

# RADIO TODAY

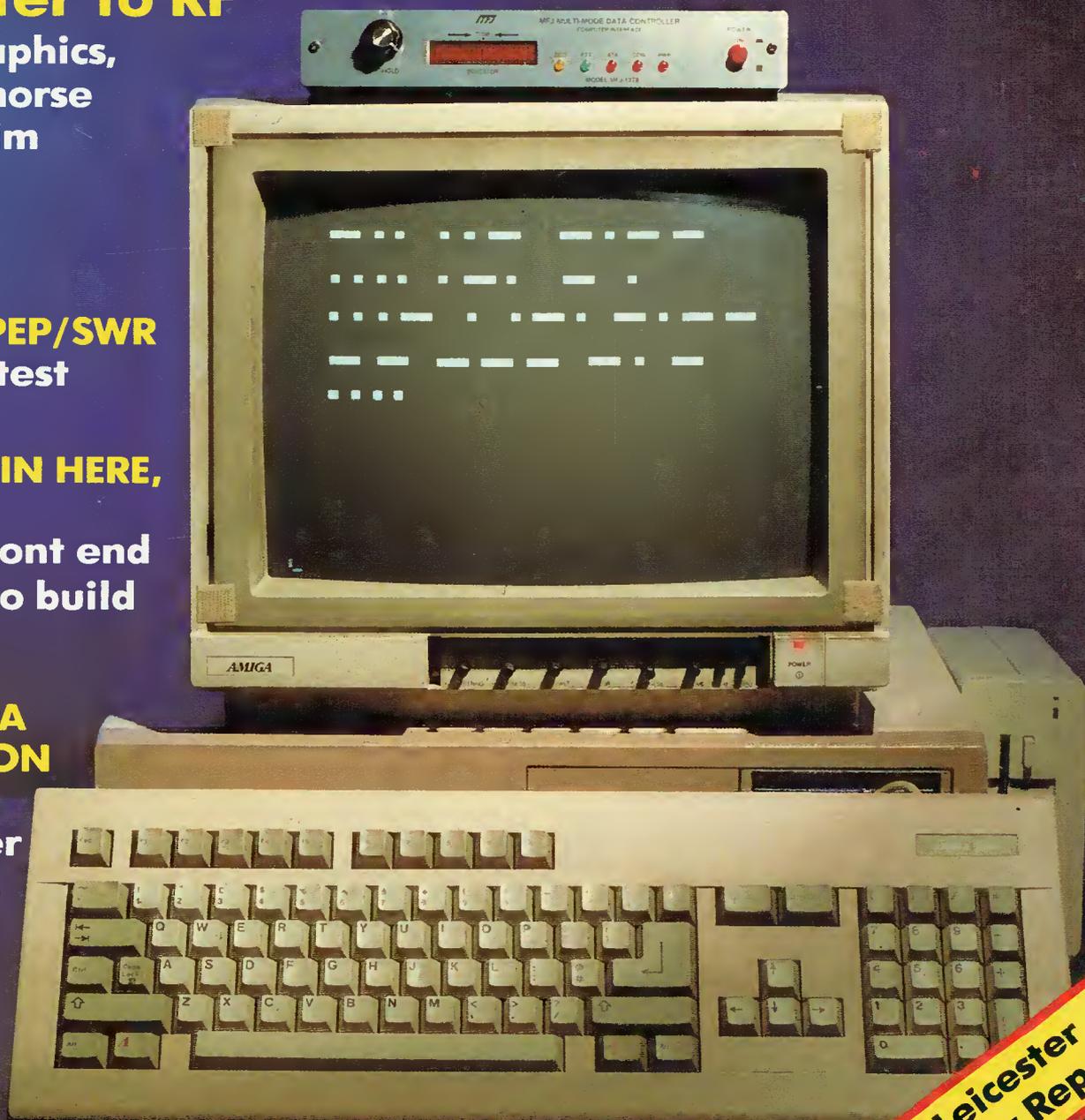
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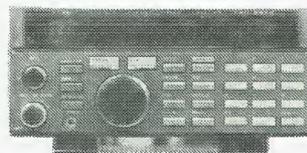
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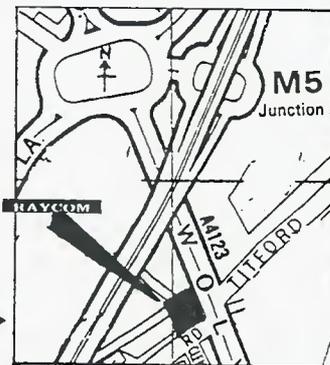
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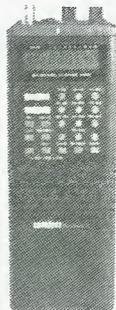


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VOLUME 7 NO 3 MARCH 1989

## TODAY

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## TX-3 RTTY/CW/ASCII TRANSCEIVE

The high performance, low cost system

Split-screen, type-ahead operation, receive screen unwrap, 24 large memories, clock, review store, callsign capture, RTTY auto CR/LF, CW software filtering and much more. Needs interface or T.U. **BBC-B/Master** and **CBM64** tape £20, disc £22. **Spectrum** tape £35, +3 disc £37 inc. adaptor board (needs interface/TU also).

For **VIC 20** we have our RTTY/CW transceiver program. Tape £20.

## RX-4 RTTY/CW/SSTV/AMTOR RECEIVE

This is still a best-selling program and it's easy to see why. Superb performance on 4 modes, switch modes at a keypress to catch all the action. Text and picture store with dump to screen, printer or tape/disc. An essential piece of software for trawling the bands. Needs interface. **BBC-B Master**, **CBM64** tape £25, disc £27. **VIC20** tape £25. **SPECTRUM** tape £40, +3 disc £42 inc. adaptor board (needs interface also). The **SPECTRUM** software-only version (input to EAR socket) is still available £25, +3 disc £27.

**TIF1 INTERFACE** Perfect for TX3 and RX4, it has 2-stage RTTY and CW filters and computer noise reduction for excellent reception. Transmit outputs for MIC, PTT and KEY. Kit £20 (assembled PCB + Cables, Connectors) or ready-made £40, boxed with all connections. Extra MIC leads for extra rigs £3 each. State rig(s). Interface only available with TX-3 or RX-4 software.

**WORLD AND UK/EUROPE LOCATOR** Maps, great circles, distances, bearings, contest scores. Lat/Long, locators. **NGR**, hundreds of placenames. **BBC-B/MASTER, ELECTRON ONLY** tape £10.

**LOCATOR** Distances, bearings, contest scores. Lat/Long, Locators. **SPECTRUM, CBM64, VIC20**, tape £7.

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All **BBC** and **CBM64** programs are available on **DISC** at £2 extra.

**NEW!! PEP BOARD** Converts any RF power meter to read pep. Assembled and tested pcb + mounting kit and instructions £12.

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# RADIO TODAY

## ATs for AR

Andrews Computer Services are offering a series of AT/XT compatible computer systems configured for amateur radio use. ACS also have an Eprom upgrade, the PMS (personal message system), for Pac-Comm TINY-2, TNC-200 and TNC-220 packet radio controllers.

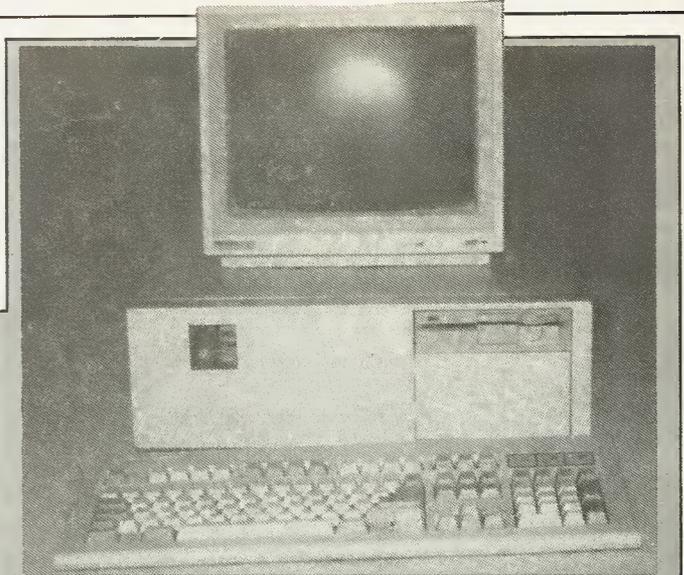
The proffered computer systems comprise in outline:

ACS AT 268 compatible: 101 key keyboard, 640K zero wait state ram, monochrome monitor, 80286 processor, 20Mbyte hard disk 65ms, Phoenix BIOS, 1.2Mbyte, 5.25in floppy drive, two RS222 and two parallel ports, 8 expansion slots, clock calendar, 200W power supply. £895 plus carriage and VAT.

ACT AT 80386 compatible Desktop/Tower system: as above, but with 80386 20MHz main board, 32-bit bus structure, 1Mbyte ram, 250W power supply. Recommended for network fileserving, CAD, real-time control environments, desktop publishing and similar tasks. £1650 plus VAT and carriage.

ACS XT 8088 compatible 20Mbyte hard disk, 360K 5.25 floppy disk drive, 640K Ram, two serial, two parallel ports, multi in/out card, monochrome monitor, latest version of the Phoenix Bios, 4.77/10MHz switchable main board. £695 plus VAT and carriage.

There is, says MD Paul Andrews G6MNJ, a set of public



domain amateur radio-related disks available for the computers at the time of order. These include programs for packet radio, SSTV, RTTY, Morse code, locator programs and more.

The Pac-comm PMS eprom allows the packet radio controllers as specified for its use to support standard packet functions, while simultaneously allowing messages to be entered or read over the air. About 15K of battery-backed ram is allocated for message storage.

The PMS eprom for the TNC-200 can also be used to upgrade the AEA PK80 and MFJ 1270/1274 controllers with 32K of ram.

The Pac-Comm PMS costs £12.50 (£7.50 if you supply your own 27256 eprom).

Further details on all counts from Andrews Computer Services Ltd, 6 Ash Hill Close, Bushey Heath, Herts WD2 1BW. Tel: 01-950 9381.

## Howe About Kits

C M Howes Communications have sent out their 1989 Radio Kit Catalogue with five new transmitter, receiver and accessory kits to further extend their range of nearly two dozen kits in the field. Howes kits include a glass fibre PCB, all board-mounted components, parts list and instructions and circuit and wiring, as well as other essential parts. Off-board components and casing are usually available separately. The new kits are:

**MBRX Marine Band Receiver.** This is a communications receiver covering the marine band from 1.6MHz to 3.95MHz in two ranges, including ship-to-shore, coastal stations, the international distress frequency and the 80m and 160m amateur bands. Some of the features are a three position RF attenuator, selectable fast or slow AGC and a stable fet VFO with fine tune control. Optional filters and signal monitor kits can be added. Suitable tuning capacitors are available while stocks last. £29.90 kit, assembled board £44.90.

**DcRx54 HF Air Band Receiver.** This is the latest version of Howes' shortwave SSB/CW receiver, popular with newcomers and QRP users. The DcRx54 covers the HF airband from 5.45MHz to 5.75MHz. It comes with ready-wound coils. "Do not be put off by the low price, this set performs well and is capable of world wide reception," say Howes. Kit £15.60, assembled board £21.50.

**AT160 80/160M phone and CW transmitter.** This AM, DSB and CW dual band transmitter has been added to the list to complement Howes' simple CW transmitters with a phone transmitter, following the tradition of the old top band/80m AM valve rigs, but using solid state technology. Pot control gives continuous carrier adjustment between full carrier and -49dB DSB, and transmitter power from around .5W to 10W PEP. Kit £34.90, assembled board £53.90.

**MA4 Microphone Amplifier.** This is an active-filter microphone amplifier designed to complement the AT160 and similar units. Kits £5.60, assembled board £9.90.

**AA2 Active Antenna Amplifier.** "Designed to enable you to convert a few feet of wire or metal rod into an 'active antenna' capable of receiving as many signals as much longer passive wires," say Howes. Designed to be mounted near the receiver or remotely in an attic or mast, and to mount in a standard drainpipe length for weatherproofing, the amp has single wire and dipole inputs and a frequency range from long wave to 30MHz. Not for transmitting. Kit £7.50, assembled board £11.50.

For more information contact C M Howes at Eydon, Daventry, Northants NN11 6PT. Tel. 0327 60178. Inland postage £1.00 on total order, £2.00 airmail outside Europe.

## Where There's Morse There's Chrome . . .

Gordon Crowhurst G4ZPY of G4ZPY Paddle Keys is continuing his search for the perfect paddle key by upgrading his already good keys in a number of ways.

G4ZPY told Ham Radio Today that his Pump Key now has 40 threads to the inch in its adjustable contact, and the return spring is now adjustable down to zero tension to suit operators with a very light touch.

Gordon feels that the Single Paddle Key cannot be improved upon, but he is asking for suggestions from CWers who feel otherwise.

There is also a MK2 Twin Paddle with several slight improvements over the MK1 model.

Gordon has now extended his range of variations to a total of 65. New to the range is a Nickel Plated Pump Key mounted on a chrome plated brass plate, which is in its turn mounted on real mahogany, priced £42.95 and "a real beauty", according to Gordon. The new nickel Plated Single Paddle Key Grande Luxe is mounted on a chrome plated steel base and priced at £68.95, and the Nickel Plated Twin Paddle MK2 Key Grande Luxe is also on a chromed steel base, and priced at £82.95.

Gordon is adamant that he will even make a gold plated key for you — if you have a bottomless pocket.

Unfortunately, due to the rising cost of materials and manufacture, the price of the Mk2 Twin Paddle Key has risen from £57.50, and the price of most other keys will probably have risen somewhat by the time you read this.

For the non-CWer, or anyone taking a break, Gordon is also producing a range of desk pen holders mounted on Lakeland Stone and Marble, and 6in quartz clocks.

Gordon and Brenda wish all our readers a prosperous New Year. For more information about any of his products, contact Gordon Crowhurst G4ZPY at 41 Mill Dam Lane, Burscough, Ormskirk, Lancs L40 7TG, UK. Tel. 0704 894299.

## Repeater Rally

The 1989 Cambridgeshire Repeater Group Junk Sale Rally Extravaganza (add your own epithets at will) starts at 10.30am on Sunday 19 March at the Philips RCS (Pye Telecom) Canteen, St. Andrews Rd., Cambridge. The all-day show will feature trade stands, a 'nearly new' bring and buy stall, and the traditional Monster Junk Sale Auction. Ample free parking, refreshments, talk-in on S22 and RB14 (GB3PYO). Proceeds will go to support the Group's repeaters.

Further details and trade enquiries to Brian Smith GODAH, QTHR, Tel. 09547 405 after 6pm.

## Scots Magnum Rally

The Cunningham and District Amateur Radio Club are doing something about the shortage of radio rallies in Scotland and insti-

tuting a new mobile rally at the Magnum Leisure Centre in Irvine. This year the rally will be held on Sunday 26 March, from 10.30am. Sunday has been chosen to allow family members who are not so keen to attend

## Morse Application for Blind Workers

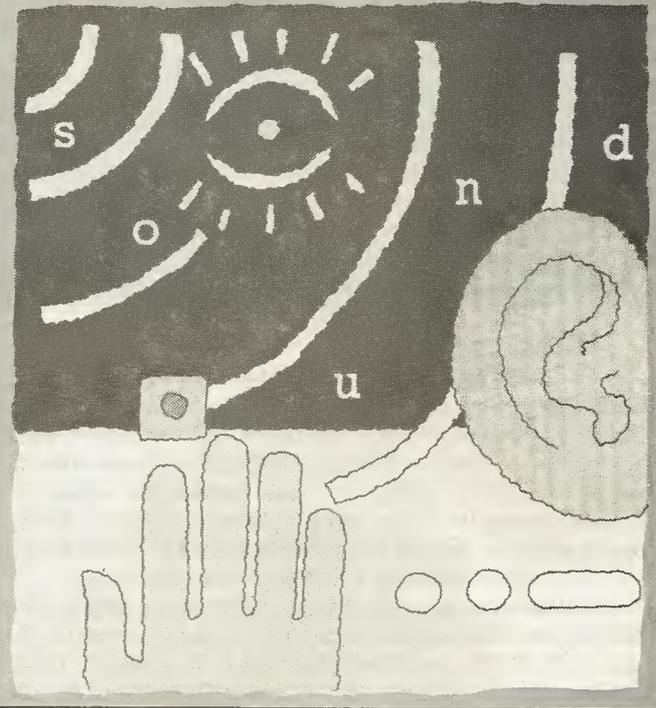
A word processor for the visually handicapped which employs morse code as the aural feedback has been produced by Gravatom Technology Ltd. (GTL) or Fareham.

Apparently based in an Atari ST520 (GTL stress that the rig simply works like an electronic typewriter and that no computing experience is needed), Soundwriter uses five redefined keys: a dah key, a dit key, a command key and two punctuation keys. The package includes a printer, program discs, taped and printed instructions and connecting cables. It is designed on the one hand to function as an office wordprocessor/computer (a keyboard cover protects the rest of the keyboard when in Soundwriter mode) and on the other hand can be connected to a domestic TV as a monitor, and set up, say GTL, by a visually handicapped person without assistance, thanks to the cassette of recorded instructions.

GTL's trials have indicated that visually handicapped users are able to read and write morse after a few hours, and improve rapidly with practice.

Soundwriter costs £800 and it is hoped that it will help visually handicapped people to word-process more easily and effectively without having to master conventional keyboard skills or braille. Because Soundwriter itself is a software package, the program can be updated easily, and the computer redefined for normal wordprocessing.

GTL, Portsdown House, West St., Fareham PO16 0EF. Tel. 0239 285827.



the rally to make use of the swimming, skating and other facilities at the leisure centre, which already has a track record as a major exhibition site.

For more information, contact Bob Low GMOECU at 2 Craigie Place, Crosshouse, Ayrshire KA2 0JR, Tel. 0294 72233 (work), 0563 35738 (home).

## Catalogues

Two new catalogues from major amateur component suppliers have recently been released. The Greenweld 1989 catalogue, on sale for £1, claims to be the largest Greenweld catalogue to date. It is a general electronic components and equipment catalogue, with sections on audio, books, cases, kits, semiconductors, and tools. The audio section concentrates on ready built equipment, with a few modules thrown in. There are audio mixers of various types, a reasonable selection of basic test equipment, and wide range of resistors.

There are some rf components, such as small trimming capacitors and a reasonable range of polystyrene and ceramic fixed capacitors, including high voltage TV types. For non-RF projects there is a very good range of Veroboards, and the diecast boxes (in a separate section from the cases!) could be useful for rf modules.

I was perurbed to notice a 3W FM transmitter kit on offer, with no warning that it cannot be licensed in the UK.

The Winter 1988/1989 Cirkit catalogue costs £1.30, but the discount vouchers that come with it will soon cover that. The choice is limited in some general areas in favour of an excellent range of rf related parts. This is the great strength of this catalogue, and I don't think that any other amateur supplier offers such a good range of rf components.

There is an excellent choice of variable capacitors (including wide spaced ones) filters and ready wound

inductors covering MF to UHF. There is also a well chosen range of RF semiconductors at reasonable prices. Cirkit market a range of kits and modules including such items as a high power ATU, transverters, a single band transceiver kit, the new Navico 2M transceiver, to name but a few. General items available include audio amplifiers, an msf clock, an automatic windscreen wiper, and a lamp dimmer. The comprehensive test equipment section includes a number of items of interest to the radio amateur, including signal generators and frequency counters.

The two catalogues complement each other. The Cirkit catalogue is of particular interest to the radio amateur, and the Greenweld catalogue can fill in some of the general items which may not be available from Cirkit.

Bulgin has issued a glossy 12-page colour leaflet featuring its Buccaneer range of robust, modular connectors for hostile environments, including waterproof connectors, pushbuttons, indicators and silicon rubber switch covers.

Lastly, Allweld Engineering's current catalogue features full details of the Altron Alitower system (see Show Report, page xx).

**Greenweld Electronics, 443 Millbrook Rd., Southampton SO1 0HX.**

**Cirkit Distribution, Park Lane, Broxbourne, Herts EN10 7NQ.**

**Bulgin & Co., Bypass Rd., Barking, Essex IG11 0AZ.**

**Allweld Engineering, Unit 6, 232 Selsdon Road, South Croydon, Surrey CR2 6PL.**



## Living on an Island

The photograph shows the members of the Ballymena ARC who went on the club's annual expedition to Rathlin Island, six miles off the north east corner of Co. Antrim in August 1988. The Marconi Anniversary Station GB2MRI was activated there in commemoration of the work of Marconi and his assistant Kemp, on behalf of Lloyds insurance, to establish a communications link for shipping in the area.

Rathlin has an area of 6 square miles, a population of 100, and three lighthouses, one in each corner of the isle and each one, coincidentally, in one of three separate WAB squares, D14, D15 and D05. Work out for yourselves what shape the island is.

During the four days of the expedition, over 500 QSOs were made, including Australia every morning. Contact was mainly on 2m and less so on 70cm — the club reminds people to point their antennas towards square 1065VH in August this year.

## Fix Faults Fastest

In a search for talented young service technicians to represent Britain in the 30th 1989 International Skill Olympics, companies in the electronics goods and services industries are being called upon to enter their best young techs in the National Elimination Competition organised by the Radio, Television and Electronics Examinations Boards. The winner of the Elimination will go forward to represent Britain in the Skill Olympics on August 30th.

Entrants must be aged under 23 as of 1 January 1990. 400 entrants from more than 20 countries will match skills in more than 40 crafts. Are you the fastest fixer in your lab? Ask your guvnor to contact The Organiser, RTEEB, 57-61 Newington Causeway, London SE1 6BL for information and a nomination form, and win glory for yourself and your workshop.

## Awards

The 3rd Annual Derby and District Amateur Radio Society National 144/146MHz Contest will be taking place on Sunday 12th March. The contest runs from 13.00 to 17.00 under any mode of operation. There will be awards for full legal power limit contacts, low power (30W maximum output) and SWL, single- or multiple-operator.

For a full set of rules, please send a stamped self-addressed envelope to the Club addressed to Contest Rules, Derby DARS, 119 Green Lane, Derby, DE1 1RZ.

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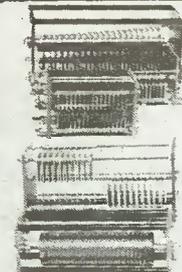


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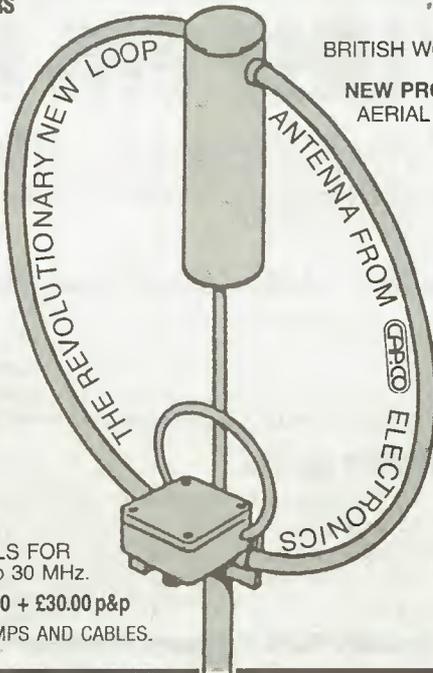
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Kenwood R5000	875.00	(—)
Yaesu FRG8800	649.00	(—)
Yaesu FRV8800 V.H.F. Converter	100.00	(2.00)
Lowie HF125	375.00	(—)

HF TRANSCEIVERS	£	(c&p)
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Kenwood TS930S	1695.00	(—)
Kenwood TS440S	1138.81	(—)
Kenwood TS140S	862.00	(—)
Yaesu FT980	1785.00	(—)
Yaesu FT757GXII	969.00	(—)
Yaesu FT767GX	1550.00	(—)
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Icom IC735	949.00	(—)
Icom IC751A	1465.00	(—)

V.H.F. SCANNING RECEIVERS	£	(c&p)
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Yaesu FRG9600M 60-950MHz	509.00	(—)
A.O.R. AR2002	487.30	(—)
Signal R535 "Airband"	249.00	(—)
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Revcone Discone Antenna 30-500MHz	32.16	(3.00)
Icom AH7000 Antenna 25-1300MHz	82.00	(3.00)

ANTENNA TUNER UNITS	£	(c&p)
Yaesu FRT7700 Short wave listening	59.00	(2.00)
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Kenwood TH415E Handheld	298.85	(—)
Kenwood TM421ES 35W Mobile	352.84	(—)
Yaesu FT73R + FNB10 Handheld	263.50	(—)
Icom IC4GE Handheld	299.00	(—)
Icom IC04E Handheld	299.00	(—)
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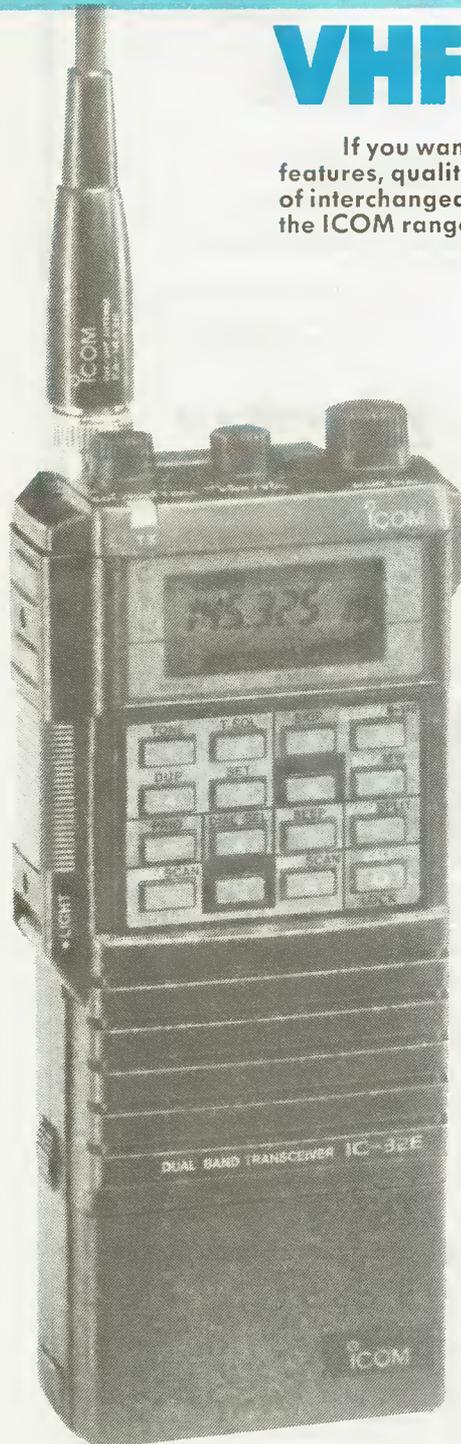
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# ICOM

## VHF/UHF FM Handhelds

If you want a handheld with exceptional features, quality built to last, and a wide variety of interchangeable accessories, take a look at the ICOM range of FM transceivers.

All ICOM Amateur handhelds are supplied with a flexible antenna, rechargeable nicad battery pack and an AC wall charger.



### IC-2E 2 Metre Thumbwheel Handheld

This popular transceiver from ICOM is still available after eight years of production. If you're looking for a straightforward but effective handheld the IC-2E takes some beating. Frequency selection is by means of thumbwheel switches (with 5KHz up switch), with simplex and repeater operation possible. Power output is 1.5 watts or LOW 150 milliwatts (2.5 watts possible with BP5A battery pack).

### MICRO 2E/4E

These micro sized 2 metre and 70 centimetre handhelds give the performance and reliability you expect from ICOM. Measuring only 148 x 50 x 30 the micro fits in your pocket as easily as a cassette tape. The micro features up/down tuning switches for quick frequency changing, 10 programmable memories, LCD readout and 1.5 watts output (2.5 watts possible with BP24 battery pack).

### IC-02E/04E Keypad Handheld

These direct frequency entry handhelds utilise a 16 button keypad allowing easy access to frequencies, memories and scan functions. Ten memories store frequency and offset, a front panel LCD readout indicates frequency, signal strength and transmitter output. Power output is 2.5 watts or LOW 0.5 watt. (5 watt is possible with the BP7 battery pack or external 13.8v D.C.)

### IC-2GE/4GE

The 'G' series of handhelds fulfills the most important criteria for a handheld transceiver, it is small, rugged and easy to operate. The 20 memory channels can store simplex and repeater frequencies and with the several scan functions there is no need to manually search for activity. The 3 watt output and power saver circuit ensures low battery drain. (7 watts is possible with the BP7 battery pack or external 13.8v D.C.)

### IC-12E 23 Centimetres

Similar in style to the 02E/04E this 1296MHz handheld utilizes ICOM's experience in GHz technology, gained by the excellent IC-1271E base station. With the growing number of repeaters on 23cm the IC-12E makes it an ideal band for rag chew contacts. Power output is 1 watt from the standard BP3 battery.

### IC-32E Dual Bander

This exciting new handheld offers 2 metres and 70 centimetres in one compact unit. Tough and splash resistant it offers many features including crossband duplex operation, 20 dual band memories and power saver circuit. The IC-32E utilises most existing ICOM accessories, ideal if you are upgrading from an existing ICOM handheld.

