7.30pm. The Market Hall, St Albans. Informal meetings second Thursday in each month, RAF Association Headquarters, Victoria Street, St Albans. Sec G4DUS.

REGION 20—RR G. Mather, G3GKA, 8 Hills Close, Keynsham, Bristol.
Bath (B&DRG)—Tuesdays, 8.30pm. The Crypt, Ascension Church, 35a Claude Avenue, Oldfield Park, Bath. Sec N. S. Cridland, Flat 3, 30 Paragon, Bath BA1 5LY.
Bristol (BARC)—Tuesdays, 7.30pm. The University Settlement, Barton Hill, Bristol 5. Sec G8GFZ.
Bristol (Shirehampton ARC)—Fridays, 7pm. Twyford House, Shirehampton. Sec G8KUM. HF and vhf station all modes, occasional lectures and films. RAE and morse classes in progress. New members welcome.
Bristol (BRSGBG)—20 March ("Telecom control CEGB microwatts, milliwatts and megawatts" by F. Crofts and D. Nelson), 24 April ("Intruder Watch" by G5XB), 29 May ("Further developments in vhf ssb" by Prof W. Gosling), 7–9.30pm. Small Lecture Theatre, Queens Building, University Walk, Clifton, Bristol 8. Sec G4FRG.
Bristol (North Bristol ARC)—Fridays, 7pm. RAE instruction Wednesdays, 7pm. Lockleaze Community Association, Romney Avenue, Lockleaze, Bristol BS7. Sec G8KSS, club address.
Cheltenham (CARA)—The Cheltenham Amateur Radio Association is derived from two long established clubs who have amalgamated—the Cheltenham ARS and the Cheltenham &DRSGBG. First Thursday and third Friday in each month, 8pm. The Old Bakery, Chester Walk, Cheltenham. Sec G3JJG.
Gloucester (GARS)—First and third Thursdays in each month, 7.30pm. Chequers Bridge Centre, Painswick Road, Gloucester. Hon sec G3MA.
Weston-super-Mare (WsMARS)—Second Friday in each month, 7.30pm. Room Lewis M2, Worle School, New Bristol Road, Worle. Sec G3PQE.
Yate (Y&DARC)—First Saturday in each month, 8pm. G3RQN QTH. All welcome, including SWLs. Local chat channel S24, 145·6MHz, 2100 Wednesday and Saturday. Further info from G8LGC.
Yeovil (YARS)—Thursdays, 7.30pm. 16 March (RSGB tape "VHF propagation" by W1HDQ), 6 April (RSGB tape "Radio over the years" by Captain Eckersley), 27 April ("Basic transistor principles" by G3OJS). Hut 101 Houndstone Camp (three miles west of Yeovil off A3088). Sec G3NOF. Info at main gate, S20 fm talk-in.
Royal Bath & West Show Shepton Mallet 31 May to 3 June. Assistance wanted for RSGB stand and station. Please contact G4GHI or G3NOF.

contest news

432MHz Cumulatives results

A most successful contest, producing a high level of activity on this normally quiet band. The winning station worked no less than 83 stations in one 2½h session. Many requests for such a contest to be held twice a year, and others would like to see a similar event on 1·3GHz.

Congratulations and certificates to G3VPK and G3JQA/P.

G4BEL

Posn	Callsign	Points	QSOs	QRA	Best dx(km)	Pwr(W)	Ant
1	G3VPK	1,304	192	AL14	520	160	68el Mb
2	G3JQA/P	934	148	YN37	355	40	Q loop
3	G8BCG/P	840	168	ZN61	—	10	Q loop
4	G3UBX/P	759	153	YM39	262	60	46el Mb
5	G8FIS/P	682	94	ZN07	325	70in	46el Mb
6	G3DY	676	120	ZM40	330	100	46el Mb
7	GD2HDZ	635	69	XO68	440	300in	18el
8	G4ERP/P	614	126	ZL01	424	10	46el Mb
9	G4CQR	550	124	ZL49	420	50	88el Mb
10	G8GP	480	114	ZL50	415	25	18el
11	G4ASR	465	129	AL22	300	120in	88el Mb
12	G8AYY/P	447	103	YM50	260	10	46el Mb
13	G8OHM	433	93	ZM41	266	50	68el Mb
14	G3WHK	428	107	ZL49	420	10	88el Mb
15	G3LRP	385	73	ZN33	—	80in	8/8el
16	G8DKK	330	93	ZL08	380	50	18el
17	G8HHI	312	76	ZL56	282	10	18el
18	G8GHR/P	302	68	ZL10	—	5	18el
19	G8AHK	242	70	ZL68	301	5	46el Mb
20	G8CDL	232	77	ZL08	375	150	46el Mb
21	G4CGS	229	57	ZN11	337	—	18el Mb
22	G8AYY	209	67	ZM41	230	10	18el
23	G8GXE/P	204	60	ZL26	255	10in	8/8el
24	G8ABI/A	203	77	ZL39	270	10	24el
25	G5UM	188	58	ZM35	268	12	14el
	G8CTT	188	60	AL41	310	10	46el Mb
27	G8GTP	186	52	YN39	290	10	18el
28	G8IEM	102	30	ZK05	213	10	Q loop
29	G3TQF	100	32	ZM24	—	4	18el
30	G8LLN	88	42	ZL29	230	—	—
31	G4GLM	49	41	ZL50	262	8	8/8el
32	G8ADM	38	8	ZL64	205	45	48el Mb

SSB Field Day 1977 results

The contest was again won this year by the Channel Group by a very healthy margin, which we are certain will provoke even more strenuous efforts from some of the northern groups to pass them in the next few years with the increasing sunspot activity. The number of stations entering is slowly increasing, but we would welcome more logs, not only from the UK, but particularly from overseas.

This year the top three concentrated their efforts on 14 and 21MHz using the following equipment and antennas.

G4DAA/P. FLDX500, FLDX2000, SB401, SB301, KW Linear, DRDX400. *Antennas:* 3·5/7, slopers; 14/21/28, 2-el quad 60ft.

G3WAS/P. T4XC, R4C, SB220. *Antennas:* 3·5/7, dipoles; 14/21/28 3-el quad 80ft.

G4AAX/P. *Antennas:* 3·5, inverted-V at 80ft; 7, similar at 76ft; 14, quad 60ft; 21, TH3 60ft.

Changes made in the rules were generally appreciated, with an overall majority requesting that they remain the same for 1978. We will try and clarify exactly what the committee requires and will allow for multipliers.

Photographs are always welcome, so next year can we have pictures of operators, shacks and antennas please?

Undoubtedly G3XEP/P leads the "table" for the maximum number of operators helping, including several YLs.

Certificates of merit will be sent to the three leading groups.

Thank you for your support, comments and suggestions, we hope the weather this year will continue to be good for this event.

Posn	Group	Mult	Callsign	No of QSOs 3·5	7	14	21	28	Total
1	Channel	127	G4DAA/P	74	79	723	205	11	1,725,930
2	Lichfield	100	G3WAS/P	131	89	656	325	1	1,323,000
3	Northumbria	110	G4AAX/P	127	68	755	68	1	1,134,100
4	Ariel	88	G3BBC/P	156	66	418	57	1	598,400
5	White Rose	83	G3XEP/P	130	49	455	119	—	581,000
6	Torbay		G3NJA/P						519,615
7	London Valley		G3PGM/P						422,100
8	Addiscombe		G4ALE/P						371,960
9	Swansea		GW5ZL/P						330,000
10	Southgate		G3SFG/P						301,200
11	Maidstone		G3TRF/P						279,415
12	West Kent		G3WKS/P						249,945
13	Barry		GW4BRS/P						247,800
14	West of Scotland		GM4AGG/P						215,050
15	Crawley		G6RC/P						181,540
16	Chippenham		G3VRE/P						144,480
17	Stourbridge		G6OI/P						141,360
18	Nottingham		G6CW/P						134,400
19	Isle of Sheppey		G3VCP/P						125,370
20	Guernsey		GU3HFN/P						124,400
21	Bury		G3BRS/P						119,270
22	Norfolk		G4ARN/P						117,300
23	Dartford Heath		G4BDF/P						112,080
24	Bromsgrove		G3VGG/P						95,115
25	Edgware		G3ASR/P						94,000
26	Reading		G4ELY/P						72,660
27	Horndean		G4FBS/P						70,930
28	Rugby		G4APD/P						69,840
29	Black Horse (Kent)		G3VLX/P						66,900
30	Newbury		G3WOI/P						44,820
31	Clifton		G3GHN/P						41,625
32	St Albans		G3VER/P						40,580
33	Chesterfield		G4AGE/P						28,210
34	Reigate		G5LK/P						14,930
35	Greenock		GM3ZRC/P						1,770

Check logs and overseas entries: LZ1BY, 9H4G, PY2ZDC.

