

# HAM

AN ARGUS SPECIALIST PUBLICATION

MAY 1988 £1.30

# RADIO TODAY

**SCRATCH PAD SCANNER**  
Kenwoods latest - with a built-in note-pad



**NEW YAESU 2M MOBILE ON TEST**  
Let your radio do the talking!

**UPGRADE YOUR IC202** Putting life back into an old workhorse

**FREE! INSIDE THIS ISSUE 24-page SATELLITE TV SUPPLEMENT**



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THROUGH YOUR CONTINUOUS AND VALUED CUSTOM, RAY WITHERS COMMUNICATIONS LTD. HAS MOVED AND EXPANDED TO ENABLE US TO OFFER YOU EVEN BETTER SERVICE AND PRICES - STILL WITH THE RAYCOM GUARANTEE, BEST EQUIPMENT, BEST SERVICE, BEST PRICES, BEST BACK-UP, AND PLENTY OF PARKING FACILITIES AND EASIER TO GET TO! WE NOW BOAST THE BEST CENTRAL FACILITIES IN THE COUNTRY, WHY NOT POP ALONG AND SEE THE LATEST TRANSCEIVERS, SHORTWAVE/SCANNING RECEIVERS AND ACCESSORIES? MOST OTHER PRODUCTS ADVERTISED IN THIS MAGAZINE ARE AVAILABLE AT RAYCOM, AND DON'T FORGET OUR EXCLUSIVE PRODUCTS AND MODS!

## NEW PRODUCTS

**NEW IC781**

**ICOM**



Come and see the NEW ICOM IC781 HF Professional transceiver with built in Band Scope, Auto ATU and PSU, the new KENWOOD RZ1 Mobile Scanner, the new YAESU VHF Base Station and Mobile, and the new FOX mobile Scanner . . . because of our purchasing power and overseas contacts we get the new models first! And offer the best introductory prices!

## SPECIAL OFFERS

WHILE STOCKS LAST!	NORMAL	SPECIAL
YAESU FT726 BASE STATION C/W 2MTRS	£999.00	£695.00
YAESU YD844A BASE STATION MIC 600/50K	£39.95	£19.95
YAESU FT777 5W-120W 1.6-30MHz PA UNIT	£149.00	£75.00
YAESU HORN RELAY ALARM UNIT WITH S55	£12.50	£4.50
ICOM ICA20 AIR BAND CAA APPROVED H/H	£429.00	£379.00
ICOM ICA2 AIR BAND CAA APPROVED H/H	£399.00	£279.00
KENPRO KT400EE 2W UHF H/H C/W CHARGER	£279.00	£199.00
COLOUR-ROTA 40KG ROTATOR 3 CORE CABLE	£45.00	£37.50

Please ask for our SPECIAL OFFERS LIST, USED LIST, SCANNERS LIST, and LATEST PRODUCT NEWS. Please send a large S.A.E.

## BASE STATIONS

YAESU FT767GX RWC/MK2 ALL MODE/BAND BASE STATION	£1499.00
YAESU FT767GX RWC/MK2 AS ABOVE C/W 2 OR 6 METRES	£1590.00
YAESU FT767GX RWC/MK2 MODEL WITH IMPROVED FEATURES	£895.00
YAESU FT726R MULTI-BAND MULTIMODE SPECIAL OFFER	£695.00
YAESU FT747GX NEW MULTIMODE 100W HF TRANSCEIVER	POA
NEW YAESU FT736R MULTIMODE BASE STATION C/W 2 METRES	POA
ICOM IC735 HF HIGH PERFORMANCE MINI HF TRANSCEIVER	£892.50
ICOM IC275 25W 2 METRE MULTI-FEATURE SUPERB BASE STATION	£949.00
ICOM IC575 10W/10 & 6 METRE ALL MODE SUPERB BASE STATION	£949.00

CALL FOR BEST PRICES ON OTHER ICOM AND YAESU BASE STATIONS.

## YAESU

**FT 767 GX RWC MK2**

**YAESU**



Raycom offer our own improved version of this fabulous HF-UHF transceiver, we fit a small SMD chip component mod board in the VCO to improve the RX dynamic range by up to 20dB, FOC when purchased new from us. If you are lucky enough to own the FT767 already, send your unit + £59.50 and we will fit it for you! (inc. return carriage). Also available at some Yaesu dealers. **SEE REVIEWS FOR DETAILS OF THIS ACCLAIMED MODIFICATION.**

## ANTENNAS & ACCESSORIES

NOW AVAILABLE AT RAYCOM: CUSCRAFT, BUTTERNUT, HY-GAIN ANTENNAS, JAYBEAM, TONNA, MET, HAM-M ROTATORS, Call for full details, prices, availability and delivery costs.

ICOM AH7000 SUPER 250-1300MHz DISCONE £79.50  
 G5RV HALF SIZE HF ANTENNA ready to use £16.50  
 G5RV FULL SIZE HF ANTENNA ready to use £18.50  
 G8KW-TYPE 7.1MHz TRAP DIPOLE KIT SO239 £24.50  
 G8KW-TYPE as above for use with 300 OHM £23.50  
 G8KW-TYPE 2X 7.1 TRAPS ONLY. LESS CABLE £9.95  
 RAYCOM AIRBAND-VHF SIX ELEMENT DISCONE £12.50  
 RAYCOM DISCONE VHF 60-600MHz 8E.80239 £29.50  
 SUN KG209 SE2M 5/8 MOBILE TILT-OVER 259 £14.50  
 RAYCOM CAST GUTTERMOUNT C/W SO239/COAX £8.50  
 GAMMA TWIN 2 METRE SLIM JIM KIT inc. instr. £14.50  
 RAYCOM/RWC HB9CV 2 METRE 2E MINI BEAM £12.50  
 RAYCOM/RWC HB9CV 70CM 2E MINI BEAM £8.95

The above popular products POST FREE.  
 (UK mainland only)

## SCANNERS

### BEARCAR BY UNIDEN



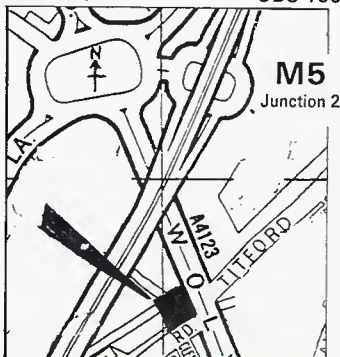
**UBC 175XL**



**UBC 100XL**

RAYCOM ARE TRADE AND RETAIL DISTRIBUTORS FOR THIS SUPERB RANGE OF QUALITY SCANNERS. THE POPULAR UBC 100XL HAND HELD HAS SOLD IN THOUSANDS, BUT IS NOW COMPLEMENTED BY THE UBC 70XL POCKET SIZED HANDHELD. ALSO THE NEW COST EFFECTIVE UBC 50XL HANDHELD. SEE THE NEW MODELS IN OUR SHOWROOMS OR SEND A S.A.E. FOR DETAILS.

FROM £99.50



## SCANNERS

YAESU FRG9600 from the company who specialises in fitting extra options, as supplied to Government departments and professional bodies. We also upgrade existing models, please call for more details, prices, delivery and information.

Yaesu FRG9600 Basic Model Improved 'S' Meter + Sens. £465.00  
 Yaesu FRG9600/RWC MK2 60-950MHz 'N' Connector Fitted £495.00  
 Yaesu FRG9600/RWC MK3 HF 100kHz-950MHz plus Mk2 Spec. £695.00  
 Yaesu FRG9600/RWC Mk5 HF 100kHz-950MHz Active Mixer £625.00  
 Icom ICR7000 25M-2GHz superb quality professional Rx £859.00  
 Icom ICR7000/AH7000 Receiver plus Matching Discone £937.50  
 Kenwood R2 1 New 25-950MHz Mobile. Wide and Narrow AM/FM POA  
 Fox VHF-UHF Multi Function Mobile Scanner FM only £139.00  
 Uniden-Bearcat UBC 50XL VHF-UHF 10ch. H/held Scanner £99.50  
 Uniden-Bearcat UBC 70XL VHF-UHF 20ch. Miniature H/held £199.00  
 Uniden-Bearcat UBC 100XL VHF-UHF-Airband H/held Scanner £189.00  
 Uniden-Bearcat UBC 175XL VHF-UHF-Airband Desk-Top £175.00  
 BJ200 Mk2 VHF-UHF-Airband-Military Airband H/held £220.00  
 AOR 2002 25-550, 800-1300MHz Desk-Top/Mobile AM/FM £469.00  
 Sony Air 7 Top Quality VHF-Airband Handheld Scanner £245.00  
 Package deal on above Mk3/5 FRG9600 c/w AH7000 discone, G5RV, PA4 AC PSU, complete receiving station HF-UHF including delivery UK mainland. Add £100.00 to above price.  
 PACKAGE DEAL AVAILABLE ON ALL MAKES.

### SHORT WAVE RECEIVERS

Yaesu FRG8800 Short Wave 100kHz-30MHz All Mode + Mem. £589.00  
 Yaesu FRG8800/FRV8800 as above with VHF Conv. fitted £679.00  
 Icom ICR7 HF Top Grade Communications Receiver £799.00  
 Sony PRO80 HF/VHF Handheld Scanner c/w accessories £345.00  
 Sony 2001D Short Wave/Airband DEI IIFX RX with ANI kit £395.00

Many more makes and models in stock, PLEASE CALL FOR PRICES. DELIVERY COSTS and any advice or information, or send large SAE. (Insured post and packing £10.00. Carrier £12.50).

**SONY. RAYCOM** now appointed official Sony dealers, full range of both professional and domestic models available to order.

## HANDHELDS

\* = Extended Receiver coverage available, call for details.

YAESU FT727R/FNB4A 2.5W (5W) DUAL BANDER. C/W CHRGR £395.00  
 \*YAESU FT23R/FNB10 2.5W (5W) 2MTRS C/W CHARGER £249.00  
 \*YAESU FT73R/FNB10 2.5W (5W) 70CM C/W CHARGER £259.00  
 \*ICOM MICRO 2E 2.5W 2MTR HANDHELD WITH CHARGER £209.00  
 CTE1600 (SAME AS ICOM IC2E) C/W NICAD CHARGER £179.00

Many other types of handheld stocked, please enquire.

## PORTABLES

FT290RMK2 2.5W MULTIMODE STANDARD ACCESSORIES £399.00  
 FT290RMK2 2.5 WATT M/M AS ABOVE C/W NICADS CHRGR £425.00  
 FT290RMK2/FL2025 (STD) WITH 25W LINEAR AMPLIFIER £489.00  
 FT690RMK2 6MTR 2.5W MULTIMODE STANDARD ACCES. £399.00  
 FT690RMK2 6MTR 2.5W M/M AS ABOVE C/W NICADS CH. £425.00  
 FT790RMK2 NEW 70CM 2.5W MULTIMODE DUE OUT SOON £499.00

## MOBILES

YAESU FT211RH 45W 2MTR MOBILE WITH FREE 1/4 WAVE ANT £299.00  
 YAESU FT212RH NEW 45W 2MTR MOBILE DVS FEATURE OPT. £349.00  
 \*ICOM IC28E 2MTR 25W MOBILE WITH FREE 5/8 ANTENNA £359.00  
 Alinco Dual Band ALD-24E £489.00  
 ICOM IC48E 70cm 25W £428.00  
 ICOM IC3200 Dual Band 25W £499.00

Compare our prices!

Many other types and makes stocked, please enquire.

Opening hours 9am-5.30pm 6 days, late nights Thursday & Friday till 7pm.



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# HAM RADIO CONTENTS

## TODAY

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# ICOM

## IC-4GE 70cm FM Handportable



The IC-4GE is the first in a line of new handportables to be announced from ICOM. The small compact style provides easy operating and rugged durability. Other models for 2mtrs and 23cm will be released later this year.

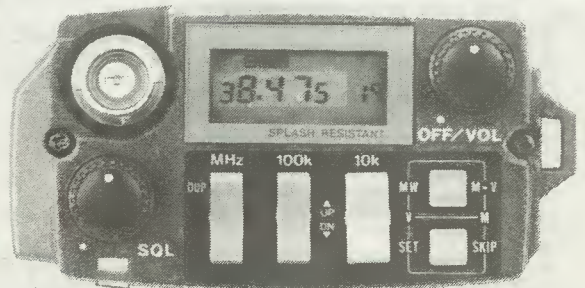
A full 6 watts of RF power is available when using the IC-4GE with the option IC-BP7 nicad pack. The IC-4GE is equipped with a total of 20 memory channels. Each memory can independently memorise frequency, offset direction and frequency.

All circuits are designed using low power dissipation techniques to create a special power save circuit in the transceiver. The power saver circuit functions if no signal is received or no switch operation is performed for more than 30 seconds. In addition, the power saver circuit can be turned off for packet communications.

Two different scans, programmed scan and memory scan are provided and in addition memory skip channels can be programmed to skip selected memory channels during memory scanning operating. The squelch monitor function allows you to monitor weak signals without having to adjust the squelch control. The high impact case is splash resistant by the inclusion of rubber gaskets. The IC-4GE is supplied with a IC-BP3 nicad battery pack, flexible antenna, AC wall charger, belt clip and wrist strap. It is compatible with many of the existing accessories for ICOM's IC-2/4 and IC-02/04 series of handportables.

Also available for the IC-4GE is a large range of optional accessories including a variety of rechargeable nicad power packs, dry cell battery pack, desk charger, headset and boom mics and new slimline speaker mics. For more information on the IC-4GE or any other ICOM handportable contact your local ICOM dealer or ICOM (UK) LTD.

◀ Actual Size ▶



**Icom (UK) Ltd.**

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

# Count on us!



## IC-575, 28/50MHz Dual band multimode.

The ICOM IC-575 base station has been developed to meet the demand for advanced communications for the recently acquired 6m band. Similar in appearance to the IC-275/475 2m and 70cm base stations, the beauty of this new transceiver from ICOM is that it gives you the best of both worlds, 6 & 10m in one compact unit. The IC-575 covers 28-30Mhz and 50-54Mhz.

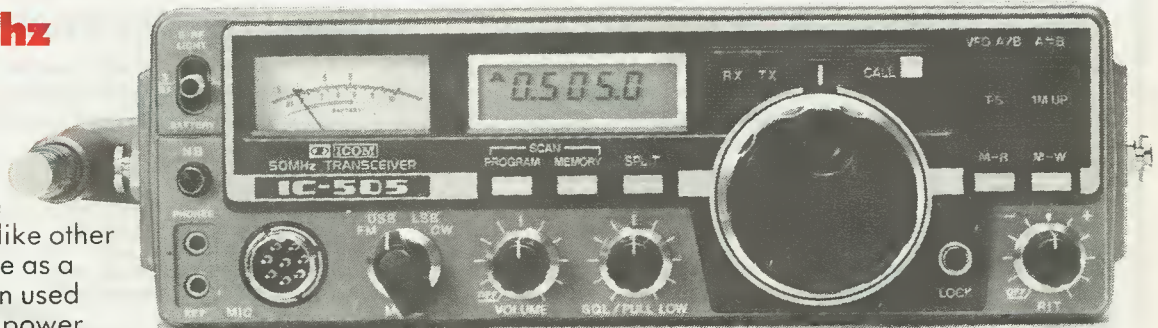
Operating modes are SSB, CW, AM & FM. Power output is 10 watts (AM 4 watts) with a front panel control to reduce output for QRP operations. A pass band tuning circuit narrows the I.F. passband width, eliminating signal in the passband. A built-in notch filter eliminates beat signals with sharp attenuation characteristics.

Some PLL systems have difficulty meeting the lockup time demands placed on them by new data communications. This is why ICOM developed the DDS (Direct Digital Synthesizer) method. With a lockup time of just 5msec the DDS method allows the IC-575 to handle data communications such as packet or AMTOR. 99 programmable memories can store frequency, mode, offset frequency and direction. A total of four scanning functions for easy access to a wide range of frequencies, memory scan, programmed scan, selected mode memory scan and lock out scan. The IC-575 has an internal A.C. power supply, but can also be used on 13.8v DC for mobile or portable operation.

Optional accessories available are the UT36 voice synthesizer, the IC-FL83 CW narrow filter, SM7 external loudspeaker, HP2 communication headphones and SM8/SM10 desk microphones. Other transceivers available in this range are: IC-275E 2m multimode 25w, IC-275H 2m multimode 100w, IC-475E 70cm multimode 25w, IC-475H 70cm multimode 75w.

## IC-505, 50Mhz Transceiver

The IC-505 is a 6mtr BAND SSB, CW, FM (Optional) transceiver. It can be used as a portable or like other transceivers of this type as a base station unit. When used with an external 13.8v power supply the 505 gives 10 watts RF output, 3 watts or 0.5 watts on low power is available when using internal batteries. Other features include 5 memories with memory scan, program band scan, dual VFO's with split operation.



The easy-to-read LCD readout includes frequency, memory scan and call modes. Full metering of battery condition signal strength and power output is provided. When fitted with the optional EX248 FM unit the IC-505 offers 50MHz operation at an affordable price.

**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.

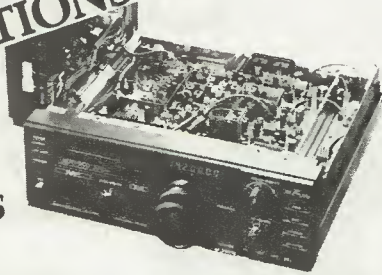
**Datapost:** Despatch on same day whenever possible.

**Access & Barclaycard:** Telephone orders taken by our mail order dept, instant credit & interest-free H.P.



# ARE COMMUNICATIONS

**TS-140S  
+ SIX METRES  
= TS-680S!**



160m to 10m. Including the 6 metre band. The new Kenwood TS-680S Transceiver is a full feature HF multimode transceiver, with a frequency range of 1.8-56 MHz. Not only does it include the new 6m Amateur band, it also has a general coverage receiver, 100 watts output between 1.8 and 30 MHz and 10 watts output on 6m. All this! And it is only the size of the old TS-440S!

Available now. Price Phone! including 6 metres.  
COMPARE PRICES WITH OTHER 'IMPORTERS'!

## JST 125T from the Japan Radio Company

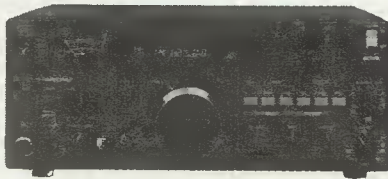
Now available ex-stock. The Fabulous JST 125T transceiver. 1.8 to 30 MHz including general coverage receiver, the JST 125T offers high performance in both operation and build quality. We are pleased to announce that the superb range of JRC equipment is now available from stock. Contact us now.

SAE for Colour leaflet.

JST 125T from £1,395.00.

Special offer during April.

Free JRC Deluxe Headphones and Base microphone worth over £150.00!



## New Yaesu FT23R/FT73R Handhelds

Every so often, the 'Big Three' YAESU, ICOM and KENWOOD produce a product out of the ordinary. Without question, Yaesu seem to produce more winners than the others, and the latest Handhelds, the FT23R/FT73R are no exception.

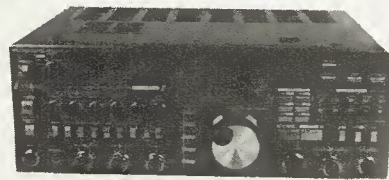
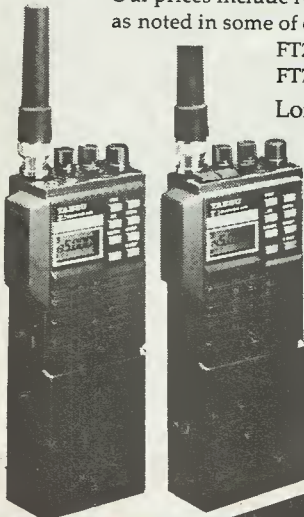
A.R.E. have purchased large quantities to ensure the very best deals.

Our prices include Nicads/Charger and are not 'hidden extras' as noted in some of our competitors' advertising.

FT23R 2m c/w FNB10/NC28C only £249

FT73R 70cm c/w FNB10/NC28C only £259

London: 01-997 4476



## Yaesu FT736R

At last! Yaesu have decided that their VHF/UHF reigning champion, the FT 726R, should be replaced. The new FT 736R has so many advanced features, it would probably take two pages of advertising to list them all! As usual A.R.E. can offer this superb piece of equipment, covering 6m, 2m, 70cm and 23cm Amateur Bands at a huge saving over list price. Please phone for your own special A.R.E. super deal.

## The FT747GX HF "Economy" Transceiver

Fully compatible with all FT757GX accessories. The new FT747GX is a real winner! Just look at the features:

- 160-10M HF Transceiver
- General Coverage Receiver
- All Mode \*INCLUDING FM FITTED\*
- 0-100W Output (25W AM Carrier)
- Computer Control Display
- Large Clear LCD Display
- Simple Operation

In stock now at only £659.00 inc. VAT



## The New Yaesu FT767GX M

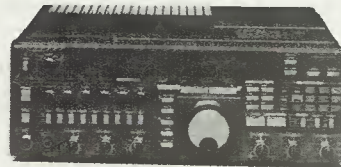
All HF + 2m/6m/70cm + Gen Cov. Multimode, Semi-duplex, Keyer, Tracking 2 VFO's Ten memories, Notch/IF shift, Audio peak Filter, CW filter etc, etc.

Odds are you have seen one or worked someone using one, either on HF or 2m/6m/70cm. The new FT767GX M. We're so impressed, all the licensed operators at A.R.E. have one! We believe we have probably supplied more FT767GX M's than any other retailer. WHY? Our unprintable part-exchange or cash prices - that's why!

Phone now for your special A.R.E. super deal. SAE for colour leaflet.

Plus 2m or 6m module worth £169 fitted Free!

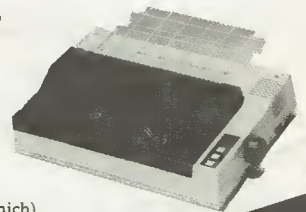
NOW AVAILABLE WITH A.R.E. MODS IMPROVING SYNTHESIZER PERFORMANCE!



## Copal SC-1500 Printer

A.R.E. have at last been able to secure a shipment of these superbly built 9 pin DOT Matrix printers. Features include:

- 9 pin superb Draft or NLQ Quality
- 180cps in Draft mode (THAT'S FAST!!)
- 80 Column, parallel.
- Epson or IBM/Amstrad Compatible (specify which).
- Ideal for use with PAKRATT PK-232.
- 1 Year Parts & Labour Warranty.
- LOW PRICE ONLY £172.95 incl. VAT
- Printer cable (for IBM/Amstrad) £14.95.
- Available NOW!



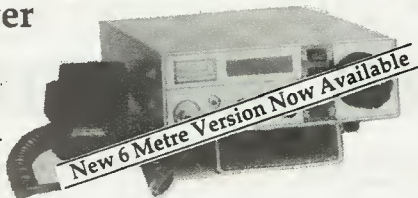
# The A.R.E. History Lesson.

## DID YOU KNOW?

That A.R.E. has been established for almost 12 years. The business started in a small shop somewhere in the depths of Ealing, West London, owned by Bernie & Brenda. (Bernie is the one with glasses).

## Tokyo Hy-Power HT-100 HF Single banders

Now available from A.R.E. on an exclusive basis, the new HT-100 series of ssb/cw transceivers. Only fractionally larger than a 2m mobile, the HT-100 is the ideal transceiver for operating in the car or at home. Available on 80/40/20/15 or 10 metres, the HT-100 would make an ideal QRP station or as a prime mover for transverting or driving a linear amplifier. Available now at only £299.00.



## WAR ON 6 METRE PRICES!!

In time for the fantastic 6 metre openings. A.R.E. have yet again **SLASHED PRICES** on the NEW Yaesu FT690R mkII. Our massive bulk buying guarantees you the very best in prices and immediate delivery.

- A new boxed FT690R 6M Multimode Transceiver only £349.00!! (List £399.00).
- Or, supplied with a 15 Watt (Minimum) Linear Amplifier for only £375.00. (List £429.00).



## AMATEUR RADIO + COMPUTERS = PACKET RADIO

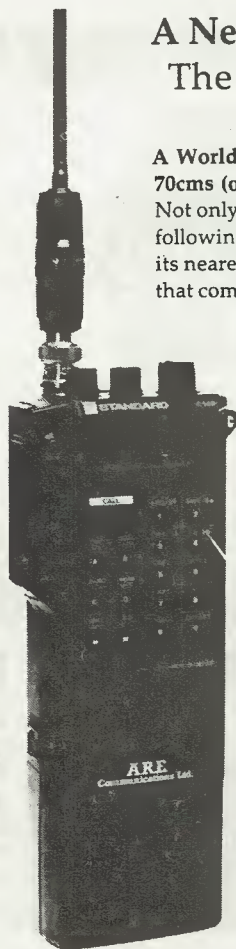
an ideal combination!

Whether an experienced user of computers or one who wants to learn, Packet Radio and your home computer make an ideal introduction. Just tune into 144.650 and hear the endless activity or 14.100 for rare dx. Save messages for other users on "mailbox", have multi-way QSO's, or hop from station to station using "Digipeat" facility. All that is required is a "TNC", (terminal node controller), a computer (BBC, SINCLAIR, IBM PC, AMSTRAD, COMMODORE etc.), simple connecting cables and some software. The top of the range is the AEA PK-232 PAKRATT, 6 mode RTTY, AMTOR, PACKET, CW MORSE and FAX. Supplied with all interface cables necessary to get you going. You have never experienced a communication terminal like this! Only £268.95 (Software extra). A.R.E. can also supply the full range of AMSTRAD 1512/1640 and PCW computers. **PHONE OR WRITE YOUR ORDER THROUGH TODAY.**  
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**A World First. Transmit on 2 metres and receive on 70cms (or visa-versa) at exactly the same time.**

Not only is that unique from a Handie, but with the following specification and at a fraction of the size of its nearest competitor, is there really any other rig that compares?