Also available for ICOM handhelds are a large range of optional extras including rechargeable nicad battery packs, dry cell battery cases, desk chargers, headset and boom microphones, leatherette cases and mobile mounting brackets. New products just released:- HM46 miniature speaker/microphone and HS51 lightweight headset/microphone complete with PTT and Vox unit.

**Icom (UK) Ltd.**

Dept HRT, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859. 24 Hour.

# COUNT ON US!

## IC-751A HF All-Band Transceiver



- **Amateur Bands 160m - 10m.**
- **General Coverage Receiver.**
- **105db Dynamic Range.**
- **100W Output (40w A.M.)**
- **32 Memories.**
- **Electronic Keyer.**
- **CW Semi/Full Break-in.**
- **HM36 Microphone.**

The ICOM IC-751A was created for the ham operator who demands high performance whether entering contests, chasing DX or just simply enjoying the shortwave bands. It is an all mode solid state transceiver with a host of features designed for the crowded HF bands of today.

Additional features include passband tuning, 9MHz notch filter, adjustable AGC, noise blanker, RIT and XIT. A receiver pre-amp and attenuator provides additional control when required. The FL32 9MHz/500Hz CW filter is fitted as standard with CW sidetone on Rx and TX modes. On SSB the new FL80 2.4Khz high shape factor filter is fitted.

The transmitter is rated for full 100% duty cycle with a high performance compressor for better audio clarity. With 32 memory channels and twin VFO's, scanning of frequency and memories is possible from the transceiver or the HM36 microphone supplied.

The IC-751A is supplied for 12v operation but can be used with either internal or external A.C. power supply. It is fully compatible with ICOM auto units such as the IC-2KL linear amplifier and the AT500/100 antenna tuners.

Options available:- PS35 internal AC power supply, PS15 external AC power supply, EX310 voice synthesizer, SM8 and SM10 desk microphones and SP3 external loudspeaker.

**Helpline:** Telephone us free-of-charge on 0800 521145, Mon-Fri 09.00-13.00 and 14.00-17.30. This service is strictly for obtaining information about or ordering Icom equipment. We regret this cannot be used by dealers or for repair enquiries and parts orders, thank you.

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# LETTERS

## Letter of the month

Re the Bonzai Antenna (HRT September 1988) this must be the same as the extended Marconi Antenna as described in *Dowset's Handbook* for wireless operators in about 1914 for use on small ships, in which it was recommended that the loading coil should be at one twentieth of a wavelength from the far end. I have used an antenna of this type for many years, but with the extended end vertical as shown in the attached drawing, and also in what I describe as an

"upside down Zepp"

In the Zepp mode, it was tested on G2BCX's famous antenna table. It was found to have a distorted lobe pattern, ie one lobe was very pronounced. It did however pull in the DX. As it is shown in your Fig. 3, it is my opinion that the so-called capacitance section would have very little effect, but if it was extended vertically some degree of circular radiation pattern would be present. Best wishes for the future of HRT.

— Fred Simmons G2FWJ, Attleborough, Norfolk.

requirement. As Jack states, there are many forms of repeater abuse, and accessing a voice repeater without giving your callsign is one of them!

As part of the purpose of the article seemed to be to 'guide' new users of repeaters to use them correctly, I hope you will print at least part of this letter so that these newcomers don't start off with bad habits.

— Ray Bullock, GW1FJI, Chairman, Bristol Channel Repeater Group.

*Quite right, of course. Jack was assuming that a licenced am knows that identification via a callsign is a must. It is usually the toneburst which actually opens the repeater. Let's face it, if the worst thing anyone did was occasionally to bleep up a repeater and break carrier to listen before speaking, amateur radio would have few problems. But point taken and noted.*

— G3YZW

## Cheap and Easy

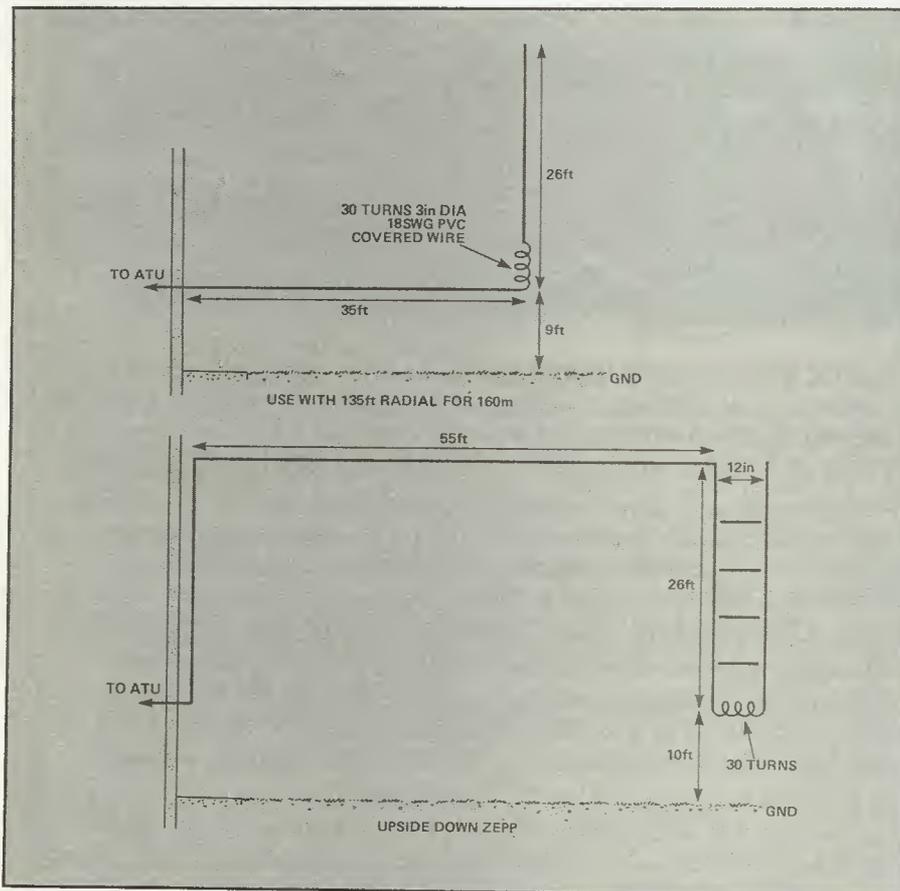
I would like to endorse the views of R. J. Shaw in HRT November 1988 as regards the skill required to operate a piece of radio equipment. Last September at the age of 63 I was looking for a hobby to follow in my retirement and decided that Amateur Radio would be suitable as I had spent some war years in the Royal Corps of Signals, but had not touched a radio since.

During the RAE Course at my local Adult Education Centre I found that it was all a foreign language and sat the exam with a great deal of trepidation. Imagine my surprise when at the end of August two credit certificates dropped through my letterbox.

I have since found that most of the equipment on the market is outside my pocket and would like to build a simple transmitter or transceiver such as we used to use in the Army. Could you tell me where I could purchase the drawings etc for such a project? Perhaps if you publish this letter you will find a number of other people in a similar situation to me.

Best wishes for future publications of HRT.

— J. T. Wright, G7CIG, Kettering



## No Tone Alone

I read with interest Jack Hum's dissertation on repeater abuse entitled "Repeater Repeats" in December's issue.

Jack made some very valid comments in the body of the article and I was very pleased to see him acknowledge the value of repeaters to the amateur community, but OH DEAR! . . . I then read the "Ten point guide to repeater use".

After extolling the virtues of correct repeater operation, he then goes on to say that the way to access a repeater is:

1. Offer a tone burst.
2. If that doesn't work try a tone burst followed by some audio.

Surely Jack hasn't overlooked the fact that our license conditions require that the first transmission on a frequency should be identified with a callsign. Accessing a repeater with just a tone burst does not meet this



### In Black and White

I certainly stirred up a hornets nest but in a completely different way than I had intended. Perhaps it was a poor choice of words but the point that I really wished to make was that we radio amateurs are under the control of the politicians. We all have to go through strict tests to get our licence and we have to abide by the rules otherwise we are closed down. So there is no room in our hobby for politics, racialism or bigotry. Every time one of us makes a derogatory statement such as "nig-nog" we are adding fuel to the fire.

If it really gets serious we stand the chance of landing up like the sportsmen. In other words some politician will pass a regulation that their amateurs will not be allowed to speak to any country that lets their amateurs talk to South Africa.

So my friends PLEASE keep our hobby clean and remember that the colour of a person's skin does not show on the air.

— Sam Manne, ZS6 BBW, South Africa

*Quite so. My personal view is that, in general, it is better to continue to have contact with societies whose ideology we may see to be wrong, but not to participate in or agree with the aspect which we believe to be wrong. On an individual level it is shown to be much more effective to persuade someone to alter their behaviour by expressing appreciation of their virtues rather than by berating them excessively for their faults. This doesn't work on a political level, and I can't think of any virtues connected to apartheid, but there are people in South Africa who are working for an equal society and they need to be open to our support even in small ways. Wholesale isolation can be another form of clamping down on free speech, even if it isn't intended that way. — G3YZW*

### Back On Your Bands!

Being a disabled radio operator having held my G7ALK callsign for one year and being on the committee of RAIBC, in my experience certain Class A operators should brush away the cobwebs from their operating practices/procedures manual. On the 2m frequencies they talk about how many bands they can go on, such as 6m, 4m, 70cm, 23cm and the HF bands, without leaving a gap between QSOs, and all on VA and S20, which is where they have great delight in holding their conversations.

— Gordon Leach G7 ALK.

### Why Weren't We Asked?

Amateur radio is my hobby and that of thousands of others in this country, and what alarms me most is that at no time were we the amateurs and members of the Society asked what we thought about the novice licence. Could it not have been possible to include a simple ballot paper in RadCom, not a yes or no, but something constructive, to get an idea how we felt about the idea, and perhaps get a lot of good ideas at the same time.

But no, RSGB, it was not to be, and it seems to be that every time I open my RadCom you are telling me what is in the best interests of amateur radio. Whose interests, yours or ours?

I notice with interest your proposed frequency allocations for the novice

license. I can see why: what novice would be interested in VHF allocations? So you suggest the HF frequencies to pull in your students, knowing a bit of DX is possible, probably at our expense I may add. I would also guess that students would have to be members of the society, think of all the extra revenue. You may find, RSGB, that the extra revenue gained will be lost, due to your present members not renewing, because of your proposals.

— Terry Mitchell GMOGLH, Livingston, West Lothian.

*All the indications are that the Novice Licence will be pushed ahead as the one sure way to increase interest in amateur radio and membership of the RSGB. There is always the theory that there is a vast, untapped market just beyond the doorstep. That may be so, but making the goods easy to get is not necessarily the same as making them desirable.*

— HPA.

*We regret that Ham Radio Today cannot reply to queries individually. Every month we publish a section of the most interesting. We will endeavour to answer straightforward queries about the back issues index if readers enclose an SAE and much patience. It helps if letters and back issue enquiries arrive on separate sheets of paper, although the same envelope can be used.*

### £10 FOR THE LETTER OF THE MONTH

You've got a gripe about the bandplans, or you're sick of being wiped out by next door's microwave. Or maybe you've been bowled over by the excellent service from your local radio shop.

Whatever you've got to say about amateur radio say it here in the letters column and you could win yourself £10 for writing the letter of the month.

Send your epistles to: Letters Column, Ham Radio Today, ASP Ltd, 1 Golden Square, London W1R 3AB.

# MORSE FORUM

Today there is quite a wide variety of high tech computer orientated modes of transmission available to the radio amateur. Amtor and Packet are two which have recently gained a popularity and of course with the new licence full Packet operation be-

are published in the magazines.

Another technical advantage of CW is the fact that it can be copied under far worse conditions than any other mode. One reason for this is that the human brain acts as a very flexible filter. It can sort out a CW

## *Ian Poole G3YWX shows that CW still has the edge on newfangled modes*

comes perfectly legal. With all this increase in the various new types of data mode some people may think that CW is rather out of date.

This is, of course, far from true. Even with all the aid which the new modes have from the latest technology, CW has a lot to offer. It still possesses certain technical advantages and above all it offers many people the sheer enjoyment of using CW.

The first technical advantage of CW lies in its simplicity. All that is needed is a source of RF and a switch. It is very easy to make a simple CW transmitter capable of making contacts all over the world. The great advantage of this is borne out by the number of circuits which

signal and copy it under far worse conditions than an SSB signal.

Receiver filtering can be made more effective. As CW has a relatively low data rate it is possible to use very narrow receiver bandwidths. This has two effects. The first is obvious — the narrower the bandwidth, the more interfering signals that can be rejected. The second is similar but probably not quite so obvious. By reducing the receiver bandwidth the amount of noise received is reduced. For example, reducing the bandwidth from 3kHz to 150Hz will reduce the noise level by 13dB. This is important under low signal conditions. One example is moonbounce, where the path losses are so enormous that even with high power and high-gain aerials it is only just possible to make contact. CW is almost exclusively used.

So when people are advertising the advantages of Packet Radio and Amtor it is worth remembering that CW is still ahead in many aspects.

## **Morse Equipment**

Looking through the advertisements in the magazines they seem to be full of high-priced multiband HF transceivers or VHF equipment. At first sight there seems to be very little on offer for the morse enthusiast. I have been scanning through the pages to see exactly what is on offer. Fortunately a surprising amount can be found, especially in some of the smaller advertisements.

One ad which seemed to be of particular interest was for a morse key kit. The manufacturers, R A Kent, have built up quite a reputation recently, and from the picture of the key it is possible to see at least part of the reason. The key itself is manufactured from solid brass and has ball race bearings and silver contacts; fine pitched screws with knurled heads are used to allow precise adjustment. A polished wooden base which is weighted for stability and finished on the underside with green baize and non-slip feet is also part of the kit. This adds the finishing touches to a key which looks impressive.

For those interested in paddles, Kent also make a twin paddle kit. This uses ball race bearings but it has a solid steel base to give it a weight of 1.2kg, and non-slip feet.

To accompany the paddle kit there is an electronic keyer kit containing all the necessary electronics. This is also manufactured in an attractive case which would fit nicely into any station. The keyer itself uses CMOS logic and can be varied to operate between speeds of five and forty words per minute. Dot and dash memories together with self completing characters and iambic operation (dependent upon a twin paddle, of course) are also possible. Finally the unit contains an adjustable built-in sidetone and has a reed relay with maximum ratings of 240V and 50mA (but not 240V at 500mA).

Full details and prices, which seem to be very reasonable, are available from R A Kent (Engineers), 243 Carr Lane, Tarleton, Preston, Lancs PR4 6YB. Telephone: 0772 814998.



## Licence Changes

January 1st saw the introduction of the new UK licence. In it there are changes relating to virtually all aspects of operation. Fortunately most of the changes relate to the removal of some restrictions or the slackening of others. As far as CW is concerned there are two major changes.

The first is the removal of the restrictions requiring callsigns to be sent at less than 20 words a minute.

This will now mean that CW contest stations can operate legally!

There is also an improvement in the Class B licence. Previously when using morse they had to identify the station on phone. This requirement has been removed, although they must still ensure that they identify themselves in readable CW.

## Events

There are not many CW events at this time of year. However, for those interested in contests the CW leg of

the ARRL DX contest is coming up on February 19th and 20th. This contest is always worth a dabble for anyone interested in Worked All States, American county hunting or just making a lot of States-side contacts. Contest exchanges for stations outside North America consist of report plus transmitter power, and from the stations they contact in America they will receive report plus state or province.

Another contest which may be of interest is the Belgian National Radio Society (UBA) contest. The CW leg is run on January 28th and 29th starting at 1300 GMT on the Saturday and finishing 24 hours later. Ten points are awarded for contacts with ON, DA1 and DA2 stations, three points for contacts with other stations in the EEC and one point for contacts outside the EEC. Multipliers consist of the nine Belgian provinces, the Belgian prefixes including DA1 and DA2, and then the remaining EEC countries. This contest may well be worth a try as it will certainly put some life into the bands if they are in the middle of the winter doldrums.

## Band Reports

It is often interesting to see what is happening on the bands on CW. Many people seem to think that it is necessary to use sideband, the full legal power and a triband beam to work DX. Fortunately this is not so, particularly on CW and if a little native cunning and general operating skills are used, there is plenty of DX about.

It would be interesting to hear what people have worked and heard on the bands. So please write in and let me know what is on.

To start the ball rolling I have found 28MHz in excellent form recently. Ws seem to be ten a penny, and the band is often open to South America as well. Unfortunately time is always a rare commodity and this has restricted operation somewhat. Even so, I managed to hook CX8BBH, FY5YE, TU4CO and T5GG together with plenty of Ws and other not so rare stations.

Well, that's all for now. For everyone who wants to write in the address is QTHR, but for anyone without a call book, here it is: 144 Worples Road, Staines, Middlesex TW18 1EQ

So, until the next time BCNU es 73s de G3YWX.



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AND RECEIVE C.W. AT  
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SEEM TO GET !!



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**TRANSMIT AMPLIFIERS**, linear two stage 1/2W in 20/30W out, unswitched, suitable for MEON. Types TA2U2, TA4U2, and TA6U2, PCB kit £41.25, PCB built £52.50, Boxed kit £45, Boxed built £59.25. Switched version for use with Spectrum transverter, types TA2S2, TA4S2, and TA6S2, PCB kit £47, PCB built £60.00, boxed kit £58.25, boxed built £72.50.

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# The Leicester Radio Show

Both old-timers and newly licenced amateurs will have one 'rally' date firmly in their diary each year, that of the Leicester Show, the annual event taking place at the Granby Halls for as long as many can remember. In keep-

stretched so far back the police had to be called to officiate. The well-equipped talk-in station offered directions to mobiles on both 2m and 70cm, useful when finding a place to park as well as when getting hope-

## *The Leicester Amateur Radio Show is home from home for many hams, including Chris Lorek.*

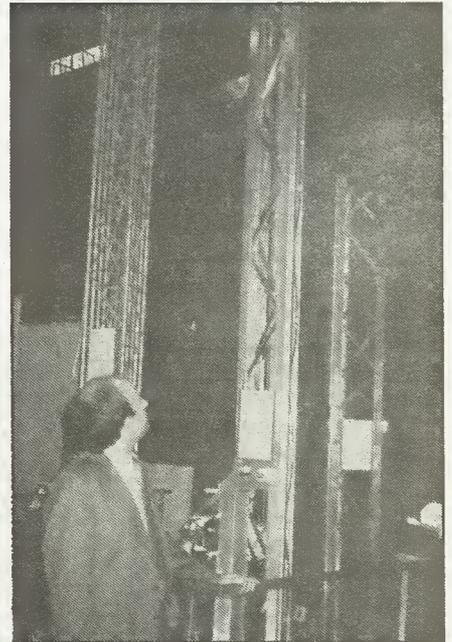
ing with the Granby Halls tradition, the show is now run by a committee of six radio amateurs together with the voluntary help of local clubs and societies such as the Leicestershire Repeater Group and the Leicester Amateur Radio Society. Any profits are ploughed back into helping these clubs in the true spirit of amateur radio 'rallies'.

This year saw an attendance of around 7000 visitors over the two days, with over 60 trade stands selling all manner of goodies from resistors and homebrew kits to all-singing all-dancing Japanese transceivers. Within half-an-hour of opening on the first day, the car park queue

lessly lost in Leicester's one-way system.

When arriving, one still gets that almost 'magical' feeling about the show, the milling crowds adding to the atmosphere that makes it a favourite for many amateurs. In the hall amateurs and SWLs alike were moving shoulder to shoulder gazing at the numerous bargains. And bargains there were, followers of the HRT ex-PMR conversion series will no doubt have picked up one of the VHF FM Pye Westminster on sale for £6 each, or the as-new condition Pye Europas for 2m FM selling for £25 each.

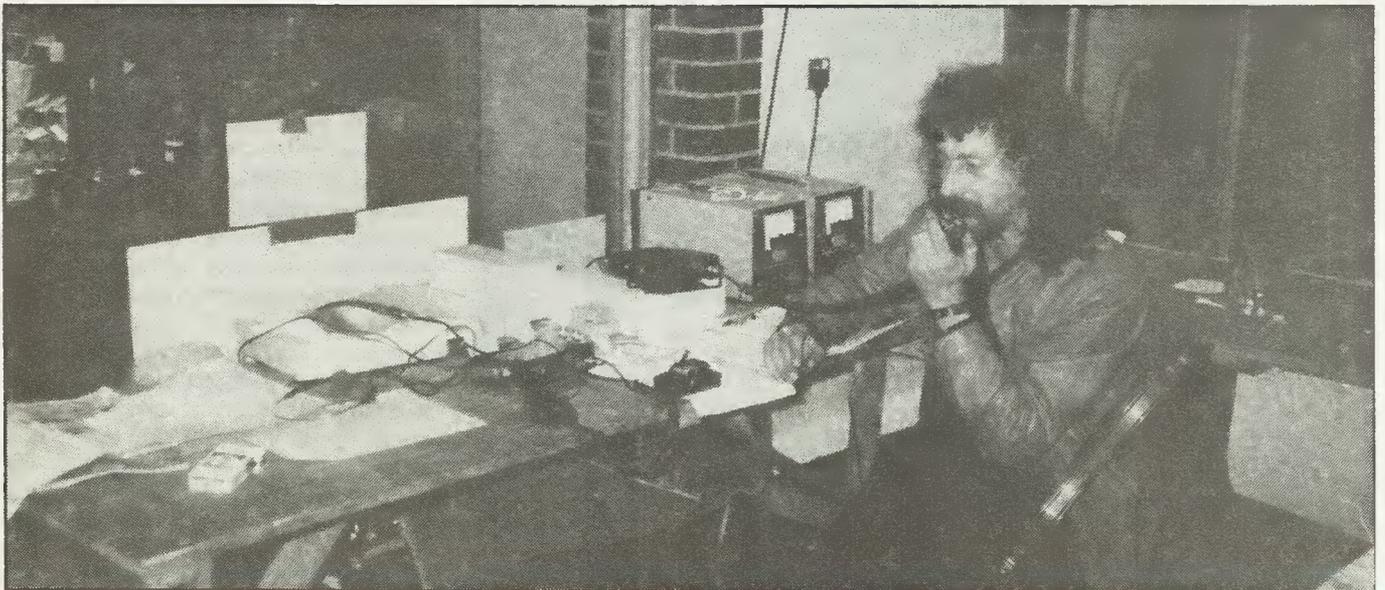
The reasonable stand prices

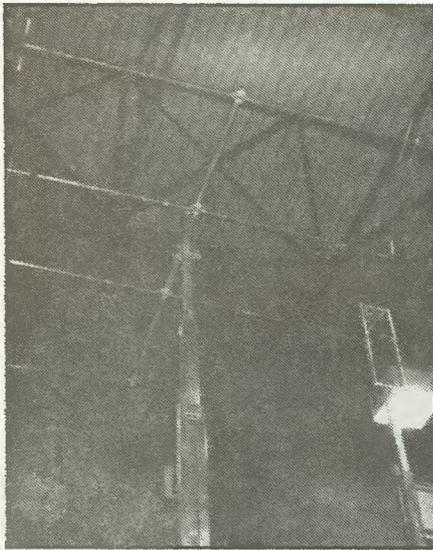


The new Alton alitowers on the Allweld stand have a good bottom . . .

allowed traders to offer bargains, one stand offering high-street electronic store goods sometimes at one-tenth the original prices — yours truly actually parted with some money

Martin on the talk-in.





... And a fine top!

there! The large RSGB stand did a brisk trade; the bring-and-buy stand was certainly very popular with people often three deep each peering above each others' shoulders for a second-user rig to take home.

Those looking for a new rig were, of course, spoiled for choice, with several new transceivers launched at the show. On sale for the first time was the all-British **Navico AMR-1000** 2m mobile, as featured in the recent 'World First' review in HRT. Alan Wrigley and Tom Crosbie on the Navico stand reported that the set was very well received by UK amateurs, with many being sold during the show.

The Icom 725 on the Arrow stand looks fresher than a daisy.



HRS Electronics displayed the range of **KW Ten-Tec** equipment for the first time, their top-of-the-range Paragon transceiver taking pride of place. Old hands will remember the popular British-made KW equipment, and it is interesting to see KW linking up with the American Ten-Tec firm, with some of the equipment on sale in the UK now being assembled in Britain.

The **Kenwood TS-790E VHF/UHF** base station transceiver was on display on the Arrow stand, this new set giving all-mode transceive operation with 45W output on 2m and 40W output on 70cm, setting you back £1495 plus an extra £182 for the PS31 12V power supply if required. An optional UT-10 23cm module costing £382 may be added for the 1296MHz enthusiasts, giving three band coverage. This looks like it could certainly give other rigs some competition if it lives up to the usual excellent Kenwood technical performance.

The new **Icom IC-725** budget HF transceiver was on show, offering amateurs a compact 100W all-band HF transceiver for £759. This gives SSB/CW transceive and AM receive operation on the amateur bands combined with general coverage reception on these modes over 30Hz-33MHz. An optional £40 UI-7 module may be added to give AM and FM transceive capabilities. ARE Communications demonstrated their



Steve G3ZZD, Chris G4HCL and Andrew G3YZW about to get a flash...

modified Icom IC-R7000 60kHz-2000MHz all mode receiver, complete with built-in HF facility. One publicity feature offered by Icom was the novel Icom coffee mugs present on several stands — free with each rig as well as a 'poser' Icom shopping bag!

**Yaesu** however stole the show with no less than *four* new transceivers on launch display on the SMC stand, together with their Japanese representative Mr Yokoi who flew into the UK especially for the event. Two miniature full-feature portables, the 2m FT-411 and the 70cm FT-711 were on show, these being the same size as the tiny FT23 and 73 but offering a sophisticated degree of control, complimenting rather than replacing the latter with no increase in cost. The full-duplex dual band FT-470 portable was shown in operation, offering true simultaneous two-frequency reception (even having a balance control between the two bands), again very small and priced just over £400. Finally, the new top of the range Yaesu HF transceiver certainly generated a good degree of interest with its two-frequency receiver complete with twin VFO knobs and frequency displays, a novel feature being the optional off-air digital voice storage module which replays the last 20 seconds of received audio for you when you miss your signal report from the BY on 80m.

All these sets are the subjects of forthcoming reviews of course, HRT again being the UK 'first' magazine, leading where others follow!



No shortage of business in the Waters and Stanton enclosure.

When not bargain-hunting, ample refreshment facilities were close at hand at the show, even the bar with its reasonably priced drinks was not totally overcrowded — yours truly stayed on the Coca-Cola until returning to the hotel for the usual chin-wags with the traders, and there is every truth to the rumours of sing-songs at 2.30am in the bar!

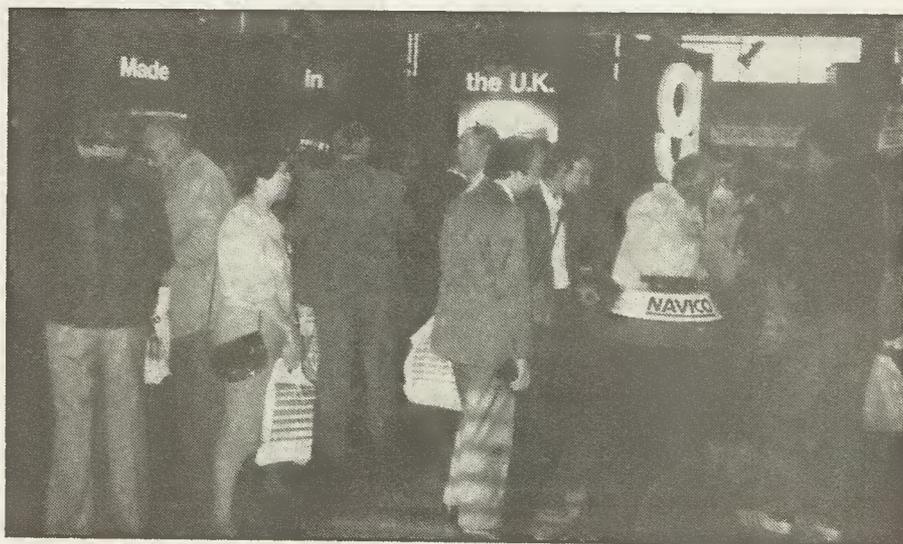
When gazing upwards the next day in the exhibition hall, a notable sight was the log-periodic yagi above the Waters and Stanton stand, offering 105-1300MHz coverage in a size that could certainly be acceptable on many housing estates. An unusual but possibly very useful support structure was seen at the side of the hall in the shape of the all-aluminium telescopic lattice Alitower from the UK firm of Allweld, offering a slimline appearance with light weight that could find many uses with contest groups.