G4AAX/P, a regular participant in the SSB Field Day, all smiles despite the fact they ran out of beer

1977 Listeners' VHF/UHF Championship

The number of listener logs was down but the number of points scored per entrant was up for the year. The 144MHz band provided the greatest number of points with 70 and 432MHz next, in that order. Ron Thomas BRS15822 has once again retained the trophy with a decisive lead, and BRS35217 will receive a certificate as runner-up.

G8ACJ

Posn	Station	Score	Posn	Station	Score
1	BRS15822	2,141	8	BRS33823	783
2	BRS35217	1,333	9	A9199	583
3	BRS34740	1,271	10	BRS38519	465
4	BRS35669	1,108	11	BRS32525	449
5	A9108	1,018	12	BRS38957	384
6	A8677	898	13	BRS37223	293
7	BRS31038	793			

Region Round-up Contest rules

TRANSMITTING SECTION

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

2. Eligible entrants. All paid-up members of the RSGB resident in the British Isles (G, GU, GJ, GD, GI, GM and GW) holding a Class A licence. Single-operator entries only may enter. Operation must take place from the home address shown on the entrant's licence, and must not be from a station belonging to a club, college, company or other organization. Callsigns issued to club stations, colleges, companies etc may not be used.

3. When. Telephony contest: 0800gmt to 1800gmt 21 May 1978. CW contest: 0800gmt to 1800gmt 7 May 1978.

4. Contacts. IARU Region 1 band plan must be observed. Bands: 3·5MHz and 7MHz. Entrants are requested to confine their operation on 3·5MHz: 3·510–3·590—cw, 3·600–3·750—telephony.

Reports, RS to RST and serial numbers must be exchanged. The serial number may start anywhere between 001 and 500 and must then continue consecutively followed by R and the operator's RSGB region, eg R07 on cw or Region 7 on telephony.

5. Scoring. Three points for each completed contact with a station within the British Isles (G, GU, GJ, GD, GI, GM and GW). Each station may be contacted for points once only on each band. The final score is the total points on each band added together and then multiplied by the total number of RSGB regions contacted. (An RSGB region worked on each band therefore counts as a multiplier of two).

6. Entries. (a) Each entrant must make at least 30 contacts. (b) Separate log sheets must be used for each band, with the score for each band clearly shown. A cover sheet with the combined score and a signed declaration must accompany the logs, which must be sent to RSGB HF Contests Committee, c/o Dr E. J. Allaway, 10 Knightlow Road, Birmingham B17 8QB. Comments and photographs suitable for publication are invited.

7. Awards. Certificates will be awarded for 1st, 2nd and 3rd places in each section.

RECEIVING SECTION

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

2. When. As transmitting section.

3. Operation. As transmitting section.

4. Logging. A station may only be logged once in the column headed "Station heard" and not more than 10 times in the column headed "Station worked" on each band. Where both sides of a contact are heard, claim for points may be made for one station only, not both.

5. Scoring. Three points for each contact heard. Other details as transmitting section.

6. Awards. Certificates will be awarded for 1st, 2nd and 3rd places in each section, providing at least 10 entries are recorded.

7. Entrants must operate from their home address and not from a club or other special station.

VHF Contests Committee chairman

The VHF Contests Committee would like to thank its retiring chairman, Dr Ian White, G3SEK, and wish him well in his new appointment as vhf manager.

The new VHF Contests Committee chairman is Roger Taylor, G4BEL, and members having any queries on vhf contests should ring him on Ely 740355.

Contests calendar

11-12 March	Commonwealth (Rules in November issue)
19 March	70MHz Open (Rules in March issue)
1 April	1,296MHz Open (Rules in March issue)
2 April	432MHz Open and SWL (Rules in March issue)
9 April	Low Power (Rules in February issue)
22-23 April	144MHz CW (Rules in March issue)
6-7 May	432/1,296/2,304MHz
7 May	Region Round-up CW (Rules in March issue)
21 May	Region Round-up SSB (Rules in March issue)
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

432MHz Open and SWL Contest rules

0900–1700gmt 2 April 1978

All entries and checklogs to: VHF Contests Committee, c/o C. Sharpe, G2HIF, 20 Harcourt Road, Wantage, Oxon OX12 7DQ.

The 1951 Council Cup will be awarded to the leading station.

The following general rules, published in the January 1978 issue of *Radio Communication*, will apply: 1, 2, 3, 4a, 5a, 6a, 7a, 8, 9a, 10a, 11–22.

144MHz CW Contest rules

0900–1700gmt 23 April 1978

All entries and checklogs to: VHF Contests Committee, c/o G. M. C. Stone, G3FZL, 11 Liphook Crescent, Forest Hill, London SE23 3BN.

The following general rules, published in the January 1978 issue of *Radio Communication*, will apply: 1, 2, 3, 4a, 5a, 6b, 7a, 8, 9a, 10a, 11–22.

70MHz Open Contest rules

0900–1500gmt 19 March 1978

All entries and checklogs to: VHF Contests Committee, c/o L. Turner, G4CUT, 59 Harewood Road, Chelmsford, Essex CM1 3DH.

The following general rules, published in the January 1978 issue of *Radio Communication*, will apply: 1, 2, 3, 4a, 5a, 6a, 7a, 8, 9a, 10a, 11–22.

1,296MHz Open Contest rules

1600–2400gmt 1 April 1978

All entries and checklogs to: VHF Contests Committee, c/o C. Sharpe, G2HIF, 20 Harcourt Road, Wantage, Oxon OX12 7DQ.

The VHF Contests Committee Cup will be awarded to the leading station.

The following general rules, published in the January 1978 issue of *Radio Communication*, will apply: 1, 2, 3, 4a, 5a, 6a, 7b, 8, 9b, 10a, 11–22.

Barking R&ES G3XBF/G8GPK 144MHz Contest rules

1400–1800gmt 26 March 1978

The following RSGB rules apply: 4b, 5a, 6a, 9a, 10a, 13–16, 18, 19, 20a, b, d, 21.

Section 1. All amateurs residing in the county of Essex.

Section 2. All amateurs residing outside the county of Essex.

Scoring. Section 1: 1 point per contact. Total number of points multiplied by number of counties worked. Section 2: 1 point per contact. Total number of points multiplied by number of Essex contacts. In both sections, countries count as one county each.

10 points awarded for a contact with G3XBF/P.

Contest exchange. The contest exchange shall consist of: (a) callsign; (b) RS or RST report followed by serial number beginning with 001; (c) county.

Awards. Certificates will be awarded to the winners of both sections and two runners-up in both sections. The certificates will be presented at a society function during the summer.

The ruling of the Barking committee will be final in all cases of dispute.

All entries to be sent to: A. L. Sammons, 80 Lyndhurst Gdns, Barking, Essex IG11 9XZ.

sstv scene

P. Burnett, G4BLL*

Motion sstv—the colleague of W3LY mentioned in the last *SSTV scene* turns out to be none other than Dr Don Miller, W9NTP. Richard Thurlow, G3WW, received the following information from Don in response to a request for further details of his colour modifications for the Robot 400:

"I am working on a special circuit that, when used in conjunction with a Robot 400, will permit the transmission of moving pictures in a bandwidth of about 35kHz. This system is 128 × 128 × 4 and transmits fields at a rate of 3·75 fields/s. I plan on getting a special authorization from the FCC to permit the testing of this system on the 10m band at the high end. I hope for band openings so that we will be the first people to transmit a moving TV picture across the Atlantic without the aid of a satellite. What I need is a British ham to work with me.

"It will require several pieces of equipment; the first is an a.m. tv modulator for a 10m transmitter. This should be easy since most of the ssb rigs can be grid modulated to do this. By the way, I plan on sending vestigial sideband. The 30kHz will be upper sideband, and the bottom 5kHz will be lower sideband. The audio will sent as fm on the carrier as narrow band. The receiver is the bigger of the communication problems. It must have a bandwidth of 35kHz and linear. The tv gear will be a heavily modified Robot 400 circuit with an extra memory. This memory board I have designed now and I am using it in the colour modification for the Robot 400."