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- 5 watts output on both bands (With optional CNB120).
- Dual synthesised VFO's.
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- Reverse Repeater facility.
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Another major aspect of the old A.R.E. days was the incredible range of "Part-Exchange" equipment available. Over the last year, we have been designing a system for the placement of your used and unwanted amateur equipment. We already know that a lot of Radio Amateurs prefer to use our facilities for selling or buying equipment. It is much faster (and safer) than using the small AD's in magazines. It is called the A.R.E. Mailbox. The way it works is very simple. It employs a powerful database programme that can store thousands of customers requiring either information on new products, latest lists of second hand equipment, the latest discount prices available, (guaranteeing your minimum price required), arrange collection and delivery, sometimes within 1 week of you giving us your details! (We have been known to place equipment for sale/wanted within the same day!!)

If you would like further details of the A.R.E. Mailbox, contact me today and I'll send you information by return. Better still, include a list of equipment or accessories for sale or required and I'll contact you even quicker!!

73's Martin G4HKS

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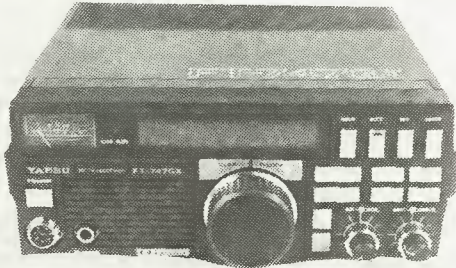




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## FANTASTIC PERFORMANCE, FANTASTIC PRICE



FM UNIT ..... £39.99  
 MMB38 ..... £22.00  
 TCXO-747 ..... £28.95

The FT-747GX is a compact SSB/CW/AM and (optionally) FM transceiver providing 100 watts of PEP output on all HF amateur bands, and general coverage reception continuously from 100 kHz to 30 MHz.

A front panel mounted loudspeaker and clear, unobstructed display and control layout make this set a real joy to use.

Convenient features include operator selectable coarse and fine tuning steps optimised for each mode, Dual (A/B) Vfos, along with twenty memory channels which store mode and skip-scan status for auto resume scanning of selectable memories.

Eighteen of the memories can also store independent transmit and receive frequencies for easy recall of split-frequency operations.

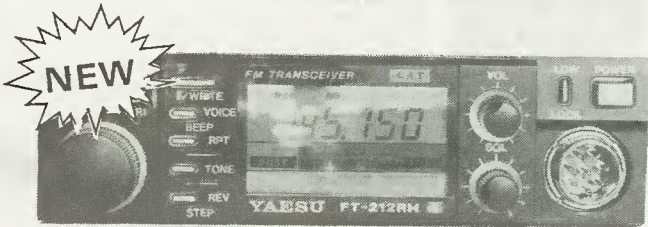
Wideband (6 kHz) AM and narrowband (500 Hz) CW IF filters are included as standard, along with a clarifier, switchable 20 dB receiver attenuator and noise blanker.

User programming for more advanced control by an external computer is possible through the CAT (Computer Aided Transceiver) System.

The transmitter power amplifier is enclosed in its own diecast aluminium heatsink chamber inside the transceiver, with forced-air cooling by an internal fan allowing full power FM and packet, RTTY, SSTV and AMTOR operation when used with a heavy duty power supply.

**FT747GX RRP £659.00 inc. VAT**

## LET THE RADIO DO THE TALKING!



We are pleased to announce a new series of FM VHF and UHF mobile transceivers for the amateur. The 45/5W FT-212RH and the 35/4W FT-712RH. Smaller than their predecessors these models utilise a new cpu with greatly expanded features, most notable of which are 19 memories and support for the DVS-1 Digital Voice System, which can digitally record and playback from the microphone or the receiver.

FT212RH & FT712RH  
**NEW FROM YAESU**

FT212RH ..... £349.00  
 FT712RH ..... £375.00  
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 £475.00 inc.

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 FT711RH £349.00 inc.

- ★ 45(35)\*(10)\$/5(4)\*(1 or 5)\$ WRF OUTPUT
- ★ Easy 'one touch' push button operation
- ★ Reversible sloped front panel
- ★ Large green easy to read LCD
- ★ Ten memories (independent Tx & Rx)
- ★ Switchable 12.5/25kHz steps
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- ★ CCC/w Hand mic and mobile mounting bracket

THE FT211RH  
 THE FT711RH  
 and the NEW FT2311R

### OPTIONAL ACCESSORIES

SP55 External Speaker ..... £19.55  
 YH1 Headset (C/W Mic) ..... £19.99  
 SB10 PTT Switch Unit ..... £22.00  
 MH 10F8 Speaker/Mic ..... £25.00  
 MH 14A8 Speaker/Mic (C/W Tone Burst) £23.00  
 MF 1A3B Boom Mic (Via SB10) ..... £25.00



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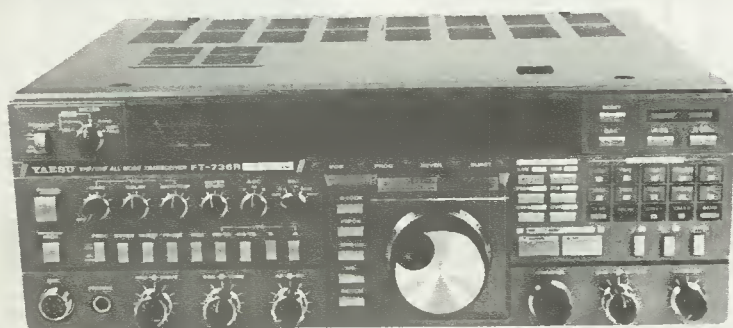


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## Serious about VHF/UHF? Then the FT736R is for YOU!



- ★ UP TO FOUR BAND CAPABILITY
- ★ LSB/USB, CW & FM
- ★ FULL DUPLEX CROSSBAND OPERATION
- ★ MEMORY STORAGE OF UP TO 230 FREQUENCIES
- ★ KEYPAD FREQUENCY ENTRY
- ★ FOURTEEN VFO'S
- ★ GLOBAL CALL CHANNEL
- ★ PROGRAMMABLE CHANNEL STEPS
- ★ ELECTRONIC KEYS OPTION
- ★ REMOTE PREAMPLIFIER SWITCHING
- ★ TXCO HIGH STABILITY REFERENCE OSCILLATOR

The FT-736R is a frequency-synthesized amateur transceiver incorporating up to four band modules covering the 50, 144, 430, and 1200 MHz amateur bands. The standard model provides 25 watts RF power output on the 144 and 430 MHz amateur bands in SSB, CW and FM modes. (10 watts output on the 50 and 1200 MHz bands).

Operating conveniences usually found only on HF transceivers, such as front panel adjustable IF shift and IF notch, a noise blanker, all-mode VOX and three-speed selectable AGC are included. GaAs FET receiver RF amplifiers are provided in the 430 and 1200 MHz band modules.

The innovative memory system includes one hundred general purpose memories plus ten full duplex cross-band memories, one global call channel memory that can be recalled from any band or mode and up to four band-specific call channel memories, all of which store mode and receive and transmit frequencies independently.

In addition, fourteen vfos are provided: two general purpose plus one PMS (Programmable Memory limit Scanning) on each band, two special-purpose full duplex vfos, and up to four clarifier memories, one peband.

Each of the two full duplex vfos can be selected so that its receive and transmit frequencies and modes can be displayed and tuned independently, or linked to tune synchronously in opposite directions for satellite operation. You can retain twelve satellite uplink/downlink modes in the special vfos and ten full duplex memories at all times.

Naturally, with FM the predominant mode on the VHF and UHF bands, the FT-736R includes all manner of convenient features for both FM simplex and repeater operation, like a discriminator center tuning meter, special narrow FM mode (to cut adjacent channel interference in crowded areas) and Automatic Repeater Shift when tuned to 2-meter repeater subbands.

The FT736R also includes a t/r-switched DC supply line for masthead preamplifiers, activated from the front panel, and digital input connection directly to the modulator for high performance packet radio tnc interfacing (preamps, personal computers and packet tncs not supply by Yaesu).

### OPTIONAL ACCESSORIES

FEX736/50	50MHz module	£239.00	XF455MC	600Hz CW Filter	£60.00
FEX736/1.2	1.2GHz module	£425.00	SP767	External Spkr c/w Audio Filters	£69.95
FMP-1	AQS Message Processor c/w display	£189.00	MD-1B8	Desktop Microphone	£79.00
FTS-8	CTCSS Tone Squelch Unit	£45.00	MH-1B8	Hand Scanning Microphone	£21.00
FVS-1	Voice Synthesiser Unit	£33.00	FIF232Cvan	CAT/TNC Interface for Packet & CAT	£69.85
Keyer Unit B	Internal Lambic Keyer Unit	£15.95	FIF232C	CAT interface for RS232 O/P	£75.00
TV-736	Fast Scan TV (ATV) Mod/Demod Unit	£159.00	FIF65A	CAT interface for Apple II series	£60.00

**FT736R RRP £1450 c/w 2m & 70cms**

## HY-GAIN - LOW PRICES



Due to the strong pound and our special purchase we can now offer for a limited period, up to 15% discount on their range of antennas and 10% on their larger rotator Ham IV. Buy now whilst stocks last (from January 1st they increased their prices and if the dollar recovers prices could go up by 30% to 40%).

		Offer Price	P&P
12AVQ	Vert. 10-15-20M	£76.95	£71.00
14AVQ	Vert. 10-15-20-40M	£109.00	£95.00
18AVT	Vert. 10-15-20-40-80M	£172.00	£146.00
18V	Vert. 10-80M tapped coil	£48.50	£43.65
TH3Jnr	3 Ele. Yagi 10-15-20M	£299.00	£254.00
TH2MK3	2 Ele. Yagi 10-15-20M	£279.00	£249.00
EX14	5 Ele. 10-15-20M Explorer	£499.00	£449.00
QK710	EX14 to cover 40M	£139.00	£115.00
TH5MK2	5 Ele. 10-15-20M T'bird	£649.00	£575.00
TH7DX	7 Ele. 10-15-20M T'bird	£755.00	£669.00
105BA	5 Ele. Yagi 10M	£220.00	£187.00
153BA	3 Ele. Yagi 15M	£135.00	£121.00
155BA	5 Ele. Yagi 15M	£338.00	£288.00
203BA	3 Ele. Yagi 20M	£259.00	£233.00
204BA	4 Ele. Yagi 20M	£420.00	£357.00
205BA	5 Ele. Yagi 20M	£499.00	£425.00
DB10-15A	3 Ele. Yagi 10-15M	£209.00	£199.00
AR40	Famous Bell Type	£125.00	Free
CD45	Medium Bell Type	£219.00	Free
Ham IV	Heavy Duty Bell	£359.00	Free
T2X	Very Heavy Duty Bell	£449.00	£399.00

## VHF/UHF ANTENNAS FROM JAYBEAM

		Normal Price	Carr.
HO/2M	Halo head only	9.78	2.75
HM/2M	Halo with 2ft. mast	11.50	2.75
UGP/2M	Ground plain flooded radiator	16.95	2.75
C5/2M MK2	Vertical Colinear 4.8dbd	90.85	3.00
LR1/2M	Vertical Colinear 4.3dbd	37.95	3.00
LR2/2M	Vertical omnidirectional	29.61	3.00
LW5/2M	5 Element Yagi 7.8dbd	18.69	3.00
LW8/2M	8 Element Yagi 9.5dbd	23.98	3.00
LW10/2M	10 Element Yagi 10.5dbd	29.04	3.00
LW16/2M	16 Element Yagi 13.4dbd	42.55	4.00
PBM10/2M	10 Element Parabeam 11.7dbd	57.50	4.00
PBM14/2M	14 Element Parabeam 13.7dbd	79.15	4.00
O4/2M	4 Element Quad 9.4dbd	37.09	3.00
O6/2M	6 Element Quad 10.9dbd	48.59	3.00
D5/2M	5 over 5 slot fed Yagi 10.0dbd	33.93	3.00
D8/2M	8 over 8 slot fed Yagi 11.1dbd	46.58	3.00
5XY/2M	5 Element crossed Yagi 7.8dbd	36.23	3.00
8XY/2M	8 Element crossed Yagi 9.5dbd	46.00	3.00
10XY/2M	10 Element crossed Yagi 10.8dbd	57.50	3.00
PMH2/C	2 Way harness circ. polarisation	13.51	2.75
PMH2/2M	2 Way harness for 2 Metres	14.89	2.75
PMH/2M	4 Way harness for 2 Metres	36.80	2.75
<b>JAYBEAM 4M/6M</b>			
DB4	4M/6M Dual Band 4 Ele	117.88	5.00
4Y6M	6M 4 Ele 7dBd	49.45	3.00
4Y4M	4M 4 Ele 7dBd	40.54	3.00
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**JIL SX-400**  
THE PROFESSIONAL SCANNER

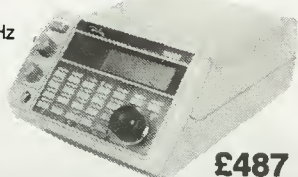
- Basic coverage 26-520MHz
- AM, NFM & WFM
- Expandable from 100kHz to 1.4GHz with SSB and CW
- Computer control options
- IF output terminals
- Specifications set by professionals



**£649**

**AOR 2002**  
THE WIDE RANGE SCANNER

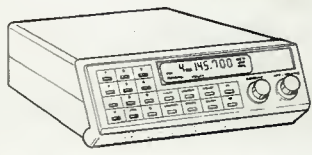
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- 20 memories
- Compact size
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- Size only 6" x 2" x 8"
- Covers: 26-32MHz, 60-90MHz, 118-180MHz, 380-512MHz
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- 50 memories
- Scan, search, priority



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THE SMALLER HANDY-SCANNER

- Covers: 75-106MHz or 60-90MHz plus 118-175MHz, 406-496MHz
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- 20 memories
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- Nicads, charger & BNC whip antenna included in the price



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THE SUPERIOR SCANNER

- The choice of the professionals
- Proven reliability
- Covers: 26-88MHz, 108-180MHz, 380-514MHz
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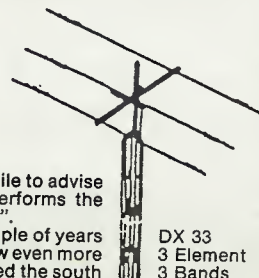
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- ★ 3 elements on each band
- ★ heavy duty 2kW rated
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- ★ Broadband operation
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- ★ SWR less than 1.3:1



DX 33  
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3 Bands

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1080	DX 6V	10/80m Multi-band vertical plus 30m	138.00
1081	DX 31	Dipole 10/15/20m 2Kw p.e.p.	115.00
1082	DX 32	2 element 10/15/20m 2Kw p.e.p.	202.40
1083	DX 33	3 element 10/15/20m 2Kw p.e.p.	297.85
1084	DX 34	4 element 10/15/20m 2Kw p.e.p.	391.00
1085	DX 31/32	Conversion Kit DX-31 to DX-32	90.85
1086	DX 32/33	Conversion Kit DX-32 to DX-33	96.60
1087	DX 33/34	Conversion Kit DX-33 to DX-34	96.60
1089	DX 103	3 element 10m Yagi	120.75
1090	DX 105	5 element 10m Yagi	178.25
1093	DX 40K	Converts DX31/2/3/4 to 40m dipole	126.50
1094	DX 27/1	Rotary dipole for 27 MHz C.B.	40.25
1095	DX 27/3	3 ele Beam for 27 MHz Gamma matched	120.75
1096	DX 24Q	2 ele quad 2, 10, 15 & 20m	290.95
1097	DX 26Q	2 ele quad 2, 10, 15, 16 & 20m	341.95
1099	DX 7/14	2 ele 40m/6 ele 20m 50' boom	1006.25

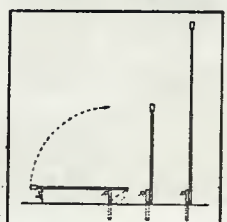
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# LETTERS

## Editorial

### Ham Radio — Where do we go from here?

Over the past few months the letters page in HRT have covered two main themes, how to attract newcomers to the hobby and expressing concern on rising rig prices. If we sit back and think about this for a while we can see that the two are closely related, after all how many people are either able or willing to shell out £1000 plus just to get QRV?

The typical youngster, as some of our correspondents have noted, is faced with a wide choice of pastime — with perhaps the dreaded microcomputer heading the top of the list. These machines are still seen as being 'educative investments' by well meaning parents and have the additional advantage of being only about a quarter of the price of a new HF transceiver. It must be clear then that one of the most important deterrents which prevents school students from joining the fray is simply one of cost — and the Japanese manufacturers are beginning to show signs of reacting to the price barrier at long last. Despite the fact that equipment prices are now starting to move in the right (ie. downward) direction more must be done to avoid a 'people drought' in the future.

### Options

One of the options is to introduce a so-called novice licence, generally aimed at giving people a low-cost introduction to the bands. The exact format of such a licence has been much discussed with the prevailing view being on the lines of a QRP CW permit. However, before

anybody goes into tight huddles about the fine print — it might be worth reminding ourselves once more of the other attractions beckoning the potential newcomer. To put it another way, if the format of the novice licence is *too* restricted then we may gain nothing at all, nobody is going to jump up and down with glee if their entry level licence gives them 50mW of CW on 1296MHz!

### A Fighting Chance

In order to stand a fighting chance, the cost of getting started must be less than £200 (ie. less than the price of a micro), should not exclude voice or data communications (especially the latter so as to 'convert' computer buffs) and prohibit the use of commercial ready built equipment to try and encourage experimentation. As for power levels, why not limit this to 10 watts input at the PA (remember the days when you could measure your output without a dBW conversion table!).

It is pointless making the licence CW only as this would only deter those who weren't interested in HF working — after all the idea is to *encourage* newcomers, not turn them away. 70MHz would seem ideal for this purpose with perhaps Top band and 20m being available for those with an 8wpm morse test. Banning ready built equipment would encourage kit-building and converting ex-PMR gear, all of which would be useful experience and - more importantly for the newcomer, low cost fun!

It would be interesting to hear readers views on the novice licence proposals outlined above as I'm sure that there are plenty of good/better ideas out there. Do write in with them.  
Dave Bobbett G4IRQ

## Letter of the month

Dear HRT, As one of the minority of RSGB members who attended the 1987 AGM I was pleased to hear that the council were going to consider venues other than London for future AGMs. On the Monday following the AGM I sent the RSGB details of what I thought to be a suitable venue, apart from a simple acknowledgement I have hear nothing further. I would therefore like to beg some magazine space from you to conduct for my own interest a poll amongst your readers.

My proposition was that the meeting be held in the main hall at Cleckheaton Town Hall. The hall is within one mile of J26 of the M62 and a quick glance at a map will show this to be reasonably central to the UK (note not just England) and is well served by motorway access. The capacity is 377 well in excess of the usual turn out and a big point in its favour is the cost of

only £70 inclusive of coffee lounge and bar areas. This also should be well below the cost of the previous venue.

Through your magazine I would like to ask RSGB members who would be interested in attending an AGM at this venue, or who support my theory, to simply send me a QSL card/postcard for ease of counting so I can judge interest. All replies will be in strictest confidence.

If you are interested in the outcome I will forward the numbers when collated. I thank you in anticipation for your help.  
Martyn Bolt G4SUI.

*It will certainly be interesting to see what the outcome is. Please don't send your cards to the HRT office though, we have to dig our way into the office as it is! Instead send them to Martyn Bolt, 112 Leeds Road, Mirfield, W. Yorks WF14 0JE and Martyn will tell us of the outcome very shortly.*

## South African Prejudice

Dear HRT, I was reading through some old copies of *Ham Radio Today* when I came across a letter from D. Simmons G1UKS concerning racism on the radio.

He is quite right but in South Africa, the most racist society in the world, we have eliminated most of it. About eight years ago our radio regulations read; *An amateur radio licence can only be obtained by people over the age of sixteen and of European descent* which meant that only whites could be radio amateurs. By a lot of hard work and patience we have changed the wording so that anybody over the age of sixteen is eligible for a licence.

This achievement is not even recognised by some of the Third World countries who ban their amateurs from talking to South Africans.

It is very frustrating to us who are fighting racism from the inside being condemned with all the rest instead of being encouraged to carry on.



I THINK YOU MUST HAVE  
A PROBLEM WITH YOUR  
HOME BUILT  
EQUIPMENT!!



'SEE ONERBAHT??  
WASSN TALKIN BAHT  
MAKIN' 'QUIPMNENT - WAS  
TALKIN' BAHT -  
HOMEBREWIN'!!



I do not know the exact figures but I talk quite often to people of other races in this country. The amateurs in these African countries are not even allowed to talk to them. Please, fellow hams, the colour of a person's skin does not show over the air. Keep the airwaves non-racial.

**Sam Manne, ZS6BBW**

*Frankly I would think that about 80% of the South African population would need an amateur radio licence about as much as a goldfish would need a bicycle. When we are talking about a country which denies the vast majority any sort of political voice and condemns millions to a life of squalor, is it really any surprise that some Third World Countries ban radio links?*

*It is ironic that your letter should arrive in the same week as the S African regime introduced yet more repressive legislation aimed at silencing its internal opponents.*

*Fighting apartheid (whether you are black or white) takes courage and can entail great personal danger, but the fact remains that any 'advances' in ham licence regulations are insignificant when compared with the changes needed to make South Africa no longer the leper of the civilised world. - G4IRO*

## More on Novices

Dear HRT, I have read, with interest the letters to the various magazines, on the class 'B' licences and also the need for a Novice licence. The recent letters in HRT February 1988 one from E. Greenhaigh GOAQL with whom I heartily agree and the other entitled a Newcomer's View.

I am not surprised that Newcomer holds the view that he does, he should get down to the Peterborough club and get the benefits of the experience of the members there. There are lots of radio amateur who know little or nothing about transistors, not everyone works in electronics, you know.

In my experience, there are lots of young licenced amateurs around. In the club I attend occasionally the split is about 50/50. I also hear all call signs from G0 to G4 especially on 80 metres.

On the subject of code practice, most clubs up and down the country run a code class or would if the demand were there, also there are code classes at various technical colleges.

I feel that there is a need for a Novice Licence, and that the test should be run by the DTI or RSGB.

The City and Guilds are not going to like me for saying that but after all they don't administer or police the air waves so why should they test the proficiency of amateurs.

The Novice test should consist of elementary theory, ie. written questions and also the ability to draw and explain the workings of simple diagrams, eg. transmitter, receiver, modulator, etc, and send CW at ten words per minute and receiving.

The above test would enable the applicant to use CW on all amateur bands. The transmitter to be VFO or crystal controlled and the power to be the legal limit. The fact that the applicant had demonstrated that he understood the working of an amateur CW transmitter would satisfy the licencing authority that he was a fit person to be let loose on the amateur bands.

After a year on CW the amateur would then sit another exam, more advanced questions and CW at 15 words per minute. On passing this test

the applicant would be allowed full privileges on all bands.

Having obtained my amateur licence under such a test system I can say that I enjoyed my apprenticeship on CW and I was able to copy well over 15wpm before going for the advanced test which I passed at the first attempt.

There is no valid reason why a novice licensee should not be able to construct a satisfactory CW transmitter out of parts which are available at club junk sales, rallies, etc, and there is enough expertise in the clubs to help beginners. With ingenuity an old valved receiver (broadcast variety). Can yield most of the parts, including the mains transformer, to build a low powered CW transmitter.

There are also quite a few of the old communications receivers around that are quite suitable to use on CW or for that matter SSB without going deeply into debt as one could when buying the expensive 'black boxes', some of which have facilities which are never used by the operator.

Finally I hope that perhaps some of the 'B' operators will have the incentive to get stuck into the code and obtain their class 'A' licences. I can assure them that most class 'A' do not sneer or look down their noses at them and that the help is there should they ask for it.

As GOAQL says should some still feel that they want HF privileges without the required CW there is still the CB bands.

**R M Dotchin G3WEP exVE3CXG.**

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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.

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# Listening On...

In the last few years, there has been a tremendous increase in the number and variety of receivers which have become available for the short wave listener. I'm not talking now of receivers specifically designed for radio amateurs and those already with a good knowledge of radio — there have always been receivers around for them since the days of the HRO, the Eddystone EA12 or the Drake R2 or R4. But for those who just wanted to

buy? Unfortunately, there is no single answer to that question. As with anything else, you get what you pay for, and there is no doubt that a £1000 receiver is going to out-perform a £40 one, but having said that, there are some excellent bargains available in the mid-price range. Your choice of receiver would also depend upon what you wanted to use it for — would you want to listen to radio amateurs, or just broadcast stations? — would

necessarily broadcasting stations in those places! These radios offer exceptional value-for-money — the present Vega Selena MB215 is currently advertised at around £40 or less. They are sensitive and have a nice audio quality, but their selectivity (the ability to separate one station from the adjacent one) is not as good as more expensive receivers. Nevertheless if you have less than £100 to spend, you probably won't find a better new radio than this. Other disadvantages are that the frequency read-out is analogue, not digital, so it is often difficult to tune in stations exactly if you know what frequency they're on, and the fact that they are somewhat larger and heavier than other portable sets.

*If you are just becoming interested in the fascinating world of international broadcasting listening, then this "Listening On..." is especially for you*

dabble with radio, or who could not afford to buy a specially designed communications receiver, there was not really very much choice until a few years ago. The cheapest and best way of getting a communications receiver years ago was to buy a second-hand ex-government receiver, such as the famous AR88 or CR100. There are still many of these around today, but they are becoming more and more rare as they get older and older. Many owners of the AR88 would not part with it for love nor money and there is no doubt that in their day they were excellent receivers, but there is also no question that they are big, heavy ugly brutes and also lack many facilities which are found on today's sets.

## What to buy?

So, if you are in the market for a new receiver today, what would you

you want to take the receiver in your suitcase with you on holiday, or only use it at home? — or would you want to take it with you in your pocket? There is no such thing as a *best* receiver, but the following should put you on the right track if you want to know what is available at present.

First, a warning. This is by no means a complete list, there are literally hundreds of different receivers available these days, some performing at least as well as those described, whilst others are really rubbishy — so *caveat emptor*.