Right through to the last few minutes of closing on the Saturday,

amateurs were still buying sets. As the PA was announcing the close I was tired, my feet were weary, my head raging with pain, but I was happy to see the final customer at the Dressler stand being thanked for his

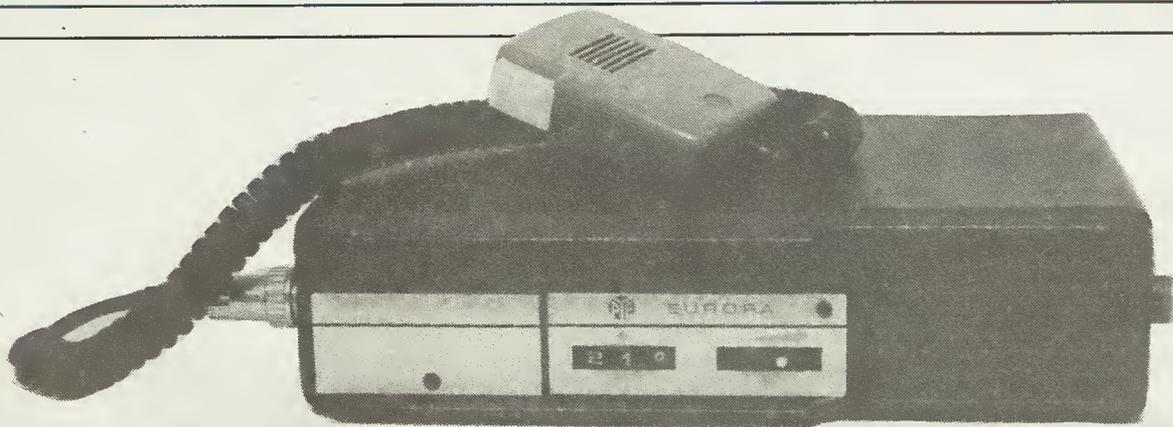
custom, and wished a safe home-ward journey with sincere friendliness that made me think 'how *do* the exhibitors manage it?'

Same time again next year ... see you there!



Navico put on a fine display of British wares.

# Conversion PYE EUROPA



With the latest upsurge in packet radio activity, many amateurs active on this mode are feeling the need for a single-channel FM transceiver for dedicated use, permanently coupled to their Packet Radio TNC and freeing

may find this has a blank unit installed, or it may be fitted with a tone facility unit housing various buttons and indicators. If you find yours has the latter then don't worry as it may easily be linked out of circuit as will

## *Chris Lorek G4HCL retrains a PMR surplus Europa to mind the shop for him, and other tricks*

their expensive do-everything rig for voice communication! Alternatively, you may like to have a dedicated rig for use on your local repeater and natter channels without the expense of using a costly synthesised mobile rig. Getting going on the bands certainly doesn't need to be a second mortgage affair, as HRT have shown from the very popular series of surplus professional radio conversion articles. We continue here with the Pye Europa transceiver, now in plentiful sale on the surplus market at around £25 a time.

### Identification

The Europa is a reasonably compact dashmount transceiver, with a built-in speaker on the right hand side of the fascia, two side-mounted rotary controls, and a black padded surround. It is easily distinguished from the similar Pye 'Motafone' by the Europa's elongated front panel housing a plug-in module at the left hand side of the fascia. You

be shown later.

Note that the Europa is a *range* of equipment, and to find out exactly which model you have, take a look at the metal serial number label fitted to the rear of the set.

Following the 'Equipment Type' you will see:

MF5FM 8W VHF set, 3 or 6 channel  
MF25FM 25W VHF set, 6 channel  
MF50 5W UHF set, 3 channel

This will normally be followed by the frequency band code:

VHF  
A 146-174 MHz  
B 132-156 MHz  
P 79-101 MHz  
E 68-88 MHz

UHF  
T 380-440 MHz  
U 440-470 MHz

Also, for VHF equipment, the channel spacing will be indicated by the 'S' for 12.5kHz, or a 'V' for 25kHz (20kHz

channel spacing models being made for export only), possibly followed also by a '3' or '6' to indicate 3 or 6 channel facility.

You will find the A and B band versions suitable for 2m, the A band being the more commonly available of the two, and either the U or T band versions suitable for 70cm with the U band model being the more common. The E band model is perfect for 4m. Details of the 4m Europa were given in the '4m special' in the September 87 issue of HRT so I will not repeat them here. The 'P' band Europa is a bit of a rarity, but it simply is not worthwhile attempting to 'convert' this due to the abundance of cheap A and U band sets on the market.

### Channel Spacing

All UHF Europas employ 25kHz channel spacing, making them suitable for current use on 70cm. However the VHF sets may either be 12.5kHz or 25kHz sets, so do ensure you obtain a set to suit your needs. At the time of writing, the majority of use is based on 25kHz spacing, but proposals are afoot to go to formal 12.5kHz spacing in the UK with corresponding changes in equipment parameters such as receiver bandwidth and transmitter deviation.

If you are in any doubt as to the spacing of your Europa, take a look inside at the metal crystal filter, which will be marked with FCO3233

(12.5kHz) or FCO3234 (25kHz). It is however reasonably easy to replace this filter with the alternative type to suit your requirements. Surplus dealers such as Garex Electronics may be able to supply spares. Apart from this filter, only slight re-alignment is required in practice to change between the two for most amateur needs.

### Crystals

The required crystal frequencies are:

$$2m = \frac{\text{RX Xtal Freq (MHz)}}{12} + 10.7$$

$$\text{TX Xtal Freq (MHz)} = \frac{\text{Tx Freq (MHz)}}{16}$$

$$70cm = \frac{\text{RX Xtal Freq (MHz)}}{36} + 10.7$$

$$\text{TX Xtal Freq (MHz)} = \frac{\text{Tx Freq (MHz)}}{32}$$

The crystal case size for the 3 channel set is HC6/u, and the smaller HC25/u for the six channel set. You may find crystals are available ex-stock on popular channels for the Europa from the usual suppliers, but if you need to order them specially you may find it useful to quote their specification type T25 (3 Chan. VHF.) or T80 (6 Chan. VHF), with T40 for UHF. Note these are commercial specifications with accompanying prices, but it will give the supplier the correct crystal loading etc. if you give this but requesting 'amateur spec'. Note also the UHF crystals are identical to those used in the earlier Pye W15U UHF Westminster.

Take heed that I have specified additive mixing in both cases for the receiver, this is correct for when using the set on the UK amateur band. If a crystal supplier attempts to sell you incorrect crystals of a frequency only suitable for subtractive mixing, ie -10.7MHz rather than +10.7MHz, as I have experienced from one supplier in the past, be warned that you may run into problems when you try to align the receiver multiplier stages, hence possibly suffering poor receive sen-

sitivity as well as experiencing difficulties in alignment. This crystal supplier once had the cheek to tell me the manufacturers of the set had made the equipment incorrectly because they did not match their crystals!

### Preliminaries

For the receiver tune-up, you'll need a multimeter, and also a variable level of signal at the receive frequency. If you have access to a signal generator then fine, otherwise a friendly local amateur transmitting a signal to you may be useful, combined with variation of transmit and receive aerials. For UHF, the third harmonic of a 2m transmitter can often provide a reasonable degree of help. On transmit, as well as a multimeter you'll need some form of RF power meter, and a dummy load if available. A frequency meter helps but off-air reports from a helpful amateur with a centre-zero meter on the transceiver are usually quite sufficient. Correct setting of the deviation may be done by a listener comparing the peak level of your audio with that of an accurate source such as a repeater, or if your set is crystallised up for the repeater itself then quickly switching between input and output frequencies will give a useful comparison.

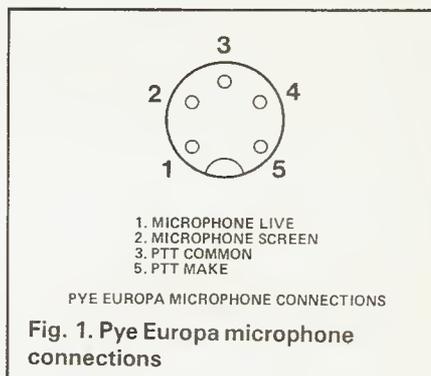


Fig. 1. Pye Europa microphone connections

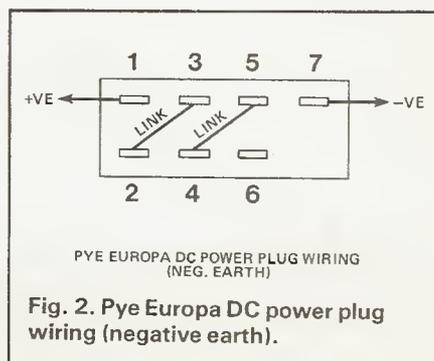
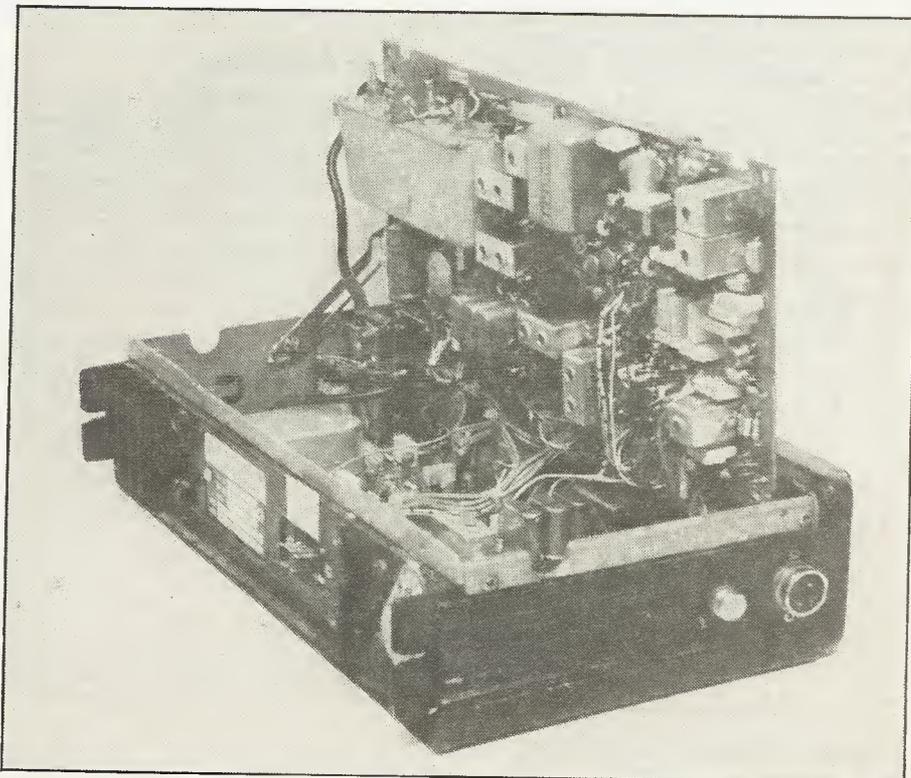


Fig. 2. Pye Europa DC power plug wiring (negative earth).

### Connections

The microphone connections are shown in the accompanying diagram, a 5-pin 270 deg. DIN plug is used for this. TX PTT control is performed by switching the +10V line between pin 3 and pin 5. If you are connecting a packet radio TNC to this then bear the polarity in mind.



Note that the receiver audio output is available on the two-pin socket on the rear of the set, but this is a floating line, so *do not* connect one of these to earth, you could easily destroy the audio IC which is rather expensive to replace. If you wish to connect an external speaker, make sure it has a impedance of greater than 6 ohms. If you need to connect received audio to your packet radio TNC, link its audio input to the RX PCB pins 12 (live) and 11 (Screen), which is the squelched audio feed to the volume control. If you require a 'busy' squelch line output, the collector of TR14 on the RX PCB of both VHF and UHF sets switches between 0.9V (busy) and 8.4V (no signal).

The 13.8V DC power connection requires a 7 pin Plessey type free socket, the connection details for this being shown. You may wish to replace this with your own socket or with flying leads, in which case you can wire the required links on the inside of the rear socket. I would recommend using a 5A fuse in the DC power lead with the MF5 sets, and a 10A fuse in line with the MF25 set.

### Opening Up

Remove the top lid of the equipment by removing the three screws at the rear of the case, then remove the three screws securing the RX PCB and hinge this upwards. Insert your crystals in their respective positions. Check that Pins 8 and 12 are linked on the facility socket on the lower TX board (pin 1 is at the left looking from the front of the set), either by a PCB link on a blanking board or by a wire

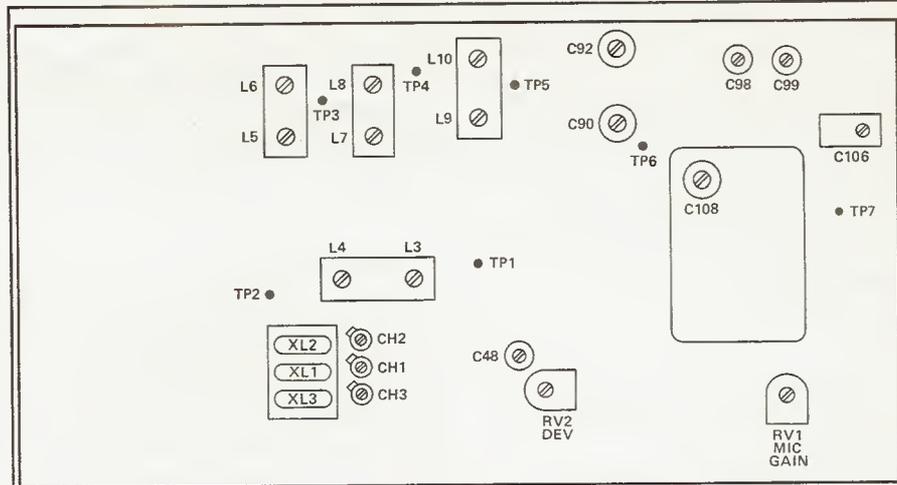


Fig. 4. VHF MF5 Tx alignment diagram

link at the rear of the socket. If a tone option board is fitted here, I would recommend removing the board and fitting the appropriate link in its place.

If you don't have a couple of suitable non-metallic alignment tools, you'll have to either buy, borrow, or fabricate some to suit the slots in ferrite cores, and the trimmer capacitors in the TX PA. A filed-down plastic knitting needle or similar object works very well here. *Do not* under any circumstances be tempted to use items such as jeweller's screwdrivers, you will not be successful due to their de-tuning effect and you could easily destroy the ferrite cores in the set.

### VHF Alignment

Start by switching to the appropriate channel for your installed crystal, and connect your multimeter negative lead to the DC supply

negative line. Switch the multimeter to its 10V DC range, and connect the positive lead to TP7. Tune the core of L10 for 'dip' in the meter reading, re-adjusting carefully for minimum voltage reading. Now transfer the positive lead to TP8, and tune L11 and then L10 for maximum reading; re-tune again for absolute maximum and then tune L12 for minimum voltage. Transfer the positive lead to TP10, and tune first L13 and then L12 for maximum, then tune L16 for minimum. Transfer to TP6, and tune L17, then L16 for maximum, re-tuning again as required for absolute maximum. This completes the crystal multiplier alignment; now we go on to the RX front end.

Here we need to receive a signal at the aerial connection, so start by adjusting the relevant multi-turn crystal trimmer to ensure your crystal is on frequency, continuing until you are sure you are receiving the least distortion possible on a modulated signal. Throughout the front end alignment, you'll need to gradually reduce the level of the signal as your receiver becomes more and more sensitive. You may find it useful to open the receiver squelch while tuning, by adjusting RV1 which is the squelch preset control.

On the large metal block front end assembly, short TP4 to the 10V line, (this being the adjacent pin 1 on the PCB linking to the feedthrough capacitor on the front end block). Tune the C5 adjuster, not necessarily with a non-metallic tool (you may need to use a pair of fine nosed pliers for instance), for best quieting of the received signal. Once you have done

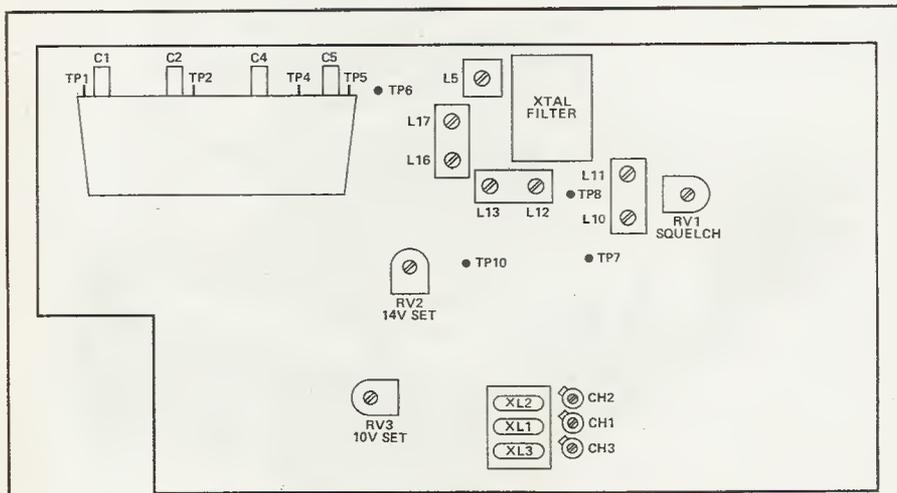


Fig. 3. VHF Rx alignment diagram

this, remove the DC link and instead link TP5 to chassis, then tune C4 for best quieting. Transfer the link now to connect TP1 to chassis, and tune C2 for best quieting. Transfer the link again now connecting TP2 to chassis and tune C1 for best quieting, and then carefully re-tune L17 and L16 for best quieting using your ferrite adjuster for the latter two. Now remove the link, and give all four capacitors on the front end a final adjustment for absolute best sensitivity, ie maximum quieting of a weak received signal. Carefully re-tune the crystal trimmer if required for spot-on reception, and at this stage if you have replaced the crystal filter you may find that you'll need to slightly re-adjust L5 for minimum distortion of a modulated signal, otherwise leave it and the successive IF coil adjustments well alone as they will have been aligned correctly in manufacture.

Now onto the transmitter. Connect your power meter to the aerial connection, and key the TX on your crystallised channel, remembering to keep it keyed when taking readings. Connect your multimeter positive lead to TP1 on the transmitter board, keeping the range at 10V DC. Initially tune C48 for maximum, then tune L3 for minimum. Transfer the multimeter positive lead to TP2, and tune L4 and L3 both for maximum, then L5 for minimum range to 2.5V DC. Tune L6 and then L5 for maximum, then L7 for minimum. Transfer to TP4, tuning L8 and then L7 for maximum, then L9 for minimum. On to TP5 and tune L10 and then L9 both for maximum. Now remove the multimeter leads, and connect the positive lead to the DC positive supply, and the negative lead to TP6. Tune C90 and C92 using a flat-bladed non-metallic adjuster for maximum indicated voltage. Now remove the positive multimeter lead, change the range to 250uA DC, and connect the negative lead to TP7. From now on, keep the TX keyed only for as long as it takes you to make an adjustment, to prevent overheating of the PA.

#### MF5FM

Tune C98 and C99 for maximum indication on your multimeter, you should now have an indication of RF power, so disconnect the multimeter and tune C106 and C108, the latter accessible from beneath the PCB, for

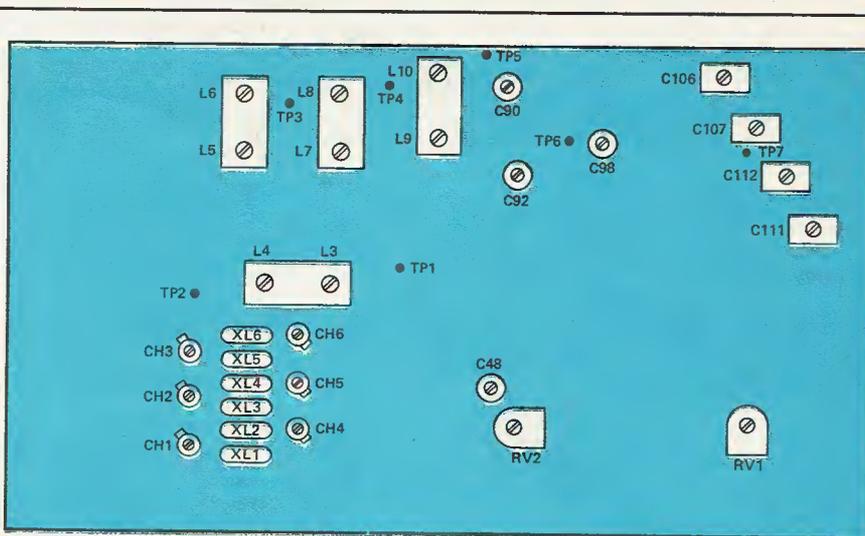


Fig. 5. MF25 Tx alignment diagram

maximum power, re-tuning the PA capacitors as required for absolute maximum, repeating several times as required.

#### MF25FM

Tune C98 for maximum current indicated on the multimeter, then watching the RF power meter tune C106, C107, C111 and C112 in that order for maximum RF output. Re-tune all the PA capacitors again for absolute maximum, repeating as required.

You may now find it useful to go through the multiplier and PA alignment stages again to squeeze the last drop of RF power out of the set. Then set the relevant crystal trimmer for the correct transmit frequency, and while modulating the transmitter adjust C48 as required for maximum deviation as heard on a monitoring receiver.

RV1 which sets the mic gain will already be set fairly accurately, but RV2, the TX deviation control, may need adjustment to give the required peak deviation, this being 2.5kHz peak for 12.5kHz channelling of 5kHz peak for 25kHz channelling. You may find that hinging the boards down often has a slight effect on the operating frequency of both TX and RX, so check this and re-adjust as necessary before finally screwing the case lids down.

#### UHF Alignment

As with the VHF set, we start by aligning the receiver multiplier stages. Switch to the appropriate crystal channel position, and connect your multimeter negative lead to the DC supply negative. Switch to the 2.5V

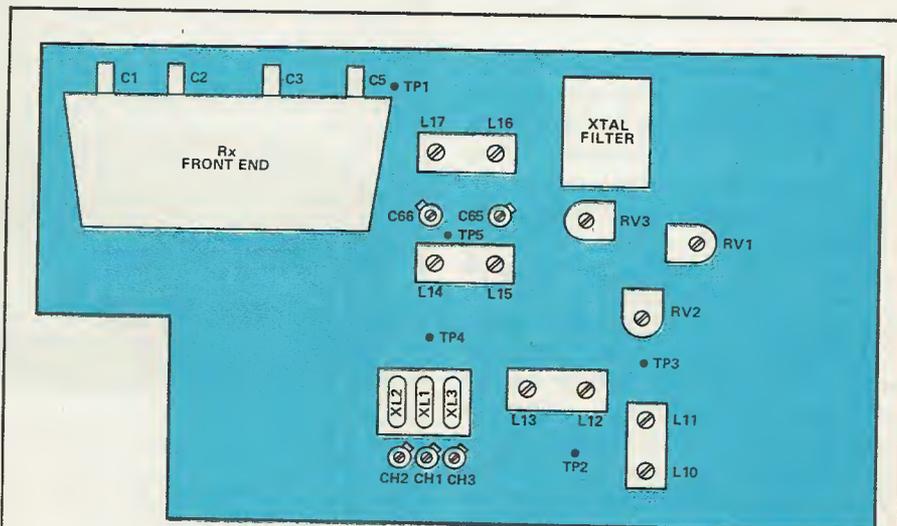


Fig. 6. UHF Rx alignment diagram

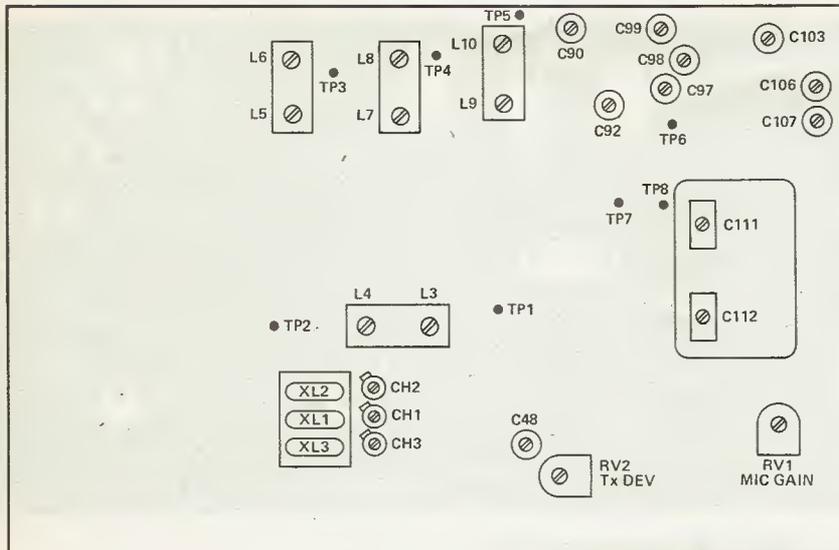


Fig. 7. UHF Tx alignment diagram

DC range and connect the positive multimeter lead to TP2. Using your non-metallic ferrite core adjuster tune L10 for minimum reading. Transfer the multimeter positive lead to TP3, and tune L11 and then L10 for maximum reading, re-adjusting as required for absolute maximum, then tune L12 for a minimum reading.

Switch to the 10V range on your multimeter, and transfer the positive lead to TP4. Tune L13, then L12, for maximum reading, again readjusting as required for maximum. Transfer to TP5, switch to the 2.5V range, and tune L14 and L15 for maximum. Now switch back to the 10V range and transfer the lead to TP1. You'll now need to use a flat-bedded non-metallic trimmer to adjust the multi-turn capacitors C65 and C66, tune these for maximum indicated voltage on TP1.

We now need to monitor an RF signal by using the aerial connection. Ensure the relevant crystal trimmer is adjusted so that you correctly receive a strong signal on the required channel, you may find it useful to open the receiver squelch at this point by adjusting RV1, the preset squelch potentiometer. On the metal front end block, adjust C5, C3, C2 and C1 for maximum quieting of a received signal, reducing the RF level of this as required. Again as with the VHF front end, you may find you need to use a pair of small pliers or suchlike for this if you don't have the correct tool. It is not necessary to use a non-metallic tool on these four. Once you have done this, go back to C65 and C66

adjusting these for absolute best quieting of a weak signal, re-adjusting the trimmers on the front end block also for absolute best sensitivity.

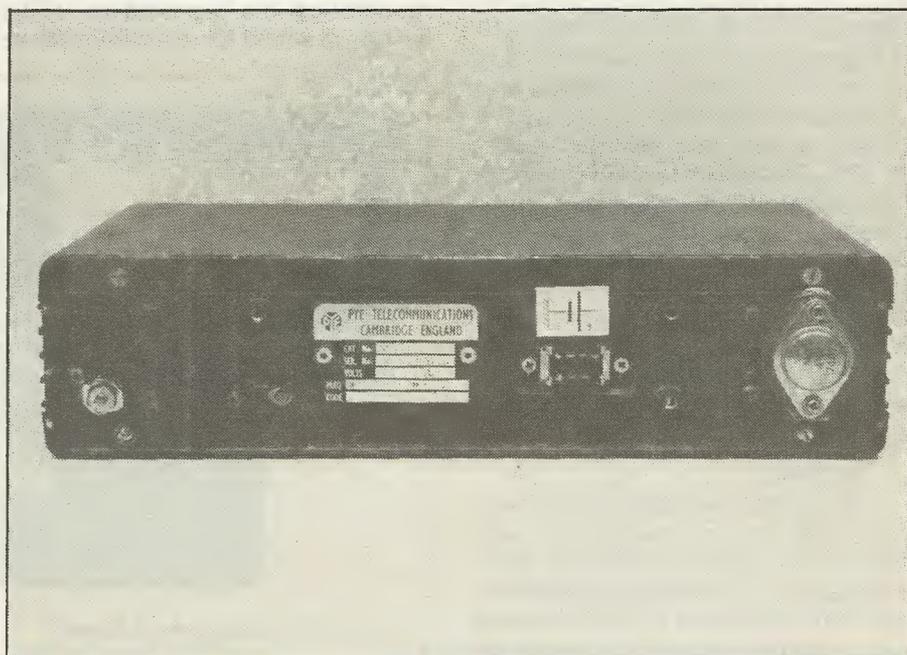
Re-check the adjustment of each crystal trimmer for correct on-frequency reception, tuning these for minimum distortion of a modulated signal. Re-adjust the squelch as required, and that completes the receiver alignment.

To get the transmitter going, connect your power meter to the aerial connection, and with your multimeter switched to its 10V DC range connect its positive lead to TP1 on the transmitter PCB, with the negative lead

again connected to the DC negative supply. Key the transmitter PTT, and remember to keep this keyed when taking readings. Using your ferrite core adjusting tool, tune L3 for a minimum voltage reading. Transfer the multimeter positive lead to TP2, and tune L4 then L3 both for maximum reading, re-adjusting as required for absolute maximum, then tune L5 for minimum. Transfer to TP3 and switch your multimeter to its 2.5V DC range. Tune L6 and then L5 for maximum reading, then tune L7 for minimum. Transfer to TP4 and tune L8 then L7 for maximum, then L8 for minimum. Transfer onto TP5 and tune L10 and then L9 for maximum.

Now remove the multimeter leads, and connect the positive lead to the +10V DC stabilised line present on pins 5 and 6 of the TX PCB, and the negative lead to TP6. Using your flat-bladed non-metallic trimming tool adjust C90 and C92 for maximum reading. Now connect the multimeter positive lead to the 13.8V DC positive supply, and the negative lead to TP7. Tune C97, C98 and C99 for maximum reading, re-adjusting again as required for absolute maximum.

Transfer the multimeter negative lead to TP8, and tune C103 and C104, again for maximum reading. By now you should be getting an indication of RF power output, so try to keep the TX PTT keyed only for as long as you need for individual adjustments, to avoid overheating the PA. Tune C106 and C107 for maximum indicated power



output, then tune C111 and C112 also for maximum output. Go back and re-tune these capacitors again for absolute maximum output; you may also find it useful to go through the DC alignment stages again to make sure you get optimum performance.

Adjust each crystal trimmer as required for the correct transmit frequency, and while monitoring on a receiver adjust C41 for maximum deviation when modulating the transmitter, then adjust RV 2 for the correct peak deviation as required. You'll find the TX microphone gain should already be set to a reasonable level, but this may be adjusted with RV1 if required.