The above is quoted direct from Don's letter and if anyone is interested in co-operating with him on these experiments please contact him at Box 95, Waldron, Indiana 46182. It will be necessary to obtain special permission from the Home Office to carry out the transmissions to Don's specifications in the 28MHz band. G3WW suggests that this project may be of interest to a university, or a large electronics firm's amateur radio club. W9NTP talks about being the first to transmit moving pictures across the Atlantic. Has a two-way sstv contact in colour taken place yet?

Dave Ingram, K4TWJ, in the December issue of *A5* magazine, reports on another slow/fast converter design by Jim Rogers, W4ATK, which utilizes the 65k RAM memory for several functions other than scan converting. Further details of this design will appear next time. Dave also puts forward the suggestion that the 14MHz sstv frequency should be moved up-band from 14·230kHz to 14·260kHz to allow "more room for future expansions, plus permitting quieter slow-scan operations". What do British sstvers think? Let me have your comments on this proposal and I will forward them to K4TWJ.

The BATC successfully held their second sstv convention at the University of Aston on 19 November 1977. A range of home-built sstv equipment was on display, including two WB9LVI slow/fast converters, built by G8CGK and G3GRJ. Many slow scanners were also able to get their first view of the Robot 400 in operation as demonstrated by Aero & General Supplies Ltd. The lecture by Grant Dixon, G8CGK, on the WB9LVI converter was well attended and provoked lively discussion.

It is suggested that G2BAR should be voted "SSTV Operator of the Year". Bert appeared in the lunchtime Pebble Mill BBC TV programme on 15 December 1977—the first time a live worldwide sstv contact has been demonstrated to a national audience! Judging by subsequent QSOs and Bert's comments, the programme certainly created a lot of new interest in sstv. Congratulations Bert—keep up the good work.

Thanks to all readers for the information and correspondence which is now beginning to come in, please keep the sstv ball rolling.

Good luck and good dx to all sstv operators in 1978.

*12 Standroyd Drive, Colne, Lancs BB8 7BG.

raynet

S.W. Law, G3PAZ *

Members will have read with interest the excellent Raynet coverage provided in the January issue. The information contained in the paper presented by the emergency communications manager, G3BPT, will also help to answer many of the queries of those who are not yet familiar with the aims, objects and work of Raynet. Regrettably, G3BPT is resigning from the chairmanship of the Raynet Committee in order to devote his talents to representation on the RSGB Council, but we are sure that all of our members will unite in thanking him for the 10 years of sterling leadership which have been so unstintingly carried out during that period.

The new chairman is Mike Barker, G8CAC; all other appointments remain as before except that G3FSZ has now joined the committee and that GW2HPG has been appointed a corresponding member for Wales. There may well be other appointments of the latter nature in order that the Raynet Committee may be even better informed of developments in areas remote from London, where direct personal representation would be somewhat difficult due to the distances involved. We unite in wishing G8CAC a long and successful period as chairman of the Raynet Committee.

Meanwhile, G3BPT, as emergency communications manager, will be readily available to accept correspondence relevant to Raynet issues, either addressed to RSGB HQ or QTHR. A sase will be appreciated if a reply is required.

Norfolk

One of the founder members of the Norfolk and NE Suffolk groups, and a controller for many years, Len Jackson, G3HPR died in January. He will be sadly missed in the area. On a more positive note, controller Doug Willies, G3HRK, and his members were on active standby during the recent gales and flooding. Twenty-five years ago they were ready; in 1978 they were still ready. Need we say more?

Group news

Recent controller appointments include: Humberside, G3PQY; West Highlands, GM3RFA; S Staffs, G8MWE; Dorset, G3ZDQ; Tayside, GM3YVX; Berkshire (Reading), G8BFT; Chichester, G4BER; Cambs (Wisbech), G8NPH; Isle of Wight, G3IOW; NE London, M. Toms, BRS31976; and a new change for Surrey (Airports), G8JMP. The latter, of course, takes the load from G3FSZ who remains sector controller, Surrey, as previously noted.

We have, as yet, no news of how the Scots groups fared in the tragic snow conditions of late January, but the official rescue teams did a first-class job in the event and many owe their lives to their unremitting efforts. Raynet has used many methods of setting-up in the past, boats included, but we await with interest news of the first "snowmobile" portable station! Perhaps an approach to the relevant emergency planning officer might produce some useful suggestions.

Raynet growth

We are delighted to report that Raynet membership now exceeds 2,000, spread over some 70 groups in the UK. This does not mean that we have yet attained anything like the full coverage which is our aim. So let this, our twenty-fifth year, bring us yet nearer to this ideal state. Remember, also, that we must be seen and recognized. Try to get kitted out with the approved Raynet gear, all of which is obtainable from our supplies officer, Jane Balestrini (QTHR as G3BPT).

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

*130 Alexandra Road, Croydon, Surrey CR0 6EW

members' ads

These subsidized flat-rate advertisements are accepted as a service to members of the 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 for 75p (stamps not accepted). 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

Datong clipper, cost £43, £30. Mosley Elan, £30. Mosley 3-el beam, 20m, £55. Katsumi speech compressor, £8. *Wanted:* TH band beam, (not TA33 jun). G3YBG. Tel Exeter 74607.

Inoue ssb 700R rx, matching 700T tx, £165. Eddystone 659/670, £35. B40C, as new, £40. *Wanted:* Marine vhf r/t, PO spec. G3DVF. Tel Alnwick 2487.

Eddystone transistor dip-meter with mod, a.m./cw monitoring 470kHz–113MHz, £30. Mains strobe 7–247Hz, £5. TX copy of Valiant with psu, built-in spkr and relays, 1·8MHz–30MHz, £10. BC221 freq meter all stabilized psu and spkr built-in correct charts, £25. Pair walkie-talkies, £5. Elliot 6ch pen recorder, £10. Elliot ac test meter type 5000–AVW, leather case, £15. Transistor chart recorder, portable, variable speeds, box of charts, £10. All above in fb cond; all plus carr. G3PVT. QTHR. Tel 021-747 2329.

Marconi BD617 test-card-C monoscope 405/625 comp, wkg, £10. Two NEV cctv cameras, comp less lenses, need some attn, full diags and gen provided, £15 the two. Eddystone EC10, mains and batt packs, immac cond, manual, £60. Marconi BD3263A broadcast studio Vidicon camera, self-op with built-in v/f and w/f mon, 3 C-mount lenses, 50ft cable, psu, SPGs, all accessories, full manuals, lovely toy, £165. Modern compact broadcast colour DAs (2), mains powered, new, tested, mint cond, bargain, £10 ea. G3UYG, QTHR. Tel 061-491 0688.

Lattice tower 40ft in four 10ft sections, £32. G4CXJ, QTHR. Tel Witney (0993) 2414.

TY2–125 valves, unused, in orig packing, £30 ea ono. One ceramic base, cracked but serviceable, £5 ono. G3UIB, QTHR. Tel Medway 367915, evenings.

Liner 2, preamp fitted, psu, £115. Prefer buyer to collect. *Wanted:* Young professional man, to share 1st-floor flat, own room and use of bathroom, lounge and kitchen, located Willenhall, SW Coventry, references required. G8LHC, QTHR. Tel 021-476 1161.

Spacemark sstv monitor, superb, £135. G2DAF 1·8kW linear amp, good cond, £50. Yaesu FR400SDX, 160m to 2m, all extras fitted, mint cond, £175. "Rose Cottage", Shenley Brook End, Nr Bletchley, Bucks. Tel 090 853 310.

Trio QR666 hf rx, no mods, exc cond, manual, £115, carr extra. *Wanted:* TF144G, good cond, no mods. G8DFZ, QTHR. Tel Otley (Yorks) 3083.

Xtals B7G, 500kHz, 333·3kHz, 7·028MHz, 11·666MHz, 14·10MHz, 10X, 330kHz, 100kHz, 1·00MHz, 7·055MHz, styled 15·000MHz, £6.50. Filters, usb, lsb, carrier 1·4MHz, £8.50. Ferguson motor tuned console model 773, manual, collectors' item, £20. G3DXI, 41 Sweet Briar, Welwyn Garden City, Herts.

Heathkit DX100, vgc, recently professionally serviced, £50. AR88LF rx, £40. Buyer collects. G3MLN, QTHR. Tel Chestfield 3826.