## The Cheap and Cheerful

You have all seen the adverts in Sunday papers for the Russian-made Vega series of radios, you know, the ones that make amazing claims like *'listen to Cape Town, Sydney, Timbukto with crystal clarity'*. Even though there are not

## Shortwave Portables

There are hundreds of radios available that fall into just this one category. Since Sony introduced the ICF-5900W receiver about twelve or fifteen years ago (sadly no longer available) that firm has arguably been in the forefront of portable receiver production. Their ICF-7600DS is around the £169 mark and covers longwave, medium-wave, VHF and shortwave 1.6-30 MHz continuously. Frequency readout is digital, and you get on the frequency you want by means of a key-pad entry, like a pocket calculator. So, if you know that Radio Netherlands is on 5955kHz, you simply press 5-9-5-5 enter, and there you are, exactly on frequency. There are several memory channels so that you can re-programme your favourite stations' frequencies (saves having to look them up all the time). Sony also make a model called the ICF-2001D, which in many respects is similar to the ICF-7600DS, except that the '2001D costs more than twice as much, around £329. However, for the serious listener who wants a truly

portable communications receiver, it is probably worth paying the extra, as the electrical performance is considerably better than the cheaper model, with very good sensitivity and selectivity. Similar models are also produced by such firms as Panasonic and Grundig. If you require something more portable still, Sony now make a *hand-held* communications receiver covering longwave to 108MHz *continuously* as well as the so-called 'air band' and the 2 metre amateur band using an add-on frequency converter. The cost of this amazing piece of gear is also £329.

## Home Use

If you are seriously interested in shortwave listening, you may consider that portability is not the most important feature that your receiver should possess, and that high performance is more desirable. Which is not to say that some of the receivers in the portable category are not capable of good performance. Possibly the only non-professional receiver currently made in Britain is the Lowe HF125. Its specifications are excellent, its basic cost is very low (no pun intended) when compared with the opposition, though you may wish to

add on several of the optional extras (such as key-pad frequency entry, or additional filters) which will bump up the price to some extent. The basic price is currently around £375. The 'big-three' — Yaesu, Kenwood and Icom — all make general coverage communications receivers. Yaesu's FRG-8800 is about £572, while Kenwood's R2000 is £595. Both of these have adequate performance for all but the keenest of SWLs or DXers who usually want to be able to receive ½kW stations in Indonesia on the 90 metre band. If you want to do that, Kenwood's R-5000, at £875, may be the answer. Icom's answer would be the ICR71 at around £825. Both these receivers offer top performance with superb selectivity, a choice of IF filters, memories and so on. A few other manufacturers, such as NRD, also make receivers of this standard and in roughly the same price range.

## Accessories

Once you have bought your receiver, you may think the next thing you want is a nice 100 foot long wire antenna, going up to those 500 foot pine trees at the end of the garden, right? *Wrong.* Most of the receivers described above (the exceptions being the more expensive communications receivers for home use) are designed to operate with their own internal telescopic antennas. They are extremely sensitive and do not generally need any external antenna at all. If you connect them up to a longwire aerial, you will probably find that most receivers overload terribly, with strong broadcast stations coming in all over the dial, even in places where they shouldn't be. If you live inside a reinforced concrete tower block, or if you do your short wave listening under ground, you *may* need some sort of external long wire antenna, otherwise probably not. If you do find you do need one, experiment by using an end-fed piece of wire about ten or fifteen feet long (only) to start with, and only extend the length if it becomes obvious that your receiver is still insensitive. With the more expensive home-use communications receivers, a long-wire antenna, as high and in the clear as possible and preferably at least 30

# WORLD SERVICE Frequencies

These charts show you how to receive BBC World Service. Find the section that covers your area. The bars show you when each frequency can be heard (all times GMT). As most charts cover wide areas, reception quality can vary tremendously within each area, so if you have poor reception on one frequency, it is worth trying others. As a general rule, lower frequencies (MHz/kHz) give best results early in the morning and late at night, higher ones in the middle of the day. Your radio may be marked in MHz, kHz or metres — our charts list all three.

A...Atlantic Relay    B...Berlin Relay    C...East Mediterranean Relay    E...Eastern Relay    W...Caribbean Relay  
 F...Far Eastern Relay    H...East Asia Relay    K&S...North American Relays    L...Lesotho Relay

World Service Daily Transmissions.    World Service Alternative Transmissions.    World Service Satellite Transmissions.    World Service Transmissions as follows:    World Service Transmissions as follows:    World Service Transmissions as follows:

18000 18000 18000 18000 18000  
 15000 15000 15000 15000 15000  
 12000 12000 12000 12000 12000  
 9000 9000 9000 9000 9000  
 6000 6000 6000 6000 6000  
 3000 3000 3000 3000 3000  
 1500 1500 1500 1500 1500  
 750 750 750 750 750  
 375 375 375 375 375  
 187.5 187.5 187.5 187.5 187.5

Denmark  
 Finland  
 Norway  
 Sweden  
 USSR

Albania  
 Bulgaria  
 Greece  
 Italy S  
 Romania  
 Turkey  
 Yugoslavia

Austria  
 Czechoslovakia  
 Germany SAE  
 Hungary  
 Poland

Belgium  
 France  
 Germany N  
 Holland  
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648

World Service  
**LONDON  
 CALLING**  
 MARCH 1988

SIX CITIES  
 on pages 12, 13

THE FIRST LADY  
 COMES TO  
**VOA**

to 40 feet long is probably the best bet. Beware of salesmen trying to sell you expensive 'active antennas'. These are fine if you have no garden at all and no space for a long wire antenna, but if you do it is almost always better to use a longwire rather than an active. Some active antennas do offer very good performance, others have strong spurious signals all over the frequency range. Most present far too much gain for the portable type of receiver, which would therefore cause them to overload.

Some communications receivers do require an antenna that is approximately 50 to 75 ohms impedance, such as a half-wave dipole. But that antenna only works over a relatively narrow band of frequencies (ie. it will only be a half-wave in length when you are tuned to one particular wavelength or frequency) so assuming that you are interested in covering all frequencies available on your receiver it is probably better to use a longwire with antenna tuning unit or ATU. It is not necessary to buy one of the very large ATUs at a cost of £200 — £400 if you are only interested in short wave reception. The only differences between these and the ones available for £30 - £60 is the size or power-handling capabilities of the components inside, the larger ones being designed for transmitting and some of which are capable of taking 1 or 2kW. It is probably only necessary to use an ATU at all if you find that your receiver requires a 50 ohm antenna: with the portable receivers using their internal telescopic antennas, even if you do find that you need to use a long wire antenna, it probably won't be necessary to use an ATU.

### SWL or DXer?

As a beginner, you will probably start listening first to the high power international broadcasting stations, many of which have programmes beamed specifically to Britain. You will be an SWL or Short Wave Listener. What, then, is a DXer? The term DX comes from the early days of radio telegraphy, when, in order to speed up the traffic, abbreviations were used as much as possible, instead of laboriously tapping

everything out in morse code in full. DX was the abbreviation used for anything distant or unknown and therefore anything particularly rare or exotic came to be known as DX. A DXer then, is someone who is interested in receiving signals from distant, rare or exotic locations. He or she is interested in the reception of the signal, in being able to identify it, rather than in what it is

actually saying. There are amateur DXers (both DX listeners and transmitting amateur DXers), broadcast band DXers, and even people who like trying to hear point-to-point communications stations from as many locations as possible.

An SWL, on the other hand, is interested first and foremost in what the broadcast station has to say, rather than where it is coming



from. Generally speaking, an SWL has an easier time of it than an DXer, because the SWL has an almost unlimited number of powerful signals to listen to, whereas the DXer is generally listening out for weak signals, often covered with interference and often barely intelligible. What category you fall in will depend on your own particular interests — and also what sort of receiver you bought — its pretty tough being a DXer with a Vega, but with a £1000 NRD or Icom you could be either a DXer or an SWL.

### Your Listening On Guide

After listening around in a random fashion for a while, you will probably want to know where and when to listen for specific stations. One way is to keep a logbook of the time and frequency when you heard, for example, Deutsche Welle's programme in English. If you are keen enough and think it is worth the outlay, the *World Radio & TV Handbook* may be the answer — the 1988 edition costs around £18. Another way is to write to those stations that particularly interest you and ask for their programme and transmission schedules. Almost all the big international broadcasting stations will send you these without charge, and in English.

I have often mentioned *Media Network* in this column. This is just one of Radio Netherlands' excellent English-language programmes. Radio Netherlands is often one of the first broadcast stations to be "discovered" by the new SWL. This is because their signal is extremely strong and can be picked up on almost any sort of receiver, providing it has shortwave. The best reception of their English programme is at 1130-1225 GMT on 5955kHz, with a repeat of the programme on the same frequency at 1430-1525 GMT. *Media Network*, a programme for SWLs, DXers, computer enthusiasts and anyone interested in electronics or the media, is broadcast on Thursdays, about twenty minutes into the programme (after the news and *Newsline* — correspondents reports).

On Mondays is a series of documentary features, on Tuesdays

*Images*, an arts programme, on Wednesdays the live *Asiascan* intended specifically for listeners in Asia, on Fridays *Report* on current affairs in the Netherlands and on Saturdays *Shortwave Feedback*. This is a listener's contact programme, answering questions, acknowledging letters and reception reports. You can even phone the station on 010-31-35-18700 and record a message, which may be used on the air in *Shortwave Feedback!* On Sundays the whole programme is devoted to the *Happy Station* programme, music and entertainment for the whole family presented by multi-lingual Dutchman Tom Meyers. Having said all that, Radio Netherlands' February *Programme News* said that, budget considerations permitting, changes may be made to their English programmes from 28th March onwards.

### Far North & Far South

Radio Sweden, which was called Radio Sweden International until the end of January (they said they could not translate the word "International" into some of their languages, so it was dropped!) also broadcasts a programme from SWLs, DXers and computer hobbyists. Called *Sweden Calling DXers*, the programme is 40 years old this year. It can be heard following the news and *Weekday* within their half-hour English programmes on Tuesday at 1600 on 6065kHz, repeated at 2100 and 2300 GMT on medium wave 1179kHz, and finally repeated on Wednesdays at 1100 GMT on 9630 and 6065kHz.

Of course, it is bi-centennial year in Australia, and to celebrate the fact Radio Australia introduced a new programme format on 1st January. There are special bi-centennial features six days a week, though not so easy to hear in Britain. The best chance is on Wednesdays at 0730-0800 GMT on 9655kHz. At the time of writing reception is not so good, but hopefully it will improve soon. On Sundays at the same time and on the same frequency is *Communicator*, yet another programme for SWLs, which replaced the popular *Talkback* (though the content appears to be largely the same).

### DX Clubs

If you have achieved some success in SWLing and DXing, you may wish to share your 'catches' with other enthusiasts. Or you may wish to benefit from others' experience. Either way, it makes good sense to join one of the great number of SWL clubs. In Britain, arguably one of the best in the British DX Club, 54 Birkhall Road, Catford, London, SE6 1TE. Send a large *sase* and ask for details of membership or a sample copy of their magazine. The BDXC-UK covers all aspects of the SWL/DXing hobby (*except* amateur radio, this being suitably catered for elsewhere) and also produces the most complete and up-to-date frequency list of all mediumwave and VHF broadcasters in the UK. This is available from £1 from the above address. Another club well worth considering is the Danish Short Wave Clubs International (DSWCI). Despite its national origins in Denmark, virtually the whole of their excellent monthly *Short Wave News* is in English, and they have many members in Britain and indeed throughout the world. It is perhaps the nearest thing to a world-wide DX club for broadcast enthusiasts. Apart from SWN they also produce a Tropical Bands Survey, listing all stations between mediumwave and 5.9MHz and a list of Home Service Stations on shortwave *outside* the tropical bands. Both these are available for seven IRC's each, as are details about membership, from DSWCI, Tavleager 31, DK-2670 Greve Strand, Denmark.

### Listen to Ham Radio Today?

I hope all the foregoing has given some of you the urge to discover what is happening on the greater part of the RF spectrum between the amateur bands. It's fun! Finally, the fame of *Ham Radio Today* is spreading. Radio Station HCJB is Quito, Ecuador, has started a programme with exactly that name, which is broadcast every Wednesday. Unfortunately, I do not know the time and frequency — if anyone can help, perhaps they would let the Ed. know? (*Good grief - fame at last! - Ed.*)

# Mods For The FT230

Brian Kent, G6EXX's article on "Mods for the FT290" (*HRT Feb 87*) set me thinking about similar improvements for the FT230R, which I use mobile. This rig lacks a 'listen on input' facility and although — unlike

button is depressed. The PTT line earths pin 3 and if the rig is set to repeater mode, will drop the frequency by 600 kHz. For our purpose of 'listen on input' we want the frequency to drop but we do not want

this line direct. However, we still require the line to be connected to pin 3 in order to drop the frequency when going to transmit during normal repeater working. The problem is overcome by including a small signal diode (IN4148 or similar) in series with the PTT line, it's 'one-way' action preventing the former and allowing the latter, see Fig. 1b.

*Would you like your FT230 to have 'listen-on-input' and lose the tone-burst on simplex? Then why not carry out these simple mods and make a good rig better!*

the 290 — it has an automatic time tone-burst included, it unfortunately transmits the tone on simplex as well as on repeater mode. The consequent 'bleep' sent at the commencement of every over is irritating to all concerned. The tone burst switch is at the rear of the rig and is generally inaccessible during mobile operation, making it difficult to switch off when changing to simplex.

The two essentially simple mods to be described here correct this situation and promote an already excellent mobile rig to one which is safer and more satisfying to operate. Do make sure that you understand what has to be done before commencing work though!

## Listen on input

The 'T call' button, being at the top right hand corner of the rig, is ideally placed as a 'listen on input' since it can be easily located while operating mobile, without the need to look down. Fortunately the 'T call' function is rarely, if ever, needed — usually only because the automatic tone burst has been left off as a result of previous simplex working.

Looking at the circuit diagram in the top left area of Fig. 1a we can see that the 'T call' button, through pin 5, earths the tone burst oscillator which in turn earths the PTT line. This causes the rig to transmit a tone burst of a little less than one second duration or for as long as the

the tone burst, or the rig to transmit.

The frequency drops if pin 3 is earthed while the rig is in repeater mode and this could be achieved using the 'T call' button if we link pin 5 to pin 3. We would also need to disconnect the existing lead from pin 5 to stop the tone burst and consequent change over to transmit. In addition it would be necessary to disconnect the PTT line from pin 3 to stop the rig going to transmit — as the 'T call' button would now earth

## Taking the plunge!

Remove the bottom cover of the rig (4 setscrews) and disconnect the loudspeaker. Locate pin 3 (PTT, red lead) and pin 5 (T call, yellow lead) in plug 6 on the control unit board and cut both leads about 2 to 3 inches from the plug. Prepare and tin the ends about  $\frac{1}{8}$  in — pass both ends through a short length of sleeving and solder them to the anode of the IN4148 diode, slip the sleeving back over the joint and similarly treat the other end of the red wire,

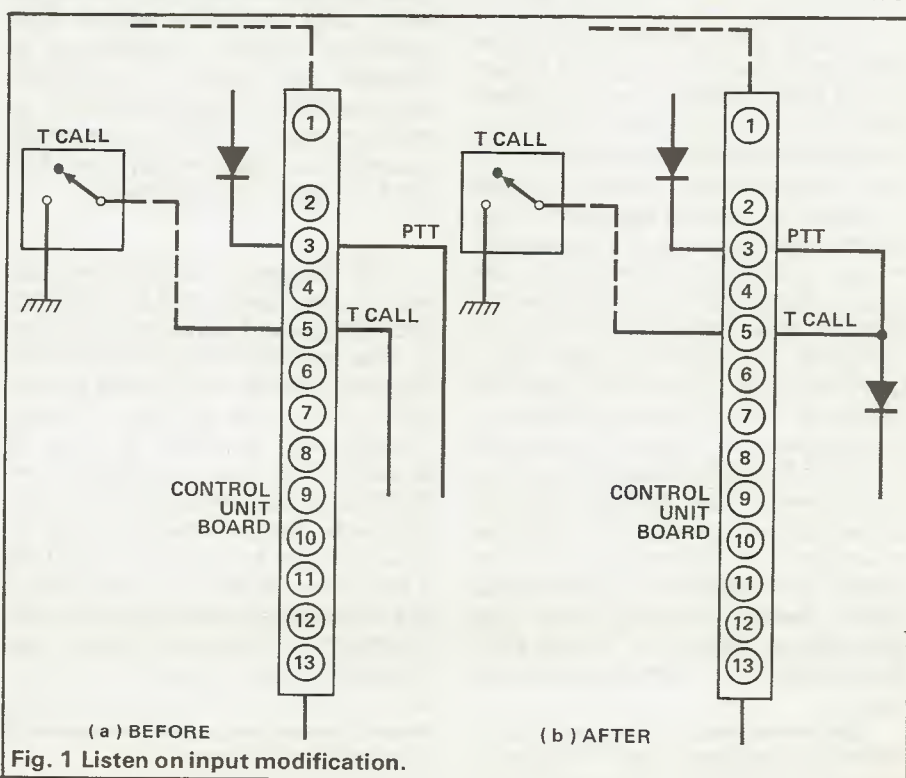
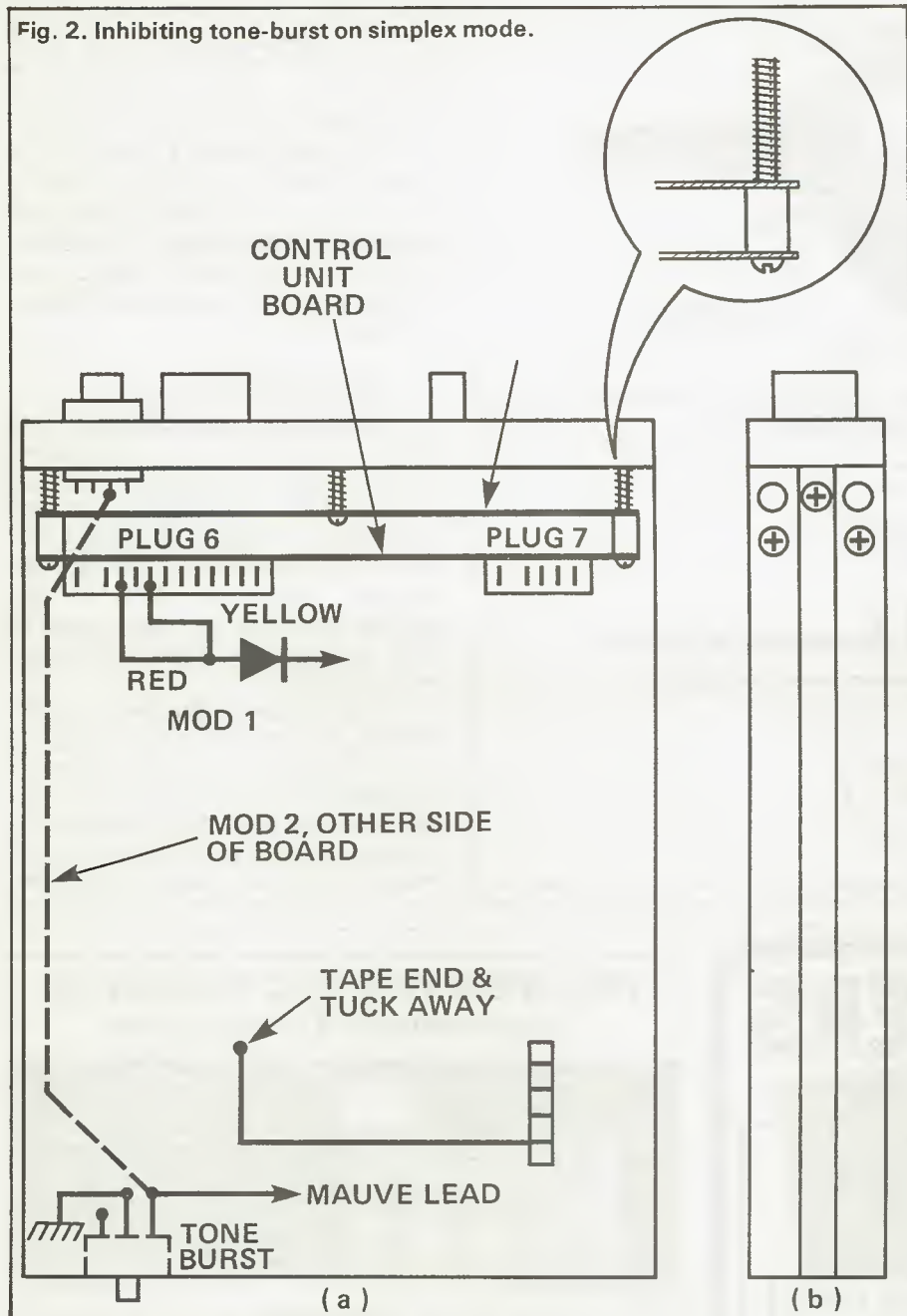


Fig. 2. Inhibiting tone-burst on simplex mode.



connecting it to the cathode of the diode.

The 'T call' button will now give 'listen on input', and all that remains is to tape up the other end of the yellow wire and tuck it away as this connection is no longer required, see Fig 2.

### Inhibit tone burst on simplex

Looking at the circuit diagram, bottom left of centre in Fig. 3a. Observe that the tone burst switch *inhibits* the tone burst by earthing the lead running to it. It will also be seen that the repeater/simplex switch lowers the frequency on transmit by earthing the lead to the 'minus' pin. If the 'simplex' pin on this switch were joined to the lead on the tone burst switch, it too would inhibit the tone burst when set to 'simplex' see Fig. 3b.

Locate the outer pin to which the mauve lead is attached on the tone slide switch on the back panel. The other outer pin has no connection and the centre pin is earthed. Note it's position for the moment — Fig. 2. Prepare a 10 in length of (preferably) mauve wire with  $\frac{1}{8}$  in bared and tined at one end and a very small eye at the other — just big enough to slip over the pin on the repeater/simplex switch.

Gaining access to the pins of the repeater/simplex switch is a little more complicated, but take courage, it is not that difficult! Remove one countersunk and two round-head setscrews on each side of the rig (6 screws in all) which hold the front panel and frame to the sides see Fig. 2. Then remove the setscrew at each end of the control unit board, which will now be slack. Remove the two hexagonal spacer/bolts (from which you have just removed the control unit setscrews) and one last setscrews to release the switch unit board — see Fig 2a and inset.

Gently prise these two boards away from the front panel to reveal the repeater/simplex switch pins. Slip the prepared eye end of the 10 in wire over the pin next to the blue wire connection and solder see Fig. 4.

At this stage, I checked with a meter that the lead was earthed to chassis when the switch was set to 'simplex' and open circuit was set to 'repeater'. Offer the switch unit

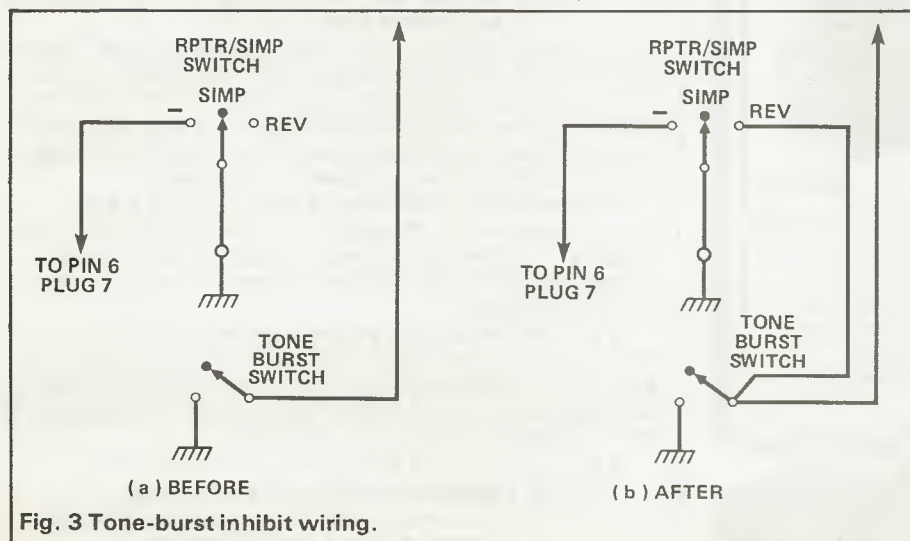
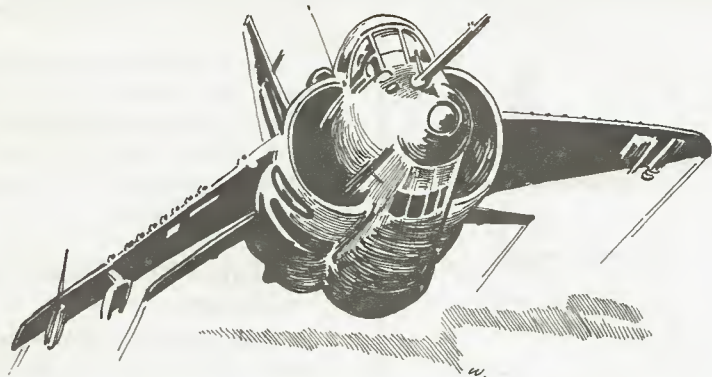


Fig. 3 Tone-burst inhibit wiring.



“... OK on first being licensed in 1932 and this is your latest project but you're still on the **WRONG FREQUENCY**...”

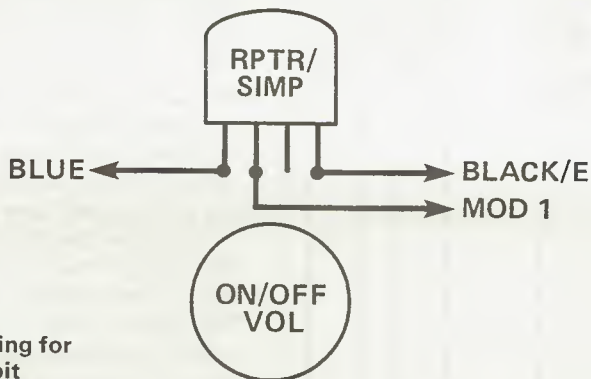


Fig. 4. Final wiring for tone-burst inhibit modification.

board back up to the rear of the front panel, making sure the push buttons are properly located and refix the switchboard, control board, front panel and frame to the main body. Solder the free end of the lead to the already located mauve pin on the tone burst switch. Tuck the surplus length between the control unit and main boards. Reconnect the speaker and replace the bottom and top covers.