### Faultfinding

It is beyond the scope of this brief article to give complete PCB layouts and circuit diagrams for faultfinding purposes, however the most common fault you may encounter is that of no receive audio. If so, first check that the audio link is in place between pins 8 and 12 on the facility socket, as a tone

board that may have once been in place could have been removed for some purpose. If not fitted, a blank PCB with a connecting track linking these two connections should normally be in place, which of course may also be missing.

If all is correct here, check the squelch potentiometer (a spray of the switch cleaner on this often works wonders) and try connecting an external 8 ohm speaker in case the internal one is faulty, remembering to keep the speaker leads isolated from the chassis. If however the large circular audio IC next to the front end block is getting hot it is likely this has been destroyed, a common reason for a set being sold as a 'scrap' bargain. This is of little consequence for packet radio use, but I would advise you to unsolder and remove the IC if it is overheating. If you do require loudspeaker level audio, I recommend adding one of the many low-cost audio ICs. Maplin and Cirkuit amongst others supply a variety. This may be built onto a small sub-board inside the set, fed from the wiper of the volume control. This point carries fully squelched receive audio, and the

output of the amplifier may of course be connected to the internal speaker as before.

### Finale

This series will continue with a look at the Pocketphone 70 range of equipments suitable for 2m use, followed by the 'Olympic' range for 2m, 4m and 70cm together with channel scanning and synthesizer modifications. As the mobile rally season approaches, more and more surplus PMR gear will be on sale, often at very low prices in view of the forthcoming PMR regulations coming into force in 1990 which make these earlier sets redundant. As this series can only give limited details on the range of ex-PMR equipment available, our sister company Argus Books will be publishing the *Surplus Two-Way Radio Conversion Handbook* written by G4HCL. in time for the 1989 rally season. This will give greater details on the many sets already covered in past issues of HRT, as well as several other equipments including repeater modifications and details for packet radio use.

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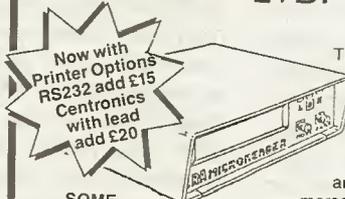
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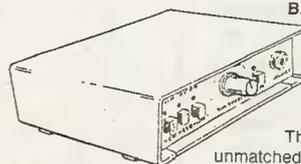


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# YAESU FT767GX

## Upgrade

In the Nov 1987 issue of HRT, when I tested the FT767GX, I commented that the synthesiser reciprocal mixing noise let the radio's performance down somewhat, and noted the improvement given in this respect by an add-on board designed and fitted by an enterprising British Yaesu dealer. It appears that the Yaesu design engineers have not been resting on their laurels however, as the large FT767GX main circuit board has now been upgraded by the manufacturers to improve the synthesiser performance. This version of the FT767GX should by the date of publication be supplied as 'standard' equipment. A review sample of one of the first sets came our way, of course, to be subjected to the rigors of the HRT review team's spectrum analysers and signal generators as well as thorough on-air testing.

### On Air

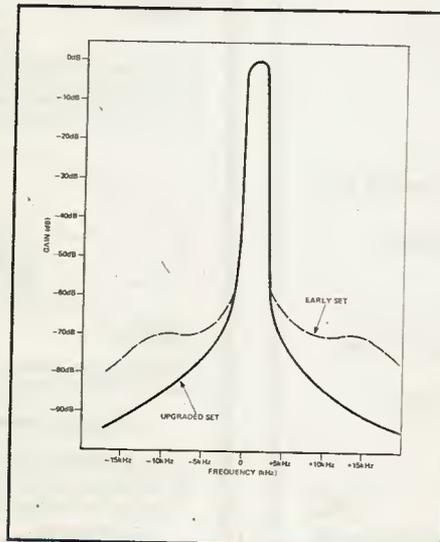
This is not meant to be a complete review of the transceiver, which may be read in the aforementioned issue of HRT. Instead the performance of the receiver section was tested during crowded on-air conditions, as well as coupling the set up in the laboratory. The set was tested over a period of several weeks, allowing a good deal of close evaluation to take place.

Tuning onto 40m, using a dipole at 10m above ground level, showed the set was coping very well. Operating close in frequency to the illegal broadcast intruders in our band didn't cause anywhere near the previously encountered level of rasping noise, increasing in amplitude as I tuned closer with a corresponding increase in S-meter level. Instead, the higher frequency splitches of AM modulation sidebands could be heard at low levels, which were previously being masked by noise. As soon as an amateur signal came up in the vicinity

### *G4HCL finds that Yaesu have improved the FT767GX's reciprocal mixing performance noticeably*

of these it was resolved with relative clarity.

When operating on less crowded bands, the difference was rather less obvious; however, bands such as 20m during busy periods did seem to yield good results. For instance when operating in the often very busy packet radio sections, corruption from adjacent 2kW Italian BBS stations was minor when attempting to copy weak DX packet stations when using narrow IF filters. The effect of reciprocal mixing here superimposes 'noise' on the received signal, in sympathy with strong adjacent signals, extra filtering in the receiver giving no improvement. This effect is best seen where constant carriers are received, ie CW or FSK Data signals, as opposed to SSB transmissions where transmitter non-linearity is often the major cause of adjacent frequency degradation.



### Laboratory Tests

Coupling a low-noise cavity-tuned signal generator combined with a variable constant-impedance cavity attenuator gave a good test of the reciprocal mixing performance; the tests were repeated on a second generator using an in-line 21.4MHz crystal filter matched to 50ohms as a further test, yielding similar results. Comparing the single-signal SSB selectivity with that measured on the previously-tested unmodified FT767GX receiver using the same apparatus shows a significant improvement, as may be seen from the accompanying plots. There was no significant difference in other respects of the receiver performance such as dynamic range although this was not closely tested, the upgrade of course being limited to the synthesiser sections rather than the front end circuitry.

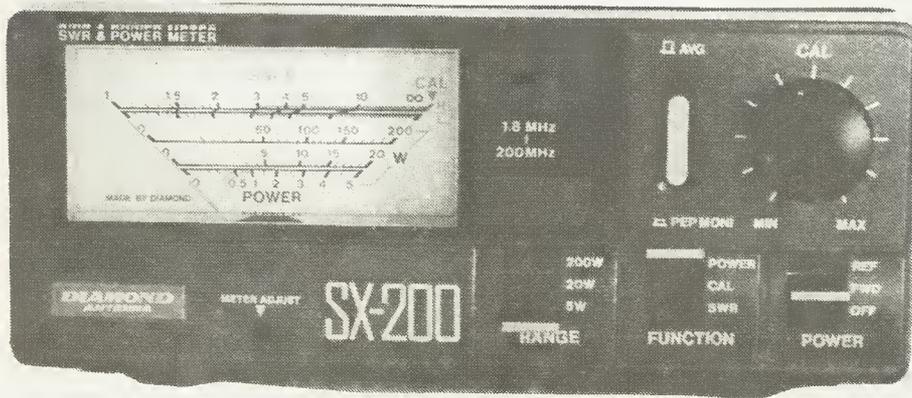
### Conclusions

The upgraded set is certainly a welcome improvement in performance of what must now be establishing itself around the world as a popular all-round HF/VHF/UHF base station. In the past, Japanese manufacturers of amateur HF rigs have often been accused of poor synthesiser design, and rightly so in my opinion, for the sake of a little more work and a few extra components it makes sense not to 'spoil the ship for a ha'porth of tar'. It looks like they're taking note, and more importantly acting upon it.

I am informed that owners of early sets may have the board fitted by S.M.C. in Eastleigh at a nominal cost to cover only the board importation/duty costs etc. However, the upgrade is not being made available as a user-fitted kit.

*My thanks go to South Midlands Communications Ltd. for the loan of the upgraded transceiver.*

# METERS WITH PEP



Following the main transceiver, the next purchase is very often an SWR meter. It certainly was in my case, in preparation for the long-awaited licence I was expecting through the letter box any day.

SX-100 1.6MHz 3kW  
SX-200 1.8-200MHz 5/20/200W  
SX-400 140-525MHz 5/20/200W  
SX-600 1.8-525MHz 5/20/200W  
The SX-200 and SX-400 meters were selected for review (we were

deflect virtually to maximum, as the tone simulates a single-frequency carrier being transmitted. Talk normally into the microphone, and the average deflection will now only be around a quarter or half of the previous amount.<sup>1</sup> As a result, many amateurs around the world often tend to 'talk up' their SSB transmitters, hollering into the mic with the mic gain at maximum in the mistaken belief that they are putting more power out. It would certainly appear so to them, because their power meter needle stays that bit higher! All they are doing, of course, is hitting the ALC of their rig harder and harder, often to the point where distortion and spluttering of the transmitted signal takes place.

A PEP reading facility on a power meter is valuable when, for instance, you are setting the drive power on your transmitter while connected to a linear amplifier. The meter reading then gives a constant true reading of the peak power level transmitted, rather than of how loud you are shouting.

As well as this, the Diamond meters also have the usual SWR measurement facility, where you first switch to 'Cal' on the meter, transmit and rotate the 'Calibrate' knob for full scale deflection, then switch to 'Rev' and read the SWR directly. Following this you either sit back smugly and continue by telling your QSO partner what a good 50 ohm match your aerial system presents, or alternatively you start trying to find the break in the coax following the high SWR reading that caused you to suspect something was amiss.

## Cases and Connectors

The meters come in a smart grey metal painted case, matching most commercial transceivers very nicely indeed, and their size is 154mm (W) × 64mm (H) × 103mm (D) excluding the knobs and the four small feet at the bottom. Round the back are two

***A good meter is the jewel in the crown of your shack.  
Chris Lorek G4HCL tries two Diamonds.***

As soon as you start on HF with long wires and aerial tuning units, an SWR meter is an absolute necessity. On all bands, a power meter giving a true indication in watts also allows us to comply with the licence requirements preventing us running more than the permissible level, as well as giving a reliable indication of how our equipment is performing, at both ends of the coax. A sudden increase in SWR may go un-noticed at the shack end, but could be slowly damaging the transmitter power amplifier as well as causing signal loss.

## The Diamond SX Series

Diamond have certainly been in the power/SWR meters and aerial business for many years now. Their latest offerings in the measurement line are the SX series of power meters.

These comprise the following models:

kindly offered any or all of them) as the two most likely to be of interest to our readers, the others having virtually identical features apart from frequency coverage and power range.

## Features

The meters all have a direct power scale, each with a switchable full-scale reading of 5W, 20W and 200W (apart from the 3kW SX-100 for the QRO merchants), and as well as indicating average carrier power an SSB peak-envelope power reading is available at the press of a button. This is an important feature, as most normal meters that deflect according to the instantaneous amount of detected RF can *never* indicate anything approaching the PEP level, due to the damping action of the meter needle movement.

This effect can easily be seen with an SSB transmitter, by whistling a constant tone into the microphone and watching your power needle



SO-239 coaxial sockets for RF supply to power the meter illumination light, a short plug-in DC lead being supplied.

### Maximum Power Handling

The actual maximum continuous power handling capabilities of the SX-200 and SX-400 are stated as:

#### SX-200:

1.8 — 3.5MHz	100W
3.5 — 50MHz	150W
50 — 100MHz	100W
100 — 200MHz	70W

#### SX-400:

140 — 220MHz	150W
400MHz band	100W

These match the capabilities of most commercial transceivers on the current market, but bear in mind that if you intend adding a 400W HF linear on the end, you'll need something a bit beefier, like the SX-100.

### Specifications

The SX-200 measurement accuracy is quoted as  $\pm 5\%$  on the 5W and 200W FSD ranges, and  $\pm 7\frac{1}{2}\%$  on the 20W FSDS range. The SX-400 has a  $\pm 10\%$  accuracy on the 5W range, and a  $\pm 5\%$  accuracy on the 20W and 200W ranges. This is certainly as good as the specifications of some professional power

meters, which have matching professional price tags.

On the SX-200 the quoted through-loss is 0.2dB maximum over the 1.8-3.5MHz and 150-200MHz ranges, and less than 0.15dB over the remainder. On the SX-400, the maximum loss is quoted as 0.1dB (140-250MHz), 0.2dB (400-470 MHz) and 0.3dB (525MHz). These figures are quite good taking all things into consideration, although the keen weak-signal operator would in any case be tempted to take any non-essential form of in-line element out from his feeder to ensure the absolute maximum ERP and receiver sensitivity. In common use however, such as a typical HF or 2m FM or SSB station, I feel these losses would not be noticed.

### Measurements

I checked both meters against my calibrated Marconi professional power meter, although it must be said the accuracy of this is only that of normal calibration standards. I took readings at a variety of power levels up to 100W on HF, 150W on 145MHz and 50W on 435MHz, and I was pleased to see less than 10-15% difference in virtually all the measurements taken at or approaching the full scale deflection. The linearity at the lower power levels degraded a little, but in this case I would add that the next scale down would invariably be used. For example, I measured 3.9W approx. with 5.0W input on the 20W scale at

2M, which in itself is quite reasonable, but switching to the 5W scale gave a virtually spot-on 5.0W reading. Reversing the meter RF connections to test for SWR accuracy gave similarly accurate results.

Measurements of the through loss on the HF bands was so low as to be virtually unmeasurable, but that seen on VHF and more so UHF was probably due to the impedance discontinuity presented at the SO-239 connection points, although an air dielectric is used for most of the RF path on the fitted meter sockets, which makes the most of a bad job. Being a 'purist' I would have preferred to have seen N-types used for 70cm, but one must consider that the meters will be used for a variety of purposes, mainly on HF and/or 2m in this country with transceiver mounted SO-239 connectors also fitted as a virtual 'standard'.

### Conclusions

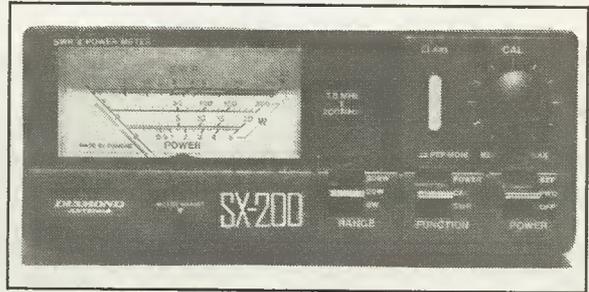
The latest meters from Diamond show a reasonable performance; their accuracy is very good indeed and on the samples tested certainly up to professional standards. The facility of measuring Peak Envelope Power is a very definite plus point and for the current price of £65.00 (SX-200) and £79.00 (SX-400) I feel they represent good value for money. Every amateur should have a power meter.

*My thanks go to Waters and Stanton Electronics, Hockley, for the kind loan of the meters for review.*

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 Sensitivity: ..... 4W FSD  
 Loss: ..... 0.2dB  
 Connectors: ..... 50 Ohm SO239

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## SX200

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 Power: ..... 5W/20W/200W FSD  
 Accuracy: ..... +/-5%  
 Sensitivity: ..... 1W FSD  
 Loss: ..... 0.2dB  
 Connectors: ..... 50 Ohm SO239

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## SX600

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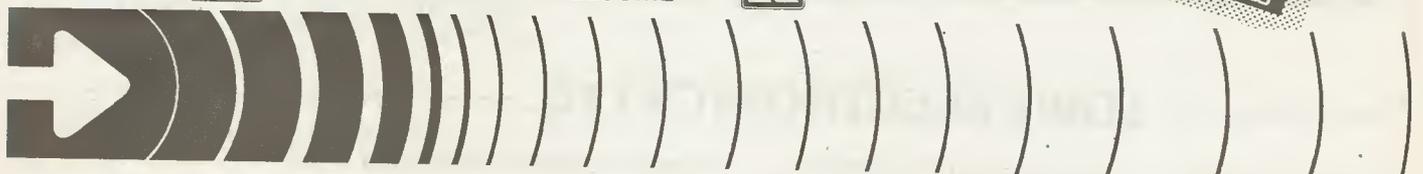
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This is the most respected HF transceiver in the world, and has maintained its lead over all the competition. Check what the leading contest stations are using, and you will find the TS-940S at the top of the list. Uncompromising performance, unrivalled facilities, and uncanny ease of use make the TS-940S the HF transceiver which you will want to own one day.



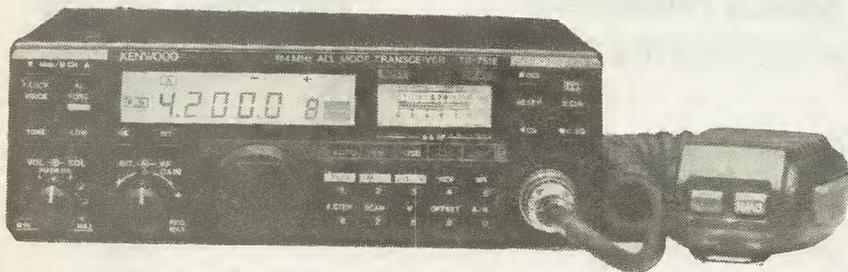
## TS-790E £1,495

Destined to be the new standard by which all VHF/UHF transceivers are judged, the TS-790E gives the dedicated operator everything he ever wanted in a multi mode, multi band home station. Covering 2 metres, 70 centimetres, and (optionally) 23 centimetres, on all modes, whether DX chasing, contest operating or chatting cross town, the TS-790E can handle it all and give you complete satisfaction. See a brochure soon.



## TS-140S £862

The TS-140S was in effect designed by our customers, who demanded Kenwood performance and facilities at modest cost. The TS-140S has all mode, all band HF coverage, and of course a high performance general coverage receiver. 100W output and a first class receiver combine to make the TS-140S a really satisfying rig to own. It's also available in the form of the TS-680S which has all the bands and modes of operation of the TS-140S but with the 6 metre band as well.



## TR-751E £599

The TR-751E is one of those transceivers which actually has no competition at all, combining as it does the all mode performance of a 2 metre base station with the convenience of mobile use as well. Whether you want to operate on FM, SSB, or CW, the TR-751E will do the trick. Release of use (in the Kenwood tradition), and sensible facilities, have made the TR-751E a firm favourite all over the world. Call in to any of our branches and see for yourself.

**LOWE ELECTRONICS LTD.**

Chesterfield Road, Matlock, Derbyshire DE4 5LE Telephone 0629 580800 (4 lines)

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# 25 YEARS IN AMATEUR RADIO

## Random Ramblings.

When compiling advertising copy, often some two months before the magazine actually appears on the news stand, it is all too easy to concentrate on the major items of equipment such as the latest receivers or transceivers, and lose sight of the fact that an amateur station needs a lot more in the way of accessories before it is complete. Naturally, we stock a wide range of these often inexpensive items, and I thought it high time I mentioned just a few of them, really to show that we carry most things you may need to complete or enhance your own station set-up.

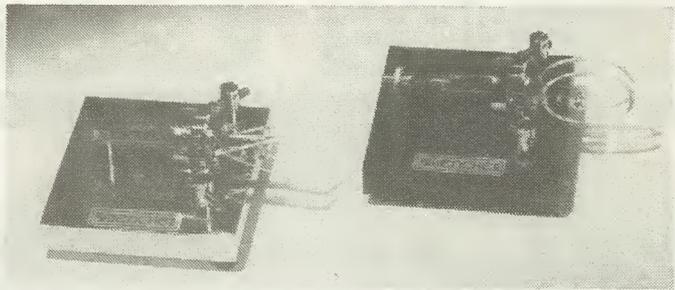
We have represented the Hokushin company for years, and have come to know and appreciate that their aerials and aerial accessories are amongst the best in the business. Their new HS-WX1 base station colinear is one of the most attractive and well made aerials I have seen. The slender glass fibre enclosed pole contains not only a 4.5dB aerial for 2 metres, but also a 7.2dB aerial for 70 centimetres, and in an overall height of only 1.8 metres. The HS-WX1 matches perfectly with the new dual band transceivers from the major manufacturers, and requires only a single feeder, so you can save on cable cost (or buy better cable). Price: £59.62 plus carriage. For the HF user, the Hokushin HS-VK5 is the answer to high performance in a limited space. This is a five band trapped vertical which comes complete with tuned radials for all five bands. It's a classic ground plane aerial, and you all know how well the ground plane performs with its low angle radiation. Rated at 1kW p.e.p., the KH-VK5 is no lightweight, but a real performer. £218 plus carriage. Hokushin also make a comprehensive range of mobile aerials, including slim line gutter mounts with quick release tilting, for example the new SS-B2 to fit hatchback/boot lid, complete with cable and plug at £22.32, and the matching Super Slim aerials such as the VM2SS half wave gain whip for 2 metres and the VM7SS for 70 centimetres, or even the dual band VM720SS at only £23.54.

The Hokushin range is too wide to fully describe here — just ask us for details, but one last item which has enormous appeal is the HS-1300MT; an in line preamp for the wide range scanner enthusiast. Giving up to 20dB of gain over the frequency range of 20 to 1300MHz, and powered from any 9 to 28 volt dc source, the HS-1300MT will boost your scanner performance when used with a mobile or small aerial. Of course if you precede it by a 10 element Yagi, you will certainly suffer from overload effects, but you all know that anyway. Priced at £25.86, it's a low cost way of giving your VHF/UHF receiver a shot in the arm.

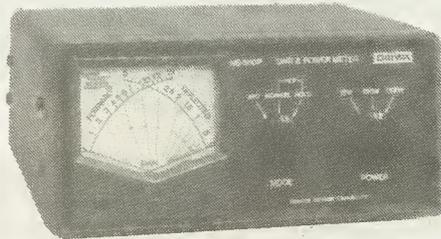
From Kenwood, we have just received the latest SMC-32 miniature speaker/mic. unit, which fits most of the Kenwood hand held transceivers such as the TH-205/215/405/415/25E/45E, and the earlier TR-2600/3600 series (but not the Th21/41). An excellent high quality unit as one expects from Kenwood, at £23.92. For those who like to take their handheld when they go hiking, but don't want it to get wet, there is a new Kenwood waterproof outer bag for all their handheld range, at £7.27. (could prevent a lot of grief and distress).

John Wilson  
G3PCY/5N2AAC

## WHEN ONLY THE BEST WILL DO



Keys by Bencher



RF power meters by DIAWA



Packet TNC from Kantronics



The best scanners in the world — from AOR.

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# Multimode Data Controller



With more amateurs becoming interested in efficient data communication modes, such as error-correcting AMTOR and Packet, there are now several multi-mode terminal units available. It is widely known that many simultaneous Packet QSOs can take place on the same frequency, and

serial data connection to your terminal or computer, with TTL level connections also fitted, and a side-mounted D-type for connection of a parallel printer for direct weather fax and slow scan TV graphic printout without the need for dedicated software.

Further connections are provided for

*This slim device, reviewed by Chris Lorek G4HCL, confers control over nearly every aspect of transmission data.*

efficient modes such as AMTOR are used extensively on HF with such good results that old-timer visitors to the shack are surprised at the 100% copy being displayed on the monitor. Regardless of your views on 'real' amateur radio, time doesn't stand still, and in true amateur tradition we are still leading the way in efficient, spectrum conserving modes of communication.

## Do-Everything Controller

The latest multi-mode controller from MFJ may be used on Packet Radio, AMTOR, RTTY, ASCII, CW, weather, fax, SSTV, and Navtex, as well as offering a CW contest memory keyer with message storage facilities. At a current selling price of £218 we thought it worth investigating. The review sample came from the UK distributors, HRS Electronics, and was supplied complete with the optional MFJ 'Packet Starter Pack' programs available for PC clones and Commodore computers.

The unit can be connected permanently to two separate receivers or transceivers, with internal switching under software control. As well as the two radio ports, a standard 25 way RS-232 D-type connector is used for the

a CW paddle key input, direct and grid block CW keying outputs to your transceiver, and external transceiver speakers. On the front panel are the usual array of status LEDs, together with a 20 LED bargraph display for signal tuning and a threshold control to vary the audio input level independently for correct decoding.

## Uses

Apart from the wide variety of amateur communication facilities, the multimode controller has variable parameters such as commercial shifts and speeds selectable on RTTY and weather fax, so that, armed with a HF general coverage receiver and a copy of something like the *Pocket Guide to RTTY and Fax Stations* a new world of communications opens up. The VHF packet enthusiast, for example, can have a 2m FM transceiver coupled to one radio port, an HF SSB receiver to the other, and switch between them, reading the Packet Bulletin Board, and then visually checking the weather over Europe from outer space.

The accompanying owner's manual has over 200 pages of instruction, plus a further manual with 85 pages covering modes other than packet. A 'caution' note on the front cover warns you to read the

instructions before operating. So I sat down by the fireside. . .

## Packet Radio

Readers of the HRT series on packet radio will of course be aware of the vast potential packet offers, so I will describe the features of the controller on this mode. It basically acts as a TNC-2 software clone, having the same commands as this original 'industry standard', so it may be used in conjunction with the many forms of standard software available in the public domain, (ie free) including WORLI and WA7MBL bulletin board systems. This mode of operation means the TNC does not have frills such as a built-in personal maildrop, or VHF/HF gateway facilities. In common with many other TNCs it does not currently have a periodic CW ID as required in the UK, but I am informed by the suppliers this may be available in a software upgrade soon..

The usual Tx and Rx audio lines are connected, and a squelch line is present on each radio connection to allow hard DCD (data carrier detect) switching to prevent the TNC going into transmit mode when the channel has an unmodulated carrier present, causing packet collisions. For HF use, each LED on the tuning indicator gives approximately 10Hz tuning increments, allowing for spot-on tuning for correct data communication. An external modem may be connected for specialised applications such as satellite packet communication, and the controller itself is capable of speeds up to 56 kilobaud.

The controller allows multiple stream switching, ie several QSOs at the same time if you enjoy the hectic life, and the baud rate may be varied for use on HF or VHF. It is *not* possible to simultaneously control different radio ports, ie have VHF and HF streams or VHF and UHF streams going at the same time.

## AMTOR

HF data communications buffs will be pleased to note that MFJ have added this mode. For the un-converted among us, AMTOR stands for AMateur Teleprinter Over Radio, an amateur version of TOR used in commercial circles. It has two modes, A and B.

Mode A, the Automatic Request for Re-transmission or ARQ, is similar to

packet radio in many ways, with error checking taking place with an instant request for re-transmission if corrupted data has been received due to QRM or whatever. Each amateur uses a SELCALL of four letters made up of the alphabetical portion of his callsign, for instance my Selcall is GHCL, and an ARQ contact consists of two stations operating in synchronous communication, continuously alternating between short transmit and receive bursts with the familiar continuous 'Chirp Chirp' transmissions heard on the bands. During an over, one station forms the Information Sending Station (ISS), the other the Information Receiving Station (IRS), with a '+' at the end (rather than a 'K' as on RTTY) to relinquish sending control to the other station.

As well as normal ARQ communication facilities, AMTOR also has a Forward Error Correction (FEC) mode, ie a one-transmitter, many-receivers mode where each letter or symbol is sent twice but with no automatic re-transmission. This is normally called Mode B, and used for CQ calls, group nets, or indeed bulletin messages, where communication is required with more than one station at the same time. A variation on this is a Selcall mode where the broadcaster can select one or a group of stations to receive the transmission.

The controller also has facilities for monitoring communication between other stations in QSO, although this is not error corrected. The STA and CON LEDs indicate standby, traffic, and idle modes, and show any phasing error.

## CW

The MFJ Controller provides several features here, which surprised me at first. The controller is claimed to receive off-air morse at speeds of between 1 and 89 WPM, with an automatic speed tracking facility from its default of 20 WPM on transmit from the keyboard. As it is often good practice to match the speed of your QSO partner, the controller has the facility of automatically transmitting at the speed of the received signal as well as providing manual speed control.

The controller really scores in its memory keyer and other facilities. Ten message buffers are provided, similar to RTTY, each storing up to 120 characters, and each may be transmitted at will as well as being chained if required, for transmission. Memory O may be set to transmit at periodic intervals for CQ calls, beacons and the like. For contest use, a serial number may be added in a memory message, which automatically increments to a maximum of 65535 each time the buffer is transmitted.

As well as this, an Iambic keyer is built in, with a variable transmission speed of 5-99 WPM as well as automatically matching the received speed as described. Transmission from the buffers is interrupted as soon as the keyer is operated.

For VHF FM users, a modulated CW audio output is provided as well as the standard transmitter keying lines, and for aspiring Class-A licences the unit has a random code generator. It transmits five letter groups with either normal or 'Farns-

worth' type random CW, the former at the user-selected speed and the latter sending at 15WPM but increasing the time of the spaces.