Liner 430, mint, £220. Arac 102 2/10m rx, £80. ST6 rtty modem, £250. TS700G, preamp, £330. AR22R rotator, £20. TR2200G, fitted 8ch, nicads, £90. VB2200 10W pa, £25. 18AVQ/WB, 10–80m, £30. Datong RFC/M processor, £15. G4CGS, QTHR. Tel Bradford 881605, weekends only.

Tektronix 'scope 535A, plug in amp ca, £150. Buyer collects. Colour bar gen Rank, £75. Fluke digital 8000A, rechargeable batts, £85. Mains chart recorder, "Amprobe", with charts, £25. GW3HXX, QTHR. Tel Llantrisant 224071.

PR120V a.m./cw tx, 150W, psu 350V at 250mA, 750V at 200mA, wkg order, deliver 50 miles, £20. *Wanted* 1976 USA/DX callbooks, 18AVQ or similar, Datong rf speech clipper. G3OCA, 1 Chesterton Road, Spondon, Derby. Tel 62818.

Total close down sale; sensible offers req'd for absolute mint gear: FT101B, TS900, TS700, TS7500, 75A4, UC/1, FL1 Datong rf clipper, KW109, FL2100B; TH3, Ham M, etc. Send sae for full details. GM4AGS, QTHR. Tel Newport-on-Tay 3113.

Drake TR3, RV3, vfo, ac psu, dc psu, spkr, mic, mobile accessories, will incl professional realignment, cash £250. G3JLB. Tel 0474 4694.

Liner 2, £100. BC348, needs attn, £10. Xtals for TR2200, R1, R2, R5, R7, R8, S20, S22, 145·32, £3 a pair. HC6U 12·08333 (145), £1.50. G3RQZ. Tel 01-653 2493, after 5pm.

Standard C828M with vfo/manuals, no mods, £130. Liner 2 with preamp, new output, audio trans etc, £95 or offer. *SWM* 1975–6, *PW* 1974–6, *Rad Comm* 1974–6, all £2 year. Will exch Standard for 2200G comp 12 ch, batts, charger. G8KLI, QTHR. Tel 01-472 4678.

Grundig Stenorette, £28. Capacitance bridge, £8. Mains intercom (pair), unused, £18. Storno Viscount controls, £4. 726L push-button telephones, £2.50. Wavemeter, £8. Valve voltmeter, £14. Microammeter (0-50), £1.50. Microwave burglar alarm, £25. W. H. Joyce, 41 Rochdale Road, London E17 8JF. Tel 01-539 5421.

FT221R, six months old, as new cond, £300 ono. Tel 0252 48021, evenings.

AR88D rx, slight fault otherwise good cond, £35. McCarthy. Tel Chesham 4883.

IC202 cw/ssb tx/rx, also fitted xtal satellite, nicad batteries, mains psu 13·8V stabilized, one year old, little used, no mods, perf cond, £150. *Wanted:* 70cm gear valve or transistor. G4AUY. Tel Telford 55082.

Move to impossible QTH makes gear redundant: KW2000E, KW107, psu, Shure 444, Datong model FL1, Hy-Gain TH3 Mk3 beam, CDE TR44 rotator, P40 Versatower, wall mounting, hand/electric hoist, all vgc, cost new £1,000+, welcome try it at G4ECH, (Kent). G4ECH, QTHR. Tel 01-467 2023.

Racal counter timer CT488 with preselect 100MHz, comp, manual, £55. New auto-trans 150VA tapped sec 0-115-200-220-240V, £2.50. New mains trans 240V pri, 30V 2A sec. SAE for lists. G3HRN, QTHR. Tel Newport, Salop (0952) 811168.

Rose Morris electronic organ, as new, three octaves, one manual, £100 ono. Must be seen, played. C. Baker, 2 Clare Cottages, Clare Street, Cheltenham. Tel Cheltenham 27352.

Marconi sig gen TF1058, 1·7–4·0GHz; Philips video tape head EL1953/00; Pocketphone PF2UB; Pye Lynx tv camera; FDK Multi vfo; Liner 2; etc; offers. *Wanted:* BC453, BC946, CG46116, state cond. Robertson, 11 Alice Way, Histon CB4 4YA.

Heathkit RA1 rx, 70W hb tx, a.m.-cw, 80, 40, 20, with fb psu, xtal, mic, hb valve sig gen, 150kHz–15MHz, all with circuits, fine for beginner or club, £40 the lot. Buyer collects. GW3WQB, QTHR. Tel 0267 7156.

Trio 7200, 12ch; Liner 2 with rx amp, £90 ea, or would exch either for a vhf gen cov rx. BNRS RAE course, £4. Linguaphone Dutch course, £20. Please collect. G8KEH, QTHR.

Going QRT, comp stn for sale: Drake TL4C, RV4C, MS4, MN4, Hal KSR 4000 DS, ST6, TA33, QRO 2m linear vert ant 10/15/20, Oskerbolk SWR 200; various other items, incl test equipment etc. G4FZF. Tel Winchester 63399.

Liner 2, mic, mobile mount, £100; property of Silverthorn RC. Hon sec, G4AJA, QTHR. Tel 01-529 2282.

TR4C, less psu and manual, new cond, £380 cash. G2UZ, QTHR. Tel Leeds 784074.

FT250, FP250, mic, spares, inspection invited, £200 ono, carr extra. Coward, 27 Rothley Chase, Haywards Heath, West Sussex RH16 3PE. Tel 0444 58992, evenings.

HW100, plus SB600, HP23A psu, £165. Heath Mohican rx, factory-built, psu, £22. Standard C430 70cm tx/rx 9ch fitted, £140. Pocketphones with deacs on 433·2, £28. *Wanted:* 4CX250B and uhf base. G4CJB, QTHR. Tel Hungarton 647, evenings.

Trio TS520, matching spkr, remote vfo, mint, little used, £400. TR2200G, matching VB2200G amp, fitted S20–23, R5, R7, nicads, accessories, mint, £150; or consider exch for hf linear SB200, FL2100 etc, adjustment as necessary. G3MIN, QTHR. Tel Shoreham 3552.

IC202, as new, £140. Trio 9R59DS, £45. Codar preselector, £5. BCC CT53 sig gen, c/w sine square mod 8·300MHz, £20. G8CZH. Tel 01-859 1852.

IC22A, 13 xtals, mobile bracket, comp, £155 ono. G3OHH. Tel Macclesfield (0625) 23839.

TR7200G, fitted 10ch, S0, S20 thro' S24, R3 thro' R6, as new, in orig box, mobile mount, etc; exch for Trio TR7010, in similar immac cond. G8KTG, QTHR. Tel Brighton 551958.

Mint comm rx collection, all modes, minvalves, Marconi Atlanta, Eddystone EA12, Murphy B40 D/S, B41 B and Cs cas rx, Collins TCS rx, and others; test equipment; new components, spares, valves, etc. Buyers test and collect all or part. Hentall, 11 Union Street, Barnet. Tel 01-440 3534.

AR30 rotator, 8-el 2m beam, little used, £30. *Wanted:* Mohican manual, buy or loan for photocopying, postage paid. GW8FJS, QTHR. Tel 0222 890665.

TR2200GX, immac, boxed, 11ch, nicads, etc, £140. IC22A, immac, boxed, 14ch, t/burst, £130. Watts. Tel 01-485 2231, daytime.

FV101B remote vfo for FT101E, £40. Microwave Modules 70cm transvtr 28MHz, £60. 88-el 70cm beam, used twice, £19. Mepham, 45 Wealden Way, Haywards Heath, Sussex. Tel Haywards Heath 57609.

Linear Dentron MLA2500, £420. Trio TS8205, digital readout incl VFO820 ext vfo, DS1A dc inverter, YG88C cw filter, SP520 spkr, £790. G5CEY, Nick Berg. Tel Ascot (0990) 25041.

Drake MN-4 atu, £65. Hy-Gain BN-86 balun, £10. Varitronics lin amp, 10W in 50W out on 2m, £55. Carr extra, all items mint. J. L. Barry, 13 Mill Rise, Bourton, Gillingham, Dorset.

Icom IC240, latest synthesized mobile rig, Thanet's hi-low power, dup—A/B mod fitted, exc cond, £160. G8KUN, QTHR. Tel Luton 21302, after 6pm.

TS7010, tx/rx 2m rig, £130. G4AUY. Tel Telford 55082.

2200GX, 12ch fitted, nicads, auto toneburst, all accessories, orig packing, incl manual, £130 ono. G8CCI, QTHR. Tel Oxford 880229, after 7pm, or Witney 3724, weekdays 9–5.