### Summing up

Everything now falls neatly into place. 'T call' is an unnecessary function and is no practical loss but if 'manual' operation is still required, a quick 'blip' on the PTT switch will transmit a tone burst for repeater operation. The 'T call' button is in just the right place to find easily as a 'listen on input' while mobile.

The repeater/simplex switch inhibits the tone burst when set to 'simplex' with no other action being required. The tone burst switch still inhibits the tone burst altogether when switched 'off' and motoring is made a good deal safer. Good luck!

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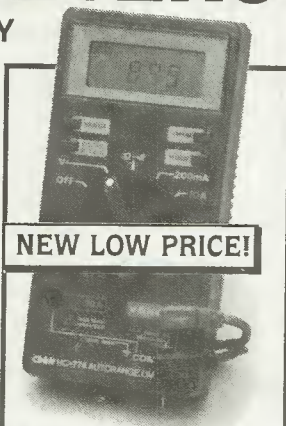
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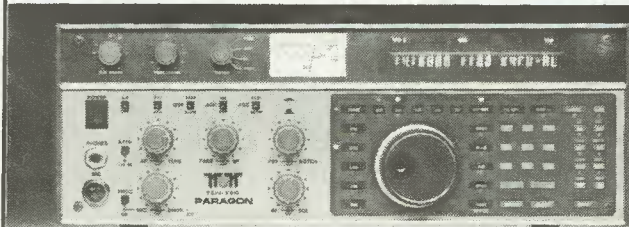


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# Icom IC-4G 70cm Portable REVIEW

Many years ago, the IC-2E 2m handheld took the world by storm, it seemed that nearly everyone had one! The IC-4E 70cm counterpart followed, then the IC-02E and IC-04E keyboard-controlled versions,

*Icom introduces a new 70cm FM hand-held with LCD readout and common battery packs. How does the new rig shape up in use? We got Chris Lorek, G4HCL, to brave the elements and find out*

and the lower-powered miniature IC-micro sets have recently become popular. Icom have now launched the IC-4GE for the amateur who wants a sturdy, go-everywhere set without the complexity of keyboard-entry control (no need for a degree in programming!). HRT were fortunate in being offered the first UK review sample, so let's see what it offers...

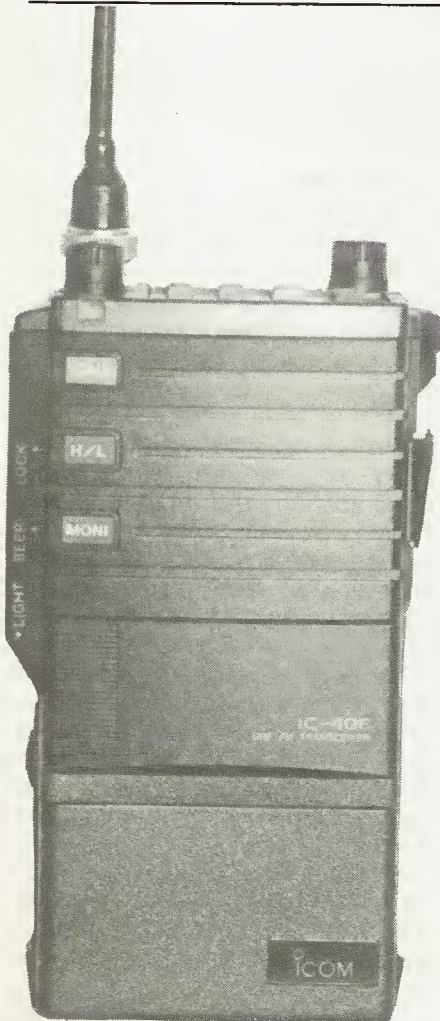
## Features

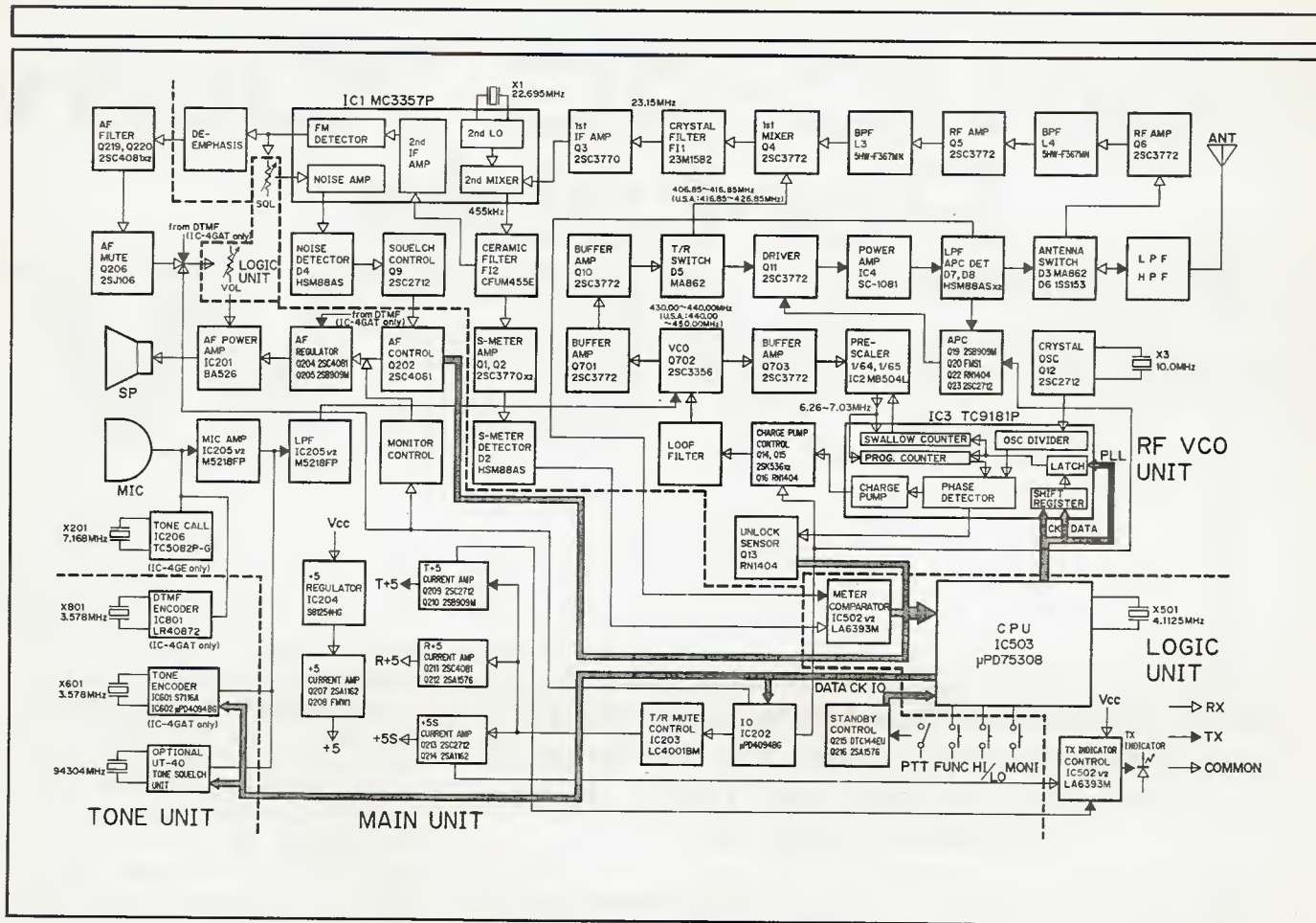
The IC-4GE is the first in a line of new portables, soon to be available in 2m and 23cm versions with similar operating features. The set is compatible with many of the accessories for Icom's IC-2/4 and IC-02/04 series of portables, so if you already have spare batteries, chargers, speaker-mics or whatever for one of these then the IC-4GE will also take them. As with the other portables the basic frequency coverage is 430MHz - 440MHz, this time in selectable 25 or 12.5kHz steps, which may be changed to selectable 5kHz, 10kHz, 15kHz, 20kHz and 25kHz steps if you wish. I am informed that with 'suitable' internal linking, the receive range may be modified to cover around 420MHz-460MHz for the more inquisitive amongst us!

The maximum transmit power output provided depends upon the battery supply voltage, a range of batteries being available giving 7.2V, 8.4V, 10.8V and 13.2V. The 8.4V 270mAh IC-BP3 pack (also supplied) gives 3.5W output, the larger optional 13.2V 425mAh IC-BP7 pack giving 6W output and so on. A low-power position of approximately 1W is also provided in each case to make your batteries last a little longer on local QSOs. An optional AD12 DC power adaptor slides on in place of the nicad and lets you connect an external DC supply to allow use in the shack or car without you flattening the rechargables. On receive, a 'battery saver' economiser circuit may be switched in if required, which samples the receiver state every so often and only powers up the set continuously if a signal appears. This facility may be quickly switched in and out, for instance where base station Packet Radio use is required as well as the odd spell for all-day portable operation or general FM monitoring. The outer case of the set is sealed to make it 'splashproof' meaning it should survive the odd downpour even if the operator gets soaked through during emergency exercises or whatever.

## Frequency Control

Frequency control is performed by three spring-loaded two-way switches on the top panel, these stepping the operating frequency in 1MHz, 10kHz and finally the selected channel step increments, an adjacent LCK (Liquid Crystal Display) letting you know where you are as well as giving a bar graph indication of relative signal strength and transmit power. Users of the thumbwheel-controlled IC-4E will find this control method familiar,





however this set also has 20 selectable memory channels, controlled by a pair of small push buttons together with the channel step frequency control switch. 'VFO' frequencies together with any pre-set repeater offset may be programmed into a selected memory channel by a single button push, and a further button push allows any selected memory channel information to be placed into the VFO for tuning around. Individual memory channels may be scanned for activity, the set halting when it finds a signal that opens up the squelch, resuming two seconds after the squelch closes. As well as this, a section of the band between two pre-programmed limits may be scanned for activity in 'VFO' mode in the selected channel steps, the set again halting on a busy channel.

**Multiple Functions**

On the front panel of the radio are a 'T.CALL' button that activates the transmitter together with a simultaneous 1750Hz tone for repeater access, a H/L button to select the desired transmitter power ('LOW' being displayed on the LCD as appropriate), and a

'MONI' button that acts as a squelch defeat on simplex together with switching to the programmed repeater input channel automatically in duplex mode to act as an input check before attempting a simplex QSO.

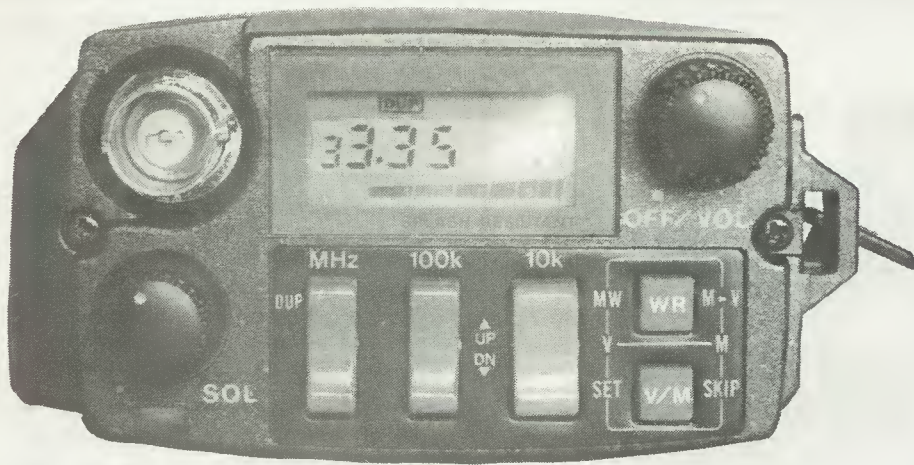
Alongside the large PTT bar is an LCD backlight control and a 'Function' bar, this doubling-up on many of the set's controls to allow programming of channel step, repeater offset and so on, together with scan parameters and 'start up'. Other uses provided by this are a 'lock' mode to prevent accidental frequency shifts, and on/off switching of a bleep tone that may accompany your button pushes if required. An LED above the T. CALL button glows red when you place the set in transmit mode, this also giving an indication of the state of your nicads.

With the IC-BP3 battery pack supplied the set measures 65mm(W) x 151mm(H) x 35mm(D) and weighs 430g. Other supplied accessories include a plug-in nicad charger, quarter wave flexible aerial, a hand carrying strap, metal belt clip, and an instruction book

containing block and circuit diagrams.

**In Use**

My first impression of the set was that it was very easy to operate, in fact I only started to read the manual after I'd had several QSOs using it! This I feel is one of the set's strongest points, as although I tend to be a 'gadget freak' many amateurs take a dislike to all the 'bells and whistles' incorporated on some sets nowadays, especially portables where one often expects simple operation without the need to constantly refer to instruction sheets to remind you of how to check the repeater input or whatever. I appreciated the provision of 20 memory channels, very often only 10 are provided which are unfortunately not enough if you tend to travel around a given area served by many repeaters, as well as having the odd simplex channels such as SU20 and SU22 in memory for a quick QSY. Personally I was a little disappointed with the relatively large size of the set, this being similar to it's predecessors, but then one must taken into account the provision of being able to use all the



accessories on the market common to the other models. I also know of at least two other battery manufacturers making Icom-sized packs and chargers, so maybe we're heading towards some form of 'standard'.

I found the set light enough to carry around in my inside jacket pocket without weighing me down unduly, in fact I often forgot about it until it occasionally burst into life

when being served in a shop with the odd comical results — the local people have got used to me emitting strange bleeping noises for no apparent reason now. (*and that's even when he isn't testing radios! - Ed*). In walking around, I received good transmitted audio reports without the usual breath noises that make me sound like a long distance runner and on receive the recovered audio was ample even in noisy

traffic areas. I found my signal into many of the 'distant' repeaters a little better than I would have expected, this probably being due to the higher than normal power being provided by this set compared with other portables of the 1½W or 2W class. By experimenting a little I found that my suitable pre-programming, different memory channels may be programmed with odd Tx/Rx repeater splits if desired, giving the set a little more versatility than may have been expected.

At night, I found the LCD backlight illumination excellent and the sensible positioning of the light button also meant I didn't need to fumble around trying to find which frequency I was on. In repeater operation, I also found the front-panel mounted 'MONI' button very useful, but what a pity the T.CALL was placed where it was. Because of this I found one-handed repeater calls virtually impossible, as one would have to send a 'phantom bleep' (unidentified toneburst) and then quickly transfer to the PTT bar to put a call out, hopefully before the repeater drops carrier, I believe a more sensible position would have been where the 'Function' bar was.

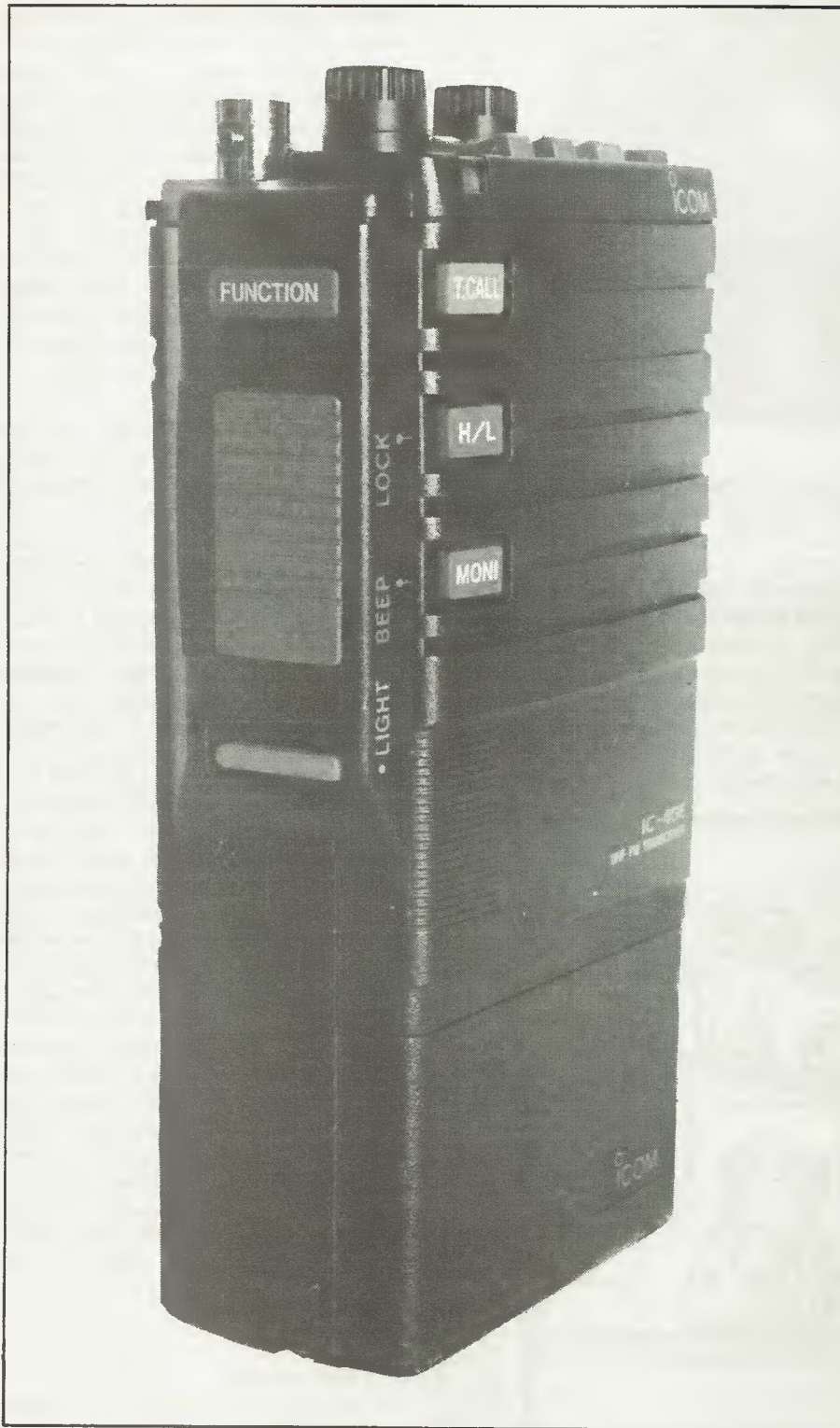
During long waffle-type overs on high power I found I flattened the fully-charged IC-BP3 nicad in around twenty minutes, (although I could obtain many hours worth of listen-only activity,) hence I would advise the all-day user to go for one of the optional higher-capacity packs as well as the supplied nicad. From my shack I successfully used the set into an outdoor colinear aerial with the set powered from an external 13.8V source, this way I could waffle on all night to my heart's content.

### Internals

The set is constructed with a metal rear panel acting as a transmitter heatsink and a plastic wrap-around front case and separate top panel housing the digital control boards and display panel. A pair of main internal PCBs are fitted into the body of the set, linked by a plug/socket arrangement. Fairly traditional circuitry has been used, with a superhet receiver using IFs of 23.15MHz and 455kHz, demodulation being performed by the much-



'...Actually we're doing so well we're moving to smaller premises...'



used MC3357 IC. On transmit a standard VCO controlled by a TC918 synthesiser (as opposed to Icom's usual Direct Digital Synthesiser) generates the final frequency signal, this is amplified using the usual 'black brick' PA module in the final stage before filtering the PIN-diode aerial switching. A separate crystal controlled toneburst generator is used to give an accurate

1750Hz burst, and the whole lot is controlled by a uPD75308 micro-processor. Memory backup is performed with a small internal battery and to Icom's credit the manual gives details of this, stating that the usual lifetime expectancy is 5 years and telling you what happens when it goes flat, ie. that you can still use the radio as normal with the exception of retaining the stored

memory information when the battery is detached.

### Laboratory Tests

Overall, the receiver results obtained were very good, with no 'nasties' found. The 12.5kHz rejection was quite acceptable in reducing the level of many of the primary band user signals separated from 'our' channels by 12.5kHz, and the sensitivity was good for a portable such as this. The S-meter dynamic range was however very limited, meaning that the bargraph indicator served as little more than a received signal detector.

On transmit the spectral purity was quite clean, coupled with a reasonably potent RF output power this could make it suitable for use in a base station environment as well as when out and about. The transmit deviation was a little over the top of the recommended 5kHz maximum, although it is within the expected setting tolerance, in most cases it should not cause problems in use. The current consumption figures, although showing a good transmit efficiency for the power output achieved, do confirm my thoughts that a spare battery could be useful for wofflers such as myself!

### Conclusions

In all, a good no-nonsense portable that performs well, together with being deceptively versatile having memories and scanning functions thrown in if the user wishes to use them. I appreciated the larger-than-normal number of memory channels which could indeed simplify operation further by one not having to keep flicking buttons all over the place. For repeater operation I found the one-touch 'monitor' facility very useful, but the toneburst button was awkwardly placed. The set gives a potent RF output, especially so if a higher voltage battery pack is used, and the facility of compatibility with virtually every other Icom portable accessory should make the set popular with existing owners of a 2m set, allowing spare nicads, fast chargers etc. to be used for both. The IC-4GE currently retails at £299.

*My thanks go to Icom UK for the loan of the review set.*



## Laboratory Results: Receiver

Sensitivity: Input Level required to give 12dB SINAD

Freq	Level (pd)
430MHz	0.205uV
435MHz	0.163uV
440MHz	0.228uV

### Squelch Sensitivity

Threshold	0.98uV pd	6.5dB SINAD
Maximum	0.304uV pd	24dB SINAD

Intermodulation Rejection: Increase over 12dB SINAD level of two interfering signals giving identical 12dB SINEAD on-channel 3rd order intermodulation product.

Spacing	Level
25/50kHz	62.0dB
50/100kHz	62.0dB

Image Rejection: Increase in level of signal at first IF image frequency over level of on-channel signal to give identical 12dB SINAD signals. 74.5dB

Blocking: Increase over 12dB SINAD level of interfering signal modulated with 400Hz at 1.5kHz deviation to cause 6dB degradation in 12dB SINAD on-channel signal.

Spacing	Level
+100kHz	77.0dB
-100kHz	77.0dB
+1MHz	84.5dB
-MHz	84.0dB
+10MHz	102.0dB
-10MHz	101.5dB

Adjacent Channel Selectivity: Measured as increase in level in interfering signal, modulated with 400Hz at 1.5kHz deviation, above 12dB SINAD ref. level to cause 6db degradation in 12db on-channel signal.

Spacing	Level
+12.5kHz	38.5dB
-12.5kHz	33.0dB
+25kHz	70.0dB
-25kHz	69.0dB

### S-Meter Linearity

Indication	Sig. Level	Rel. Level
S1	Sq. open	
S3	0.994uV pd	-4.4dB
S5	1.20uV pd	-2.7dB
S7	1.42uV pd	-1.3dB
S9	1.64uV pd	0dB ref
S9+	1.87uV pd	+1.1dB
S9++	2.17uV pd	+2.4dB

Maximum Audio Output: Measured at 1kHz on the onset of clipping.

Load	Output (RMS)
3ohm	530mW
8ohm	480mW
15ohm	370mW

### Harmonics/Spurri

2nd Harmonic	-76dBc
All higher order Harmonics	<-90dBc
Spurri	+/- 30MHz at -81 dBc
Peak Deviation	5.6kHz
Toneburst Deviation	3.68kHz

### Current Consumption

Mode	Current
Squelch closed, economiser off	59mA
Squelch closed, economiser on	13mA average
Receive, mid volume	96mA
Receive, max volume	197mA

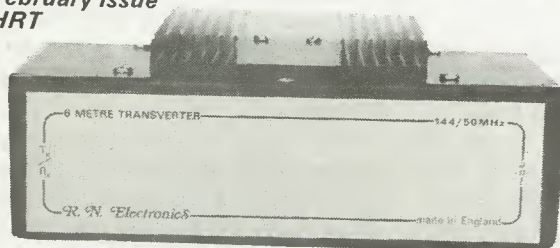
### TX Power and Current Consumption

MHz	Power	7.2V Batt	8.4V Batt	10.8V Batt	13.2V Batt
430	High	3.05W 1.30A	4.56W 1.65A	6.64W 1.85A	6.55W 1.70A
	Low	1.02W 0.70A	1.08W 0.70A	1.01W 0.85A	1.08W 0.80A
435	High	3.09W 1.35A	4.63W 1.70A	6.53W 1.85A	6.43W 1.70A
	Low	1.01W 0.75A	0.00W 0.75A	1.00W 0.85A	0.99W 0.80A
440	High	3.08W 1.35A	4.64W 1.70A	6.45W 1.90A	6.35W 1.75A
	Low	0.00W 0.75A	0.98W 0.75A	0.98W 0.80A	0.98W 0.80A

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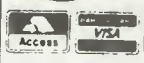
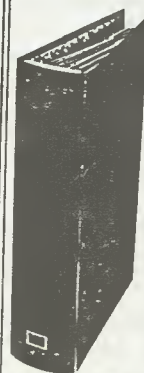
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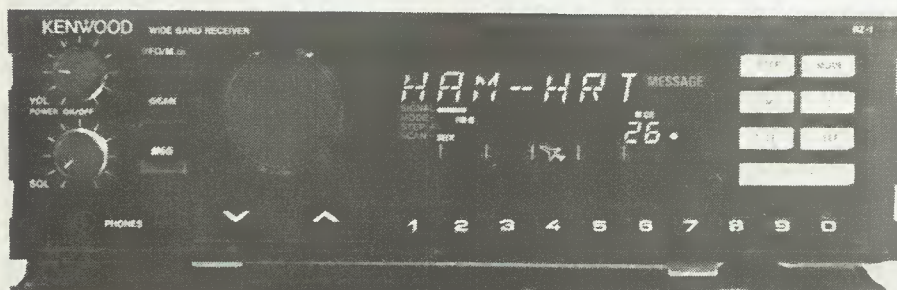
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# Kenwood RZ-1 REVIEW



Getting a little tired of listening to Radio 1 on your car journey into work? Fancy listening to Radio Australia, your local TV station, or indeed sampling 4m, 6m, 2m and 70cm channels to see what's around? The car radio-sized

for this purpose. Modes of operation are AM, FM-N (for narrow-band FM such as amateur, CB and PMR), and FM-W (for wideband FM such as Broadcast Band II and TV sound). A front panel variable squelch control operates on FM-N. Direct numerical

---

*Now there's a car radio sized scanner with a built-in memory jogger. Chris er... Lovek tries it out*

---

Kenwood RZ-1 scanner covers the 500kHz-905MHz spectrum on AM and FM, which encompasses Medium Wave, every Short Wave broadcast band, 10m FM, TV sound channels, and all VHF/UHF amateur bands up to 70cm, as well as covering things like the Civil and Military Airbands, all two-way PMR bands including the new Band 3, System 4 radiophone, domestic cordless telephones — the list of things we're not supposed to listen to is endless!