## FAX

The unit may be set up to receive, and transmit from external computer memory when using appropriate software, the following formats:

60 lines/min ('Wire' Photographs)  
90 lines/min  
120 lines/min (Weather Fax)  
180 lines/min  
240 lines/min (Satellite Weather Fax)  
360 lines/min, and  
480 lines/min

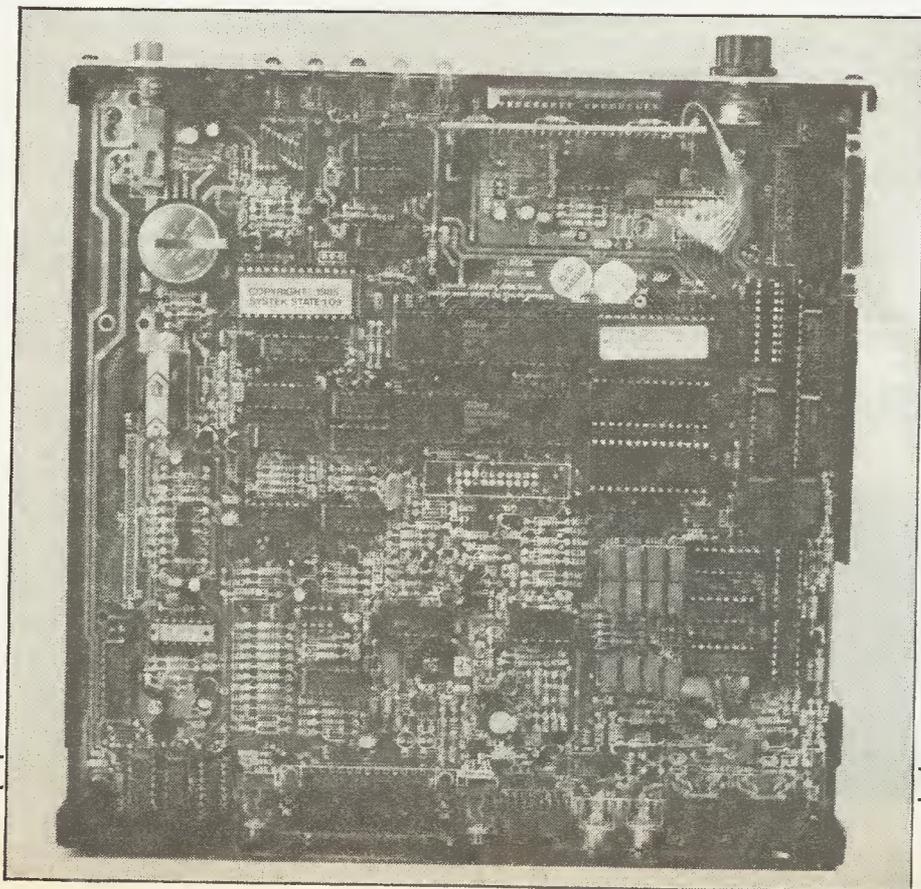
Fax reception does not require dedicated software if you have an Epson-Graphics compatible printer connected to the controller's parallel printer socket, in which case 'real time' reception and printing is possible. An internal 'lock' detects the beginning of each picture at the 120 line/min speed (as generally used), which may be defeated if required. On other speeds a lock may be forced at any time. The aspect ratio may be varied, and the received picture shifted side to side by operation of the '<' and '>' keys on the terminal.

## SSTV

Slow scan television has relied heavily on dedicated long-persistence screens, followed by slow-to-fast scan converters using quantities of ICs. The purists often use the latter, but for the amateur wishing to look in on the activity the MFJ controller offers a simple starter. It can receive five frame rates, ie 8.5 secs, 12 secs, 17 secs, 24 secs and 36 secs, using a simple two-level black or white format with direct printing to an attached Epson compatible parallel printer. With suitable software, SSTV pictures may be displayed on screen, stored, or transmitted to other amateurs.

## RTTY/ASCII

The unit is capable of receiving Baudot RTTY and the less-commonly used ASCII mode using many shifts, including the 170Hz, 425Hz and 850Hz shifts commonly used on RTTY, at baud rates of 45, 50, 57, 75, 100, 110, 150, 200 and 300 baud. When 'HF' has been selected the unit transmits 200Hz shift using tones of 2120Hz and 2320Hz. Selecting 'VHF' provides an 850Hz shift using tones of 2125Hz and 2975Hz (note that neither of these is suitable for VHF/UHF FM use in the UK). Invert commands allow you to invert the high/low tones if required, and ten transmit memory buffers are available for message storage such as station details and contest exchanges.





MHz and 4.782MHz. Companies such as Spa Publishing (18-20 Main Rd, Hockley, Essex) supply a wide range of frequency listings and other information in this respect, which I have found invaluable when roaming the bands in this way.

### Getting Started

The controller requires a 12V nominal DC supply, using the coaxial DC socket on the unit's rear panel. A pair of leads are

**Fig. 1. Start-up message**  
 MFJ ENTERPRISES INC  
 MODEL NO. MFJ-1278  
 MULTIMODE DATA CONTROLLER  
 AX.25 level 2 Version 2.0  
 Release 2.2 09/28/88 — 32K RAM  
 Checksum \$B3  
 cmd:

supplied for connection to radios, suitably terminated at the controller end, and with open wire ends at the other. Connections required are Ground, Tx audio, Rx audio, PTT (ground to Tx), and an optional hard-wired squelch line for carrier detection.

On power-up, the controller automatically runs an auto-baud routine, where it matches its serial data speed to that of your terminal or computer, coming up with the text shown in Fig.1 with a 'cmd;' command prompt. To set the mode of operation the menu facility shown in Fig.2 is enabled by entering 'SET', alternatively various short form methods of switching commands may be entered, eg 'MODE VP' for VHF Packet.

### Connecting Up

The controller was first coupled through its radio port 1 to a 2m FM transceiver, to get a taste of the packet radio activity on 144.650MHz. Needless to say, the VDU screen filled up, rapidly monitoring all the messages flying by. The set-up performed perfectly first time. A connect request to my Node G4HCL-8 on 145.650MHz (albeit in the same room) resulted in an immediate response without having to alter any parameters such as the TXDelay, DWait etc. Further 'Connects' over a greater distance were then attempted, with good results, only limited by channel congestion.

Radio port 2 on the unit was permanently coupled to my FT107M transceiver, in turn being coupled into a variety of aerials ranging from an indoor dipole, a high-Q magnetic loop at garden level, up to a tower mounted rotary beam. Setting the mode to 'HP', ie HF Packet, and taking a listen around 14.099MHz often resulted in much activity being received. Leaving it on this frequency filled the 'MH' (Callsigns of stations heard) list up very quickly. Very careful tuning around the BBS section also resulted in perfect copy, a typical example of received text being

### NAVTEX

Navtex is a navigational Telex system, broadcasting urgent weather, navigational and other information intended for shipping use. Stations currently cover most coastal areas of Europe, operating on 518kHz, and the rest of the world is catching up. Reception of this forms part of AMTOR Mode B (FEC), each Navtex transmission starting with the two characters ZCZC followed by a coded series of letters and figures to identify the station, message number, and type of information, ending in NNNN. The controller allows automatic reception and selection of both types of messages, as well as the transmitting station itself. For example, general messages are identified as:

- A Navigational Warnings
- B Storm Warnings
- C Reports of Ice
- D Search and Rescue Information
- E Weather Forecasts
- F Pilot Service Messages
- G DECCA Systems
- H LORAN-C
- I Omega Systems
- J SATNAV Systems

Each message is numbered from 00-99, the controller detecting this to prevent repeat messages being printed apart from emergency messages which are numbered 00.

### Computer Control

The controller acts as an intermediary between your radio and your terminal/keyboard, which latter may be a computer with a suitable terminal program. This is the type I personally use. Alternatively a specialised communications program may be used with your computer to allow various added features.

A dedicated program package for the MFJ controller is the 'Packet Starter Pack', consisting of a computer program, manual and connecting lead, available as an option from MFJ to suit a PC clone or one of the Commodores. For text communication with the MFJ-1278, it offers split screen control, ie with received and transmitted text on separate portions of the computer screen, as well as file handling using the function keys.

The most useful of its facilities is on-screen FAX and SSTV picture display, together with picture storage and retrieval to and from disc. This requires at least 128K of memory in your computer, with a CGA graphics adaptor and composite monitor. A monochrome adaptor is not compatible, says the instruction manual. When used in conjunction with a further graphics program to generate images, these may be transmitted allowing you to build up your own QSL cards etc.

### In Use

As special authority is required in the UK to receive many of the services the MFJ controller can receive, this review will be confined to those used by radio amateurs . . . we at HRT wouldn't dream of suggesting our readers should start tuning in to Reuters, foreign embassies, Interpol and the like, would we?

However, I'm told it is often a simple formality to obtain permission to receive certain weather pictures off-air for your own use (not to publish in a magazine or start up your own weather service in competition to the IBA!), by providing a 'suitable reason'. The accompanying MFJ user book gives the frequencies of several USA services transmitting these, but in the UK you'll find the UK weather centre at Bracknell, Berkshire provides a 24 hour service on frequencies such as 3.289

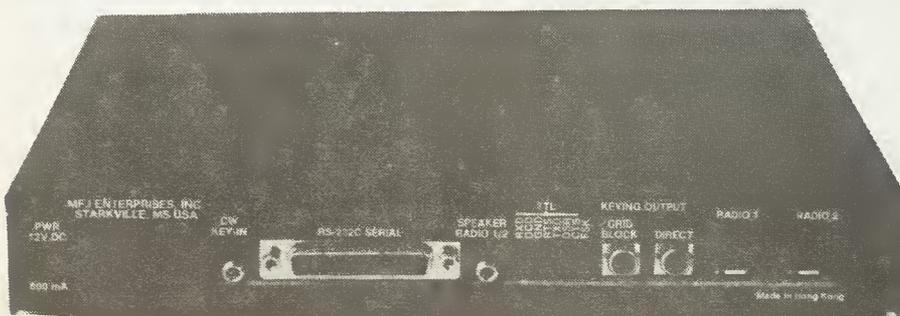


Fig. 2. Menu Text

```

Radio: 1 Terminal: 2400
Mode : Packet,1200 (VHF)

Modes
VP -- VHF Packet HP -- HF Packet
VP -- VHF Baudot HB -- HF Baudot
VA -- VHF ASCII HA -- HF ASCII
CW -- CW MC -- Modulated CW
FX -- Facsimile TV -- SSTV
AM -- AMTOR (HF/VHF)

Modem Terminal
M -- VHF Packet/FAX/TV Q -- 300
N -- HF Packet/RTTY R -- 1200
O -- VHF RTTY S -- 2400
P -- CW T -- 4800
V -- Radio 1 U -- 9600
W -- Radio 2
X -- Make changes

Select?
    
```

shown in Fig.3. Note that the way the text is broken up is of course due to the information being transmitted in short packets, but add them all up and you'll see no breaks occur.

When first trying the unit in communication on HF, a connect request to a German station calling CQ brought an immediate acknowledgment response on the very first packet when using the indoor dipole, showing the system using the MFJ controller to be performing very well. The controller did appear to have a good amount of rejection to QRM, although sometimes careful adjustment of the front panel threshold control was necessary.

Switching over to the AMTOR mode, and entering 'Listen' gave varying results, however, after careful tuning and threshold adjustment very good copy indeed resulted. An example of reception on the indoor dipole with heavy QRM received from the computer and VDU timebase is shown in Fig.4. In communication, 100% copy would always result from the error-correcting protocol, and one's QSO in QRM conditions would normally only cause a 'slowing down' in communication. Prospective AMTOR users must however remember that successful use will often rely on the transceiver having

a fast TX/RX switching speed; many early transceivers and one or two later models need modifications for satisfactory AMTOR capability.

On a more negative angle, I found the

success in receiving amateur 170Hz shifts even when off-tuning my SSB RX. It was also unfortunately impossible to use the unit on VHF/UHF FM RTTY due to American tones being used, rather than the standard 1275Hz/1445Hz used by the rest of the world, including my local UHF RTTY, which though not correct should not be too much of a problem technically, but the manual gives no information on how to change the HF shift, although it states that this is possible. This is disappointing. I would say that the unit is a compromise on RTTY for UK use, due to non-standard aspects which evidently cannot be changed, but it would be worthwhile checking whether it meets your needs prior to purchase if you intend using it on this mode.

### Conclusions

For your £218 even if you only get a VHF/HF packet radio TNC, an AMTOR

Fig. 4. Off-Air AMTOR ('listen mode')

```

THE ACC COMMAND DISPLAYS THE QSO-LOG, AND ALL THE
TRAFFIC ACCESSES FOR EACH QSO.
YOU MAY SEARCH ON A CALLSIGN, OR A DATE.
(OR PART OF CALLSIGN/DATE)
OR YOU CAN DISPLAY THE WHOLE LOG.
    
```

THE MAN+ COMMAND.

'GIVES YOU A LIST OF ALL BULLETIN BOARDS, AND THEIR MANAGERS.

THE INPUT+ COMMAND.

```

INPUT MAY BE ABORTED WITH BREAK-IN BEFORE THE TXT+
PROMPT HAS APPEARED, IF YOU NOTICED THE CALLSIGN
WERE WRONG. MISTYPED W_RDS CAN BE EDITED
(DELETED) BY ENTERING FIVE X:ES DIRECTLY__ AFTER THE
MISTYPED WORD, FOLLOW__D __BY A SPACE__C
    
```

Fig. 3. Off-Air HF Packet

```

LA6CU>LA3T-1:
14905

Satellite: meteor 3-2
Catalog number: 19336
Epoch time: 883
LA6CU>LA3T-1:
38.04540578
Element set: 82
Inclination: 82.5489 deg
RA of node:
LA6CU>LA3T-1:
314.4295 deg
Eccentricity: 0.0016092
Arg of perigee: 309.2529 deg
Mean ano
LA6CU>LA3T-1:
maly: 50.7246 deg
Mean motion: 13.16846669 rev/day
Decay rate: 3.91
    
```

automatic CW reception facility virtually useless. If the signal was extremely strong, with no QRM and with virtually 'perfect' morse, acceptable off-air results were obtained, as shown in Fig.5, again only after careful tuning and adjustment of the threshold control and careful beam rotation. Most of the time, the screen simply filled up with rubbish, while perfectly copyable audible morse was being received. This of course is little different from many solid-state morse readers, and I would suggest that no serious CW operator would make practical use of this facility. However for CW addicts, on the transmission side the unit's built-in lambic keyer combined with its excellent memory keying facilities could certainly make up for this when used with a good 'human ear'.

Over the review period it was impossible to investigate thoroughly every aspect of the unit's variety of modes. I did have some difficulty on RTTY. I had little

Fig. 5. Off-Air CW (strong signals)

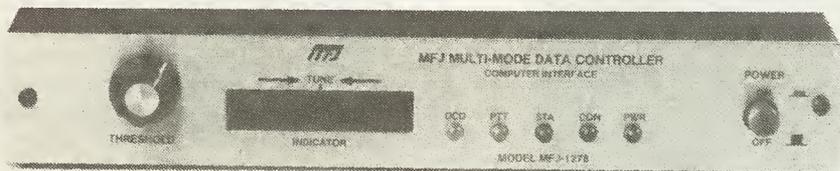
```

Locking . . .17 wpm
AM?U OCWDEIK LHK E I I E HF IT
EE EIEE E E I E N 7R CQ CQ CQ
DX DX DE
DF9 Z N DF9 ZN DF9 ZN PSE DX K
E CQ CQ CQ DX DK CQ CQ CQ
DX DX DE DF9
Z N DF9 Z N DF9 Z N DF9 Z N PSE
DX K
    
```

unit, and a CW lambic memory keyer I feel the unit would represent good value. Considering the potential of all the extra modes added in, it is worthy of serious consideration. I feel it is of no serious use for automatic CW reception, and I have misgivings about its RTTY capabilities as stated in the text, but one really must consider the 'value for money' aspect here.

My thanks go to HRS Electronics for the loan of the review model.

# MFJ multi-mode data controller



## Now with **AMTOR, KISS** eight digital modes for . . . £218.14

Amateur radio's newest multi-mode data controller — the MFJ-1278 — lets you join the fun on Packet, AMTOR, RTTY, ASCII, CW, Weather FAX, SSTV and gives you a full featured Contest Memory Keyer mode . . . you get 8 modes . . . for an affordable £218.14

Plus you get high performance HF/VHF/CW modems, software selectable dual radio ports, precision tuning indicator, 32K RAM, AC power supply and more.

You'll find it the most user friendly of all multi-modes. It's menu driven for ease of use and command driven for speed.

A high resolution 20 LED tuning indicator lets you tune in signals fast in any mode. All you have to do is to center a single LED and you're precisely tuned to within 10 Hz — and it shows you which way to tune!

All you need to join the fun is an MFJ-1278, your rig and any computer with a serial port and terminal program.

You can use the MFJ Starter pack to get on the air instantly. It includes computer interfacing cable, terminal software and instructions . . . everything you need. Order MFJ-1282 (disk)/MFJ-1283 (tape) for C-64/128/VIC-20; MFJ-1284 the IBM or compatible; MFJ-1287 for Macintosh. £18.70.

### Packet

With MFJ's super clone of the industry standard — the TAPR TNC-2 — you get genuine TAPR software/hardware plus more — not a "work-alike" imitation.

Extensive tests published in *Packet Radio Magazine* ("HF Modem Performance, Comparisons") prove the TAPR designed modem in the MFJ-1278 gives better copy with proper DCD operation under all tested conditions than the other modems tested.

Hardware DCD gives you more QSOs because you get reliable carrier detection under busy, noisy or weak conditions.

A hardware HDLC gives you full duplex operation for satellite work or for use as a full duplex digipeater. And, it makes possible speeds in excess of 56K baud with a suitable external modem.

A new KISS interface makes MFJ-1278 TCP/IP compatible.

Good news for SYSOPs! new software lets the MFJ-1278 perform flawlessly as a WORL/WA7MBL bulletin board TNC.

### New AMTOR mode!

Now MFJ-1278 has a new AMTOR mode, making it the only controller to feature eight digital modes.

MFJ-1278 transmits and receives AMTOR in the standard 100 baud rate. MFJ gives you all the AMTOR modes: ARQ (Mode A), FEC and Mode S (Mode B).

### Baudot RTTY

You can copy all shifts and all standard speeds including 170, 425 and 800 Hz shifts and speeds from 45 to 300 baud. You can copy not only amateur RTTY but also press, weather and other exciting traffic.

You can transmit both narrow and wide shifts. The wide shift is a standard 850 Hz shift with mark/space tones of MARS and standard VHF FM RTTY.

### ASCII

You can transmit and receive 7 bit ASCII using the same shifts and speeds as in the RTTY mode and using the same high performance modem. You also get Autostart and selectable "Diddle".

### CW

You get a Super Morse Keyboard mode that lets you send perfect CW effortlessly from 5 to 99 WPM, including all prosigns — it's tailor-made for traffic handlers.

A huge type ahead buffer lets you send smooth CW even if you "hunt and peck".

You can store entire QSOs in the message memories, if you wanted to! You can link and repeat any messages for automatic CQs and beaconing. Memories also work in RTTY and ASCII modes.

A tone Modulated CW mode turns your VHF FM rig into a CW transceiver for a new fun mode. It's perfect for transmitting code practice over VHF FM.

An AFSK CW mode lets you ID in CW. The CW receive mode lets you copy transmitted CW. Even with sloppy fists you'll be surprised at the copy you get with its powerful built-in software.

You also get a random code generator that'll help you copy CW faster.

### Weather FAX

You'll be fascinated as you watch WEFAX signals blossom into full fledged weather maps on your printer. Other interesting FAX pictures can also be printed — such as some news photographs from wire services.

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# TUNING BACK THE CLOCK

## Part 2

In the first part of this article two months ago, we described the transmitter circuits. This month we continue with the receiver, and constructional details.

used as the input because the available microphone needed a low input impedance to get the best audio quality. High impedance high output types could usefully feed the control

paralleled cathodes. Audio is applied to one of the control grids. This unbalances the circuit in sympathy with the audio. The long tailed pair connection communicates the unbalance to the other half of the circuit. With no audio applied, the centre tapped wideband transformer T7 cancels the RF applied at the cathodes except when modulated by the signal. The carrier null control preset provides at least 40dB of carrier suppression. As with other circuits cathode switching on a common line disables the modulator during receive.

### In the second part of Frank Ogden's "steam radio", we get down to nuts and bolts.

**Transmit exciter strip.** The circuitry shown in Fig. 5 turns audio from the microphone into a few hundred millivolts of SSB together with unwanted additive mixing products. The latter are taken out by the preselector section which functions in both receive and transmit modes.

The microphone signal is amplified by the EF86 grounded grid amplifier stage, V15. The cathode was

grid through a microphone gain potentiometer. Attention should be paid to preventing RF getting into this preamp. It will cause distortion and instability if it does.

V16, an ECC81 double triode, serves as a balanced modulator. Its function is to produce 1.4MHz double sideband and carrier from a combination of audio and carrier from the carrier insertion oscillator. RF carrier is applied to the

Those wanting CW operation could place a morse key across R44. A slight sophistication would be to provide a variable degree of keyed unbalance for adjustable power CW operation.

The output from T7 (60 turns CT primary, 20 turns secondary) feeds

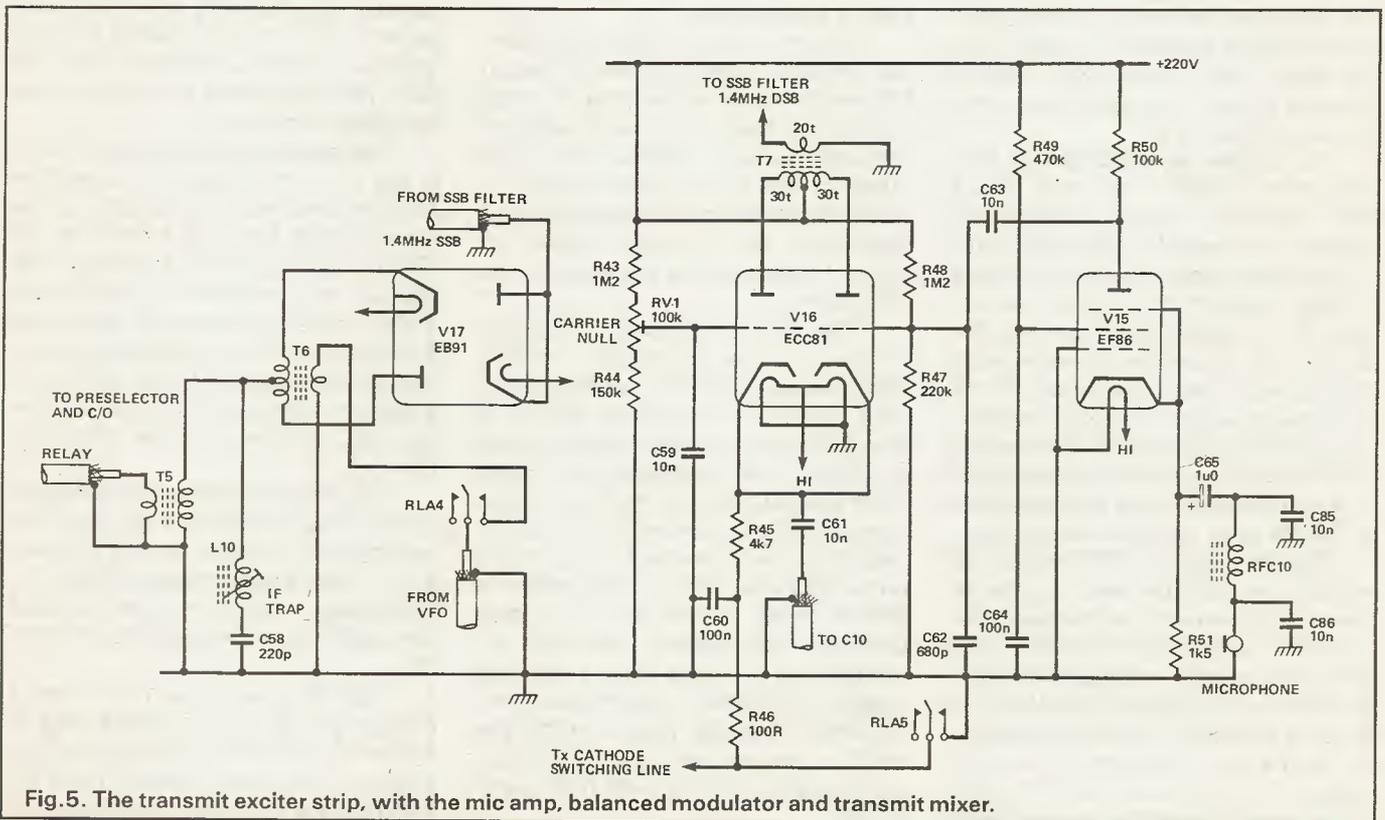


Fig.5. The transmit exciter strip, with the mic amp, balanced modulator and transmit mixer.

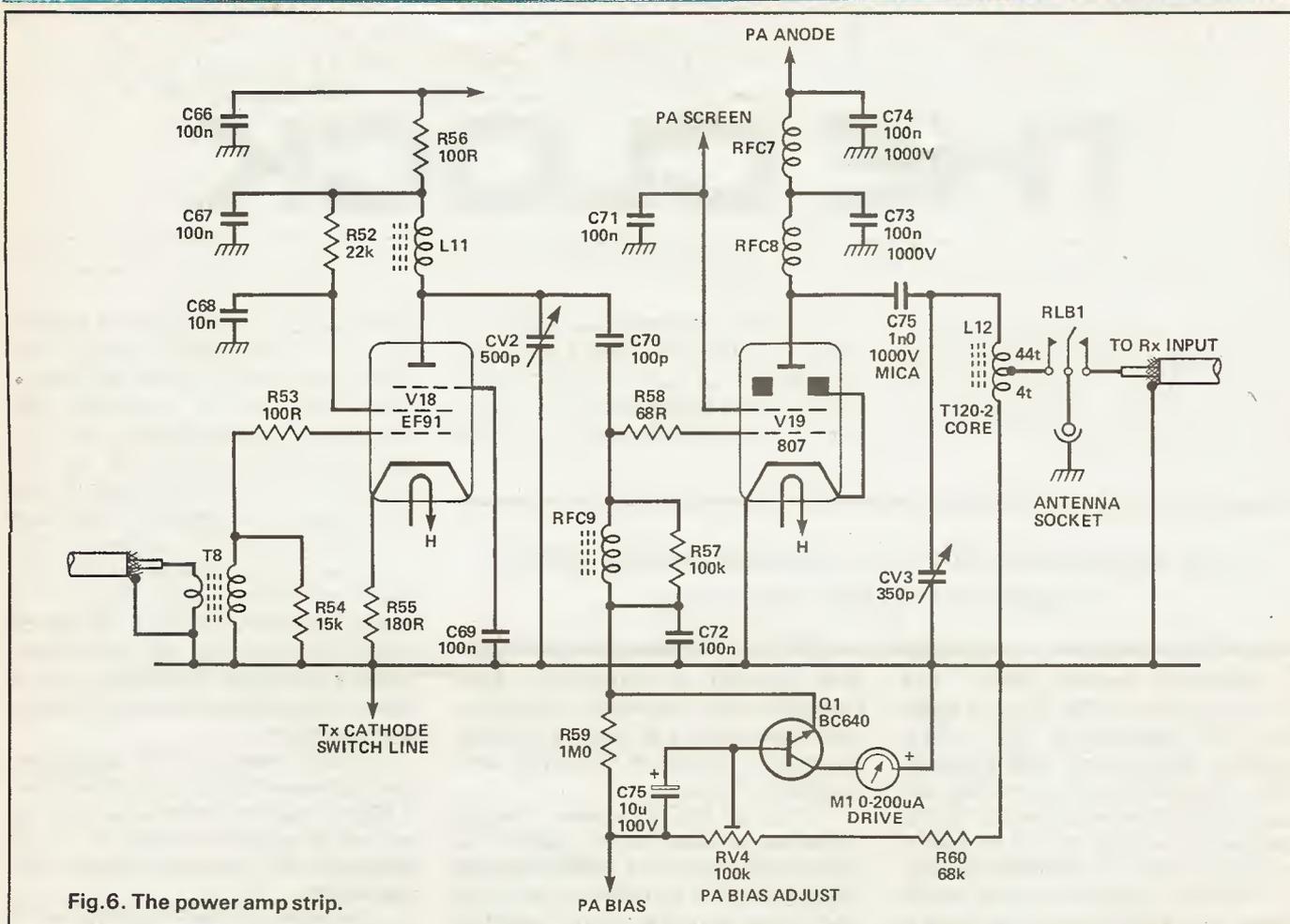


Fig. 6. The power amp strip.

the SSB filter through a relay connection active in transmit. This chops off the unwanted sideband. Output from the filter, now pure SSB, passes through a relay controlled line to the transmit mixer, V17.

The single balanced design provides some 20dB of isolation to the local oscillator signal. Thermionic diodes work surprisingly well in this position, possibly because they have the right sort of impedance characteristic to match the rest of the circuit. L10 resonated in series with C58 is essential: it removes the IF component which is largely unattenuated by the mixer itself. The output from the transmit mixer passes back to the preselector and subsequently to the PA strip via relay switching.

**The PA strip.** The 807 valve V19 requires around 80V peak to peak of drive for full, undistorted output. V18, the driver, amply provides this with the tuned anode arrangement. Too much drive will produce splatter. The circuitry around Q1, the only transistor in the set, provides a low impedance return point for PA grid current while the meter in the collec-

tor circuit provides a reliable indication of overdriving.

The grid current dump is essential. Its lack seems a general design failure in many valve PAs. A high impedance bias supply will cause an increase in bias voltage with grid current. This cuts off the bottom of the RF envelope causing splatter and distortion. A standing current of about 15mA appears optimum for an 807 valve.

The PA tank circuit was kept simple in the prototype, mostly through lack of space. I used a T120-2 core (which is about the size of a small ashtray) wound with 44 turns of 18swg wire tapped at four turns from the cold end. It requires a wide spaced 350pF capacitor for VC3. The resulting tuning range amply covers both 160 and 80m. This offers a 6000R load to the 807, an ideal situation. Be warned that the arrangement provides only a modest degree of harmonic attenuation. An external lowpass filter before the aerial tuning system is essential if you wish to stay friends with the neighbours.