Liner 2 tx/rx, exc cond, preamp, spare mic, £90. *Wanted:* hf tx/rx such as KW2000B; will pay cash adjustment in p/exch for Liner 2. G3ZQF, QTHR. Tel Medway 723694.

FR50B full 10m plus 160m plus 100kHz calibrator (all mods by Lowe), £70 ono. PR40 preamp 1·5–30MHz, £8. Carr by arrangement at cost. Write G4DSE, QTHR (18 March–18 April) or via GW3UCB, QTHR (other).

IC240, mint, boxed, £150. 12V–12A variable voltage psu, fully metered, £40. LM-7 freq meter, charts, mains psu, £25. Drake TV-3300 lp filter, as new, £14. KW1000 linear, mint cond, £185. KW107 Super Match, as new, £65. GI3YDH, QTHR. Tel Belfast 643913.

KW Vanguard hf tx, £20. Trio 9R59DS, £25. PR40 preselector, 1·5–30MHz, £7. Liner 2, vgc, £115. Power swr meter, 3·5–150MHz, £8. 2m 3-el quad, £4. 10m UR67, £2.50. G8KMV, QTHR.

3-el 10m Cub quad, to swop for less conspicuous Yagi or multiband vertical. G3ZDF, QTHR. Tel 07914 5112, after 6pm.

Pye Westminster W1-5U, boot mount, modified to 6ch, fitted SU8, SU20, RB4 and xtal toneburst, comp with handbook, £80. YF90F 9MHz ssb filter, carrier xtals, £11. GI8LBP, QTHR. Tel Belfast 22451 ext 47, 9–5.

Codar atsu tx with psu and manual, offers? G8MUI, QTHR. Tel 0423 502318.

FT101E, four months old, perf cond, £400. 18AVT/WB vertical, £40. GW8AIB, QTHR. Tel Newtown 27526.

FT101E, cw filter, as new, £360. FT221, as new, £290. EK108A electronic key, £25. Hi-Lo mast and electric extension unit, £150. HQ1 beam, £30. Other shack items; health reasons force sale. G4FDR. Tel Albrighton (Nr Wolverhampton) 3793.

Liner 2, mint cond, comp with preamp, all accessories, £100. G8FRA. Tel Coventry (0203) 415815, after 6pm.

Heath HW8, 4-bands, QRP tx/rx, in mint cond, handbook, Heath aligned and checked, exc as exciter for QRO cw amplifier, £65. Ancillaries available, extra. Please write for details to G3TYJ, 10 Avenue Road, Frome, Somerset BA11 1RP.

Yaesu FT2 auto, fitted S20, 21, 22, 24, R3, 5, 6, 7, narrow filter, toneburst, mains or batt, extra xtals (S0, S8, S32) incl λ/4 ant, £165. Magnum Two transverter, up to 100W output, £65. FTDX401, immac 560W input, cw/ssb filters, £295. G3IWE, QTHR. Tel Warrington 601485.

FT/FP200, £220. Marconi TF801A oscillator, 10-310MHz, bargain £20. 135–137MHz vfo, very stable, 135·3MHz xtal, fm input, £12. DJ9ZR tx board, 12V operation, £4. *Wanted:* TC7 or similar Trio R599CS, mint, £175. GM8MRK, 4 Burnett Terrace, Ayr KA8 9JR. Tel 0292 69030.

Tecumseh 8hp petrol engine, two hours use only, fitted governor for use with generator, £50 ono. G3JZF, QTHR. Tel 021-350 3553.

G-whip, comp, 160m 80m coils, top extension, £24. 160m a.m. tx/rx. 12V psu, £20. Hudson AM108, fitted PA3 preamp, wkg on 145, £15. *Wanted:* 4m transverter, homebrew considered. G4FRO, QTHR (Blackburn). Tel Garry Orford, Alsager (Cheshire) 3535.

ZVC board, wkg on 80m and 20m, QC1246 AX filter, preselector, three 6146 pa 100W+ o/p, 5–5·5MHz vfo, psu, etc, £70 ono. 12V 8A transformers, with thermal cut out, £2.50 ea plus 80p post, or £1.20 post for two. G4FAW, QTHR. Tel Ipswich 58815.

Pye Cambridge, 6ch, fm, £50. MMC 432/144 converter, £18. New 70cm 18-el Parabeam, £12. Emu rx fm adaptor, £8. Brand-new Pye Westminster mic, £5. Pye U450L tx chassis, two xtals, manual, slight fault, £15. G8BWR. Tel 0926 48388.

FM Westminster, W25FM, 40W, 10ch, on 2m, comp, vgc, £150. Spares: 10ch tx osc board, £7; 6ch rx board, £4; 3ch rx board, £3; fm multiplier board, £10; fm mic board, £3; multiway control plug, £2; xtals (R3, R4, R5, R6, R7, S0, S20, S21, S22), £2 ea. Spectrum analyser, Furzehill S560 with If S561 adaptor, 20Hz to 36MHz basic, filters for 6,30, and 150Hz, spare set valves, vgc, £120 ono. ATV (sound and video) tx, approx 10W, professional unit, tunable 420–850MHz, psu, ccts, test spec, etc, £50 ono. G8HVV, QTHR. Tel 0342 712005, weekends.

Homebrew 20/15/10 reduced-size quad, superior construction; 35ft windlass-operated tiltover mast, with substantial house-corner mounting brackets; offered at cost of materials, £50 ea ono. Reason for sale, removal to restricted QTH. Buyer collects. G4DXL. Tel Guildford 73019.

TR2200G, fitted ch R5, R6, R7, S0, S20, S22, comp with nicads, all accessories and auto toneburst, as new cond, £100, or would consider exch Liner 2. G2BSR, QTHR. Tel 0452 713300, evenings.

KW202 rx, six months old, hardly used, going tx/rx, best offer over £200. G4FXI, QTHR. Tel Aylesbury 21542.

Sale or exch for vhf gear: 274 copies *Practical Wireless*, several full volumes; *Rad Com*, Jan '68, Dec '77; *Radio Const*, 54 copies; *SWM*, 60 copies; *Pract Elect*, 50 copies; three volumes plus circuit book of *Modern Practical Wireless and Television*, reprint 1951 by Caxton; as new, no single copies please. G3XLC, QTHR. Tel 0782 311811.

"SWM", June '46 to Feb '54, almost comp, £5. 150W pi-tank pa unit 807s, £5. *Ham Radio Magazine* Jan '73 to Jan '74, £2. Various transformers, eg Woden 750V 250mA, £5. SAE lists, carr extra. G3CBV, QTHR. Tel Basingstoke 0256 58921.

Trio TV502 transverter, as new, a bargain at less than half today's price, £85 ono. GM3FRZ, QTHR. Tel Aberdeen (0224) 37398.

Trio 2200GX, fitted S0, S20, S21, S22, S17, R6, R7, nicads, Flexi whip, charger, etc, £125. Microwave Modules 4m converter, i.f. 2MHz, £12. Costello, G3YPP, 2 Malcolm Avenue, Cranwell, Sleaford, Lincs. Tel Cranwell 61593.

FT75, vfo and linear, £170. AR88 lf, £40. 1155, £15. 1155, £6 or exch for stamps or fm gear. G4BHM, QTHR. Tel Leeds 664833.

TS500 PS500 80m to 10m tx/rx, 180W p.e.p. input, ssb, a.m., cw, immac cond, comp with spare pa valves (two 6146Bs), £135 ono. G4FBA, QTHR. Tel Pontefract 72978.

Avo Model 8, leather case, unused since overhaul and recal; surplus-to-requirements AR40 rotator, requires slight attention. *Wanted:* TS700 or FT221, good cash price for unmodified up-to-spec rig. G4DVE, QTHR. Tel 0384 55816, office hours.

FT221 (new), with QQVO6-40 linear, part assembled in neat case, £290. Xtals (10×) 10·0MHz, 5·0MHz, 2·0MHz, 1·8MHz, 500kHz, 100kHz, 95p. BC221, vgc, psu, handbook, new spare valves, phones, £19.50, 6A(+) 0–240V+10% Variac, ac voltmeter, £12.50. *Wanted:* IC202. G2HCV, QTHR. Tel 01-954 2960.

Super QTH, pleasant NE London suburb, terraced, three bedrooms, two recep, garage, carpets, full gas ch, close shops, schools, Gants Hill Central Line underground, and TH6DXX on 60ft telescopic tower! Offers around £23,000. G3UML, QTHR. Tel 01-550 0882.