### Offerings

The set itself is capable of fitting into a standard size car radio aperture, and has a mounting screw hole on its rear panel to allow its fixing into most modern cars. Besides this however, the set contains an internal top-mounted speaker, and is smartly cased to permit table-top use, even coming supplied with four small rubber feet

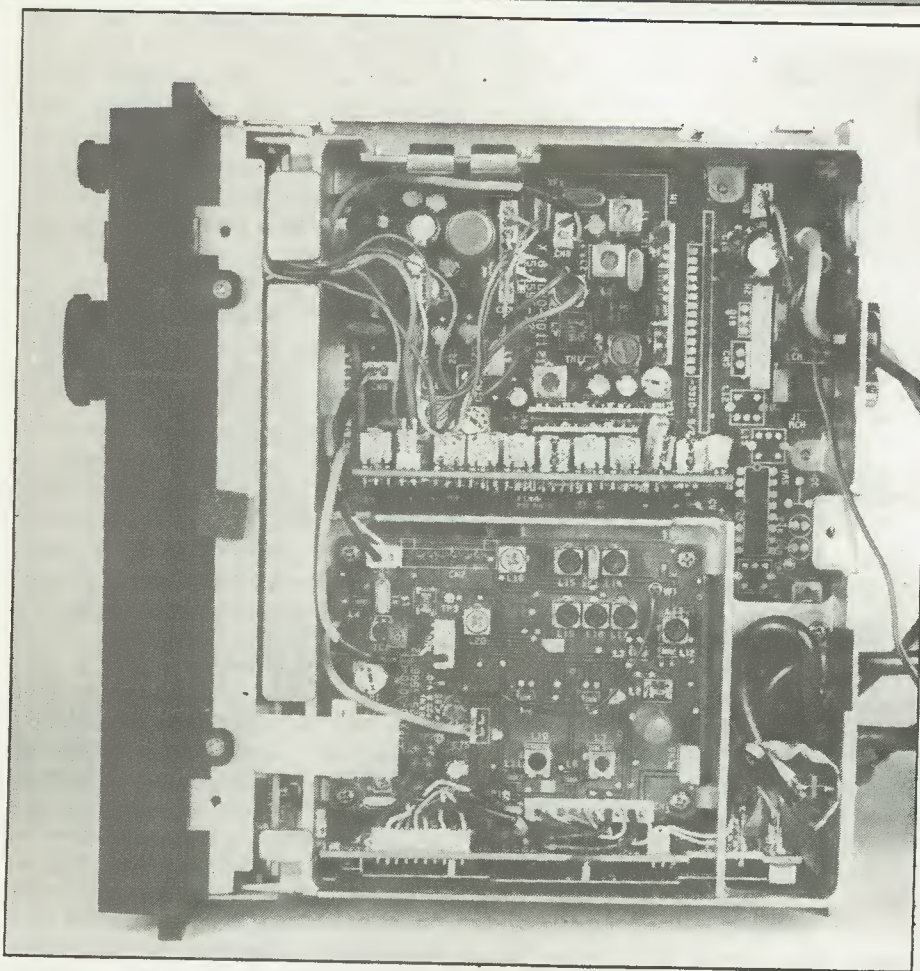
entry of any frequency in the 500kHz-905MHz range is possible, and from then you can tune in selectable 5kHz, 12.5kHz, 20kHz or 25kHz steps either by using the main click-step tuning knob or the panel mounted up/down buttons. An 'Auto' mode facility may also be used, where the set automatically selects AM with 9kHz steps from 504kHz to 1.629MHz, AM with 5kHz steps from 1.630MHz to 87.495kHz, FM-W with 50kHz steps from 87.5MHz to 108MHz and FM-N with the previously selected VFO step size from 108MHz up.

### The Clever Bit!

With all these frequencies to tune between, a total of 100 memories are provided for you to store your favourite channels in, a one-button press instantly transferring the frequency and mode into the VFO allowing you to tune around. But here's the clever bit. If

you're like me, you can never remember whether 11.780MHz in memory number 78 is Radio Moscow or the Voice of America. With the RZ-1 the set comes up with 'MOSCOW' or 'AMERICA' on its alpha-numeric display, instantly solving your problem! No, it doesn't have a super-intelligent brain built in, but it does allow you to enter any combination of up to seven letters, numbers, and/or symbols in any or all of the programmed memory channels to be displayed when tuned in. As well as this, a suitable pictorial symbol may also be displayed, such as a TV screen, radio set, aircraft, car, boat etc to give you further information as to what you're receiving. An internal large capacity lithium battery with a ten year lifetime is fitted for memory information backup in the absence of DC power. As well as frequency and memory channel information, a dual-colour bargraph gives an indication of the relative signal strength.

A scan facility of memory channels or the VFO is provided, with various scanning models being possible. In Memory mode, either all the memory channels may be scanned for activity or any selected group or ten such as 0-9, 10-19, 50-59 and so on and any of the channels may be locked out of scan mode if required whilst still allowing manual selection by using the up/down buttons or the tuning knob. In VFO mode, the entire frequency range from a programmed starting frequency may be scanned, or alternatively a programmed band-scan may be performed covering one of up to ten pre-selected bands programmed into memory channels 10 and 19, 20 and 29, 30 and 39 and so on. The scan halts when a busy channel is found, this may be either a carrier



**Topside view of the RZ-1.**

above the FM-N squelch threshold, or a stronger signal than an internally-set threshold level on other modes. Four types of scan mode are possible, in SEEK mode, the scan halts when it finds a signal and inhibits further scanning, in CAR mode it continues scanning when the signal drops, in TIME mode it halts for approximately six seconds before resuming regardless of the signal state, and in AUDIO mode the scan only halts when an audio-signal accompanies the carrier, always resuming scan six seconds later.

### Connections

The set has two aerial connectors on flying coax leads, one is a standard car-radio type socket and the other is the SO-239 type as found on virtually all amateur rigs. A rear-panel switch allows you to select either for use, or an 'auto' position connects the car-radio socket in on the MW and FM broadcast bands, and the SO-239 on the remainder. A rear-panel switch is provided to place an RF attenuator in circuit on the car aerial socket

connection to reduce strong signal overload. A built-in 2W RMS mono amplifier is fitted, this feeds the internal speaker or an optional external speaker connected to the rear panel 3.5mm jack socket, a front panel sub-miniature jack socket allowing you to connect an earphone if required, either of these disabling the internal speaker. Rear-panel mounted phono sockets give line level outputs (150mV) to feed an external amplifier for stereo FM reception, a multiplex decoder being incorporated in the RZ-1. The radio measures 180mm(W) x 50mm(H) x 176mm(D) and weighs 1.5kg, it comes supplied with a DC lead, spare fuse, mobile mounting hardware, short wire aerial, an instruction manual and circuit diagram.

### Impressions

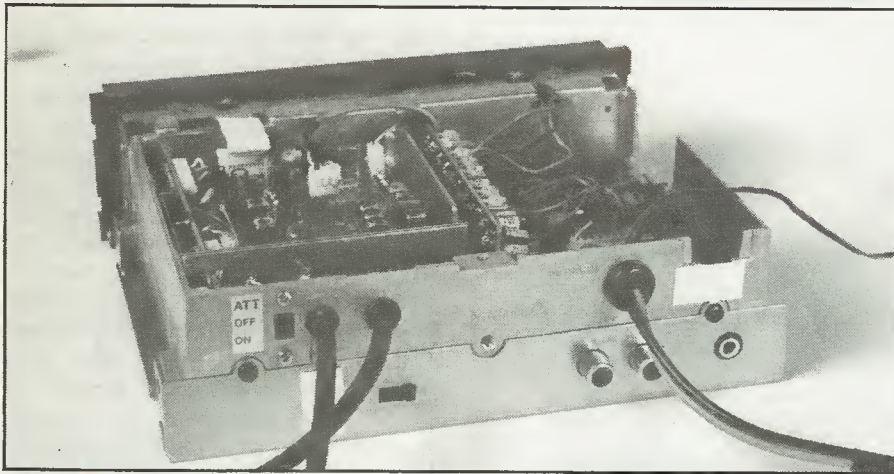
When I first saw the RZ-1 advertised in a Japanese radio magazine at the time of the Leicester Exhibition, I did hope that Kenwood would be considering the UK amateur market amongst others for

this, as the set could easily be considered to be a 'consumer' item rather than a communications receiver. I know of no other set at present with such a wide frequency range and certainly nothing at this size. I was offered the chance to review one of the first sets to come into the country, and I must say that its features were in excess of my expectations. The only thing I find slightly disappointing is that the maximum frequency limit is 905MHz, I feel that an upper frequency of say 950MHz would have been more useful, I understand the set may actually be capable of with this internal modification.

### Listening Around

On powering the set up, the first thing that occurs is a micro-processor 'self-check,' the display showing everything it can together with a 'KENWOOD' alpha-numeric readout. After around a second the set bursts into life and you're in business. I first coupled the receiver up to my wideband discone aerial to gain a 'feel' of operating it, this was soon followed by a massive programming session with the aid of one of the many 'Confidential' frequency listings that seem to be available everywhere. With the occasional help from the World Radio and TV Handbook, I soon had the majority of the memories programmed up with all sorts of interesting things together with local 2m and 70cm repeaters, their callsigns (eg GB3PI, GB3CF etc) being proudly displayed on the readout rather than just 2m frequencies. Similarly with other channels, the 'car' and 'aircraft' symbols seemed to feature rather often in my programming activities!

The reception quality of FM, both narrow and wide band, was very good indeed, giving ample audio output even from 12.5kHz channelised signals with their low FM deviation. On tuning into a broadcast FM station (or indeed FM TV sound), I found that I had to make a hasty grab of the volume control as the recovered audio was significantly greater; eventually I ended up storing these frequencies in the final 'block' of memory channels, locked out of scan mode,



Rear panel view, showing the flying lead connectors, attenuator switch and audio line level output sockets.

and used manual selection as appropriate.

Tuning around on the Short Wave broadcast bands with my discone attached, showed the set to be perfectly sensitive enough for use with a small aerial such as this for general listening, plugging in my 60m long HF/LF trap dipole certainly brought the overall signal strengths of received stations up but I found the set prone to overload on the more congested broadcast bands, where high-power propaganda stations battle with each other for the strongest signals. However by switching in the rear panel RF attenuator together with coupling the HF dipole up to the car radio aerial connector gave me the best of both worlds, the aerial selector then switching between the discone for general reception and the suitably attenuated 'monster' aerial for more serious SW listening.

When listening to VHF AM, I noticed that the recovered audio from even very strong received signals was rather weaker than that from other modes. When scanning involving a mode change from FM to AM, I noticed a gradual decrease in noise, and if a strong signal was present the large S-Meter reading also dropped in sympathy with the recovered audio level, which was initially quite respectable. This I believe is due to the AGC fed back to the front end stages possibly being at too high a level. I managed to live with it, but it was slightly irritating when scanning. I also noticed this drop in audio when tuning onto HF AM with no aerial connected, but due to signal levels encountered on HF in comparison to weak inter-

mittent VHF signals the effect did not rear its head in practice.

### Going Mobile

The next step was to grab the screwdrivers and go out to the car with RZ-1 in hand. With the car radio/cassette suitably extracted, in went the Kenwood. A threaded hole is fitted on the rear chassis of the RZ-1 to allow its fitting into most cars with standard car-radio fixtures, I quickly unbolted the plastic 'slider' from my Ford-fitted radio and fixed this onto the Kenwood, the set then nicely sliding into place. Fixing the front panel took a little more ingenuity though to prevent the set sliding back onto the depths of the dashboard, in the end a lining with black self-amalgamating rubber tape around the front provided a surprisingly neat fixture as well as preventing damage from vibration effects. I initially connected the rear-windscreen aerial (used for broadcast band reception on the normal car radio) to the RZ-1 for use on all bands, but although I found this worked well on the frequency ranges it was intended for, it was abysmal on other frequencies such as 70cm and HF due probably to the aerial matching network/preamp bandwidth. I then connected my normal dual-band 2m/70cm mobile whip to the set, this operated well on most bands except medium wave, so the best of both worlds was obtained by using the 'auto' aerial switch position provided.

In driving around whilst listening to virtually everything on the air, I found no traces whatsoever of ignition interference, even on weak HF AM signals, which is very good.

Reception of broadcast FM was every bit as good as that from my normal receiver, as was that of the not-so-local 2m repeaters, and listening to the news or quiz programmes on TV sound when driving along often made a novel change especially when coming out of the four speakers in the car. It also impressed the occasional passenger friend who often marvelled at the set reading out 'CAPITAL', 'ANGLIA', 'SWEDEN', 'GATWICK', and other more unusual things as I tuned around, with the resultant question of where a similar set could be bought! I did however find that the display was rather dim when the set was operated in bright sunlight, but just about right when used at night.

### How It Works

For those interested in the internal goings-on, a triple-conversion superhet with IFs of 45.75MHz, 10.7MHz and 455kHz is used on all narrow band modes, on wideband FM the discrimination is performed at 10.7MHz, the final IF not being used. Signals are initially split into those below 60MHz and those above, the latter being fed to a modular tuner with a built-in oscillator and mixer, providing a fixed 45.75MHz IF output. On the lower frequencies, the signals are passed through a bank of diode-switched bandpass filters covering 0.5-1.8MHz, 1.8-4.5MHz, 4.5-11.0MHz, 11.0-22.25MHz, 22.25-36MHz and 26-60MHz. Amplification by a 3SK131 dual-gate MOSFET follows, with a 2SK302 FET mixer with HF side injection from a pair of VCOs to give the 45.75MHz IF. An MB86006 synthesiser controls the two HF VCOs, together with the VHF/UHF tuner's internal VCO via an MB501 dual-modulus ECL prescaler.

The 1st IF signal is amplified and again split into two paths for wideband and narrowband modes, the narrowband signal being fed through a 45.75MHz roofing crystal filter. Down conversion to 10.7MHz follows with a mixer fed from a 35.05MHz crystal oscillator, on wideband FM demodulation into mono and stereo audio follows on a separate module. On AM and FM-N the signal passes through a pair of monolithic dual crystal filters, a TA7761 is used to mix the FM signal

to 455kHz for further ceramic filtering and demodulation, on AM an LA1133 also mixes down to 455kHz, passes the signal through a ceramic filter, and performs the final demodulation and AGC generation, the AGC being fed back to the VHF/UHF tuner and the first HF MOSFET amp stage.

### Laboratory Tests

In testing the image rejection I was pleasantly surprised, as many wideband scanner receivers fail miserably here, and this one is about as wideband as you can get! The sensitivity results show the set to be perfectly adequate on HF AM but rather lacking on VHF AM, as found in the on-air tests, in fact I could not get better than a 20dB SINAD AM signal on VHF AM no matter how high a level of signal I injected, showing the AGC was cutting this down somewhat. The sensitivity on VHF FM was quite reasonable though, it was down slightly on UHF but still quite usable, especially for TV sound reception where one should often get good results from fringe area or DX reception. As the set could often also be used for general entertainment, I quickly measured the resolved audio distortion on FM-W and found this to be very good, perfectly adequate for in-car hi-fi listening via the usual power boosters and graphic equalisers that some of us blast ourselves out with!

### Conclusions

The RZ-1 should certainly be popular with many amateurs as well as members of the radio-aware public who never like to miss a thing when out and about, and given today's limited dashboard space it can very easily replace the position occupied by most car radios without losing out on normal entertainment. The alpha-numeric display is certainly a very useful feature in my opinion. Overall I found it an extremely versatile set, the VHF AM performance was limited but otherwise it performed well, particularly so on 2m FM. The maximum frequency limit of 905MHz does not go quite as high as that of one or two other receivers on the market which is a pity, but then you shouldn't really listen to many of the goings-

on up there should you? I was fascinated with the set, as I am writing this it is away at the HRT offices and I must confess I'm rather missing it, when it comes back it is

going to be installed as a permanent fitment in the 'HCL-mobile', need I say more?

*My thanks go to Lowe Electronics for the loan of the review set.*



## LABORATORY RESULTS

**Sensitivity:** Input level (in  $\mu\text{V}$  pd) required to give 12dB SINAD;

Freq MHz	AM	FM-N	FM-W
0.5	2.51	—	—
1.0	1.26	—	—
2.0	0.791	—	—
4.0	1.41	—	—
6.0	0.891	—	—
8.0	2.24	—	—
10.0	1.11	—	—
15.0	1.99	—	—
20.0	1.78	—	—
25.0	1.78	—	—
30.0	3.55	1.58	—
50.0	5.01	1.41	—
80.0	6.31	0.355	—
90	—	—	1.12
110	11.2	—	1.00
130	7.01	—	—
140	5.01	0.282	—
150	5.01	0.251	—
160	5.09	0.282	—
170	5.17	0.355	—
200	5.13	0.313	—
250	6.02	0.546	—
300	6.08	0.575	—
350	5.89	0.453	—
400	6.12	0.803	—
435	—	1.09	—
450	—	1.72	—
470	—	0.686	—
500	—	0.760	1.07
600	—	1.03	1.91
700	—	0.928	1.61
800	—	1.02	1.38
900	—	2.12	6.02

**Maximum Audio Output;** Measured at 1kHz at the onset of clipping;

Load	Output
3 Ohm	2.30W RMS
8 Ohm	1.45W RMS
15 Ohm	0.89W RMS

**3rd Order Intermodulation Rejection;** Increase over 12dB SINAD level of two interfering signals spaced by 50kHz, giving identical 12dB SINAD on-channel 3rd order intermodulation product;

Frequency	Level
10MHz	51dB
145MHz	64dB
435MHz	62dB

**Image Rejection;** Increase in level of signals at the first IF image frequency over level of on-channel signal to give identical 12dB SINAD signals;

Frequency	Level
10MHz	65dB
145MHz	101dB
435MHz	68dB

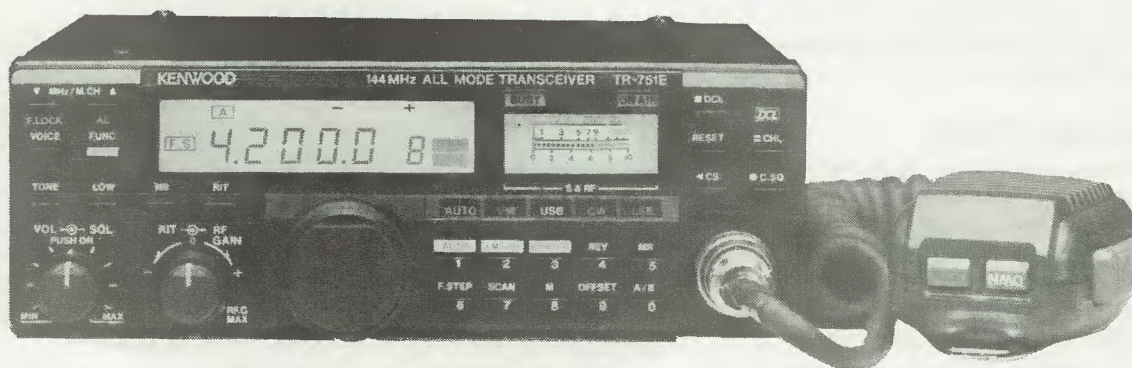
**FM-N Adjacent Channel Selectivity;** Measured as increase in level of interfering signal, modulated with 400Hz at 1.5kHz deviation, above 12dB SINAD ref level to cause 6dB degradation in 12dB on-channel signal;

Spacing	Level
+12.5kHz	34dB
-12.5kHz	35dB
+25kHz	40dB
-25kHz	41dB

**Audio Distortion;** Measured flat at 0.5W RMS output into a 3 Ohm load, 1kHz AF with 1mV pd RF input signal;

Freq	Mode	Distortion
10MHz	AM	5.40%
120MHz	AM	7.00%
90MHz	FM-W	0.57%
145MHz	FM-N	1.60%

# The TR751E from Kenwood



Now for something completely different – or how I found 2 metres and discovered the true secret of life.

Kenwood have always tried to give the radio amateur a sensibly thought out range of equipment, and the TR-751E occupies that particular place devoted to the all purpose, go-anywhere, high performance 2 metre multi-mode transceiver. Many of you will remember what an impact the TR-9000 had on 2 metre operation when it was introduced, and with other manufacturers scrambling to keep up, the success was repeated by the TR-9130. The TR-751E follows and improves upon those earlier successes, and it's no wonder, when you consider what is contained in this tiny package.

The TR-751E does not simply give you high performance; it presents it in such a way as to be easily used, logical in operation, and a lasting source of satisfaction. Is it any wonder that Angus McKenzie said in his review (*Amateur Radio*):-

"Trio (Kenwood) have clearly thought out the ergonomics very carefully and I found it one of the easiest mobile rigs to use, especially considering its comprehensive facilities." He also said, commenting on the actual performance of the receiver:-

"The receiver sounded alive, and seemed to be giving a performance very similar to that of the Icom IC271 with MuTek front end. I found this rather stunning, and it is clear that Trio have achieved a far better noise figure in the front end than ever before on a 2 metre rig."

Chris Lorek, in his review (*Ham Radio Today*) confirmed what had already been said:-

"The receiver appeared remarkably efficient at pulling weak signals in. When I connected in an external GaAsFET preamp at the aerial socket I noticed very little improvement."

This level of performance also extends to the transmitter, and Kenwood transceivers have always been noted for their high quality audio on the air. With 25 watts of RF available, the signal has more than enough "punch" to get through, and all in all there is little one can find about the TR-751E which is less than ideal. So-what does it all do?

You know by now that I dislike quoting long specifications, particularly considering that one could describe both a Metro and a Porsche as having four wheels on the outside and one in front of the driver – doesn't really tell you a lot about the true differences does it? Well, I believe that the TR-751E gives you a most versatile 2 metre multi-mode station; small enough to use mobile or portable, but comprehensive enough to use as a full-spec. base station at home. In that respect, it's also attractive enough to be domestically acceptable, and discreet enough in styling to go anywhere in the house. The facilities provided are quite remarkable considering the size of the set, but as always easy to use, in Kenwood tradition.

For those of you who read about the TS-440S last month (didn't you?), you will recall my comment about the need for a transceiver to stay on the same frequency when switching modes (yes, that's right, some of them don't). The TR-751E gives you true frequency readout at all times, in all modes, on receive as well as transmit. Would you expect Kenwood to do anything but what is correct?

Also in Kenwood tradition, a comprehensive colour brochure is available which describes the TR-751E in complete detail, together with the range of matching accessories (no, there isn't a matching handbag . . .) The information is free, but the Post Office demand payment for getting it to you. If you care to send a stamped addressed envelope we will fill it with the required information. If you want something weightier to read, send us £1 and we will fire back the complete full colour Kenwood catalogue and other interesting reading. If you want to have a moan, my name is:-

John Wilson  
G3PCY/5N2AAC  
73 (or for 2DYM 73s) see you soon Richard . . .

**TR751E £599 inc. VAT**

Glasgow: 4/5 Queen Margaret Road.

Tel. 041-945 2626

Cardiff: c/o South Wales Carpets, Clifton Street.

Tel. 0222 464154

Darlington: 56 North Road.

Tel. 0325 486121

London: 223/225 Field End Road, Eastcote, Middlesex.

Tel. 01-429 3256

Cambridge: 162 High Street, Chesterton.

Tel. 0223 311230

Bournemouth: 27 Gillam Road, Northbourne.

Tel. 0202 577760

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## FREE

Information is free; only the Post Office demand payment for handling it – and the Penny Black is no longer used. Send us the coupon opposite, with £1 to cover Post and Packing and we will return not only the full colour Kenwood catalogue, but details of any particular rig you mention and lots of other information including latest prices.

## The Guide to Packet Radio

I freely admit that with a callsign like mine I must be rapidly approaching the age when I cease to be a fount of knowledge and become a reactionary old so-and-so. Under these circumstances, when something really new comes along, may the Lord continue to grant me the wisdom to recognise my failings and ask some one else for assistance.

In this spirit I am pleased to tell you about our "Guide to Packet Radio", one of a series of hopefully helpful booklets which I have been pleased to present over the last few years, initially as author, but in this case as Editor.

The reason for my being Editor is that Richard Hillier knows far more about the subject of Packet Radio than I, and he is willing to stay up until the small hours finding out what he doesn't already know.

Packet Radio came galloping over the horizon quite some time ago, but like everything new in amateur radio, everyone waited for his friends to try it out first before committing hard earned cash to purchasing any equipment.

This meant that the mode had the usual gestation time of about two or three years, but oh dear, the amateur radio fraternity has suddenly woken up to the possibilities which Packet can offer, and our showrooms are crowded with people wanting to see, try, and buy Packet terminals.

This guide therefore, is our attempt to answer some of the questions which the newcomer to Packet is likely to ask, and if you would like a copy, just clip the coupon on this page, enclose the necessary postage, and ask us to include it with all the other reading matter.

As I read the text, I am sure that Richard Hillier has done a good job in leading you by the hand into this new and intriguing aspect of our hobby, but of course in true Lowe Electronics tradition, if there are any further questions you wish to ask, we are here to help at any time.

As for me; I shall go away and write the definitive work on how to modify surplus World War 1 spark transmitters for working on 200 metres and below . . .

Morituri te salutant.

John Wilson

G3PCY/5N2AAC

## HF125 HF all mode receiver



Why did we design and produce the HF125 receiver? Simply to provide the keen short wave listener with a receiver which offered not only all the facilities he or she needed in an HF receiver, but to give at the same time a level of performance which would cope easily with HF conditions likely to be encountered in Europe.