Note that RFC8 should be a high current, good quality air cored component. RFC7 simply needs to cope with the current. C75 should be an RF rated part capable of standing off the PA supply voltage.

**The power supply.** Not too much to say about this (Fig. 7) except that a thermionic rectifier provides a nice slow voltage build up from turn on. T10, the principal mains transformer, should be capable of delivering 100mA rectified current at 250V and 6.3V at 5A for the valve heaters. Twin heater windings on the original provided a simple bridge connection for the DC supply to the oscillator heaters.

T9, the transformer providing the screen and anode rails for the PA is switched into action during transmit only. I used a spare pole on the aerial changeover relay for this purpose although not a recommended thing to do.

The PA bias is derived from a charge pump circuit connected to one arm of the HT transformer secondary. The pump capacitor, C84, should have an appropriate AC volt-

age rating. A small neon tube of the sort used in mains indicators provides stabilisation. A 60V zener diode would do the same thing but wouldn't look as pretty.

**Mechanical.** Building electrical dinosaurs is largely dictated by available materials. For instance, chassis construction. Metal bashing once formed part and parcel of home construction. Chassis blanks were available off the shelf and hole cutters could be found in the toolbox. I used a 19x10x2in scrap chassis purchased for 10p at a junk sale. Part of someone else's unfinished masterpiece, it had a few holes but they mostly proved useful.

The VFO needs careful mechanical consideration. The tuning drive and its associated variable capacitor gang, oscillator valve, coil and other

components must be rigidly mounted to a mechanically stable subchassis. One part should not be able to move in relation to another. A large diecast box would make the ideal subchassis. I used an assembly of aluminium extrusions cut to size to form a box structure. Door frames, I think. The subchassis also offers a degree of thermal stability and electrical screening.

I placed the VFO squarely in the centre of the chassis because that's where tuning knobs should be. The two mains transformers went into the chassis rear corners to distribute their mass and get their hum fields as far away from the VFO as possible. Electrically offensive items such as the PA stage went into a front corner with the sensitive bits placed towards the opposite front corner.

The strategy works well. The chassis required just a single screen topside isolating the PA from everything else. The open bottom of the chassis dictates a cover plate for mechanical stability and to avoid interference from external sources, such as when everything else in the shack is red hot with RF. No internal screens were needed.

**Electrical — receiver.** Projects like this are ideally built and tested a bit at a time. The chassis will already have been planned and drilled/cut. Start with the power supply because you can't test anything else until that works. Continue by building the receive section back to front. Start with the audio stages, check them and continue with the product detector/carrier insertion oscillator. A signal generator and frequency coun-

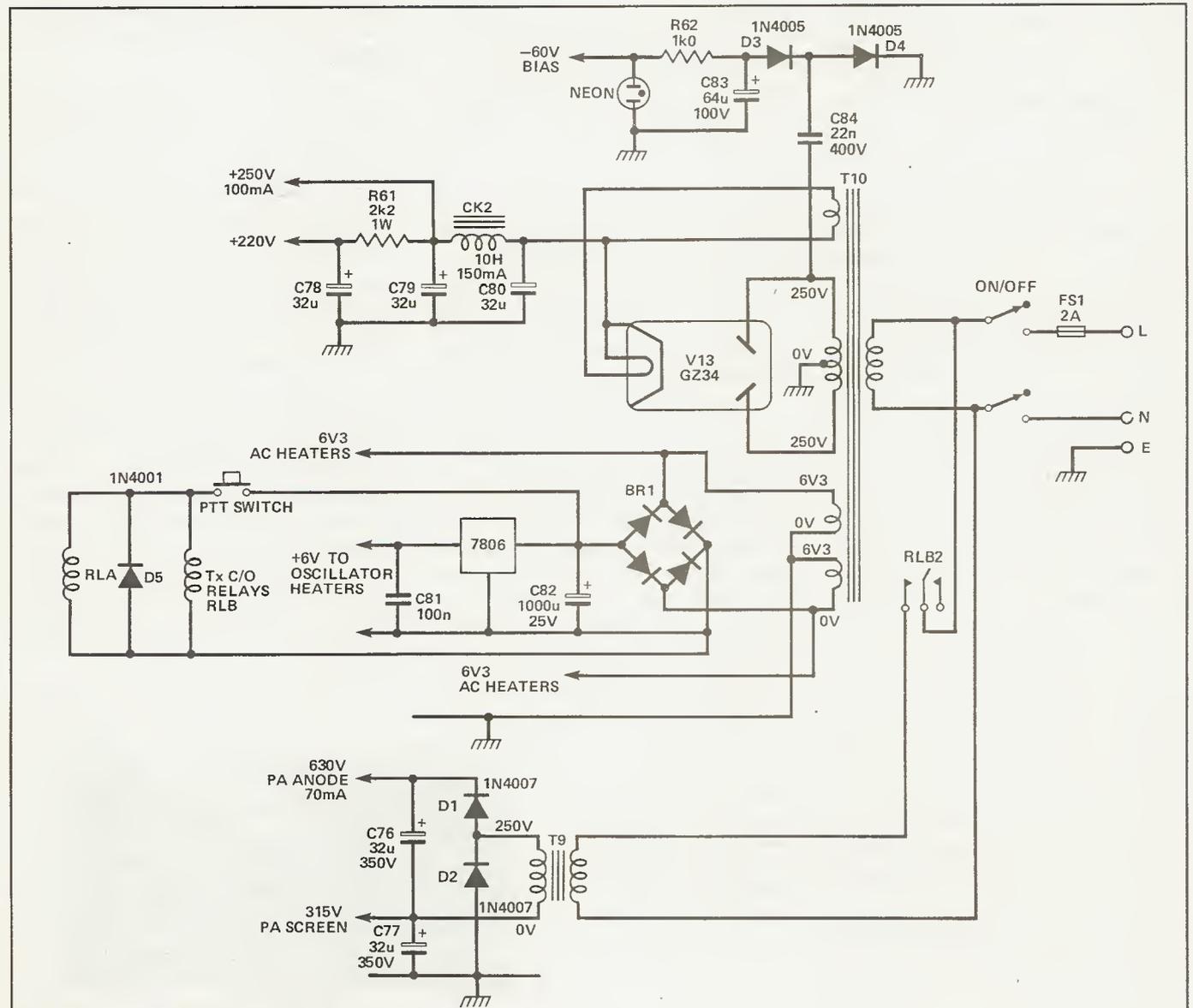


Fig. 7. The power supply. Build and test this circuit first.

ter are indispensable.

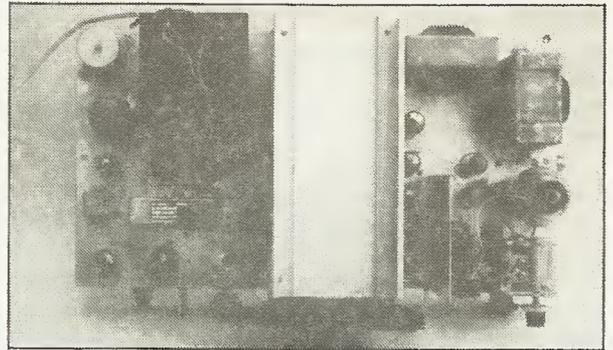
When a few millivolts of 1.4MHz on the product detector input cause a loud heterodyne, move on to the IF stages. A couple of microvolts of 1.4MHz at the grid of V2 will cause a substantial whistle in the speaker. White noise will also be apparent from the IF stages alone. Stronger signals will cause a progressive increase in the AGC voltage line rising to at least  $-15V$  with a 50mV IF input.

**Front end alignment.** The VFO should be made as a complete sub-assembly ready for mounting in the space allocated on the chassis. The original used a three-gang tuning capacitor, the last two being used for the preselector. Adjustment and alignment/tracking was carried out on the VFO/preselector as an independent unit. This required a great deal of iterative fiddling between the oscillator and aerial circuits; this wouldn't have been possible with the unit in place. Tracking can present something of a problem on home designed receiver front ends and an explanation of method is called for.

When the LO runs high of signal frequency as in this case it is the RF circuits (L1, 2, 3, etc) which require alignment first. Connect an accurate, preferably high output signal generator to the coupling coil on L1. Both this and its match, L3, will have been prewound to resonate at 5.2MHz with a 50pF load. Solder a germanium signal diode (OA91 type) to the top of L3. Solder (temporarily) a 22F capacitor from the same point to ground. This last item is to simulate V8 input capacitance. Connect a sensitive voltmeter between ground and the free end of the diode. A low capacitance RF probe would do just as well.

With the tuning capacitor at minimum, swing the signal generator about the 5.4MHz point and note the response. There should be two distinct peaks separated by about 0.8MHz with the higher one just under 6MHz. Set the capacitor to maximum capacity and repeat exercise with the signal generator swung from 1.5 to 2MHz. The preselector bandwidth should be reduced to around 100kHz with response centred on 1.7MHz or thereabouts. Examine the peak response. It should be flat or just separating into two peaks. It shouldn't be lop-sided, for instance

**The screening requirements from valve to valve are minimal. Isolation between the outside and inside of the chassis is important.**



one peak much higher than the other. Adjust the turns on either L1 or L3 (carefully) and retry. If no distinct even double peak can be obtained at the lowest frequency, increase the turns on L2 and retry. If the dip between peaks is excessive, remove turns from L2.

Once even response is obtained both at maximum and minimum capacity (the dip between peaks will be rather deeper at the high frequency end) seal the preselector coils and make no further adjustments. Plot the preselector response accurately over ten repeatable tuning capacitor positions. This will allow future comparisons between preselector and VFO to ensure that receiver (and transmitter exciter) response falls within the preselector bandwidth for any given dial setting. The local oscillator frequency (minus 1.4MHz) is then forced to follow the preselector frequency template during the second round of adjustments.

All further adjustments are confined to VFO components. Don't be tempted to tweak anything on the preselector. With a frequency counter connected to the VFO buffer output (assuming that everything has been proven working) note the tuning range of the VFO starting out with the padding and trimming capacitance values shown. Note how the actual LO output deviates from a preselector dial setting (+1.4MHz).

With the preselector tuned to 3.5MHz adjust the inductance of

oscillator coil L8 until the VFO output frequency corresponds to 4.9MHz. Retune to the lowest frequency tuned by the preselector (which should be about 1.7MHz). Adjust the padding capacitor C35 so that the output frequency equals the centre of the preselector passband (+1.4MHz). Retune to the top end. Adjust the VFO trimmer C38 until the VFO is 1.4MHz higher than the middle frequency of the preselector passband.

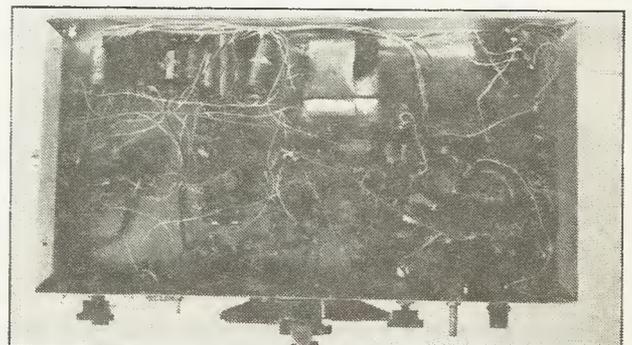
Return to the 3.7MHz mid point and repeat the circle of adjustments: L8, C35 and C38 until no further improvements can be obtained. Carry out a check of VFO tracking at all 10 preselector calibration points. Seal up and leave well alone once completed.

Install VFO assembly, crystal filter, relay switching and mixer. Check receiver operation. It should appear lively. A fraction of a microvolt should be easily readable.

**Electrical — transmitter.** This section should also be constructed and tested in easy steps. Start by making the mic preamp functional followed by the balanced modulator. Remember the earlier caveats about keeping IF CW out of the IF strip. Check that the modulator balance control produces a deep null in the carrier. Over a volt of DSB should be available from the T7 secondary winding to the crystal filter.

Build the transmit mixer V17 next. Be careful to make transformer

**The underneath is a designer rat's nest. Screened leads carefully earthed at each braid end are a must for long RF signal runs. Other signal paths aren't so fussy. Power leads don't care.**



T6 symmetrical about its centre tap. As with all the broadband transformers, wind on as many turns as possible but without overlapping turns. The VFO coupling coil is wound in the ratio 5:1. T5, the mixer output coil requires a turn ratio of 4:1.

There should be around 300mV of 1.4MHz SSB available at the mixer input and 100mV of SSB at operating frequency at the output of the pre-selector section. Adjust the IF trap L10, C58 for lowest 1.4MHz breakthrough.

The PA strip presents no special problems. PA neutralisation wasn't required on the prototype. There are plenty of volts around with the PA active so exercise care when making adjustments (one hand behind the back is a good idea).

Components		SEMICONDUCTORS			
<b>RESISTORS</b> (All metal oxide ½W unless stated)		Q1	BC640 or similar	C53	25p
R1,2,18,20,22,24,28,35,50,57	100k	ZD1		C62	680p
R3	39k	D1,2	1N4007 fig 7	C73,74	100n, 1000V
R4,7,8,31,46,53,56	100R	D3,4	1N4005 fig 7	C75	1n,1000V, mica
R5,6,15,59	1M	D5	1N4001	C76,77,78,79,80	32µ, 350V
R9,10,17	220R	BR1	Bridge rectifier eg WO05	C82	64µ,100V
R11,14	33k	ICI	7806	C84	0.02µ, 400V AC working
R12,21,40	47k	<b>MISCELLANEOUS</b>		CV1	500p triple gang variable capacitor
R13,16	270R	RLA		CV2	500p single gang variable capacitor
R19	1k5	RLB		CV3	350p wide spaced
R23,49	470k	SSB filter	Cathodeon 8-pole 1.4MHz	<b>INDUCTORS</b>	
R25	390R			L1,2,3,4,8,10,11,12	Tuned inductors
R26	1k2	Meter	0-200µA drive	L5,6,7,9	Variable tuned inductors
R27	1k, 1W	Neon	See text	RFC1,2,3,4,5,6,7,8,9,10	See text
R29,45	4k7	PTT switch, 2A fuse & fuseholder		CK1	AF choke
R30,37,42,52	22k	DPDT mains switch		CK2	10H,150mA power supply choke
R32	150R	<b>CAPACITORS</b>		T1	See text
R33	4k7 5W	C1,4,8,9,14,15,39,40,42,44,46,48,51,52,55,56,60,64,66,67,71,72,81		T2	See text
R34	10k	C2,7	100n	T3	9:1 ratio, see text
R36	39k	C3,11,23,54	60p preset	T4	9:1 ratio, see text
R38	1k	C5	1n	T5	See text
R39	100k	C6	470n	T6	See text
R41	150R	C10,13,18,58	150p	T7	60T centre tapped primary, 20T secondary
R43,48	1M2	C12,17,24,28,34,41,47,57,59,61,63,68,85,86	220p	T8	See text
R44	150k	C16,20,70		T9	Mains xfmr, 250v secondary
R47	220k	C19,21,32,33		T10	Mains xfmr, secondaries 3*6V3, 250-0-250
R51	1k5	C22	8µ, 350V electro	T11	See text
R54	15k	C26,49	470p	T12	See text
R58	68R	C27	25µ	A certain amount of ingenuity and calculation will be needed to fabricate the coils for this project.	
R60	68k	C29	47µ,64V		
RV1,4	100k preset	C30	3n3		
RV2	1M log pot	C31	2µ2		
RV3	470R wire wound pot	C35	1400p		
<b>VALVES</b>		C36	47p		
V1	ECC81	C37,65	1µ electro		
V2,3	EF92	C38	60p		
V4	6AK5	C45	47n		
V5	EB91				
V6	ECC83				
V7	EL92				
V8	EF182				
V9	6AU6				
V10,11,12	EF80				
V13	GZ34				
V14	OA2				
V15	EF86				
V16	ECC81				
V17	EB91				
V18	EF91				
V19	807				

# QRZ

Since the last "QRZ" conditions on all the HF bands and in particular 10 metres have been quite superb. There has been something on the bands for everyone, and even amateurs with very modest stations have been able

24 hours a day. Towards the end of their operation, at the end of November, it seemed as if they had worked most of the active DXers in the world, for they were very easy to work with no big pile-ups, and often

without the necessity of their working split (listening on a frequency other than their transmit frequency — standard practice for DXpeditions or when the pile-up is big.) I worked them on 10 metres SSB with 100 watts to an 18AVT trap vertical on my second call, several DXers worked them on 10, 15 and 20 metres with QRP (3 watts or less) and several other DXers worked them on 10-80m, SSB and CW. All in all, an excellent operation. Anyone who worked them, or SWLs who heard them, should QSL to: P.O. Box 271 (for SSB QSOs) or P.O. Box 131 (for CW QSOs), Vienna 1141, Austria, enclosing an s.a.e. and 2 IRCs per QSL.

The second major DX story is that the ARRL have agreed that Maly Vysotsky Island should be counted as a separate country for DXCC purposes. This island was activated in July 1988 as 4J1FS by a joint Finnish-Soviet DXpedition team, but there was some doubt as to whether or not "M.V. Island" (as it is known) should count, because of recent changes in

## *HRT's travelling man finds that Vietnam is now open, and islands are getting their own identities*



Fig. 1. A view of some of the Cocos (Keeling) Islands, VK9Y, from the South Lagoon left to right: Direction Island, Prison Island, Home Island.

to make some interesting DX QSOs.

There have been two major DX stories in the last couple of months. The first was the appearance on schedule of 3W8DX and 3W8CW from Vietnam. There had been no amateur radio activity from Vietnam since the American withdrawal at the end of the Vietnamese war, so it was not surprising to find that Vietnam was considered to be one of the top three most wanted countries in most DXers lists. A group of Hungarian amateurs managed to get permission to operate from there and did a superb job in working the pile-ups which inevitably resulted when one of the rarest countries in the world appeared on the air. Their target was announced as 100,000 QSOs and I wouldn't be at all surprised if they exceeded that number, as they were active for about six weeks, virtually

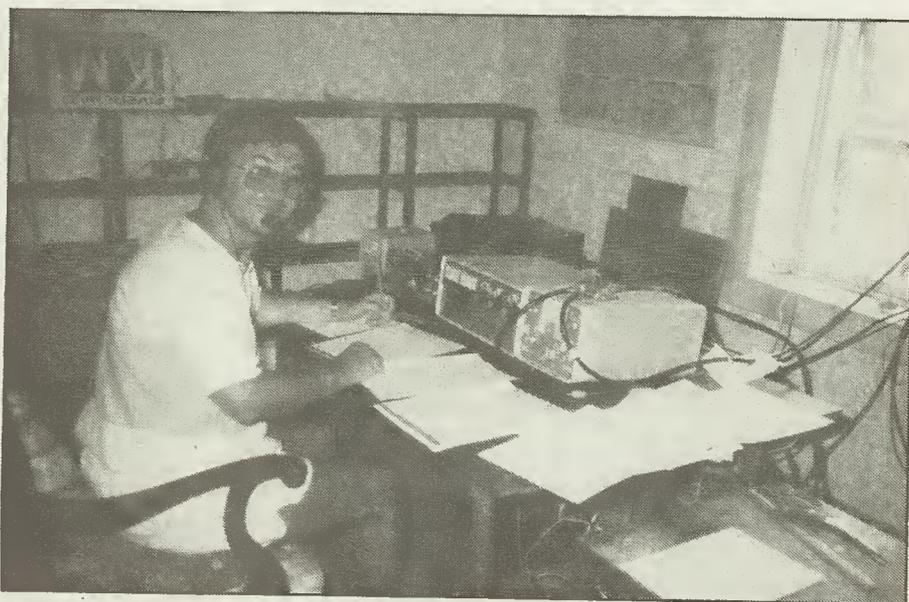


Fig. 2. The author operating as VK9YG in the CQ worldwide SSB contest. The rig is a TS440S with Yaesu FL-2000B linear.



Fig. 3. VK9YG by the lagoon, with a 70 foot tower and 8 element log periodic yagi for 10m, 15m and 20m.

the DXCC countries criteria. QSLs for last July's 4J1FS operation should be sent out by the time this is read: the QSL information for this one was via OH2NB. Now that MV Island has been accepted, I wouldn't be surprised if there is another operation there this summer. For the uninitiated, MV Island is in the north-east Gulf of Finland, near the Soviet city of Vyborg.

### The Island Race

One of the changes in the DXCC countries criteria, already referred to, is that rule 2a now states that an island or group of islands counts as a separate country if it or they are separated by at least 225 miles of open water from a continent, another island or group of islands that make up any part of the parent DXCC country. This change means that several islands or island groups can now be considered separate DXCC countries, and the first of these likely to be accepted is Rotuma, a group of islands more than the stipulated 225 miles from Fiji, to whom they belong. 3D2XX was active from Rotuma in October and we all await the decision from ARRL HQ with interest. If Rotuma is accepted, there will almost certainly be a spate of DXpeditions to other island groups that are just more than 225 miles from their parent country, which could make DXing in 1989 very interesting! A quick look through the atlas reveals at least a dozen or fourteen potential new

countries, such as the Marquesas, part of French Polynesia, but a long way from Tahiti; Aladbra, one of the out-lying Seychelles islands and even possibly Rockall.

Rockall is a dubious one, though, for although it is 230 miles west of the island of North Uist in the Outer Hebrides, there are other outlying islands, such as St Kilda, which are between the two. In any even, it would be next to impossible to activate Rockall, although having said that, it has been activated by a certain Tom McLean, who gave himself an artificial call sign and made a few QSOs on 20 metres, even getting

himself on "News at Ten" in the process. Needless to say, this one would not count, as Tom McLean does not have an amateur radio licence at all.

I started by saying that conditions on 10 metres in particular had been superb, and this was true especially during the CQ World Wide SSB contest. I was operating as VK9YG from the Cocos Keeling Islands and found that during the contest, 10 metres was open 24 hours a day (during the previous two weeks it had been closing at about 7 or 8 pm local time). I made just over 3000 QSOs in the contest, of which over 2000 were on 10 metres. 15 metres was also in good shape, but I had antenna problems on 20m and on the lower frequency bands found it difficult to get QSOs, as Cocos Keeling is so far from anywhere other than Indonesia. I participated on the contest as part of the CDXC Contest Team, CDXC being Britain's only organised grouping of DX and contest-orientated amateurs. The other members of the team were Steve, GW4BLE; Phil, G4OBK; Don, G3XTT; and Don, G3OZF.

All five of us participated as single operator, all band entrants and GW4BLE in particular put in an excellent score. Steve made 3936 QSOs for a final score of over 5,200,000: in any previous year this would have been a European record, but we will have to wait to see if any other Europeans beat Steve this year. I hope to write an article about my

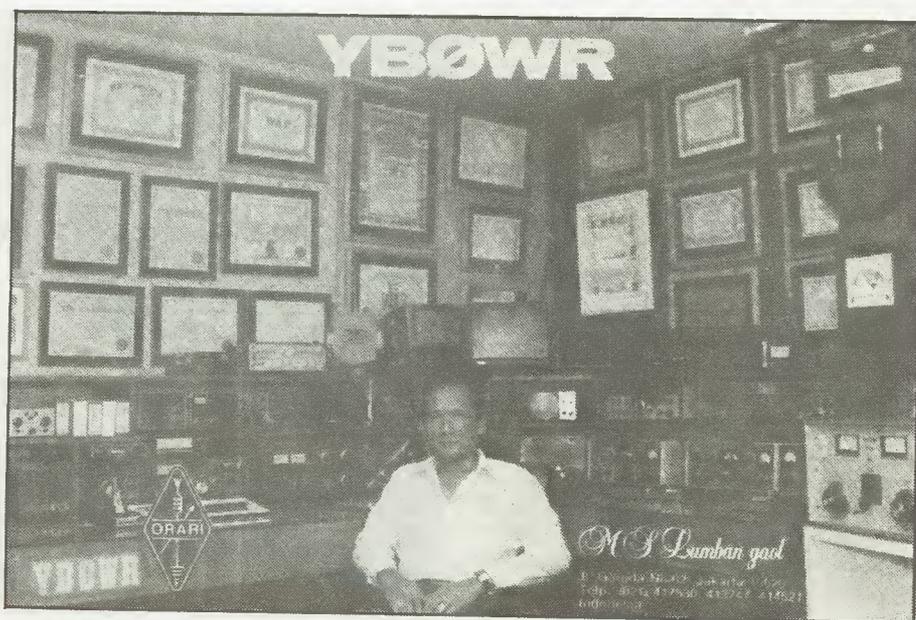


Fig. 4. M. S. Lumbran gaol, YB0WR, in his Jakarta shack.



Fig. 5. YBOWR's antennas: left to right, 3 element on 40m, 6 element on 20m (with VHF/UHF antennas above), KT34XA 6 element tri-bander, and a 4 element 80m beam.

experiences in Cocos Keeling, which I hope will appear in the near future. Meanwhile, news from California has it that P40V, operating from Aruba off the north coast of South America, set a new record in the multi-multi category of the CQ World Wide SSB contest. Operating simultaneously on all bands, they made over 5000 QSOs (in 48 hours!) on each of 10, 15 and 20 metres and had a total of about 21000 contacts. Their final score will be in the region of 55 million points, which shatters the previous record of 42 million. Congratulations to Carl AI6V, the holder of the P40V callsign and his team of dedicated operators.

### Indonesia

Before we arrived in Cocos Keeling we spent a few days in Indonesia where I was pleased to meet Lumban gaol, YBOWR, whom I had previously worked on both 40 and 80 metres. When you see his station, and especially his antennas, you realise why YBOWR is such a good signal, not just on the low frequency bands, but on all bands. The YBOWR antenna set-up is the biggest in Asia and includes a full-size 3 element beam for 40 metres, a 6 element yagi for 20 metres (with some VHF and UHF antennas above), a KLM KT-34XA 6 element tri-bander and, most impressive of all, a KLM 4 element rotatable beam for 80

metres. Although the antennas are all commercially made, all the masts are home-made, which is perhaps even more impressive when you realise the scale of them. One of Lumban gaol's main interests in amateur radio is award hunting and for the last year of two most of his efforts have been diverted into producing what he hopes will become the definitive amateur radio awards book, which is now available. The *International Awards Guide Book* by M.S. Lumban gaol has details of over 750 awards, of which 630 are illustrated in full

colour. There are 440 pages in A4 format, all glossy art paper. This has been a real labour of love by YBOWR, who is now selling his book at \$40 (US) delivered anywhere in the world by surface mail. I saw the first proofs off the press and can confirm that it is a superbly produced book, more like a coffee-table book than an amateur radio guide book. If you are interested, send \$40 by International Money Order, or cash, by registered mail to M.S. Lumban gaol, P.O. Box 4602, Jl Garuda 62, Jakarta 10620, Indonesia.

### Celebrities

In the last "QRZ" I mentioned the happenings at last year's RSGB HF Convention, held at the end of September near Oxford, but unfortunately I had not at that time received my photographs of the event. These have now come and show Paul Granger, F6EXV, the only European operator on last year's DXpedition to Palmyra Island and Kingman Reef in the Pacific. He is being presented with a CDXC Certificate of Merit by Roger Brown, G3LQP, the CDXC Vice-Chairman, for Paul's outstanding efforts at working Europeans in sometimes difficult conditions. The other photograph is a rare picture of G4LJF and ON4UN together, along with WOAIH and G3HTA. John, G3HTA, is one of the top DXers in the South West of England, on the DXCC Honour Roll,



Fig. 6. Left: F6GXV Paul. Right: G3LQP Roger.



Fig. 7. Left to right: G4LJF Ian, ON4UN John, W0AIH Paul, G3 HTA John.

and Paul, W0AIH has one of the biggest antenna set-ups in the USA and probably the world. He gave a very interesting slide show and talk on the development of this station over a period of 20 years, at the Convention.

John, ON4UN, probably needs no introduction, being one of the top low-frequency band DXers in the world, especially known for his work on 80 metres. Finally Ian, G4LJF, has a most impressive station at Wokingham, Berkshire, but nevertheless likes to go on DXpeditions to exotic spots. In the past, Ian has operated as D68AAB from the Comoros and S79LJ from Bird Island in the Seychelles while at the time of writing he is active as G4LJF/V2A from Antigua in the Caribbean. Unfortunately I have not yet been able to work Ian from Antigua, although I have heard him on three occasions recently. When I have heard him, the pile-up of both European and US stations has been fairly intense and I have not been able to get through with my 100 watts and vertical.

I find it ironic that what, two months ago, was one of the rarest countries in the world (Vietnam) proved very easy to work, whereas somewhere like Antigua, with plenty of resident amateurs, has proved much more difficult. I think the reason for this is that the novelty of attracting a large pile-up whenever you go on the air quickly pales for residents of semi-rare places like

Antigua, or closer to home, Gibraltar or even the Isle of Man; so that residents of these places rarely go on the air except to work their friends. Thus whenever a DXpedition visits such places, with the intention of working as many people as possible, the pile-ups are always much larger than you would expect for a place with a fair number of resident operators. I noticed the same effect myself when I operated from OH0, the Aland Islands: no end of people, some of whom had been licensed for many years, said I was their first OH0, despite the fact that there are over 30 resident amateurs there, some of

whom are quite active. This makes going on DXpeditions even to places that are not considered to be particularly rare, such as Corsica, Luxembourg, Liechtenstein or even Mallorca, great fun.