Eddystone EC10 rx, vgc, manual and phones, £53. R. E. Crispin. Tel 958 9287.

Belcom FS1007P 2m 16ch tx/rx, 17W/1W, fitted 11ch, c/w t/b, £155 ono. Trio 2200GX 12ch, c/w nicads, £160; Trio matching vfo 30G, £75; both ono and new 1978. ZL-Special 2m minibeam, £14. Steam 8-band hf Pye rx, £5. G4FIR, QTHR. Tel Abingdon 20707, or 01-802 8783.

Trio TS700, fitted mosfet preamp, auto toneburst, comp with all leads, cables, manual, orig box, exc cond, any demonstration, £350 ono. Adrian Green, G3UZF, QTHR. Tel (work) Rickmansworth 71211, (home) Luton 424696.

TR7200G, £135; vfo 30G, £40 ono; with xtal toneburst, ssm rf amp, orig box, mobile brackets and manual. Heavy-duty rotator cable, 7-core, 20p per metre. *Wanted:* W15AM/D Westminster. Write first to Nigel Brown, G4DCQ, 6 Hamilton Road, Cromer, Norfolk.

Trio TR7200G tx/rx and vfo 30G, comp cov 2m, mic, power lead, mobile mount, manual, orig packing, first class cond, £160. G8KUE, QTHR (Sydenham). Tel 01-659 5269, after 6pm.

WANTED

Aircraft Radio Museum, member of the British Aircraft Preservation Council, would like to acquire R1116, R1224, T1083, ARC3, APS13, RA10, TA2J, TR1133, APX6, TR3173, BC800 and any other old airborne radio or radar and manuals. Curator, G3TFC, QTHR. Tel 0203 302668.

Amateur visiting UK in last three weeks of May requires 2m mobile rig, hire or loan, deposit offered as security, will collect London area. Write to ZS5R, 30 Krantzview Road, Kloof 3600, S Africa.

Newly formed school club requires ex-gov't type rxs. Details please to G4DIX, QTHR. Tel Sevenoaks 55757.

Tuition for RAE and morse, swl will pay £50. Any willing operator please contact Ray Maslen. Tel Dulnain Bridge (Scotland) 254.

KW2000E or KW2000B, good cond essential. G3AJD, QTHR. Tel 01-449 0877.

Junker precision hand key or similar, must be vgc, price incl delivery to GM3WRN, 2 Maryfield West, Inverurie, Aberdeenshire.

Racal RA66 spectrum display unit, RA37 or RA137 low frequency converter, to fit RA17 rx, good cond essential, cash, or trade vacuum variable capacitors or other gear. John Knight, W6YY, Box 3, La Canada, California, USA 91011.

Service manual or circuit diagram for General MTC 110T cctv camera; also Philips LDL 1000 or similar video recorder, any cond considered, must be reasonably priced. Wilson, 112 Upgate, Louth, Lincs LN11 9HG. Tel 0507 2220.

DL707 displays, 5MHz xtal, Ferranti ZN1040E ZN1034E ics, 78M05 ttl 7490 (6) 74196 74123, dil sockets, any other components for G8CZW digital frequency meter, 2N6084 transistor. *For sale:* BC221 c/w charts, psu, £17.50 collected. G3IDW, QTHR. Tel Stratton St Margaret 2055.

Urgent: FT75B 10m tx/rx, in workable cond, please send details of cost and equipment to G4FZS, M. Bulmer, Searchlight Workshops, Mount Pleasant, Newhaven, Sussex BN9 0NQ.

Army C42 B47 A41, or any other equipment, ancillaries and accessories, comp or otherwise, wkg or not. What have you? PSV 16, C13 atu, A13, remote units, C12 etc, also Bird Thruline inserts. Buckley, 62 Ballards Way, S Croydon, Surrey CR2 7JN. Tel 01-657 4778.

Service manual for B & O 3400 colour tv, urgent, (not circuit diagrams), will photocopy and return immediately. G3NRW, QTHR. Tel Wade, Toddington (05255) 3180, afternoons or evenings.

Heath OS1 'scope for spares or rebuild, also manual for same, would consider uncompleted kit or why? G3LYU, QTHR. Tel 0533 876459.

Army radio sets 19, 22, 62, C12, must be comp and in good cond. G8IDL, QTHR. Tel Newmarket 76230.

Linear hf homebrew g and d or why?, up to £40. Tel Macklin, 01-890 7161 (office).

Type 88 rx manual, circuit diagram or any information, will buy or borrow, any offers? Andrew Stavros, "Barhatch", Barhatch Lane, Cranleigh, Surrey. Tel Cranleigh 3631 evenings, or Woking 70331 ext 254, daytime.

Urgent please: circuit diagram Codar PR30 rf preselector to photostat and return, or modification details to use with rx BC348Q chassis which is above earth potential. G3SMY, QTHR.

150W cw 80–10m tx, preferably wkg, £15? G4FXD, 38 Thornhill Gardens, Sunderland, T & W. Tel 58957.

NAG 144, Tempo or similar vhf linear. G3UPB. Tel 089-425 3323, or 022-870 474 evenings.

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. (Rally will be signposted from the outskirts of Swansea.) Attractions will include trade stands; displays by S Wales repeater groups and the local Raynet group; demonstrations of rtty, sstv, Teletext (Ceefax and Oracle) and vintage radio equipment; a junk stall; and a raffle. Refreshments and ample car parking space will be provided. Talk-in will be on 2m channel S22.

23 April—North Midlands Mobile Rally, Drayton Manor Park, near Tamworth. Rally chairman, B. Willetts, G8DEM; publicity, N. Gutteridge, G8BHE, 68 Max Road, Quinton, Birmingham 32. Details later.

30 April—Tulip Time Rally, Spalding Grammar School, Priory Road, Spalding (new venue). All the usual attractions.

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, tel Penarth 702877.

28 May—Hull & DARS 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.

15 July—BARTG Convention, Harpenden Public Hall, Harpenden, Herts, 1100-1700. Attractions will include trade stalls, bring and buy, picture tape factory, demonstrations and lectures (including one on "Microprocessors" by G3PLX, which should attract particular attention) and refreshments. Easy access provided by rail and motorway network, with car parking facilities. BARTG members and non members welcome.

16 July—Hornsea ARS Mobile Rally, Hornsea School, Hornsea, North Humberside. Details from G8KFK.

23 July—Cornish Mobile Rally, Truro. Details from G3NKE, tel Camborne 712419.

23 July—Anglia Mobile Rally, Stanway School, Winstree Road, Colchester, 10am. Details from G4DKI, QTHR, tel Colchester (0206) 67512.

6 August—RSGB National Mobile Rally, Woburn Abbey.

13 August—Derby Mobile Rally.

20 August—Preston Mobile Rally. Details later.

10 September—Telford Mobile Rally, Town Centre Malls, Jointly organized by Telford & DARS and Salop ARS. Full programme of events. Details from G8IDR, tel Shrewsbury 64273, or G3UKV, QTHR.

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

1 October—Great Lumley Mobile Rally, Community Centre, Great Lumley, Tyne & Wear. Trade stands, etc. Details from G8JLQ, QTHR.

Looking ahead

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.

2-4 November—ARRA Exhibition, Granby Halls, Leicester.

PETE, G4DYG

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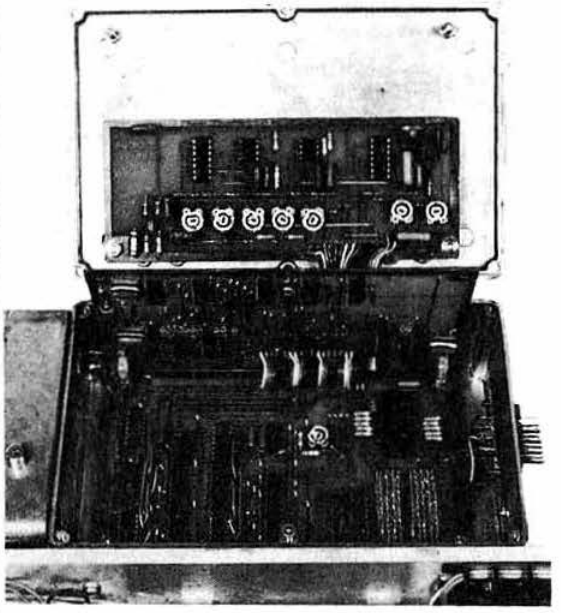

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144·030 ..	b	b	b	b	b	b	b	b	b	b	b	b	b	b
144·4/433·2 ..	a	b	a	b	b	c	b	c	b	b	b	b	b	b
144·480 ..	b	b	b	b	b	b	b	b	b	b	b	b	b	b
144·800 ..	b	b	b	b	b	b	b	b	b	b	b	b	b	b
144·850 ..	b	b	b	b	b	b	b	b	b	b	b	b	b	b
145·000/SO ..	a	a	a	a	a	a	a	a	a	a	a	a	a	c
145·050/R2T ..	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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The leading UK manufacturer of VHF equipment. Full range of Transverters, Converters, pre-amps frequency counters. Send SAE for lists.