You all know the problems, high power broadcast stations pounding in at night, blotting out the weak signals you wanted to hear - and many of the unwanted signals were generated in your receiver itself. That we succeeded in designing a receiver which could solve the listening difficulties is obvious from comments from reviewers, but we also did it at an attractive price.

The HF125 performance ranks equal to or better than imported receivers at twice its price, and its success stretches around the world.

So what did the reviewers say. I'll give you a few comments, but for the full story why not send a stamped addressed envelope marked "HF125" and we will return a fully descriptive brochure with all the review comments included.

### Quotes:

"What is particularly important is the fact that so much attention has been paid to RF and IF performance; areas so lacking in many Japanese sets. Short Wave Listeners will be particularly pleased about the many choices of selectivity on AM." Angus McKenzie

"I tuned straight to the 40 metre amateur band to see how it stood up to the battering from high powered propaganda broadcasters when attempting to resolve relatively weak amateurs striving to get contacts. The simple answer was, no problem." Chris Lorek

"After an hour, drift was less than 50Hz in each instance. This is comparable with receivers in much higher price classes." World Radio and TV Handbook

"It's refreshing to find a receiver that does exactly what it claims." World Radio and TV Handbook

The HF125 costs £375 including VAT. Need I say more?



Why am I going to tell you about a unit which is "just a receiver" in a magazine devoted to amateur radio? Because the NRD-525 cannot be dismissed as "just a receiver"; in fact it is the most sought after communications receiver in the world, in the dedicated listener and semi-professional field.

We have been JRC distributors for many years now, and proud we are to handle their products, because they stand head and shoulders above the run of the mill, both in performance and sheet quality. We have sold untold numbers of their receivers to totally satisfied customers, but it is only recently that radio amateurs have asked us "why are you not selling the JST-125 transceiver?"

Well, we did sell the JST-100 forerunner, and although quite expensive it proved as totally satisfactory as all other JRC products. However, when the JST-125 appeared, we had already been selling the NRD-525 for some time, and the JST-125 seemed to us to be no more than an interim model and slightly out of date. One problem we could foresee was that it could not operate in transceive with the NRD-525, and we thought we would wait and see.

Sure enough, we were right, and we shall shortly be releasing details of the new JST-135, which matches the NRD-525 in styling and appearance and also operates in full transceive with the receiver, making what must be the ultimate station. If you bought a JST-125 from someone, I am afraid you may have been led astray as to its future, and you now know why we, the appointed JRC distributor, were not selling it.

As for the NRD-525, we are preparing an information pack which will tell you all about this truly top class receiving instrument, and the pack can be included if you send the coupon at the bottom of this page.

Happy listening.

## The NRD-525 An extraordinary receiver

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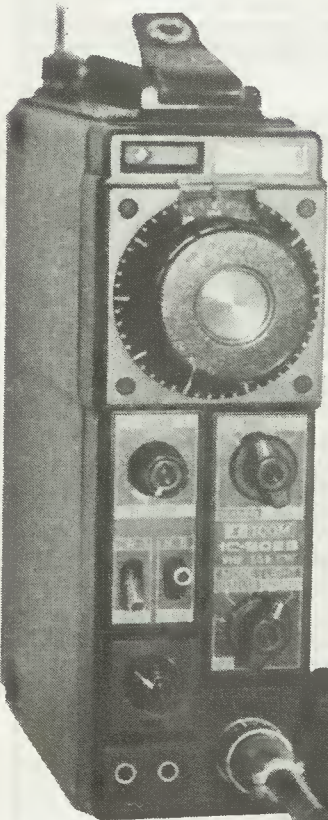
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# MODS TO THE IC-202



necessary 133.3MHz injection. Four switched crystals (two fitted as standard) each provide a tuning range of 200kHz. The transmitter produces an output of a little over 3 watts.

about simply adding a pre-amp (which in itself can cause problems with an uneven distribution of gain throughout the receiver) but by addressing the problem at its source, the front-end. When these

TO RADIO	<b>G4DHF</b>	VIA	RST
Wk	David Johnson	Topic	
CONFIRMED	65 West Street,	Address	
NAME	Bourne,	Box	
QTH	Lincolnshire PE10 9PA	Phone	
QSO	<b>ZM19F</b>	QRP	Diag
DATE	<b>XVHEX</b>	TX	
TIME	<b>XVHEX</b>	ANT	
MODE		TS de	in GPO

*Turn your IC-202 SSB box into a golden oldie with this performance upgrade by David Johnson, G4DHF, and put the new ones to shame*

The simplicity of this conversion system is the reason why so many high power linear amplifications use the 202 as their source. The spectral purity of the output with low-noise sidebands (unlike many synthesised systems) provide the operator with a means of producing an extremely clean and narrow signal. This increased signal aware-

ness has given rise to something of a renaissance among many VHF DX enthusiasts judging by the increasing number of requests appearing in the "Wanted" columns in amateur journals. At a little over £100 second-hand, these rigs represent outstanding value for performance and cost-effectiveness.

modifications are completed the receiver will be good enough for the most demanding of weak signal communication, including EME. (Earth-Moon-Earth communication. I have had many successful Moon-Bounce contacts using just the modified receiver feed via LDF450 heliax while operating portable. From home in the centre of town, over 300 European QRA locators in around 42 different countries have been worked. Not bad for a little hand-held with fewer knobs than all the highly expensive "wonder-boxes"! Remember, you do not need a good 400 watts from a pair of 4CX250B's to actually hear the weaker DX. Careful attention to eliminate as many lossy circuits and possible sources of noise (including feeder loss) will pay dividends and enable the operator to more ably copy the weaker DX pulsing amidst the receiver noise. In fact the 202S has formed the base-station rig on four major Scottish DX-peditions during the past three years and has completed many hundreds of Meteor-Scatter QSO's. The receiver noise was measured at the 1985 VHF Convention at under 1.2dB. Several rigs have since been modified and each have given excellent results.

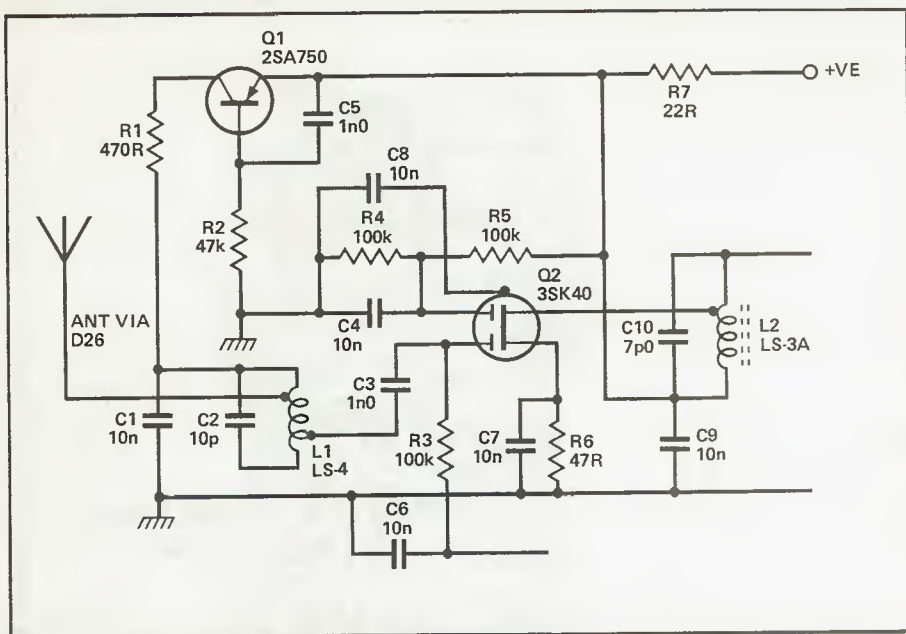
### Receiver Upgrading

In order to match the capability of the transmitter the receiver needs a number of modifications and a certain amount of re-design. Make no mistake, we are not talking

So much interest was shown "over the air" that a broad-sheet

The Icom IC202 was first introduced over ten years ago as a 2 Metre SSB/CW hand-portable transceiver. It enjoyed enormous publicity and three versions were developed culminating in the 202S. Even later versions of this model were up-graded with the extensive use of state of the art devices. The success of the radio was due largely to its design, being a simple and straightforward single-conversion system with a 10.7MHz IF. The conversion oscillator uses a VXO running at around 14.8MHz and is multiplied by 9 to provide the





containing the basic modifications was circulated. Since then the modifications have evolved into their present state of refinement as the devices available have improved, with assistance and suggestions from G8PNX and G4CYA. As with most radios having such excellent potential some simple modifications have appeared in European publications over the years. In the case of the 202 these have usually consisted in bypassing the band-pass filter on receive. The following modifications are far more extensive but are certainly worth the time and care needed in their implementation.

### Front-End Modifications

As the intention is to reduce the overall noise figure by the elimination of lossy circuits and possible sources of noise, we are going to completely rebuild the first stage and remove the band-pass filter, diode switching and AGC control as the mixer is more likely to overload before the RF amplifier. Diodes in the RF circuit have been known to become noisy, and they can adversely effect the performance of the receiver in the presence of strong local signals. Aerial change-over is accomplished by a miniature metal gas-filled relay (by National) which is mounted on its side and lightly soldered to the crystal filter.

### Procedure

Referring to the circuit diagram, Fig. 1 and the board layout, Fig. 2; 1. Remove both side panels and any internal battery source.

2. Remove the five retaining screws on the main board and the two which secure the PA heatsink to the case. Disconnect the antenna and earth links from the SO239 socket and gently ease the board past the leads which pass to the power input socket.

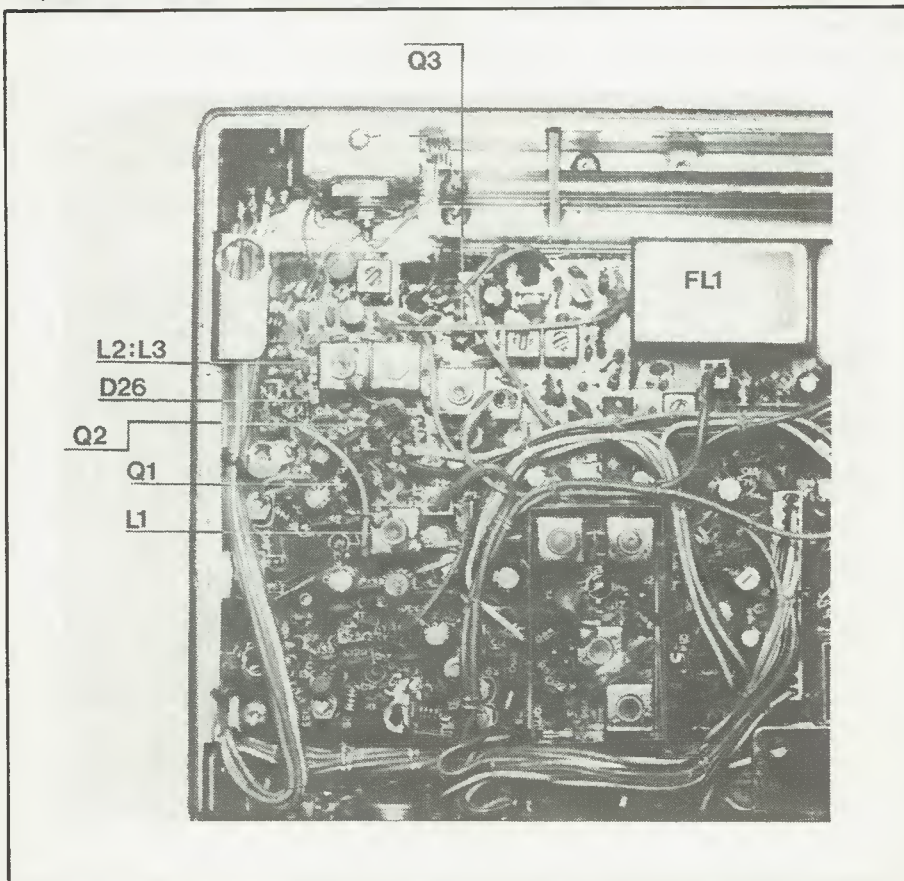
3. Remove the following components; R1, R2, R3, R5, R6, C1, C2, C3, C5, C7, C8, L1, Q1, Q2, D26. Replace R5 with 68k, R7 with

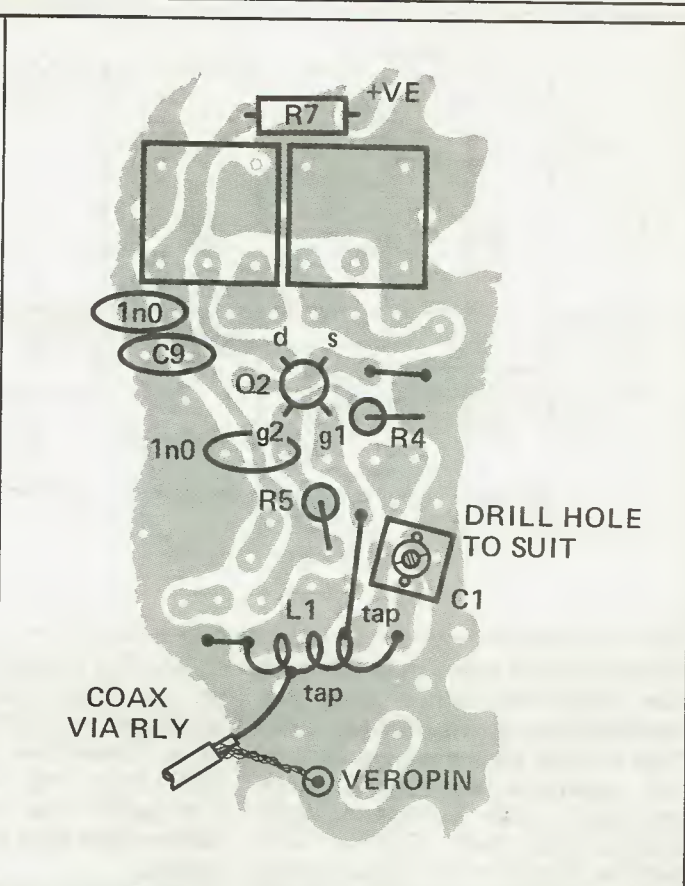
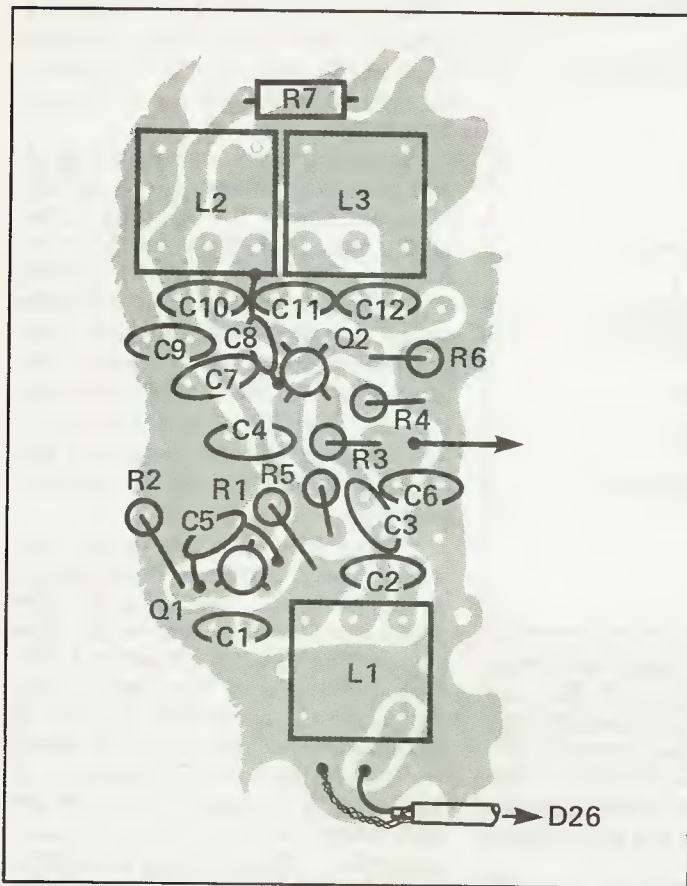
100ohm and add 1nF miniature ceramic capacitors directly across C4 and C9, soldered to the underside of the PCB with the minimum lead length.

4. Referring to the circuit in Fig. 3 and the diagram Fig. 4, rebuild the front-end using the existing holes on the main PCB. The coil is inserted first and the air-spaced variable capacitor fitted in the available space. An extra hold may need to be drilled into the PCB earth-plane, the location of which is determined by the pin spacing on the capacitor. The holes which accommodate Q2 (BF981) will have to be slightly enlarged.

Take care not to damage the copper track. Note how the source is connected to earth with the absolute minimum lead length. The connection to L1 is tapped one turn from the 'hot' end. This removes the tendency for oscillation at UHF. A short wire link connects the top of the coil to the main PCB and Q1. A Vero-Pin is soldered in one of the redundant holes in the earth-plane around L1. This provides an anchor point for the outer of the coax which connects with the switching relay.

As is good practice at VHF keep all leads short, and where a com-

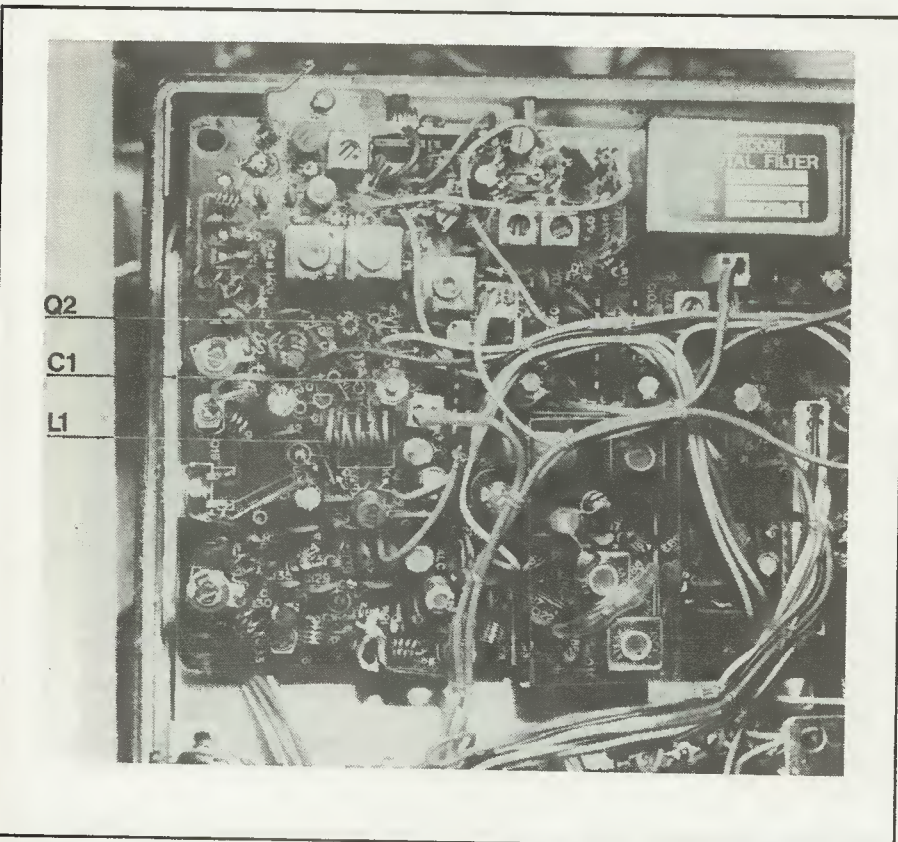




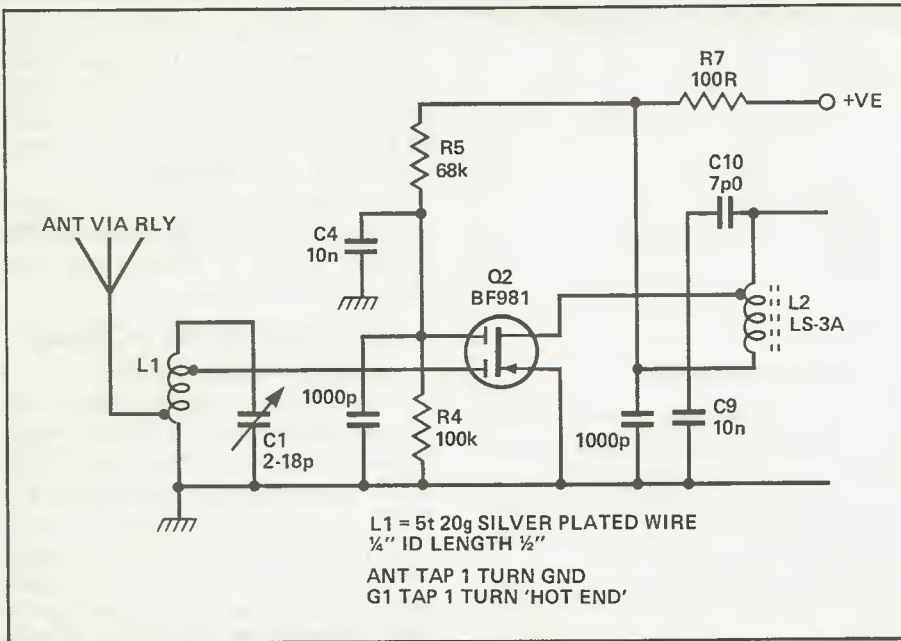
ponent is mounted vertically locate its body in line with the RF path to prevent radiation via the leads. A ferrite bead on the other end would also help.

Carefully attach three lengths of miniature 50ohm coax to the leads of the miniature relay and then locate it by the side of the crystal filter.

Because we have removed the diode switching the relay must connect directly with the signal paths. The antenna input is connected to the centre of the relay via a 1nF ceramic capacitor which has the function of blocking the DX external switching voltage (described below) from the signal paths. The Tx output is still through the band-pass filter and appears at the ANT connection on on the main PCB. The receive signal is routed and tapped one turn from the 'cold' end of the new air-spaced input coil L1. Be careful when connecting the supply voltage as the relay coil is polarised and will only operate with the correct polarity. Positive voltage on transmit is obtained via a connection to the top of the black connector-block which taps the main Tx supply. Some later 202s have twin plug-in connectors. Here the connection is made to the top of R75 located just to the right of the connector (Fig. 5a, b).



Upon completion, clean the underside of the board to ensure no tracks have been shorted and that all leads are cut short. Relocate the board inside the rig and reconnect the earth-link and a signal paths to the change-over relay. Ensure that



the main supply lines are not shorted. Carefully remove the wax which secures the cores of L2, L3, L4, apply power and tune the rig to 144.100. Carefully realign the entire front end for maximum sensitivity on a stable weak signal source or perceived band noise. The new input capacitor can be adjusted for the best signal to noise ratio. Simply replacing the antenna connection will show a marked increase in the registered amount of noise. Bandwidth is such that switching to the higher range crystals should show a decrease in the amount of noise at the audio output. This is of no real consequence because normal operating is confined to around 400kHz at the bottom end of the band. Maximise the effectiveness of the system by using the best quality, lowest loss feeder cable available. Remember that the feeder losses have to be taken into account when determining the receiver noise figure. Alternatively, use a mast-head system to eliminate feeder loss.

### External Switching

Some means of remote switching for external amplifiers, and mast-head systems is highly desirable. As previously indicated, this is easily accommodated with the circuit in Fig. 5a, b. A voltage on Rx or Tx can be provided by connection to the appropriate point on the main connector block. Unlike the original 202 which produced a

voltage on Rx, most commercial rigs produce a positive voltage on Tx which appears down the centre of the coax. The circuit in Fig. 6 senses the voltage and provides the necessary change-over function. The relay contacts can either supply or short an existing voltage to ground. This has the advantage of completely isolating all voltages within the radio.

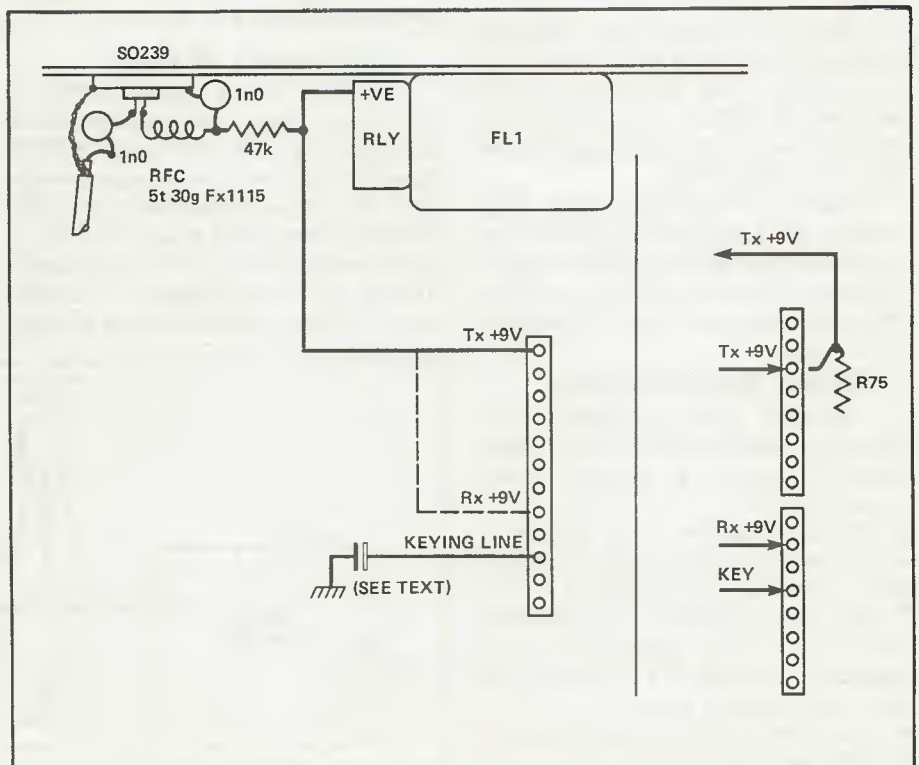
### Mixer

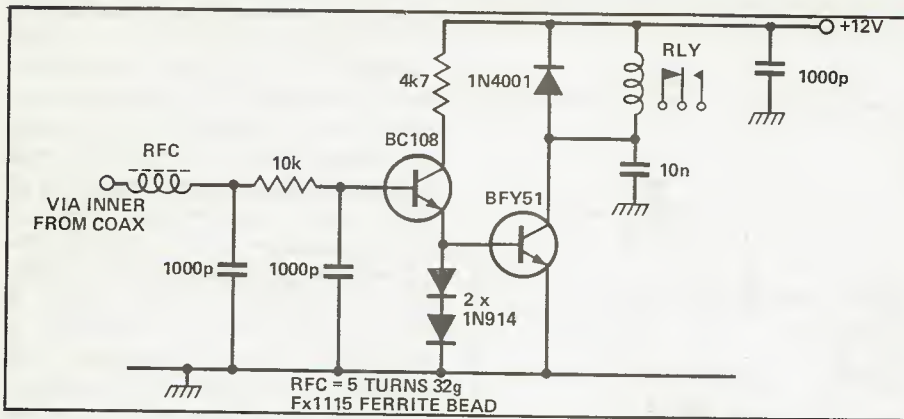
This type of mixer is capable of excellent performance under

strong-signal conditions but there is an inherent design problem with the IC202. The output from the conversion oscillator is in the region of 250mV which is ideal for the transmit mixer (IC7) but around 2V peak to peak is required on the source of Q3 for best performance. This has the advantage of increasing the conversion gain and improving the dynamic range of the mixer. If strong-signal performance is important then a separate LO amplifier is necessary on receive. This has to be interfaced with the diode switch (D28, D29) and could be located in the available space under the loudspeaker housing. This operation has been successfully completed by G4CYA who reports favourably on the improved performance. Due to a rural environment the author has yet to find it necessary to implement this modification, choosing only to substitute the device with a J310 and optimise its performance under weak-signal conditions with the available low voltage.