Someone who went on a semi-local DXpedition (to him) to a semi-rare location is Fred, PY7ZZ, who operated from Fernando de Noronha island as PYOFZ at the end of November. I found him easy to work on both 10 and 15 metres SSB, even though according to DX New Street he was going to be particularly active on the lower frequency bands. Fred's QSL information was via the Heard Island DX Association, c/o VK9NS, Jim Smith, P.O. Box 90, Norfolk Island, Australia, 2899.

By the time this is read it will be almost time for the CQ WPX SSB contest, which will be on 25th and 26th March this year. Although at the time of writing no plans have been made, I hope to be operating as part of a CDXC multi-operator team as GB4CDX. In last year's contest we made 2200 QSOs and 3.2 million points, and we would hope to do somewhat better this year. If we do indeed operate as GB4CDX and you hear us on, please give a call. I will also be handling the QSLs, so I look forward to hearing from you. I would also like to receive any pictures or news of your activities for inclusion in "QRZ". Please send them to: Steve Telenius-Lowe, "Penworth", Tokers Green Lane, Tokers Green, Reading, RG4 9EB.



# Receiver Front-End Protector

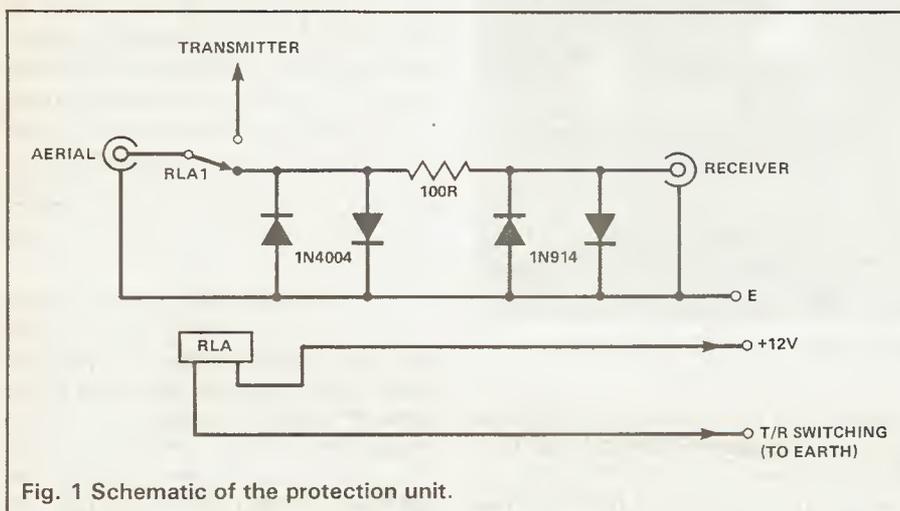


Fig. 1 Schematic of the protection unit.

I suppose that I was asking for trouble when I moved into a house next door to another radio amateur. We discussed the situation, however, and decided that as his interest was mainly the DX bands and mine was

and was surprised to find that over half an ampere of RF current was being induced into my aerial!

The next day, when I was intending to go on the air, I found that the induced RF had destroyed two of

transistor failed in my Corsair, needless to say, on the most inaccessible board in the equipment.

Goldfinger once said: "Once is circumstance, twice is happenstance, three times is enemy action". I therefore decided to eliminate the possibility of the third occasion.

The most usual receiver protection device is a pair of back-to-back diodes across the input, but the commonly used diodes such as 1N914 or 1N4148 would expire very rapidly when exposed to half an amp of RF. Consideration was then given for the use of a pair of power diodes which would take the RF without flinching. Many people told me that these could not possibly work due to internal capacity, inductance, etc., but, nevertheless, an attempt was made.

For the first test a pair of 1N4004 power diodes were placed back-to-back across the output of an old valve 25 watt CW transmitter and the waveform monitored on an oscilloscope.

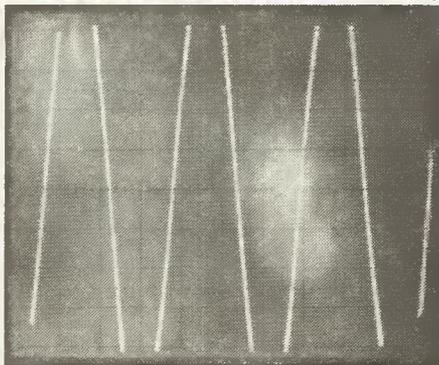
Across the unloaded output of the transmitter (Photo 1), the oscilloscope trace deflection was far more than the screen height (estimated in excess of 100 volts peak to peak, for the output is not 50 ohms). When the 1N4004s were connected, surprisingly, the expected clipped waveform did not appear. Instead there appeared a sine wave with an additional peak as shown in Photos 2 & 3. Most encouraging was that, even with this,

## *Is next door's HF buff blowing the socks off your receiver MOSFETS? Brian Kendal, G3GDU, comes to the rescue with this simple add-on.*

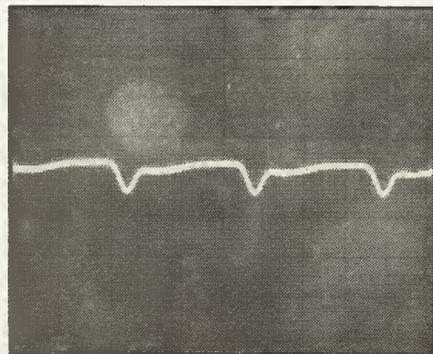
VHF and Eighty, it was unlikely that we would cause each other many problems. In general, over the past ten years, this has proved true, but the warning bells should have rung in my mind when, one day, I came home from work and noticed that my neighbour had erected an eighty metre dipole.

The AFS contest took place over the next weekend and when I went into the shack to listen (I was not competing), I was surprised to see the power meter on the Aerial Matching Unit jumping all over the place even before I had switched anything on. Realising now why my neighbour had erected his new aerial, as a matter of interest, I connected an RF ammeter in series with a 50 ohm dummy load in place of my tranceriver

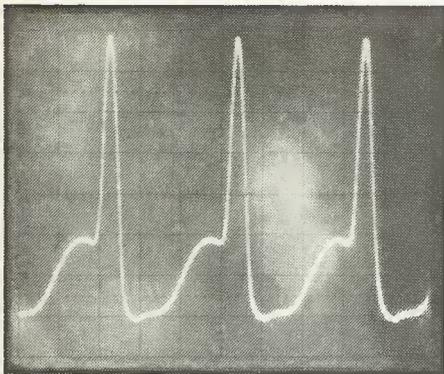
the switching diodes in my Swan 100MX tranceriver. For the next few days I assiduously remembered to disconnect my HF aerial each AFS weekend, but this year I forgot — with the inevitable result. A switching



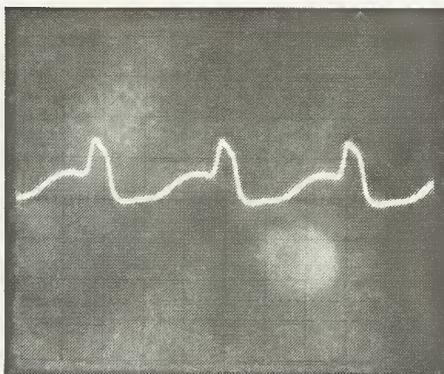
Signal input to the protection unit from a CW Tx — Scope sensitivity 10V/cm.



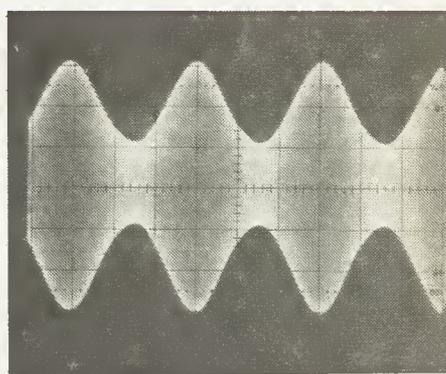
Signal reduced by 1N4004 diodes, 10V/cm.



As Photo 2 but with sensitivity of 1V/cm.



Signal across 1N914 diodes (sensitivity set to 1V/cm). Signal level is now less than 2V peak to peak.



The protection circuit has no effect upon a 0.1V RMS, 60% modulated signal derived from a signal generator.

the overall amplitude was now only 9 volts peak-to-peak. This remained constant regardless of the transmitter output level.

It might be expected that the waveform would have been limited to the knee voltage of the diodes (about 0.3 volts) but, undoubtedly, the internal capacity and inductance of the power diodes had their effect.

This was still, however, sufficient to cause concern for the safety of a transistor receiver front end and so a further pair of smaller diodes (1N914), isolated by a 100 ohm resistor, was added to give further protection.

The oscilloscope was now indicating less than 2 volts peak to peak. This was felt to be adequate to safeguard the receiver. (Photo 4).

Having now reduced the value of a high incoming RF voltage to a point where the receiver would be safe, it now remained to examine the effect of the circuit on more normal signal levels.

The first of these checks was to inject the highest possible level from my signal generator and examine the output for possible distortion. At one volt input, none could be seen on the oscilloscope trace on any waveband from 1.8 to 28 MHz (Fig. 5).

The second check was for losses in the circuit. In view of the 100 ohm resistor some were expected but, provided that they were moderate, they could be tolerated due to the excellent sensitivity of the Corsair.

For this check a receiver was connected directly to the signal generator and the S-Meter reading noted. The protection circuit was then placed between generator and receiver and the signal generator output increased until the receiver S-Meter returned to its original reading. The difference between the read-



ings corresponded to the losses due to the protection circuit. On all bands from 160 to 10 metres these did not exceed 3dB. This was considered acceptable.

It now remained to incorporate the protection circuit within the system. Having no wish to modify the Corsair, it was decided to take ad-

vantage of the fact that the receiver input of the equipment can be isolated and to substitute relay for electronic aerial switching. This would invalidate full break-in CW operation but, as this mode of operation is rarely if ever used, its loss could be tolerated.

Aerial changeover relays are

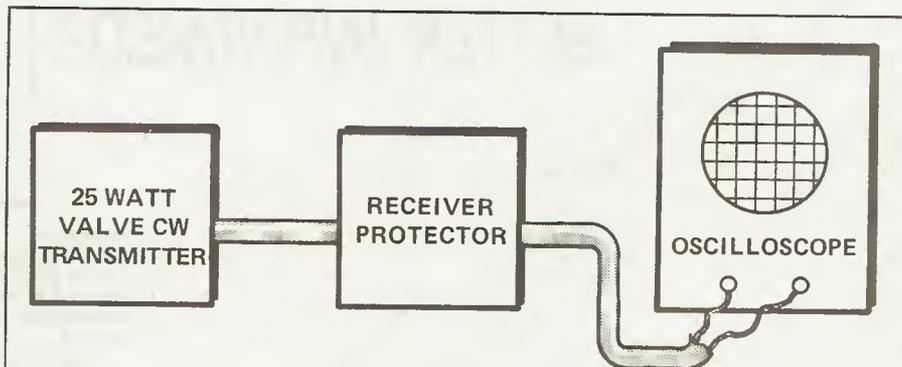


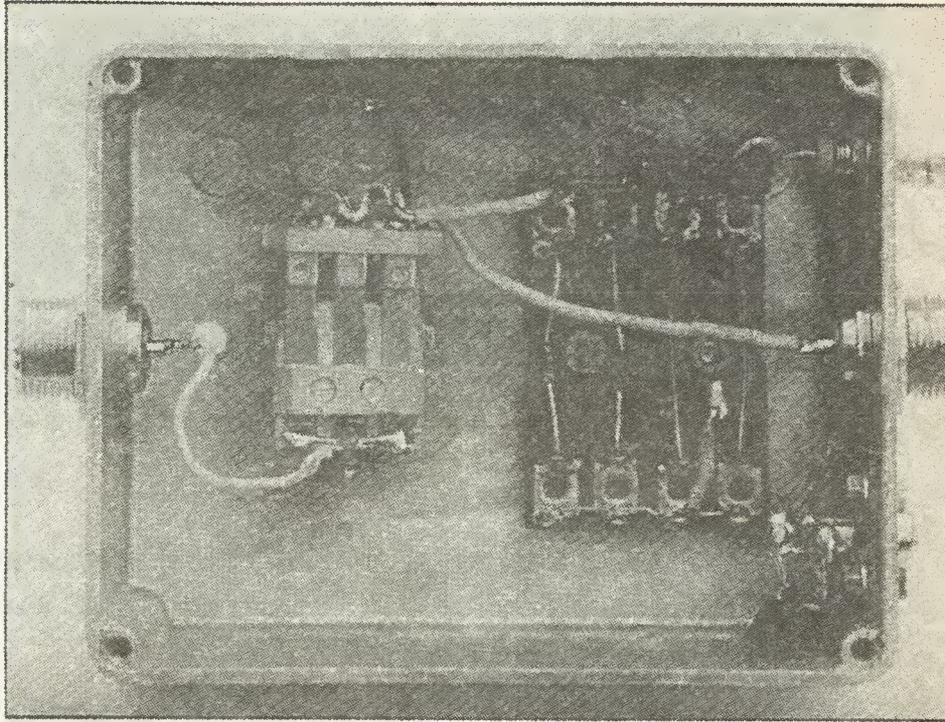
Fig. 2 Test set used in the experiments.

usually considered a difficult and expensive item, but the author has found the the RS standard plug-in relays (Cat 348-756 and 348-807) perfectly adequate. These are modified by removing from the base, paralleling the connections and mounting them in a suitable screened box (Photo 6).

The provision of receiver protection circuits such as described are not normally necessary, only when there are two aerials and in close proximity will such heavy currents be induced. However, when two radio amateurs live next door to each other and each has an eighty metre dipole some problems are inevitable.

It is unlikely that the aerials will be more than forty or fifty feet apart and this corresponds to less than a quarter of a wavelength. Even with only moderate transmitter power being used, sufficient power will be induced to cause damage to transistor receivers and consequently safety precautions must be taken.

The circuit described is both effective and inexpensive but this does not preclude other techniques



Internal view of the finished unit. The aerial is connected to the SO239 socket at the left whilst the Tx output goes to the other SO239 socket. Receive output is via the protection circuit and the BNC socket shown.

being used, although the author has not seen this problem being addressed before in amateur radio publications.

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# CONTACTS

# CONTACTS

Aberdeen ARS	Don	04676251	Grafton RS	Rod GOJUZ	01-368 8154
Abergavenny & NH ARC	GW4XQH	0873 4655	Gt. Lumley ARES	G4MSF	091 4693955
Aberporth ARC	GWODPR	023987 274	G. Peterborough ARC	Stan	0733 69822
Aire Valley RS	G6NPT	0532 44597	Halifax DARS	D. Moss	0422 202306
St Albans ARC	Walter G3PMF	Kings Langley 62180	Harpden ARC	G1BJC	05827 2455
Alyn and Deeside ARS	GW4RKX	0244 660066	Harrow RS	Tony	01-861 0419
Amateur Radio & CC	Trevor	04895 81032	Hastings ERC	Dave Shirley	0424 420608
AMRAC	Phil, G6DLJ	0703 847754	Haverhill DARS	Rob Proctor	0787 281359
Armagh & Dungannon DARC	J. A. Murphy	0861 522153	Havering DARC	GOBOI	04024 41532
Atherstone ARC	Roy	0203 393518	Hillingdon ARC	Howard, G6SII	01-561 2917
Axe Vale ARC	Bob	029 74 5282	Hornsea ARC	Richard	0401 62498
Ayr ARG	GM3THI	Ayr 42313	Horsham ARC	Paul, G4YFY	0403 87 404
Barking RES	R. Woodberry	01-594 4009	Horsham ARC	P. Godbold	13 Dawn Crescent, Steyning
Barnsley ARC	Ernie G4LUE	8 Hild Av, Cudsworth:		M. Wardle	11 Sokwell Av, Barnsley
Barry College RS	John	065679 710		Brian	0463 242463
Basingstoke ARC	Dave	07356 5185		G1IPQ	S'oton 736784
Basingstoke ARC	D. Deane	0734 332777 (hm)		G1IGH	0274 496222
		0734 787930 (wk)		Tony	0562 751584
Bath DARC	G4UMN	Frome 63939		G3ODH	Epsom 26005
Biggin Hill ARC	GOAMP	0689 57848		Jim, G14TCS	0846 682474
Biggin Hill ARC	Geoff G3UMI	01-462 2689		G1EBS	0274 665355
Borehamwood Elstree ARS	Tony	01-207 3809		Pete Brazier	052 523 270
Braintree DARS	N. Willicombe	0376 45058		Pam, G4STO	0427 788356
Bredhurst RTS	Kelvin GOAMZ	0634 376991		Robin	0506 890177
Bridgend DARC	Dave	0656 723508		Philip	0509 412043
Brighton DARS	Peter	0273 607737		Bill	0365 24905
Binstead ARS	Douglas	Ryde 67665		G4FKI	0525 714591
Bristol ARC	G4YOC	Bitton 4116		J. D. Ray G8DZH	01-508 3434 (ev), 01-508 3434 Micronet 800 mailbox
Bristol (Shirehampton) ARC	Ron Ford	0272 770504		G1IZB	047286 595
Bristol: see South Bristol				G1NUS	0625 24534
Bourne DARS	Vince G4ODG	0778 422795		John	0628 28463
Burham Beeches RC	G6EIL	062825720		GOBUW	0622 30544
BT (Reading) ARC	G4MUT	0734 693766		Keith, G1PQW	0709 814135
Bury RS	Allan	0204 706191		G4GYU	0623 27257
Cambridge DARC	D. Wilcox	0954 50597		Tony	0634 578647
Cambridgeshire Repeater Group	Brian G0DAH	09547 405		D. Thomas	Doncaster 859654
Chesham DARS	Liz Cabban	09278 3911		G8BHE	021-422 9787
Cheshunt DARC	G4VMR/G4VSL	092084 250		R. Nicol	37 Thicknall Drive, Stourbridge, West Midlands DY9 0YH
Chichester DARC	C. Bryan	0243 789587		GOGMC	07918 2937
Clacton ARS	Reg	0255 430466		Sam	07622 22855
Chiltern ARC	Ron, G3NCL	0494 712020		G4TIL	Southam 4765
Clifton ARS	Martin G0DCG	01-691 2341 (hm)		Mike, QOERE	0234 750629
		01-691 6111 (wk)		G4ZJL	0524 52042
Clifton ARS	R. A. Hinton	01-301 1864		Alan Booth	0272 690404
Conwy Valley ARC	GW4KGI	0745 823674		J. West	0288 4916
Coulsdon ATS	Alan	01-684 0610		G6MLI	0782 332657
Coventry ARS	Bill, G3UOL	0203 414684		Steve	0532 536633
Coventry ARS	Jonathan G4HHT	0203 610408		G3VOW	0635 43048
Crawley ARC	Jack	0293 28612		GW6ZUQ	02912 6867
Cunningham DARC	Bob Low	0563 35738		Andy	Norwich 610874
	GMOECU			Craig Joly GOBDG	0603 485784
Darenth Valley RC	Sec	0322 63368		J. M. Hotchin	White Horse Inn, Wakefield (?)
Dartford Heath DFC	Pete	0322 844467		Brian	0691 831023
Delyn RC	Stephen	0244 819618		Peter, G4PNW	
	GW7AAV			G4SCA	0752 337980
Denby Dale DARC	G3SDY	0484 602905		Colin, GOAAO	0977 43101
Derby DARC	Ken G4FPY	0332 669157		GOEQV	0202 674802
Derwentside ARC	G1AAJ	0207 520477		George	0772 718175
Doncaster ARC	K. McMahon	Doncaster 852938		Steve, G4YFB	Reading 867820
Donegal ARC	E13BOB	074 57177		M. G. Anthony	9 Paice Green, Wokingham
Dorking DRS	John	0306 77236		GW1PLI	097-888 621
Droitwich DARC	G4HFP	0299 33818		F. Moody	Rotherham 552925
Dudley ARC	John	0384 278300		Neil	0980 22809
Dunfermline RS	GMODYD	0383 413440		Simon Price	0743 67799
Dunstable Downs RC	T. Kelsey-Stead	0582 508259		Alan Pemberton	Sheffield 670866
E. Lancs ARC	Stuart	0227 68913		John	Sheffield 581766
Eastbourne EARC	G1BRC	0323 29913		P. Green	6 Yews Close, Worrall
East Kent ARS	Stuart	0227 68913		Alan, G4PSO	Hitchin 57946
East Lancashire ARC	Stuart	0254 887385		Tim, G6RCT	0707 372211
Edgware DRS	G4IUZ	0707 65707		Len Baker	0272 834282
Exeter ARS	Roger Tipper	0392 68065		Chris	07816 73185
Fareham DARC	Alan, G3CCB	0329 288139		G4VKE	0229 65359
Farnborough DRS	Mr Taylor	0252 837581		Dave Holland	061-973 1837
Felixstowe DARS	G4YQC	0473 642595		G4XWR	S. Shields 543955
Fishguard DARS	Bernard	0348 872671			
Fylde ARS	F. Whitehead	0253 737680			
Galashiels DARS	GM3DAR	0896 56027			
Glossop DARG	G4GNQ	QTHR			
			Hoyland ARC		
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			Itchen Valley RC		
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			Shefford DARS		
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			S. Cheshire		
			S. Lakeland ARS		
			S. Manchester RC		
			S. Tyneside ARS		

Continued next month . . .

Every month (give or take the odd one) we have a rolling list of club contacts in alphabetical order. This allows us to include as many clubs as often as possible in a single page.

# RADIO Tomorrow

- 3 Feb** Coventry ARS: Night on the air, and Morse tuition.  
Taunton DARC: Radio Quiz — details from Peter GOEYR on 0823 275972. County Hall, Taunton, Emergency Planning HQ.
- 6 Feb** Basingstoke ARC: Packet Radio by G1WKK (provisional). Forest Ring Community Centre, Sycamore Way, Winklebury. 7.30pm.  
Stourbridge DARS: Natter night.
- 7 Feb** Worksop ARS: Natter night.
- 8 Feb** Hornsea RC: Telegraphic Communication by G4IGY. The Mill, Atwick Road, Hornsea. 8pm.  
Norfolk ARC: Mast planning problems by Chas Matthews G8NXU of the RSGB Planning Panel.  
South Bristol ARC: CW Activity evening.
- 9 Feb** Edgware DRS: Smith charts. Watling Community Centre, 145 Orange Hill Rd, Burnt Oak, Edgware.  
Southgate ARC: Quiz evening by G4UKR.
- 10 Feb** Coventry ARS: Quiz night. Baden Powell House, 121 St. Nicholas Road, Radford, Coventry. 7.30pm.  
Loughton DARS: Power Supplies Revisited by John Ray G8DZH.  
Mansfield ARS: To be confirmed.  
Wimbledon DARS: Bring and Buy Book Sale. 8.30pm. St. Andrews Church Hall.
- 14 Feb** Delyn RC: Valentines Night. Daniel Owen Centre, Mold.  
Worksop ARS: Junk sale. Contact Sec. G4ZUM (0909) 486614 for details.
- 15 Feb** Derby DARS: to be announced.  
Hornsea RC: 5Z4 Kenya by G1TFT. The Mill, Atwick Road, Hornsea. 8pm.  
Norfolk ARC: Informal meeting.  
South Bristol ARC: Wine and DX Meats evening (it says here). Whitchurch Folk House, East Dundry Road, Whitchurch, Bristol.
- 16 Feb** S E Kent YMCA ARC: Natter night.
- 17 Feb** Coventry ARS: Night on the air and Morse tuition.  
Taunton DARC: Talk by member of the First Class Operators Club. County Hall Taunton, Emergency Planning HQ.
- 20 Feb** Dragon ARC/ARC DDraig: Video evening. Four Crosses, Pentraeth Rd, Menai Bridge. 7.30pm.  
Stourbridge DARS: Constructors Competition.  
Robin Woods Centre, Beauty Bank, Stourbridge.
- 21 Feb** Worksop ARS: Natter night.
- 22 Feb** Derby DARC: Vintage railways films — GOFVU. 119 Green Lane, Derby. 7.30pm.  
Hornsea RC: Natter night.  
Norfolk ARC: 38 Years with Air Traffic Control by John Stephens G8LGB. The Norfolk Dumpling, Livestock Market, Harford, Norwich, 7.30pm.  
S Bristol ARC: 2m activity evening. Whitchurch Folk House, E. Bundry Rd, Whitchurch, Bristol.
- 23 Feb** S E Kent YMCA ARC: Construction contest.
- 24 Feb** Dover YMCA, Godwynehurst, Leyburne Rd, Dover.  
Southgate ARC: Club meeting, Holy Trinity Church Hall, Winchmore Hill, London N21. 7.45pm.
- Coventry ARS: The indoor direction finding contest (cup qualifier), Baden Powell House, 121 St. Nicholas St., Redford, Coventry. 7.30pm.  
Mansfield ARS: Open forum.  
Wimbledon DARS: Antenna Matching Units by Alan Bartle G6HC. St. Andrews Church Hall, Herbert Rd., Wimbledon, London SW19. 7.30pm.
- 25 Feb** Loughton DARS: 6 metre night on the air using club callsign G4ONP. Room 20, Loughton Hall. 7.45pm.  
**Bredhurst Receiving and Transmitting Society: The Rainham Radio Rally will be held on Saturday, February 25, from 10am. Talk in by GB4RRR on 2m and 70cm. Traders, bring and buy, snacks, bar and hot drinks. Parkwood Community Centre, Deanwood Drive, Rainham, Gillingham, Kent. Near M2 Junction 4. Free parking. Entrance 50p. Contact G1LKE on 0634 362154 for information.**
- 28 Feb** Delyn RC: Open night. A chance to discuss the forthcoming AGM. Daniel Owen Centre, Mold.  
Worksop ARS: Official Club Meeting.
- 1 Mar** Darby DARC: Official Club Meeting.  
Hornsea RC: SWR by G3TEU.  
S E Kent YMCA ARC: Natter night.  
Norfolk ARC: "Any Questions?", ask the panel.
- 2 Mar** Horsham ARC: Spring Junk Sale, Guide Hall, Denne Road, Horsham. 8pm.
- 3 Mar** Coventry ARS: Night on the air, and Morse tuition.  
Taunton DARC: Talk by Eric Godfrey G3GC.
- 4 Mar** Tyneside ARS: Blue Sar Radio Rally at High Gosforth Part (Newcastle Racecourse). All the usual attractions, talk-in available. Further details from Terry (G6VEG) on 091 264 8196.
- 5 Mar** Bury Radio Society Annual Hamfeast on Sunday 5th March at the Castle Leisure Centre, Bolton St, Bury. 3 mins from M66, Talk in on S22. Food and drink. Entrance buy programme, 50p. Contact: C Mancroft G4JAG, Mosses Centre, Cecil St, Bury, Lancs.
- 6 Mar** Basingstoke ARC: Visit by RSGB RLO Trevor Emery G3KWU. Forest Ring Community Centre, Sycamore Way, Winklebury, Basingstoke. 7.30pm.  
Dragon ARC/ARC DDraig: Debate: Will the introduction of a student licence be a good thing for amateur radio!?
- 7 Mar** Stourbridge DARS: Natter night.
- 8 Mar** Worksop ARS: Natter night.  
Darby DARS: TVI, its causes and cures by Fred Ward G2CVV.

- Hornsea RC: Committee Meeting.  
 Norfolk ARC: Surplus equipment auction/bring and buy. The Norfolk Dumpling, Livestock Market, Harford, Norwich. 7pm.  
 SE Kent YMCA RCA: Ten Minute Talks. Dover YMCA, Godwynehurst, Leyburne Rd, Dover.
- 10 Mar** Coventry ARS: Members' slide/video show. Baden Powell House, 121 St. Nicholas St., Radford, Coventry. 7.30pm.  
 Loughton DARS: G3OPA Top Band DF Set construction judging night. Judge is Essex RSGB RLO Ted Whitworth G4TUO.  
 Mansfield ARS: To be confirmed.
- 14 Mar** Delyn RC: AGM.  
 Worksop ARS: Video — W5LFL lecture. Details from Sec. G4ZUN (0909) 486614.
- 15 Mar** Hornsea RC: Omega entertains by G4YTV. The Mill, Atwick Road, Hornsea. 8pm.  
 Derby DARS: to be announced.  
 Norfolk ARC: Computer aided printed circuits, Paul Sergent G4ONF. The Norfolk Dumpling, Livestock Market, Harford, Norwich. 7.30pm.  
 S. Bristol ARC: Bring and buy/junk sale.
- 16 Mar** SE Kent YMCA ARC: Natter night, committee meeting, morse tests. Dover UYMCA, Godwynehurst, Leyburne Rd, Dover.
- 17 Mar** Coventry ARS: Night on the air and Morse tuition. Baden Powell House, 121 St. Nicholas St., Radford, Coventry. 7.30pm.  
 Taunton DARC: RSGB video. County Hall, Taunton, Emergency Planning HQ.
- 19 Mar** Tiverton South East Radio Club 1989 Mid Devon Rally, at the Painter Market, Tiverton, Sunday March 19th. Easy access, minutes from junction 27 of the M5. Excellent free parking. Two halls of trade stands, bring and buy, mobile snack bar. Displays and full refreshment facilities in Club Room bar, open all day. Doors open 10am. Talk in on S22. Further information from G4TSW, Mid Devon Rally, P.O. Box 3, Tiverton, Devon.
- 19 Mar** Wythall Radio Club are holding their 4th Annual Radio Rally at Wythall Park, Silver St., Wythall, Worcs. The site has three large halls, a flea market, trade stands, a large bring and buy stand, RSGB Morse tests (subject to confirmation), bar and snacks and talk in on S22. There is free parking "and more of it this time", and the site is just off the A435 south of Birmingham. Admission is 50p. Details from Chris G0EYO on 021 430 7267.
- 20 Mar** Dragon ARC/ARC DDraig: Fifty years of amateur radio by Ron Horrocks GW2FLP. Four Crosses, Pentraeth Rd. Menai Bridge. 7.30pm.  
 Stourbridge DARS: Annual general meeting. Robin Woods Centre, Beauty Bank, Stourbridge.
- 21 Mar** Worksop ARS: Natter night.
- 22 Mar** Hornsea RC: Computer operating systems by Simon SWL. The Mill, Atwick Raod, Hornsea. 8pm.  
 Derby DARC: AGM. 119 Green Lane, Derby. 7.30pm.  
 Norfolk ARC: The Shefford Club Project 2m DC XCVR, Dick Bacon G8LGB. The Norfolk Dumpling, Livestock Market, Harford, Norwich. 7.30pm.  
 S. Bristol ARC: Easter activity evening.  
 Whitchurch Folk Club, E. Bundry Rd, Whitchurch, Bristol.
- 23 Mar** SE Kent YMCA ARC: Construction contest. Dover YMCA, Godwynehurst, Leyburne Rd, Dover.