HY-GAIN

12AVQ 10-15-20m Vertical	£39.93
14AVQ/WB 10-15-20-40m Vertical	£56.19
18AVT/WB 10 through 80m Vertical	£81.45
TH3MK3 Tribander beam	£167.62

ROTATORS

AR40	£51.75	KPR400	£97.00
CD44	£106.87	AR22R	£48.38
HAM2	£145.12		

JAYBEAM

Full range of antennas home station and mobile for 2 metres and 70cm. Send large SAE for catalogue and price list.

STATION ACCESSORIES

3-way antenna switch	£5.50
6-way antenna switch	£16.50
HP3A High Pass filter	£3.00
Bauer Keying paddle	£10.86
Twin paddle	£15.50
Junkers Heavy Duty Morse key	£19.85
Hy-Mound Morse keys	£8.75

ACCESSORIES

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Twin Meter SWR	£10.50
50 Ohm Dummy Load	£22.80
Drake TV3300 Low Pass filter	£18.00

SECONDHAND EQUIPMENT

Atlas 180 Transceiver	£250.00
Comtek 2m Linear Amplifier	£100.00
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Drake R4C with 2 filters	£450.00
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Eddystone EC10MK2 with ac psu	£120.00
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MK1 2-30MHz **£17.50** MK2 550kHz-30MHz 50 switchable tunable position to match most antennas to your receiver. Now in use in 40 countries. SAE for information and test report.

Send SAE with all general enquiries please. Good clean equipment wanted for cash. If you have any equipment surplus to your requirements we would be pleased to sell this on commission for you. We can arrange instant HP facilities with a 20% deposit and the balance over 6-12-18 or 24 months.

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MONOLITHIC CRYSTAL FILTERS, 3 LEAD HC18/U can size 3dB BW 20KHz, 20dB BW 60KHz, 9.0 & 10.7MHz—**£3.70,** 21.4MHz **£5.20.**

CRYSTAL DISCRIMINATORS—avoid the need to convert to 455KHz. Extract quality audio from the 1st I.F. 9.0 & 10.7MHz **£13.50,** 21.4MHz **£14.30.**

TBG-2 Tone Burst Generator **£8.00.**

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Did YOU know that we have the widest range of professional quality VHF and UHF equipment available to meet the most stringent requirements of the discerning amateur radio enthusiast, who is continuously endeavouring to keep his shack up to date. We have listed our complete range of products below, and we are pleased to introduce three new products.

NEW PRODUCT * A DC power supply, **MMP12/3**, which provides 12·5 Volts at 3 Amps to power any of our equipment from a mains supply.

NEW PRODUCT * A new version of the highly successful 144 to 432MHz linear transverter, **MMT432/144**, which now includes a 1·6MHz repeater shift. **MMT432/144 R.**

NEW PRODUCT * A new version of our standard 28MHz to 432MHz transverter, **MMT432/28**, which now includes a 2MHz upshift facility for OSCAR operation etc., **MMT432/28S**.

As space only permits a brief description of each of our products, please do not hesitate to contact us by post, telephone or telex for any technical details, or to request detailed data sheets for any of the products mentioned below. We have experienced sales and technical staff who will be only too pleased to assist you with any queries you may have.

144MHz

MMT144/28 : 144MHz linear transverter.
Features: 10 watts RMS output power.
30dB receive gain.
2·5dB noise figure.
Aerial changeover achieved by a PIN diode switch.
I.F. : 28–30MHz.
Price : **£88.88** incl VAT. (**£79** + VAT).

MMC144/28 : 144MHz receive converter utilising protected dual gate MOSFETS.
Typical gain: 30dB. Noise figure 2·5dB.
Other I.F.'s : 12–14, 14–16, 18–20, 24–26, 28–30MHz.
Price : **£20.25** inc. VAT (**£18** + VAT).

MMC144/28LO: As above unit, but has an extra buffer amplifier at 116MHz for use in transverters.
Provides 5mW at 116MHz.
Price : **£22.50** inc. VAT (**£20** + VAT).

MMC144/2 : Double conversion 144MHz receiver converter which achieves good image rejection at low intermediate frequencies.
Other I.F.'s : 2–4, 4–6MHz.
Price : **£20.25** inc. VAT (**£18** + VAT).

MMA144 : Low noise preamplifier with two independent outputs.
Typical gain: 18dB. Noise figure 2·5dB.
ALSO AVAILABLE FOR 70 and 136MHz.
Price : **£14.63** inc. VAT. (**£13** + VAT).

1,296MHz

MMC1296/28 : 1296MHz receive converter utilizing a hybrid ring mixer, with a matched pair of schottky diodes driving a MOSFET I.F. amplifier.
Typical gain: 25dB. Noise figure: 8.5dB.
Other I.F.'s : 28–30, 144–146MHz.
Price : **£31.50** inc. VAT (**£28** + VAT).

MMV1296 : 1296MHz varactor tripler.
Will accept up to 30 watts of 432MHz drive and achieves 60% efficiency.
Price : **£33.75** inc. VAT (**£30** + VAT).

432MHz

MMT432/28S : 432MHz linear transverter.
Now fitted with 2MHz upshift facility for OSCAR operation.
Features: 10 Watts RMS output power.
30dB receive converter gain.
3dB noise figure.
Aerial changeover achieved by a PIN diode switch.
I.F. : 28–30MHz.
Price : **£133.88** inc. VAT (**£119** + VAT).

MMT432/144R: 432MHz DOUBLE CONVERSION linear transverter.
Now fitted with a 1·6MHz repeater shift.
Features: 10 Watts RMS output power for 10 Watts 144MHz input.
10dB receive gain.
3dB noise figure.
Aerial changeover achieved by a PIN diode switch.
I.F. : 144–146MHz.
Price : **£169.88** inc. VAT (**£151** + VAT).

MMC432/28 : 432MHz receive converter featuring 2 RF amplifiers and a MOSFET mixer.
Typical gain: 30dB. Noise figure: 3·8dB.
Other I.F.'s : 14–16, 18–20, 28–30, 144–146MHz.
Price : £27 inc. VAT (**£24** + VAT)

DIGITAL PRODUCTS

MMD050 Six digit 50MHz frequency counter.
Frequency range: 0·45–50MHz.
Input sensitivity: Better than 50mV RMS.
Price : **£66.96** inc. VAT (**£62** + VAT).

MMD050/500 : Six digit 500MHz frequency counter.
Two ranges: 0·45–50MHz.
50–500MHz.
Combined version of **MMD050** and **MMD500P**.
Price : **£85.32** inc. VAT (**£79** + VAT).

MMD500P : Divide by 10 prescaler to give 500MHz capability when used with **MMD050** or similar counter.
Fully TTL compatible.
Output level is 2·5 Volts p.p.
Input sensitivity: Better than 200mV.
Frequency range: 50–500MHz.
Price : **£27** inc. VAT (**£25** + VAT).

70MHz

MMC70/28 : Receive converter for 70MHz.
Similar to **MMC144/28**.
Other I.F.'s : 4–4·7, 14–14·7, 18–18·7, 28–28·7MHz.
Price : **£20.25** inc. VAT. (**£18** + VAT).

MMC70/28LO : Similar to **MMC144/28LO**.
Features buffered local oscillator facility at 42MHz for transverter use.
Price : **£22.50** inc. VAT (**£20** + VAT).

POWER SUPPLY

MMP12/3 : Compact matching 12·5 volt 3 amp PSU for our transverter range.
Price : **£56.25** inc. VAT (**£50** + VAT).