### Selecting Mixer Device

Obtain a number of J310 JFETs in order to select the best device for the job. On selection the following parameters need to be determined; 1.  $I_{DSS}$  = The maximum Drain — Source current when the Gate — Source voltage is zero.





2.  $V_{gp}$  = The negative voltage required on the Gate to cut-off the Drain-Source current. This may be difficult to determine accurately so regard the device as cut-off when the Drain current is reduced to  $100\mu A$ .

Set up the circuit in Fig. 7 wiring  $1nF$  capacitors directly across the pins of the transistor holder with the shortest possible leads to prevent the device oscillating. For each device:

(a) Set the Gate — Source voltage to zero.

(b) Plug FET into test circuit.

(c) Switch on Drain supply and quickly note the drain current on the mA meter. It is important to note the reading ( $ID_{ss}$ ) quickly since after switch-on there is some thermal drift due to internal heating of the device, causing a shift in the  $ID_{ss}$  value.

(d) Now increase the negative voltage on the Gate from zero to the point where the Drain current is reduced to  $100\mu A$  (or thereabouts) on the mA meter. Note the Gate-Source voltage ( $V_{gp}$ ).

Having completed this procedure for each device, select the example that had the highest  $V_{gp}$ . It is likely, but not necessarily so, that this example also had the highest  $ID_{ss}$  value.

### Mixer Modifications

1. Remove R10 ( $220\Omega$ ) and replace it with as short a wire link as possible with a ferrite bead threaded on it.

2. Remove R9 ( $1K$ ) and replace it with the  $220\Omega$  resistor that has been removed from position R10.

3. On the underside of the PCB, install a  $1nF$  plate-ceramic capacitor across C17 using the shortest possible leads.

4. Remove Q3 (2SK49) and replace it with the selected J310 taking care

to orientate it correctly (see pin out) pushing it as close to the PCB as you can in an attempt to keep the leads as short as possible without damaging the device.

5. Realign L4, L5 for maximum gain.

### IF Amplifier (IC202, 202E, and early 202S)

This modification ensures that any white-noise present in the IF due to the MOSFETs oscillating at UHF, is eliminated.

1. Locate and remove the IF screening can.

2. Remove C156 ( $.01$ ) from TO72 can of Q6 (MEM616).

3. Remove Q6, Q7 (MEM616).

4. Thread a small ferrite bead onto Gate 2 of Q6, Q7 and reinstall, pushing the devices as close to the PCB as possible.

5. Reassemble and check the alignment of L7, L8, L9.

### Increasing IF Gain

A little more gain in the IF amplifier stages can be obtained by substituting Q6, Q7 with BF960 type devices, but some experiments with a number of devices in position Q7 may have to be made in order to get a reasonable S-Meter response. When this modification is carried out it further enhances the strong-

signal handling capabilities of the rig by virtue of the increased AGC action available. To effect this modification simply follow the above procedure substituting the MEM616s with BF960s.

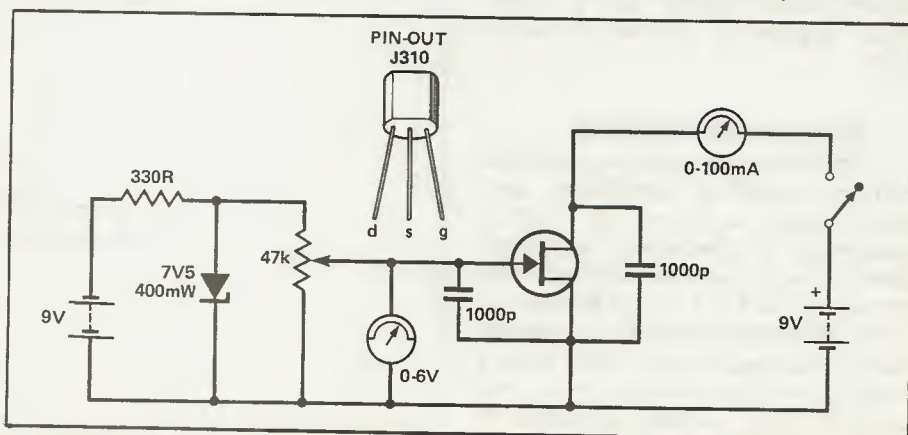
It was noticed that later versions of the 202S used 3SK74 devices in the IF which has the same effect as above.

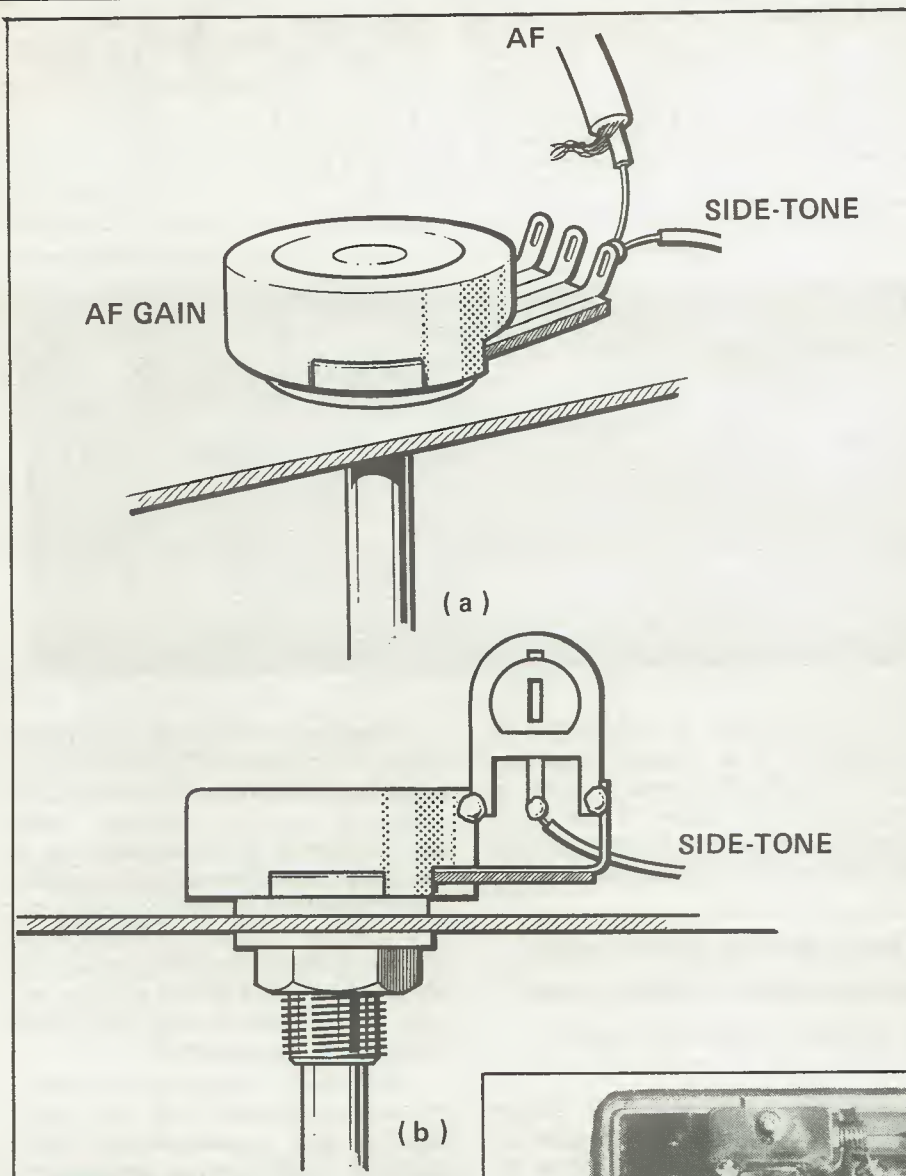
### Eliminating Key-Clicks (particularly 202S)

The 202 is well suited for Meteor-Scatter as the keying circuit is able to cope with well over 1000 LPM. However, at these speeds the 202S is prone to produce quite heavy key-clicks across the band. This appears to be caused by a rapid rise time on the keying line due to the omission of capacitors across the emitters of Q16, Q17 in the transmitter amplifier. These capacitors are present in earlier versions but were probably omitted in the 202S because they had a slight pulling effect on the side-tone oscillator. The bandwidth of the signal is significantly reduced by placing a  $10\mu F$  tantalum capacitor across the keying-line and earth. Some amount of experimentation may be necessary for best effect. Increasing the value of the capacitor will have a 'softening' effect and so the keying-line will not be able to respond to such high speeds. Values between  $4\mu F$ - $10\mu F$  appear to be optimum without impeding keying resolution.

### Side-Tone

Switching to transmit when operating CW has a deafening effect because of the discrepancy between receiver and side-tone audio levels. This is because the side-tone output is directly connected to the audio amplifier with





no means of level control. The fitting of such a control is quite straightforward because the side-tone input to the audio amplifier is via the outer pin on the AF gain control, which is easily accessible without removing the main PCB or any internal components.

### Fitting

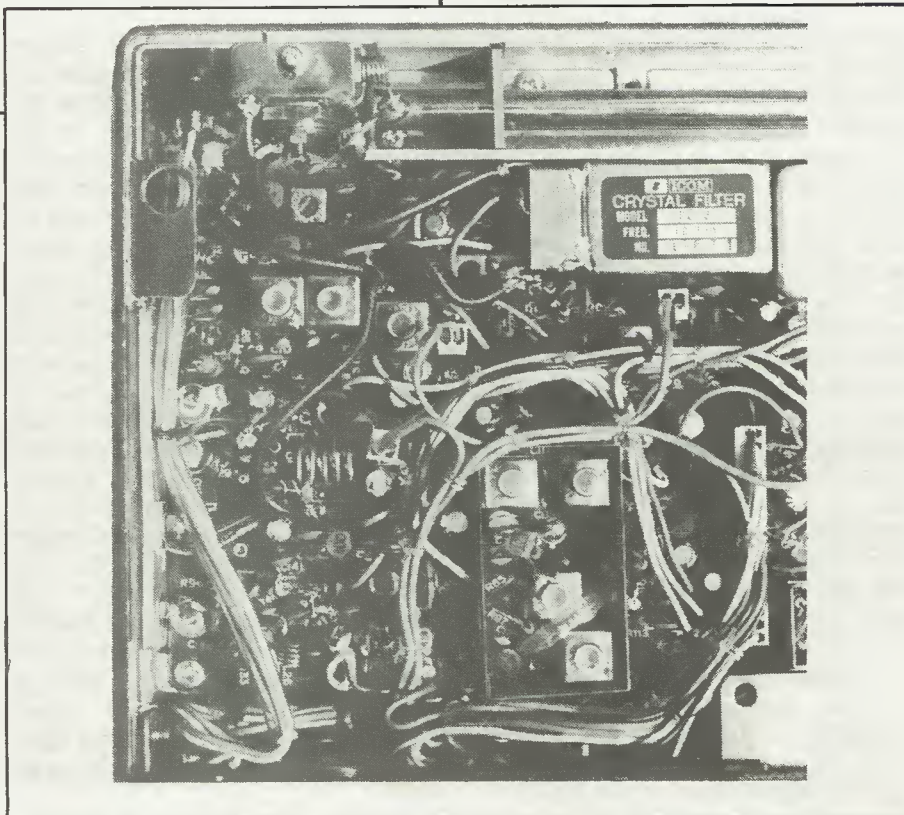
Looking down into the rig above the AF gain control, there are two wires which connect to the "top pin". One is screened and carries the main audio signal, the other is coloured and unscreened. This is the side-tone input.

1. Disconnect this wire and solder it to the centre-pin of a 1K vertically mounted variable resistor.
2. Referring to the illustrations in Fig. 8a, b, connect the resistor across the "top pin" and earth (metal case of the AF gain).

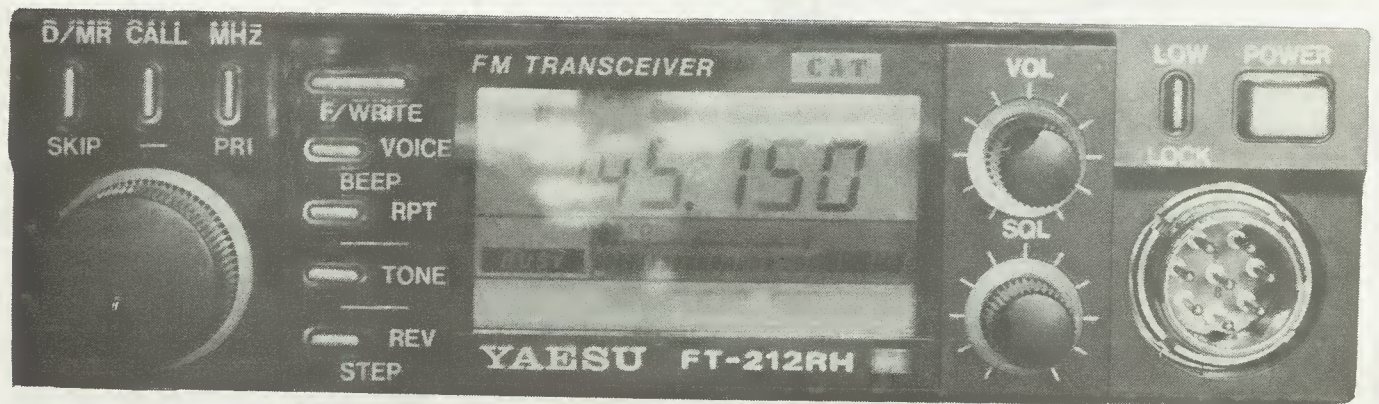
This operation does not appear to interfere with the workings of the AF circuit in any way and allows the level of side-tone to be continually variable. At low levels a slight "click" will be audible when keying. This is caused by the AF amplifier (IC2) and is unavoidable.

### Finale

The analogue dial is accurate to within plus or minus 2kHz, depending on the alignment and tracking of the VXO crystals and is perfectly adequate for most tropo work. However, anyone who seriously operates weak-signal DX soon realises that some form of digital readout is necessary. For most this is achieved with an external frequency meter. For others some form of digital display is interfaced with the internal local oscillator. The author is aware of two operators who are successfully using inexpensive and readily available 4MHz liquid crystal counters at the output of a simple converter. Here the local oscillator is lightly coupled into Gate 1 of a MOSFET and a crystal source of around 130MHz is injected into Gate 2. The Drain circuit is tuned to 4MHz and displayed on the counter to an accuracy of around 100Hz. It is hoped to publish more details at a later date.



# Yaesu FT-212 Mobile REVIEW



In the January 1988 issue of *HRT* we disclosed what was 'round the corner' in terms of the latest sets to come. One of these was a new talking mobile rig from Yaesu. "So what?" you may ask, there's

At 140mm(W) × 40mm(H) × 160mm(D) it is smaller than the earlier FT-211RH series of sets, in fact in the FT-212RH the rear heat-sink takes up nearly half of the size. The set covers the band with select-

Provision is made for internally fitting an optional CTCSS (Continuous Tone Controlled Squelch) unit allowing you to monitor only transmissions accompanied by a similarly programmed sub-audible tone frequency, as well as having an encode-only mode if required. This system is becoming very popular in some busy areas of the country as well as facilities for its use being fitted on some repeaters.

*Let your radio do the talking? That's the one option which this new 2m FM mobile offers the operator. Chris Lorek, G4HCL, tries out the audio sequel to packet radio*

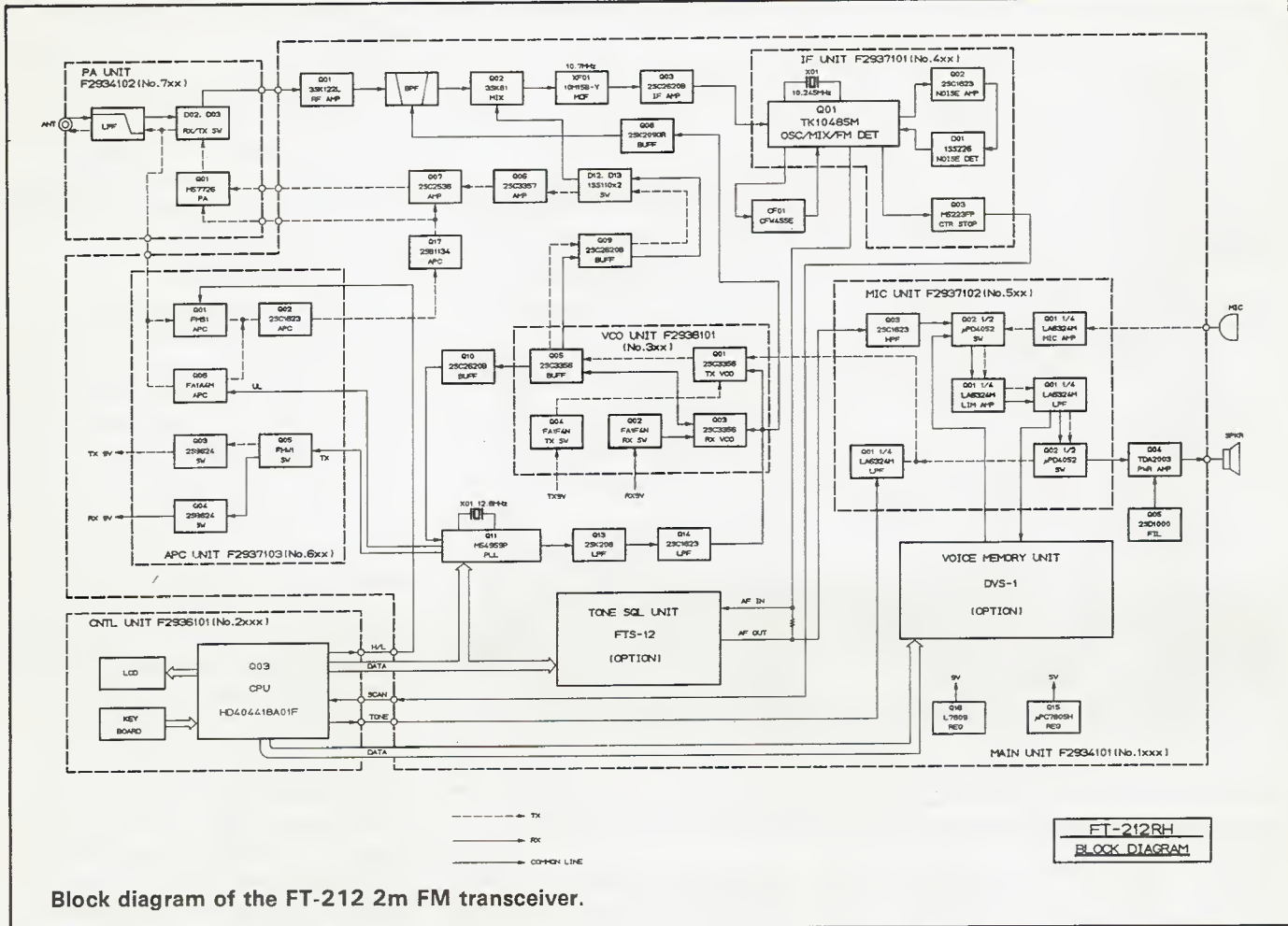
nothing new about sets with built-in speech synthesisers. Well with an optionally fitted module this one actually talks to you, or other amateurs in *your* voice — what's more it can digitally record speech messages from other amateurs who have called you in your absence, to be replayed at your leisure! A prototype set was displayed at the Leicester Exhibition, and *HRT* were able to obtain the very first 2m production model to reach our shores. G4HCL/M then hit the East Anglian amateurs with something they'd never heard before, leaving many gasping in amazement that they'd been talking to a silicon chip as well as a human! Want to find out what else the set has to offer? Then read on...

## Small is Beautiful

The set offers coverage of 144MHz - 146MHz with 45W transmit output power, with a switchable 5W low power position.

able 5kHz, 10kHz, 12.5kHz, 20kHz or 25kHz steps, the frequency control being performed either by the click-step rotary knob or by up/down buttons on the supplied mobile first mic. An up/down lock slider switch is fitted to the rear of the microphone to help prevent accidental frequency shifts. For repeater operation, a programmable Tx repeater offset is provided at the push of a button, and a microphone mounted 1750Hz tone button is fitted as well as a panel-mounted tone button for easy repeater access. A facia-mounted button allows a 'listen on input' facility to allow you to check reception before attempting a simplex QSO. The facia mounted knobs and the majority of the buttons are backlit for night-time use, and is the LCD panel, a small light sensor gives a dual-brightness lighting level depending on the surrounding light to save distraction when driving at night.

Eighteen general-purpose memory channels are provided, together with a quick-access 'Call' channel, each storing frequency, any programmed repeater offset, and CTCSS encode/decode mode and frequency information if fitted. Two further memory channels (L and U) store upper and lower frequency hand limits for use with a programmed band scan facility where all frequencies between the two pre-set limits are searched for activity in the pre-programmed channel steps. Memory channels may also be scanned for activity, any of which may be locked out of the scan as required, the scan mode in all cases being initiated by keeping one of the microphone mounted up/down buttons pressed for more than half a second. In each case, the scan stops when a busy channel is found, ie. when the receiver squelch raises, and resumes either when the signal disappears or 5 seconds after the scan halts regardless of whether



Block diagram of the FT-212 2m FM transceiver.

the signal is there or not, dependant upon the pre-set 'pause' mode programmed by the operator. As well as all this, a 'Priority' channel monitor facility is selectable where the set briefly samples memory channel 1 every five seconds, operation shifting onto that frequency for as long as a signal is present on it. Musical dual-tone beeps accompany each button push or scan halt, these may be disabled if you can't stand them by using the facia mounted controls.

The set comes supplied with a quick-release mobile mounting bracket and fixing hardware, the first microphone, a long DC supply lead fused in each leg, an instruction book with block and circuit diagrams, and a 'quick reference' chart to remind you how to use the sets many functions.

### Computer Connections

The packet radio operators amongst us may like to know that all connections required to interface with a TNC (Terminal Node

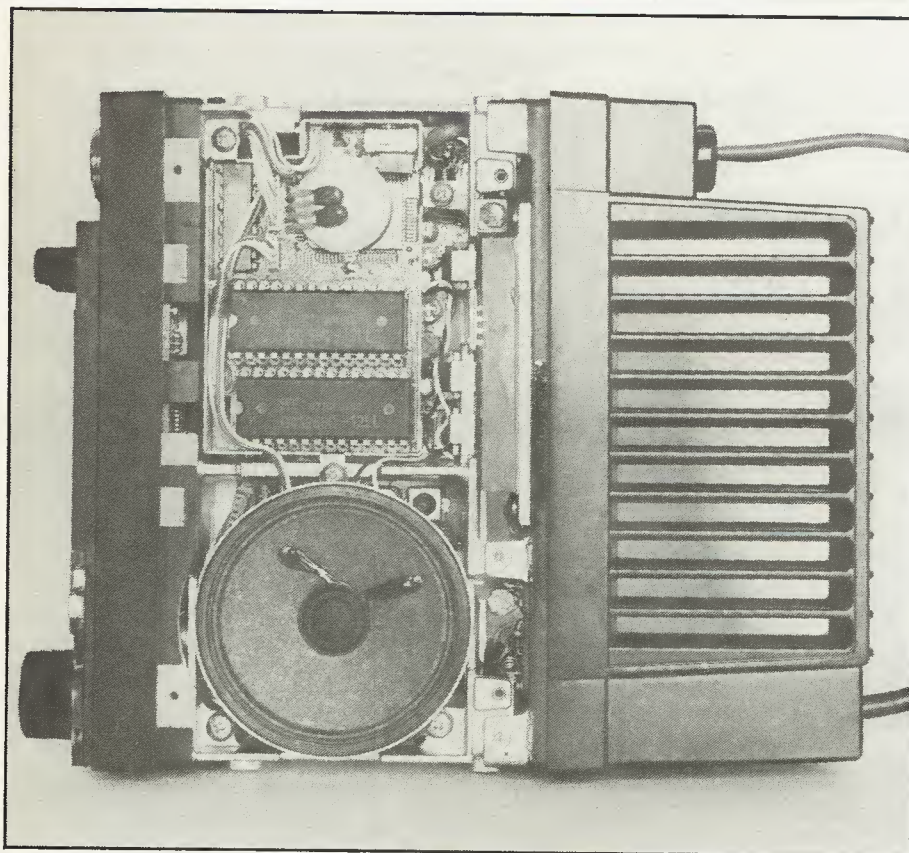
Controller) may be made by using only the microphone socket. This usage requires a small internal modification which allows the squelch detect output to be provided but removes the microphone-mounted 1750Hz tone facility, the facia-mounted tone button however may still be used for this. As well as TNC connection, the microphone connector allows Yaesu's CAT (Computer Aided Transceiver) control system to be used, this allows external control via a computer's RS232C port of the set's operating frequency, transmit/receive switching and high/low transmit power selection, together with the CTCSS tone frequency and encode/decode status if optionally fitted. As well as this, the mic connector may also be used for memory 'cloning' between one set and another, by physically wiring the two sets together. This enables all memory information stored in one set to be quickly transferred to

another without manual re-programming.