"I'M EXPECTING A CALL FROM MOTHER."

- 24 Mar** Coventry ARS: Talk from the British Amateur Television Club (provis).  
 Mansfield ARS: Foxhunt.
- 26 Mar** Cunnigham DARC: Mobile Rally to be held at the Magnum Leisure Centre in Irvine (the site of the Scottish National Convention in 1987). New annual rally, 10.30am onwards. Leisure centre facilities available for non-amateur family members. More information from Bob Lowe GMOECU, 2 Craigie Place, Crosshouse, Ayrshire KA2 0JR.
- 28 Mar** Delyn RC: RSGB film or video. Daniel Owen Centre, Mold.  
 Worksop ARS: Astronomy by Kevin G4MDQ. Details from Sec. G4ZUN (0909) 486614.
- 29 Mar** Cambridgeshire Repeater Group: 7th Annual Junk Sale Rally Extravaganza to be held at the Philips RCS (Pye Telecom) Canteen, St. Andrews Road, Chesterton, Cambridge from 10.30am. Trade stands and monster junk auction, nearly new bring-and-buy. Refreshments and ample car free parking. Talk-in on S22 and RB14 (GB3PY) by G5PI. All proceeds to finance the six local repeaters operated by the Group. Enquiries to G0DAH, tel 09547 405 after 6pm.  
 Hornsea RC: Natter night.  
 Norfolk ARC: Informal and committee meeting.  
 S. Bristol ARC: Hand held rig meet. Whitchurch Folk House, E. Brundry Rd, Whitchurch, Bristol.
- 30 Mar** SE Kent YMCA RCA: Natter night.
- 31 Mar** Coventry ARS: Night on the air, and Morse tuition. Baden Powell House, 121 St. Nicholas St., Radford, Coventry.

We need your dates at least three calendar months in advance to get them into the nearest issue. For example: the last possible issue for dates from mid-August to mid-September is the September issue. The September issue normally appears on the first Friday in August, and we need club dates by the second Friday in June. Club dates received four months in advance will normally be run in two issues. We don't run full meeting place details with every entry, but if you scan the columns you will find details under one or more entries.

# Free Readers Ads!

## FOR SALE

**YAESU FT757GX**, excellent transceiver; also FT902DM, all options FM, AM, SSB, FSK, superb machine, ERA Micro-reader, Ritty & CW including CW Tutor Rtty, Data CW, scrolls across screen. Wanted quantity ATU IC Kenwood, KW or FL 102. — 0704 880345.

**YAESU FT7B** Mobile solid state HF transceiver, 80 to 10 metre bands, USB/LSB, AM/CW power cable, microphone, plus manual, nice condition, offers around £310. — 01-390 0514.

**FOR SALE**, Crotech 3132, dual trace scope £300; or nearest offer. Write to — C. T. Bamber, "Rozel", Maespica Road, Lower Cumtwrch, Swansea SA9 2PP.

**YAESU FT100B** Transceiver, near mint condition, spare PA valves, handbook and dust-cover, £300. — Tony 0608 811102 (Oxfordshire).

**EXCHANGE BEARCAT** Scanner UBX 175XL, value about £130, for good digital Comm Rx or BBC Computer, cash adjustment as required. After G3JXR. — Tel. 0908 642398.

**TS440S** Transceiver with internal auto antenna tuner, 1.8kHz SSB and 500kHz CW, filter options and VS1 voice synthesizer. Unmarked and fully functional condition. — Phone John 0579 (Liskeard) 43749.

**FT290 R.R.I.A.T.B.**, FT790 Nicads charger, boxed etc, complete. 3 mobile mounts, Tonna 19X Jaybeam 10XY plus poles, rotor, complete. Morse key HK706. Mobile antennas  $\frac{5}{8}$  wave,  $\frac{7}{8}$  waves, mobile headset, mike, channel changer wired to suit, £650 ovno. — Bedford 52725.

**EXCHANGE** 360 CB FM, ideal for 10M conversion, low, mid, super Hi, AM, FM, SSB, for any good scanning receiver with air band coverage AM, FM. — Tel. 021-788 8447.

**FOR SALE**, Intellivision games computer with paddles and full range games from golf, football, space to intelligent material, about 25 hardly used mint, £80. — Phone Barton-under-Needwood 71 3727.

**FOR SALE**, Telephone Receiver inserts 40p each, five for £1.50, Wanted Pye Pocketfone PF1 circuit diagram to buy or borrow. — Bubez, 4 Southway, Burgess Hill, W. Sussex RH15 9ST.

**FOR SALE**, Standard C58 2 mtr Multimode portable, plus 25 watt Linear mobile mounting bracket and slide mount,  $2\frac{1}{4}$  wave and  $1\frac{1}{2}$  wave Whip antennas, three sets spare Nicads includes original boxes; or exchange for W.H.Y. — G4XPP QTHR.

**SALE**, Icom IC275E 2M multimode 25W £875 ono. TNC 220 packet radio modem with VHF and HF ports £100. — Ring Peter G4HQX, 0453 48808.

**SALE**, Icom 251E 2M multimode with Mutek board £380 ono. Heatherlite 2M Explorer linear amplifier £420 ono. Philips D6350 variable-speed cassette recorder £25; Marconi HF-amplifier 400W £110; 9MHz crystal filters, SSB & CW £16. Bits for high-power ATUs. — Ring G3ILO 0453 83 3411.

**BELCOM** 144MHz linear 2 SSB Rx Tx VXO Rit mic lead 144.100-144.330 channelled readout with fitted pre-amp, ideal cheap second mobile rig, 12v DC, buyer to inspect and collect; must sell, surplus, no reasonable offer refused; also Alan K350-B 40 ch AM 27MHz Tx Rx, any offers? Wanted, R2000 with VHF, sorry no phone, all letters acknowledged. — S. P. Martin, 24 Collingwood Close, Worle, W-S-Mare, Avon BS22 9PQ.

**THREE** month old Sony Pro 80 converter power pack AN1 active and FM antenna, swop for general coverage receiver or good shortwave receiver, Sony Panasonic or similar. — Stephenson (0946), Harrington 831517, Cumbria. **SUPERSTAR** 360 FM, 26.95-28.30MHz £80; Avanti PDL-2 quad antenna and rotor £75; half wave silver rod £10; above suitable for 10M conversions, Trio 9R-59D receiver 0.55-30MHz £85, 42M heavy duty co-ax (RG-8 similar) £20; Heath kit valve oscilloscope £25. — Martin 021 744-8322.

**FOR SALE**, AMT-2 with BBC ROM for RTTY, CW, Amtor, ASCII, £130 ono; also Zetagi B100VHF linear for 2 metres, 15 watts in, 100 watts out, vgc; £60 ono. — Tel. Derek (04312) 242.

**FOR SALE**, Cobra 148 GTL some mods £100; Superstar 2000 £100 ovno; Ranger 3600 LSB/USB FM/AM/CW 25 watts/SSB 8 watts FM. WANTED: Aerial suitable for scanner receiver. — Phone 0283221870.

**REALISTIC PRO** 2021 VHF/UHF scanner, boxed, £90; exchange for 70cm linear or crossed Yagi. — G6BFP (0753) 824840.

**TRIO/KENWOODR-2000** Rcvr, 7 hours old, absolutely pristine condition, cost £595. Sale sadly due to bereavement. Manufacturer's guarantee. Will accept £450. Price includes Securicor delivery if required. View Weston-super-Mare. — Tel. 0253 822846 for further details.

**LOOK!** Sait MR1410 multimode receiver 0.1-30MHz, 10Hz resolution, service manual, super receiver now needs slight attention, originally £1000+. Nato 2000 11M transceiver for conversion with K40 processor, transformer etc. Offers/W.H.Y? Student desperate to get cerv. — G1YSB London 790 3813.

**D100 DX-TV** converter £60; Yoko  $5\frac{1}{2}$ " mono TV for DX-TV £65; Yaesu SP-102 speaker £45; Yaesu FRT-7700 HF receive ATU £40; Datong DC144/28 converter £25; Alinco EMR-4000 rotator £60; Daiwa 4-way BNC co-ax switch £15. — G6IAT, QTHR, Luton 0582-23750.

**AR 2002** Scanner, boxed, mint condition, Diamond D130 antenna, £400. — Sheffield 0742 887210, anytime.

**FOR SALE**, Oscillator Hewlett Packard 180A/AR 50MHz, dual channel £150 ono. — Phone after 6pm, 031 668 3451.

**FOR SALE**, FT290, soft case, nicads, mobile bracket, headset, plus boom mike; vgc; no mods or mutek, £260 ono. — Phone Ray 0277 625649, after 7pm.

**CT100** RTTY terminal unit and CT300 VDU unit, £40; Exchange for rotator Wayne Kerr B641 auto balance universal bridge £30; service scope type S32 £30; all plus postage. — Blake, 10 Meadow Way, Didcot DX11 OAM, 0235 816947.

**ST5MC** Bartg built plus TX3 prog for CBM64, works with computer or machine or both; complete with leads and I/face for C64; £82.50 includes postage. — G4SNC not QTHR. Tel. (05047) 66151.

**EXCHANGE:** I have complete course of Rapid Results College Study at Home for the radio amateurs licence; I also have Ham Radio Today Morse Course Two tapes with instructions why to with short wave radio. — 0903 762624.

**POWER UNITS**, new parallel inputs stepped 0 to 300V $\mu$  outputs 0 to 110V $\mu$  3 amps, 25-0-25V $\mu$  LOA,DC; 2 stud rectifiers 70 amp on large heat-sinks 3x34,000 $\mu$ F 50V wkg with bus bars on steel chassis DC=37V unreg, ideal for linear, £100 each. — 076387 378, evenings only.

**YAESU FT709R** 70cms hand-held FNB4 nicad case, original packing (mint) £150 ovno; Kenwood HC-10 digital 'world clock', mint, £50; Jaybeam D15 23cms Yagi (new unused), £35. — Phone Paul G4XHF (0293) 515201.

**SOMMERKAMPTS 788DX** mobile transceiver 26-30MHz, all modes, 90W output, frequency readout, speaker/microphone incorporating freq, vol and Rit adjustment, boxed, bracket, manual, excellent condition; £200 ono; 3-ele Yagi £25; Kopek rotator £25. — Peter 20/2, 10 Red Road Court, Glasgow G21 4PF.

**GRUNDIG** Satellit 3000 18-band SW/FM receiver, hardly used, cost over £4000, digital tuning with LED display in red, mains or battery, super bargain, offers over £50, must be worth more, even for parts. — Bournemouth (0202) 427863.

**FOR SALE**, a pair of valves, 6146, price £13. — Please phone GW0 DLA at 0443/436655.

**S.E.M. TRANSMATCH** with Ezitune, 4 months old, £65; Welz SWR meter, 1.8-160MHz, 1KW rated, £50; YP150Z dummy load wattmeter £50. Shack reorganisation; all in first class condition, would consider exchange 2M or 20cm gear, W.H.Y. — Newton 061 624 2808.

**FOR SALE**, FT102 FV102DM, £625 ono; magnetic loop antenna £180 ono; Altron minibeam £100 ono; Pye receiver with triple 4 teleprinter £100 ono; All in excellent working order. — Telephone 0602 307004, Mick.

**EDDYSTONE** Communications receiver model 730/4, 480kHz to 30MHz, diagrams, manual and some spares, good working order, £125 ono. A. Gaunt, 0772 617176.

**YAESU** FT480R 2 mtr multi-mode transceiver £275; Hoku-shin 3/4 wave mobile antenna with gutter mount £15; Hirschmann antenna rotator £30; Jaybeam 9-el Yagi £10; Drae 3-way antenna switch £10; GP 144w 2 mtr vertical base station antenna £30; other bits. — G1OER (0793) 692780.

**BUG-KEY** Marconi TF1313 bridge; signal generators TF144H, TF801A; Q-meter TF1245; attenuator TF1073; M voltmeter TF899; Variac; HRO; manuals for BC221, HRO, BP4, CT436 oscilloscope; 807 valves (new); vintage Wheatstone bridge; early ARRL RS6B handbooks; 50-100Kc HRO coil. — Details 0293 885701 (Sussex).

**FOR SALE**: Midland 6001, covers 26.065 to 27.855, £90 ono; also Cobra 148GTL DX £90 ono; plus York FM home base £60 ono. All suitable for conversion. — Tel. Kevin on 0224 684004.

**PYE** P.M.Q. M293 LB 68-88MHz AM 12½kHz c/s, c/p 6 watt complete mic etc, £135; MF5 AM LB 68-88MHz AM 12½kHz c/s, o/p 4 watt, £25. — 506996 Bishops Stortford, 5pm, G1NOL QTHR.

**EDDYSTONE** EA12 comms Rx, as new con, £140 ono; Eddy-stone 730/1A comm Rx, overhauled, £100 ono; Binoculars 8x24x40 £45. — Phone 699-4413, after 6pm.

**BNOS 2M** linear amp model L144-10-100, £110. — GOIMG, not QTHR. Tel: 0799-27155.

**YAESU** FT290R for sale,

complete with brand new charger unit, mike, etc, £220. — Tel, evenings, 01-422 3821.

**TRISTAR** 747 120 channel AM/FM/SSB, immaculate condition with box, original mike, instructions, etc, ideal 10M conversion, £100 ono; 2M 9 element crossed tonna £45; Sun King SU2000 VHF rotator £40 ono. Both under 12 months old. — G7AJL QTHR. Tel. 0926 29719, after 5pm please.

**FOR SALE**: IC02E VHF hand portable, as new, with case, charger, handbook, £180; Pye PF70UB VHF portable on 70cmx with charger and spare battery, £60. — 5 Beverley Hills, Amesbury, Wiltshire SP4 7LH. All letters answered.

**YAESU** FRG8800, absolutely mint condition, hardly used, any trial, £400, no offers. — Telephone, anytime, 01-281 2493. Buyer collects.

**FOR SALE**: AR88D manual £3; AR88D output transformer £5; 1155 Rx with circuit instructions, £20. Wanted Codar CR70A handbook; info on R9109 multiplier & PR30X preselector, 1986 on. — Tel. 0922-415078, G4HMV QTHR.

### Wanted

**WANTED**: Racal RA1772, good price. — Tel. 235 5422, Ext. 251.

**WANTED**: Mk 123 HF set, any accessories, hand generator, etc; also 128 set, R301 receiver; Larkspur MkIV Sabre; A16 (PRC316); A13 Hi-Power or Low Power. — Contact Steve 0634 64354.

**WANTED**: Yaesu FRG8800, FRV7700, FRT7700 or FRG 7700. — Tel. Wolverhampton (0902) 783299, after 5pm.

**WANTED**: Ft7B, consider FT7 or similar; would collect within 100 miles. — Phone, evenings, Walsall 25631.

**WANTED**: Crystals for CB handheld; 27.53625, 27.43625, 27.40625, 13.932125 or any in 27 and 13.9 MHz ranges. — Mark (0296) 88064, 18 Kingsland Road, Aylesbury, Bucks HP21 9SY.

**WANTED**: G.E.C. BRT400 or BRT402; If anyone has this type of receiver for sale I would be most grateful of a call QTHR in spring 1987 callback under G1TYE or — Ring Winchester 64810, after 8pm.

**WANTED**: R1155 RAF receiver and T1154 RAF transmitter, must be in good condition and unmodified; also Eddystone 640, 680, 840; also required Collins 75A4 receiver and Collins KWM-1 transceiver. — Ring Winchester 64810, after 8pm. Thank you. Graham GOIHA.

**WANTED**: Frequency converters and computer interface to match my J.I.L. SX400 scanner. — Phone John on Leicester (0533) 878562.

**WANTED**: FT707 or FT101ZD with FM, in exchange for £700 stack stereo (not midi), includes CD, amp, twin tape; record deck and Jamo CD speakers; also wanted RTTY for C16? — Bill 089272 3567 (Brenchley, Kent), after 6pm.

**WANTED**: Trio VFO 700S; also Welz SP15M power SWR meter. — Phone Ray G7/BHC, 098681 582, Suffolk.

**WANTED**: Yaesu FT7. — Please contact Norman on 0283 5271967.

**WANTED**: HRO speaker box & spares; also complete HRO, good condition B40, B62; will collect London and south. — Tel. weekends (0983) 740854, Steve.

**WANTED**: Morse Tutor Datong or other; also morse Key, must be suitable for trainee. — Phone 091 415 1550, evenings.

**WANTED**: Variometer for 19 set, power supply and amplifier unit for 38 set AFV, 6/12 point leads for 19 set; sale WWII receiver by RCA, Model RBC-1 (CRV46148) 4-27MHz with PSU, £50. — G4DVH, QTHR. Tel. 0229 54466.

**WANTED**: KW204 Tx (and or) KW2000B (range) spkr for TS520; will pay carriage costs. — 0287 34397 (daytime only).

**WANTED**: CR100, BC348, HRO and early Eddystone receivers, in good unmodified condition; good price paid; will collect; also interested in any WWII surplus radar units; W.H.Y.? — Bristow, 6 Finmere, North Lane, Bracknell, Berks RG12 4WF, 0344 425638.

**WANTED**: Early valve receivers; vintage radio equip; old valve Hi-Fi, Tannoy, Garrard, Decca, Ortofon, Lowther, Voigt etc; also rado and audio valves especially Output-Triodes; any clandestine spy-sets, spares, manuals;

anything valve possible. — Please Tel. John, 01-328 9275.

**WANTED**: Manual for reception set R107. — George Lee, 16 Greystones Drive, Ossett, West Yorkshire. Tel. Wakefield 0924 263389.

**WANTED**: SSB attachment for Grundig Satellit 2100. — (Verwood) 827369.

**WANTED**: Panasonic DR49RX with accurate readout, no mods; and prefer near mint; for cash; OAP. — Tel. Walton 244701.

**WANTED**: Sony, Panasonic or any other make of shortwave radio with SSB digital or analogue readout. — Please ring Hereford 0432-271091. Thank you.

**WANTED**: Racal 117E, in excellent working condition; also 158 adaptor, LF converter; and RA66 or RA166, all for Racal 117E. — Tel. Pat, Coventry 226252 (0203) outside Coventry.

**WANTED**: Matsui MR4099 or Sony ICF2001D, preferably with mains leads; — Write, state price and condition: K. F. Odaly, Room FO32, Freemans Hall, Castle Leazes, Newcastle NE2 4NY.

**WANTED**: IC202 2 mtr TXCVR in any condition, HF linear amp, valve or solid state HB? W.H.Y.? also wanted KW linear, working or not, dead or alive! — Phone Mike GOGPX on 022023 2369. Cash awaits! Also for old MX294 MX295.

**WANTED**: Parts for GODZU, HF linear, valve base SK800B or SK890B, Jennings vacuum variable capacitor, 500pF 5kv minimum; also transformer 1.3kva 240v primary 1100v + 1100v secondary, 1000pF 1000v lead through capacitors — Bob GMOHRT. Tel. Kilbarchan 4163, evenings.

**WANTED! Wanted!!** Mobile bracket MS1 suitable Trio TR2500/3500, h/held etc; also 10 mtr FM transverter to suit Yaesu FT480. For sale, Yaesu FT707, FC707, FP707, mint, no mods, £650. — Syd, Bursledon 4333 Std 042121. No time wasters please (must collect).

**FT107**, must be immaculate and unmodified. — Tel. Mark (0634) 30822, eves/w-ends, G4RGB QTHR.

**WANTED**: Shure Microphone model 444, good price paid. — Tel. Chesterfield 0246 236496.



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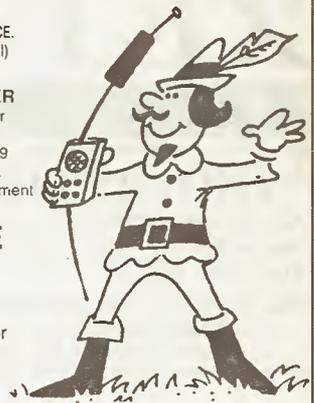
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2SA564	£0.10	2SC1213	£0.12	2SC2092	£1.41	3SK48	£2.26	BD245	£0.84
2SA608	£0.11	2SC1306	£0.74	2SC2097	£21.09	3SK88	£0.59	BD246	£0.75
2SA673	£0.13	2SC1312	£0.09	2SC2099	£19.25	3SK97	£2.08	BD292	£0.51
2SA678	£0.38	2SC1318	£0.22	2SC2166	£0.95	40673	£1.50	BF244	£0.39
2SA683	£0.20	2SC1359	£0.13	2SC2236	£0.22	BC107	£0.13	BF245	£0.29
2SA684	£0.31	2SC1384	£0.27	2SC2290	£24.55	BC108	£0.07	BFY50	£0.25
2SA699	£0.66	2SC1398	£0.60	2SC2312	£3.15	BC109	£0.14	BFY51	£0.25
2SA733	£0.13	2SC1674	£0.15	2SC2314	£0.30	BC141	£0.26	MRF237	£3.39
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2SB525	£0.25	2SC1945	£3.41	2SD234	£0.46	BC214L	£0.08	MRF455	£23.85
2SC380	£0.09	2SD1946	£12.37	2SD235	£0.41	BC238	£0.06	TIP29C	£0.26
2SC495	£0.35	2SC1947	£4.29	2SD313	£0.56	BC639	£0.12	TIP30C	£0.29
2SC536	£0.10	2SC1957	£0.66	2SD325	£0.43	BC640	£0.13	TIP31C	£0.27
2SC710	£0.11	2SC1969	£1.58	2SD330	£0.48	BD131	£0.32	TIP32C	£0.33
2SC711	£0.09	2SC1970	£1.52	2SD360	£4.26	BD132	£0.42	TIP41C	£0.35
2SC730	£0.63	2SC1971	£2.95	2SD471	£0.29	BD135	£0.22	TIP42C	£0.36
2SC828	£0.09	2SC1972	£8.25	2SD837	£0.71	BD139	£0.22	TIP120	£0.38
2SC900	£0.27	2SC1973	£0.51	2SD980	£0.41	BD140	£0.25		
2SC930	£0.17	2SC2002	£0.25	2SK192	£0.23	BD201	£0.33		

## BOOKS

Screwdrivers Guide to CB  
PLL Data Book  
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7812	£0.39	HA1392	£2.54	LC7131	£3.21	TA7051	£0.76	TA1020	£2.28
7815	£0.37	HA1394	£2.72	LC7132	£2.89	TA7120	£0.48	TA1510	£3.89
7818	£0.59	HA1397	£2.55	LC7137	£2.77	TA7130	£0.53	TA1512	£3.12
AN240	£1.28	HA1398	£2.68	LM324	£0.45	TA7204	£0.98	TA2002	£0.74
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50 watt 3R3, 5R1, 18R, 27R ..... 60p each

## PHOTO DEVICES

BPW50 Infra red photo Diode ..... 3/£1  
Slotted opto-switch OPCA OPB815 ..... £1.30  
2N5777 ..... 50p only  
Photo diode 50p ..... 6/£2  
MEL12 (Photo darlington base n/c) ..... 50p  
RPY58A LDR 50 ORP12 LDR ..... 70p  
GREEN or YELLOW 3 or 5mm 10/£1 ..... 100/£5.50  
FLASHING RED OR GREEN LED 5mm 50p ..... 100/£35  
LEDs assorted RD/GN/YW + INFRA/RED ..... 200/£5

## SUB MIN PRESETS HORIZONTAL

1K 4K7 10K 22K 47K 1M 10M ..... 15/£1 100/£5  
3/4"

## CERMET MULTI TURN PRESETS

10R 20R 100R 200R 250R 500R ..... 50p  
2K 5K 10K 22K 50K 100K 200K 2K2 2K5 47K 500K 2M2

## IC SOCKETS

6-pin 15/£1 8-pin 12/£1; 14-pin 10/£1.00; 18/20-pin 7/£1; 22/24/28 pin 4/£1 40 pin 30p

## TRIMMER CAPACITORS 5/50p

Grey larger type 2 to 25pF 5 to 50pF, 2 to 22pF Transistors 60p  
Feed Thru Ceramic Caps 1000pF ..... 10/£1

## SOLID STATE RELAYS NEW 10A 250v AC

Zero voltage switching Control voltage 8-28v DC ..... £2.50  
40A 250V AC Solid State relays ..... £18  
Miniature relays suitable for RF 5 volt coil 1 pole changeover ..... £1  
12 volt coil 1 pole changeover ..... £1

## POLYESTER/POLYCARB CAPS

1uF 100v 10mm SIEMENS block polycarb 10k available ..... 1000/£80  
1n/3n/5n/6n/2/10n 1% 63v 10mm ..... 100/£50  
2u2 160v rad 22mm ..... 100/£10  
33n/47n 250v AC X rated rad 15mm ..... 10/£1.00  
1u 600V Mixed dielectric ..... 50p ea

## STC NTC BEAD THERMISTORS

G22 220R G13 1K G23 2K G54 50K G25 200K G16 1M Res@20°C directly heated type ..... £1 each  
FS22BW NTC Bead inside end of 1" glass probe res @ 20°C 200R ..... £1.00

## BEAD TANTALUM CAPS

6UB 25V, 47U 3V, 2U2 20V, 10U 10V ..... 12/£1 100/£6

## MONOLITHIC CERAMIC CAPS

10n 50V 2.5mm ..... 100/£4.50  
100n 50v ..... 2.5mm or 5mm 100/£6  
100N 50V axial Shortleads ..... 100/£3  
100n ax long leads ..... 100/£6  
100n 50v RAD 0.3" centres ..... 100/£10

## STEPPER MOTOR 4 PHASE 2 9v WINDINGS

£3.50 ..... 10/£30

# KEYTRONICS

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P&P AS SHOWN IN BRACKETS (HEAVY ITEMS)  
65p OTHERWISE (LIGHT ITEMS)

ADD 15% VAT TO TOTAL





# The new AMR1000/S

## It checks out from every angle



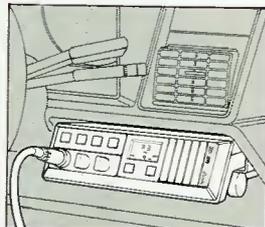
**W**hichever way you look at it, the Navico AMR1000/S sets new standards in 2m mobile transceivers.

The angled, reversible control panel, together with a range of inexpensive optional mounting brackets enables installation in any vehicle, whether under or on top of the dash, either side of a central console or even from the roof.

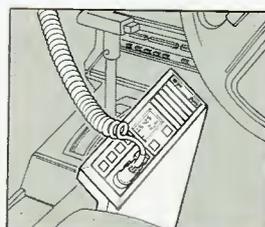
This means the display will always face you giving total access to the controls which are spaced to allow simple, safe, mobile operation. The front mounted loudspeaker will also face you, projecting the sound toward you and not at your feet or into the dashboard.

Combine this with the most sensitive and selective receiver, an audio response tailored for today's busy band and the unique, fully automatic repeater/simplex operating facilities and you have a truly remarkable mobile radio.

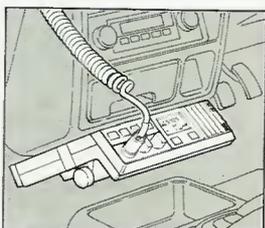
There is also a choice of models to suit your exact



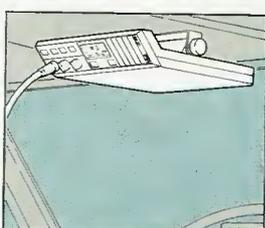
Under dash mounted (side)



Central console mounted



Under dash (central)



Roof mounted

needs. In the words of Chris Lorek of HRT about the Navico AMR1000/S "Not only does it out-perform its competition on technical grounds but it offers many very useful operating features not found on other rigs, and sells at what appears to be a very competitive price".

Check it out for yourself, prices start at just £247.25 (incl. VAT). For more details and to arrange a personal

demonstration clip the coupon today.

### PRIORITY INFORMATION REQUEST

For full details send to:

Navico, Star Lane, Margate, Kent CT9 4NP,  
United Kingdom. Telephone: 0843 290007.

Name

Address

Tel.

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