Features : Current limits at 3 amps.
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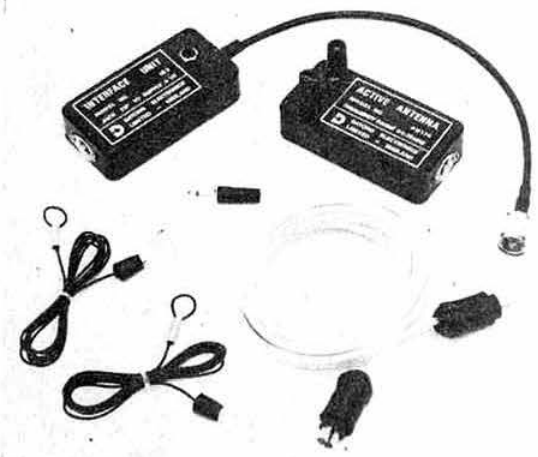
MODEL AD170 Continuing our policy of constructive innovation we are proud to introduce what we think is the first broadband active dipole antenna at a price which puts it within easy reach of the Radio Amateur or short wave listener.
The Datong Active Antenna is designed for indoor mounting only but 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 (e.g. 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 minimise receiver intermodulation effects.
- ★ Balanced dipole configuration gives choice of polarisation 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.

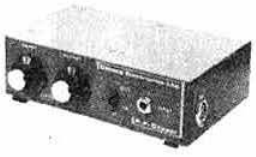
Although active antennas give lower signal strengths than conventional antennas, received noise levels are also lower and therefore signal-to-noise ratios are comparable when used with modern sensitive receivers.

Model AD170 is supplied fitted with PL259 coaxial output plug and complete with the accessories shown in the illustration, i.e. 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 **(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.

RF 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 30 1MHz wide synthesiser controlled segments. Also works as a two-metre converter. Connects between receiver and antenna.

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Good quality mains adaptors designed and made in the UK specifically for use with our products. The unstabilised output is suitable for Models FL1, AD170 and UC/1 when using 240v AC mains and for FL1 and AD170 when using 220v AC mains. MPU has a built-in 13 amp fused mains plug while MPU/1 has an 18 inch long mains lead.
When ordering please specify whether output plug is required to suit FL1, AD170, or UC/1.

PRICES: (NOT INCLUDING VAT): AD170 **£29.50**, MPU and MPU/1 **£5.50**, AD170 + MPU or MPU/1 special package price **£33.00**. FLI **£53.00**. UC/I **£105.00**. RFC **£40.00**, RFC/M **£21.50** (PCB version of RFC).
All prices are subject to VAT at 12½%. Prices include delivery within UK. More data on any product plus complete price list showing accessory leads, etc, available on request.

12

DATONG ELECTRONICS LIMITED

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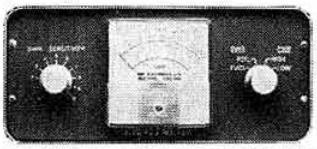
Optimum Performance with KW



Decca-KW 103 Combined Swr/Rf Power Meter is an instrument for measuring a 50 ohm coaxial line feeding an Aerial System or Dummy Load (1) Standing Wave Ratio. (2) RF Power with two ranges 0-100 & 0-1000W when used with a 50 ohm Dummy Load.

Decca-KW 1000 Linear Amplifier for SSB and CW 10-80 metres, 1200 watts p.e.p. input SSB, can be 'driven' by most 100 watt Transceivers and Transmitters. Employs a pair of T160L Tubes in grounded grid. Pi-section input and output circuits. Built-in 2·4Kv P.S.U.

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Decca-KW Dummy Load is air convection cooled and has been designed as a purely resistive 50 ohm load up to 30MHz. Power capability up to 1000W.

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Decca-KW 107 Antenna Tuning System Incorporates E-Z match, SWR/RF Power Meter, Dummy Load. Antenna switch. High power version KW 109 is available.

Other KW Favourites KW E-Z match; KW Traps (the original and the best) KW Trap Dipoles; KW Antenna Switch; Stockists for Hy-Gain beams and Verticles; CDR Rotators; Shure Microphones etc. KW spares are normally stocked for a minimum of five years after manufacture of equipment. Write or 'phone for catalogue.

KW

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ASPE 667 colinear 420-440MHz, 5dB gain **£14.95**
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ASP 659UK colinear 420-440MHz 5dB gain, base station antenna **£19.95**
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K220A Mag mount with cable, fits 201, 462 **£7.19**
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ASP332 gutter mount, fits 629 **£7.10**
ASPR 332 gutter mount, fits 677, 667 **£7.10**
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UR67 Coaxial cable, attn. 0·68dB/100MHz, 2·5dB/1000MHz per 10m, 50Ω **£0.50** per m.
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TOKO coils: Ambit now holds over 200,000 in stock

AM IFTs for 455/470kHz	1st, 2nd and 3rd	£0·30
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MFH41T/MFH7IT 4 or 7kHz Bandwidth, 455kHz mechanical filters with matching transformers	£1·95
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FOIL trimmers—Mullard and Dau types

1-8pF, 3-30pF, 7-45pF in 7·5mm diameter: 18, 23 & 26p resp.	
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VARICAP DIODES—VHF and MF/HF wide range tuning diodes

BA102—30p; BA121—30p; BB104—45p; MVAM2—£1·35
NEW MVAM125: 20 to 400pF with 25V bias available in singles or sets for multi stage tracking 90p each, 3 for £2·65.

ICs for Radio: The best and most recent popular types:

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TBA120 FM detector block with gain	£0·75

*Please remember to include VAT (usually 12·5% except where marked *) and our flat rate 22p P&P charge. Catalogue 40p inc. Please accompany enquiries with an SAE. Price list leaflets available FOC with an SAE.*

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2N3866	1W 10dB	28V 175MHz	£0.78
2N5913	2W 7dB	12V 470MHz	£1.40
2N3553	2·5W 9dB	12V 175MHz	£0.95
2N6080	4W 12dB	12V 175MHz	£4.00
SD1143	10W 10dB	12V 220MHz	£5.70
2N6081	15W 6·3dB	12V 175MHz	£5.50
2N6082	25W 6·2dB	12V 175MHz	£7.50
2N6083	30W 5·7dB	12V 175MHz	£8.40
2N6084	40W 4·5dB	12V 175MHz	£11.10
RF2127	70W 6·6dB	12V 175MHz	£23.50
SD1019-5	100W 6·0dB +	28V 175MHz	£18.70
2N5590	10W 5·2dB	13·6V 175MHz	£4.70
2N5591	25W 4·4dB	13·6V 175MHz	£6.80
2N5944	2W 9dB	12V 470MHz	£5.40
2N5945	4W 8dB	12V 470MHz	£7.60
2N5946	10W 6dB	12V 470MHz	£9.50
SD1136	10W 5·5dB	12V 470MHz	£6.40
SD1088	25W 6·8dB	12V 470MHz	£16.45
SD1089	40W 4·3dB	12V 470MHz	£19.50
2N5179 Gen. purpose amp. FT = 900MHz		TO72	£0.72
2N5031 UHF amp NF 2·5 at 500MHz		TO72	£2.15
BFX89 UHF amp FT 1100MHz TO72			£0.90
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TP393 2·0dB NF at 500MHz	£2.00
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1N5139 varactor, 7pf (4V) 5W max. in. Wire-end **55p** + 8% Hp5082-3080 UHF. Pin diode **65p** + 8%.

Antenna Relays. Mag. Dev. 951-170-12V 50ohm good to 1296MHz RG43 cable entry. Still at **£5.75** + 8%. 33% inc expected soon.

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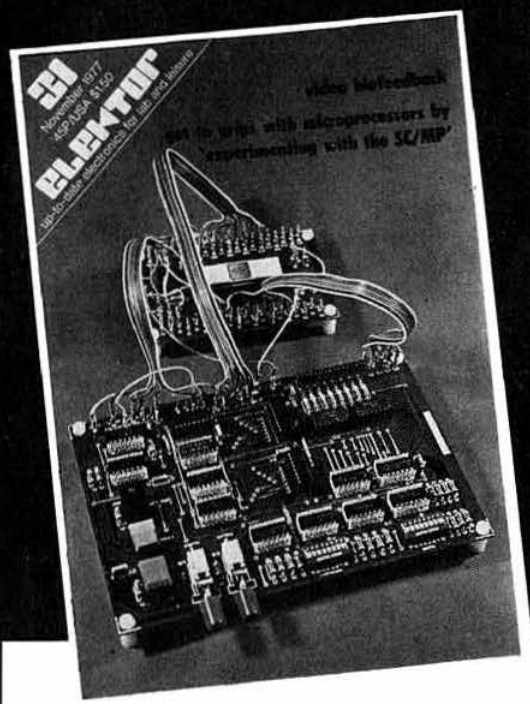

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