### Digital Voice System

Now here's the clever bit. An optional DVS-1 board, which was supplied with the review set, may be fitted inside the FT-212RH to allow digital storage of either local microphone audio and/or received audio of up to 128 seconds, using an on-board 1Mb (one megabit) RAM (Random Access Memory). This may also be performed remotely over the air using 'touch-tone' DTMF (Dual Tone Multi Frequency) control, ie. the tones that are sent out by some keyboard-controlled sets on transmit. Depending upon the prevailing licence conditions, this facility may be internally linked to act either as record-only or playback and record when commanded over the air.

Eight separate storage 'segments' may be used either separately or combined for message store and playback. The sampling rate setting (recording time and speech



Underside view showing the underslung loudspeaker and the extensive heatsinking arrangements; power and antenna connections are by flying leads.

quality), individual or combined segment record and playback, locking and unlocking of each segment and so on may all be commanded remotely, a pre-programmed four digit access code may also be used to allow a degree of selective calling and storage to be performed as required. Yours truly couldn't wait to try it!

### On The Air

I first coupled the set up in my shack to gain a few hours or so of operating experience before taking the set out on the road. I quickly programmed the memory channels up with the repeater channels, S20 and one or two local natter channels. I found I could store 5kHz as well as 12.5kHz step channels in the memories which was very useful, in many areas as well as my own some net channels operate on 'odd' frequencies purely for historical reasons, they've always been there and will probably stay there for quite a while!

The next thing of course was the digital voice system! I first experimented by using the adjacent FT736R transceiver with it's touch-tone pad, and found the set recor-

ded messages perfectly, and with such clarity that I honestly could not tell the difference between stored messages and those received 'off air'. Using the set's fist microphone I then programmed segment 1 of the memory with a general 'CQ' message, and segment 2 with a repeater access message, and then the fun began!

In commanding the set to put a call through our local 2m repeater, my regular amateur colleagues answered quite normally, and were amazed to be told they had answered a silicon chip. After the ensuing hilarities were complete, I went to a simplex channel with a local amateur and performed some very successful message storage experiments, these I replayed back under manual control (as present licence conditions permit). The final conclusions were that the system could be extremely useful in providing a personal 'message system', which could indeed make mobile data units and the like seem a little behind the times in terms of operator convenience. The highest sampling rate was 32kbit/sec, this giving speech quality undetectable from that normally received with 32

seconds maximum storage time. When slower rates were selected, giving a longer overall message storage time (of up to 128 sec) the speech fidelity remained similar but the recovered signal-to-noise ratio grew worse, becoming similar to listening to someone over a noisy telephone line.

### On the Road

Having been satisfied with my little 'play', I took the set out in the (t)rusty jalopy to see how it coped mobile, using the set over around 1500 miles or so of travelling. Using an inconspicuous (ie. tiny) 'Comet' dual-band whip around 20cm long mounted on the car gutter I found the performance on receive to be set up to the standard I have on my normal set, however the 45W output certainly helped in making the best use of such a small aerial. Although the small internal speaker was quite efficient, I found at high speeds I had the volume almost flat out, and really needed to use an external speaker to give good readability. Frequency control was very easy using the mic up/down buttons, I also found the mic mounted tone button very useful for repeater access, this being the most sensible place to put such a control in my opinion. However I did find the mic to be very light in relation to the weight of its curly lead, meaning that if I put it down anywhere it rolled away very easily! Moral — use a mic clip.

### Memories

Switching between VFO and memory mode was made easy due to the sensible positioning of the relevant button at the top left corner of the set's fascia, but I found repeater shift entry and to a lesser extent repeater input checking a little difficult due to the slightly awkward switch positions for these functions, in the end I just programmed these channels into the memories, using this mode for repeater operation and the VFO in conjunction with programmed band scan for searching out amateurs on simplex channels to talk to. Even when mobile, I must confess to occasionally using the digital voice facility to put the odd call out, this being possible by a simple press of the microphone mounted 'down' button, by storing an externally-



generated 1750Hz toneburst I could use it quite successfully to generate an 'access' for repeaters such as my local box that require a period of audio as well as a toneburst before speech is relayed. (I found using the mic-mounted tone button in storage mode upset the storage sequence).

At night I found the set's illumination very good indeed, a small ring of light surrounding the knobs and switches making their location easy without the need to grope around in the dark. With the set installed beneath by dashboard I found the rear heatsink never became excessively hot, even after long (one hour) ragchews during my usual car journeys each day.

### Internals

The set comprises a folded-metal chassis with a substantial rear heatsink to which the PA is directly fitted, the remainder of the circuitry being mounted on a main motherboard with sub-boards fitted, together with a front-panel mounted digital control PCB, all of which employ chip components in great abundance. The digital voice system and CTCSS options fit internally, connecting to the set via tiny multi-way plugs.

On receive, a multi-section varicap-tuned front end is used, which suggests the receiver could possibly have been designed to cover far more than 2m! A common 10.7MHz first IF is used with two monolithic dual crystal filters pro-

Backlight controls and a clear LCD aid night operation.

viding a degree of selectivity, further ceramic filtering occurs at the second IF of 455kHz in a CFW455E filter. Twin VCOs are used, one to generate the Rx injection and the other providing the modulated final frequency transmit signal. Final power amplification is performed in an M57726 PA module, with automatic power control and VSWR detection and protection circuits following to save the expensive device blowing up if you forget to connect your aerial. An M54959 single-chip synthesiser controls the VCOs under serial command from the HD404418 CPU. A backup battery is fitted here, of which no information is given in the manual or indeed about what happens when it eventually goes flat.

### Laboratory Tests

The receiver sensitivity measured reasonably if not showing a spectacular sensitivity, the wideband front end would account for this I feel, the good blocking performances however showing the front selectivity to be excellent at rejecting out-of-band signals. The adjacent channel selectivity was good at 25kHz but a little lopsided at 12.5kHz spacings, re-checking the frequency accuracy of my signal generators showed this to be the set rather than a wrong-set measurement, which I initially suspected.

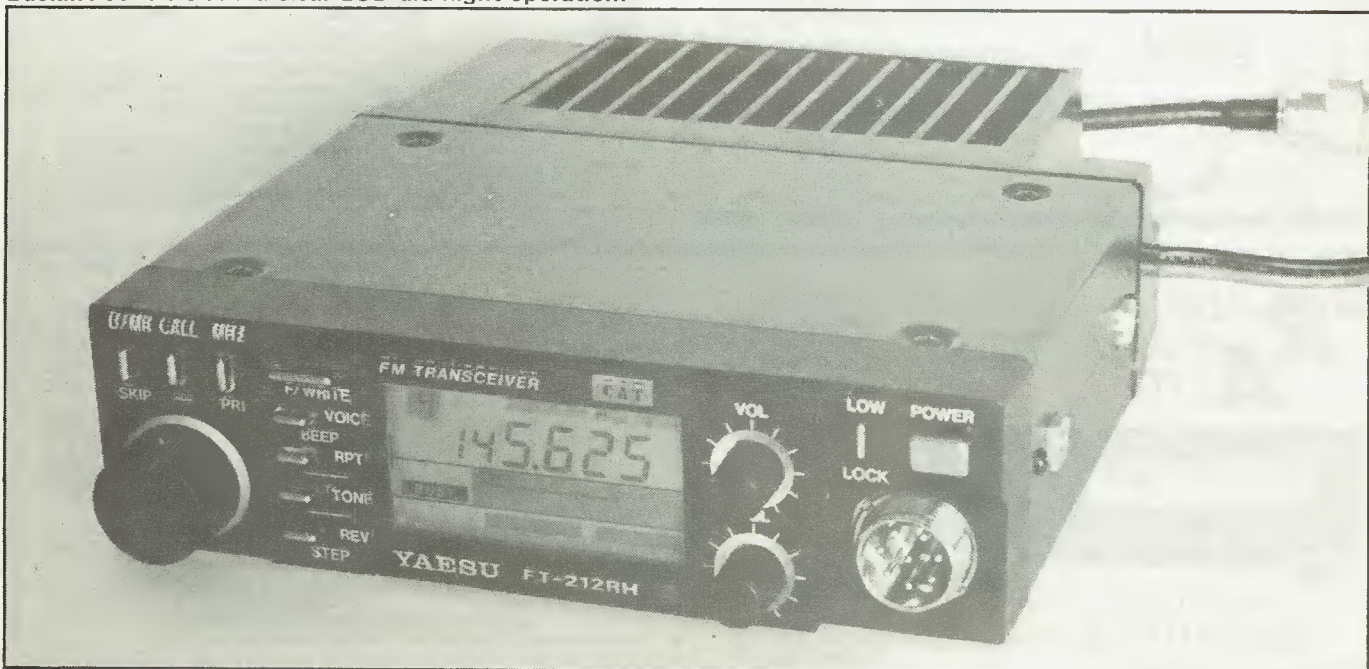
The transmit power output was always in excess of 50W at normal charged battery voltages which should help put your signal into those far-distant receivers, and the harmonic suppression was exceptionally good, I found no trace of spurious above the -90dBc level which is excellent. The peak deviation was over the top of the recommended maximum, with 2m becoming more congested each day with 12.5kHz operation used in many places I would have liked to have seen this a little lower.

### Conclusion

In all, a very nice, small set that should fit very easily on top of or beneath many crowded dashboards in todays modern cars. Overall the set performed well, and I was pleased with the provision of the digital voice system, I feel this could be potentially very useful indeed in years to come, many amateurs I contacted described it as 'voice packet radio'. Inspection of the set's internal design shows it to have been made with future versatility in mind, this is confirmed by the built in provision of computer control, cloning, and TNC connection.

The suppliers have informed me that although this set was a 'one off', stocks will be available by the time this review appears in print, so you don't have to wait!

*My thanks go to SMC Ltd for the provision of the review sample.*



## Laboratory Results:

### Receiver

Sensitivity: Input level required to give 12dB SINAD

Freq.	Level
144MHz	0.189uV pd
145MHz	0.188uV pd
146MHz	0.188uV pd

### Squelch Sensitivity

Threshold	Level	SINAD
Maximum	0.141uV pd	8dB SINAD
	0.407uV pd	25dB SINAD

Adjacent Channel Selectivity: Measured as increase in level of interfering signal, modulated with 400Hz at 1.5kHz deviation, above 12dB SINEAD ref. level to cause 6dB degradation in 12dB on-channel signal.

Spacing	Level
+12.5kHz	55.0dB
-12.5kHz	13.5dB
+25kHz	76.0dB
-25kHz	76.0dB

Blocking: Increase over 12dB SINAD level of interfering signal modulated with 400Hz at 1.5kHz deviation to cause 6dB degradation in 12dB SINAD on-channel signal.

Spacing	Level
+100kHz	88.5dB
-100kHz	88.5dB
+1MHz	95.5dB
-1MHz	96.0dB
+10MHz	102.0dB
-10MHz	103.5dB

Intermodulation Rejection: Increase over 12dB SINAD level of two interfacing signals giving identical 12dB SINAD on-channel 3rd order intermodulation product.

Spacing	Level
25/50kHz	72.0dB
50/100kHz	72.0dB

Maximum Audio Output: Measured at 1kHz on the onset of clipping

Load	Output (RMS)
3ohm	1.20W
8ohm	1.05W
15ohm	665mW

Image Rejection: Increase in level of signal at first IF image frequency over level of on-channel signal to give identical 12dB SINAD signals 85.0dB.

### S-Meter Linearity

Indication	Sig. Level	Rel. Level
S1	0.303uV pd	-14.6dB
S2	0.377uV pd	-12.7dB
S3	0.448uV pd	-11.2dB
S4	0.538uV pd	-8.9dB
S5	0.655uV pd	-7.9dB
S6	0.842uV pd	-5.7dB
S7	1.01uV pd	-4.1dB
S8	1.26uV pd	-2.2dB
S9	1.62uV pd	0dB ref
S9+	2.09uV pd	+2.2dB
S9++	3.09uV pd	+5.6dB
S9+++	5.81uV pd	+11.1dB

### Transmitter

TX Power and Current Consumption:

Freq MHz	Power	10.8V Supply	13.8V Supply	15.6V Supply
144	High	40.7W/6.85A	25.5W/7.40A	52.5W/7.35A
	Low	5.09W/2.40A	5.08W/2.45A	5.09W/2.45A
145	High	39.8W/6.65A	51.9W/7.20A	52.0W/7.15A
	Low	5.02W/2.35A	5.03W/2.35A	5.00W/2.35A
146	High	38.7W/6.45A	51.3W/7.00A	51.4W/6.95A
	Low	5.01W/2.30A	5.00W/2.30A	4.99W/2.30A

### Harmonics/Spurii:

Harmonic	-87dBc
3rd Harmonic	-89dBc
All other harmonics and spurii	<-90dBc
Peak Deviation	5.77kHz
Toneburst Deviation	4.73 kHz

Books for radio amateurs

**FDK**

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QSY OLD MAN TO

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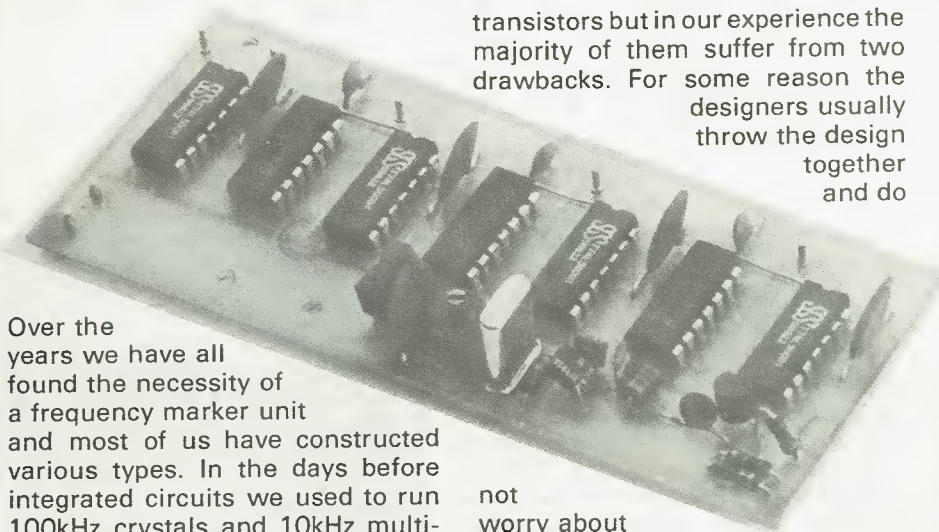
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# A 'Better' Marker Generator



Over the years we have all found the necessity of a frequency marker unit and most of us have constructed various types. In the days before integrated circuits we used to run 100kHz crystals and 10kHz multi-vibrator circuits locked to the crystal ... ugh, the number of times we have calibrated equipment only to find 11 markers between the

transistors but in our experience the majority of them suffer from two drawbacks. For some reason the designers usually throw the design together and do

not worry about having a 1:1 mark space ratio of the output signal, which is important if you wish to use it in digital circuitry where an odd mark to space ratio

receiving equipment it is very frustrating to be looking for the 1MHz signal which you have selected only to hear weak pips every 10 and 100kHz because of the large amplitudes leading out of the unit. It is a very simple matter to disable the unwanted dividers and have a clean output signal.

Another consideration is whether frequencies other than simple decades are required. My old marker unit develops signals in steps of 1, 2.5, 5, 10kHz etc and I cannot remember using anything other than the decades! The unit described here only covers the main frequencies used ie. 10MHz, 1MHz, 100kHz and 10kHz.

Provision is made for another board to be fed from the output on this unit to decrease the frequencies right down to 1Hz and below if required but the prime design consideration was to keep the unit simple, practical and with a good specification at the lowest price.

*Stop getting lost amongst the Megahertz by building this useful little project from the Kanga gang. You'll never be off frequency again!*

100kHz points where the multivib was locking to the 11th harmonic!

There must be as many variations of marker unit as there are

may cause problems. Also they do not inhibit the unwanted dividers below the output frequency required and when working on

## The Circuit

The oscillator uses a standard 100MHz crystal in a Colpits circuit and this has a trimmer to enable it to

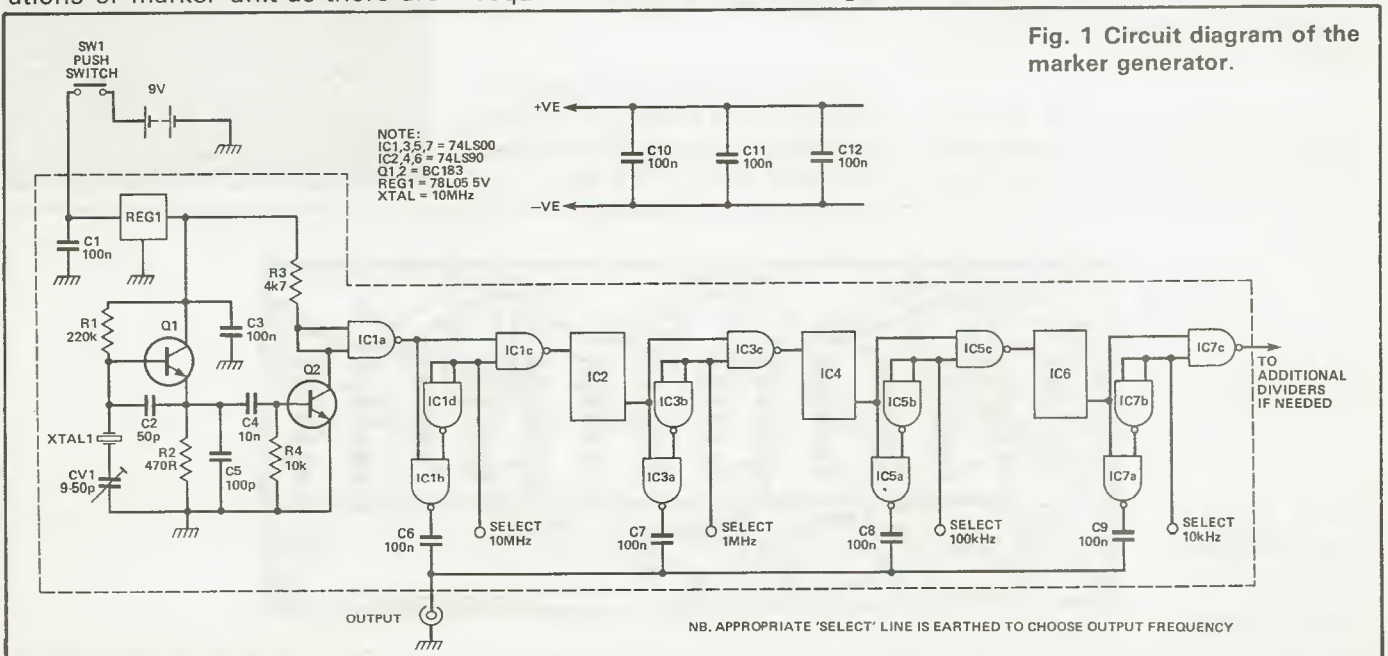


Fig. 1 Circuit diagram of the marker generator.

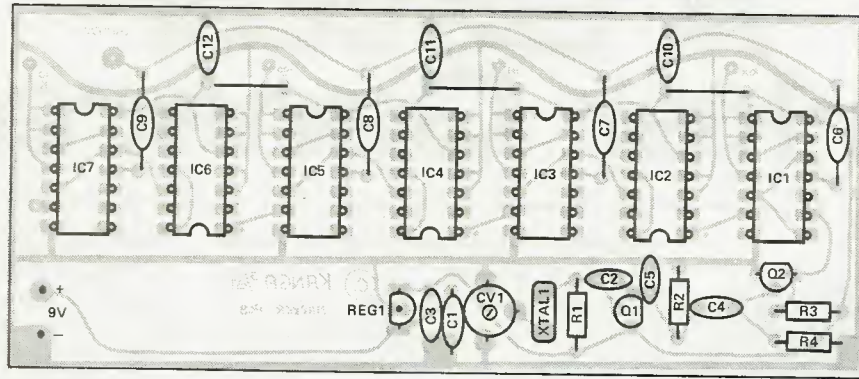


Fig. 2.  
Component  
placement  
overlay for the  
generator.

be set to exactly 10MHz. The oscillator then drives a single transistor to interface it with the TTL circuitry. The first device is a 7400 quad NAND gate which, when an earth is connected to the "select" terminal, will pass the 10MHz signal directly to the output. If the select terminal is left open then the signal is fed to the first decade divider stage instead. The 1MHz output from this stage is fed to a second quad NAND gate which will either pass the signal to the second divider or to the output — depending upon the state of the select terminal. In this way, when 1MHz is selected, the second divider will not be running and so the annoying 100kHz signals will not be found at the output. The last IC in the chain is a quad NAND gate and works in exactly the same way as the others except that the output is terminated in a pad. If required it would be possible to provide additional PCB's to divide to whatever decade you require.

The outputs from the various decades are coupled to a common output line via 100n capacitors. This

could cause problems when trying to drive several gates, but I have not yet come across it in practice. If it is thought necessary to have DC coupling to the output it will be necessary to include switching to connect the activated output to the output socket. The alternative method would be to use 7403's, which are the open collector version of the 7400, replace the four coupling capacitors to the output line with wire links, and add 'pull-up' resistors to each output of the 16 gates used.

There is very little to go wrong in this circuit and with a current drain of less than 60mA when using "LS" low power schottky devices a small PP3 battery will last many months in normal use. As the output signals are square waves they are very rich in harmonics and the marker pips are audible on normal equipment well up above 144 MHz.

*A kit of parts for this project is available for £8.45 inc VAT and p&p from Kanga Products, 3 Limes Road, Folkestone, Kent. CT19 4AU.*

### COMPONENTS LIST

#### RESISTORS

R1	220k
R2	470R
R3	4k7
R4	10k

All 10% 0.25W carbon film

#### CAPACITORS

C1, 3, 6-12	100n (9 off)
C2	50p
C4	10n
C5	100p
CV1	9-50p trimmer capacitor

All fixed capacitors ceramic disk.

#### SEMICONDUCTORS

IC1, 3, 5, 7	74LS00
IC2, 4, 6	74LS90
Q1, 2	BC183
REG1	78L05

#### MISCELLANEOUS

SW1	Push-on, Push-off switch
XTAL	100MHz HC25 $\mu$ or similar

Metal box, output socket to suit, one pole four-way switch.

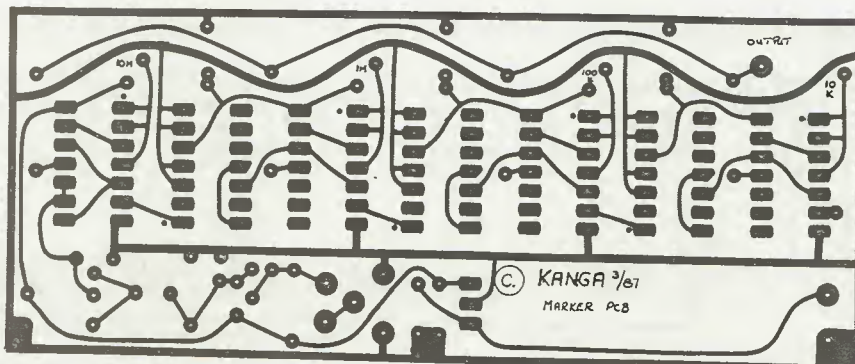


Fig. 3. PCB  
track detail on  
the underside,  
copper areas  
shown in black.

# RADIO Tomorrow

- 1 Apr** Coventry ARS: Night on the air & morse tuition. 8.00 pm. Baden Powell House, 121 St. Nicholas St, Radford, Coventry.
- 4 Apr** Burnham Beeches RD: Easter Monday family foxhunt. Haymill Youth & Community Centre, Burnham Lane, Slough.  
Sutton & Cheam RS: Natter night in the Downs Bar, Downs Lawn Tennis Club, Holland Avenue, Cheam.
- 5 Apr** Wakefield DRS: Night on the air.  
Fylde ARS: Visit to Lancs County Fire Brigade HQ, Garstang Road, Fulwood. 7.30pm.  
Ealing DARS: Morse Training with Bill G3SGT. 7.30 pm The Community Centre, 71a Northcroft Road, Ealing.  
Chichester DARC: AGM 7.30pm St. Pancras Hall, St. Pancras, Chichester.  
S. Powys ARC: Talk 'Practical satellite TV, Part 1'.
- 6 Apr** Chestnut DARC: Natter evening. Church Room, Church Lane, Wormley, Nr. Cheshunt, Herts. 8pm.  
S Bristol ARC: Morse Practice under exam conditions at Whitchurch Folk House, East Dundry Road, Whitchurch, Bristol.
- 7 Apr** Bredhurst RTS: Construction & natter night.  
Horsham ARC: Open meeting, Guide Hall, Denne Rd, Horsham.  
Salop ARS: Construction contest.  
North Wakefield RC: Talk 'Cavity wavemeters in 3 easy lessons. Details — Steve Thompson, G4RCH. Leeds 536633.  
Yeovil ARC: Talk 'Transequatorial Propagation' by G3MYM. 7.30 pm Recreation Centre, Chilton Grove, Yeovil.  
E Kent RS: Presentation by the Kent Repeater Group at Parkside Lodge, Kings Road, Herne Bay.  
Vale of Evesham RAC: Talk 'Packet Radio' by G8AMD and G4JGD at the Round of Gras, Badsey.
- 8 Apr** Loughton DARS: AGM. Loughton Hall, Rectory lane, Loughton, Essex  
Coventry ARS: Night on the air & morse tuition. 8.00pm. Baden Powell House, 121 St. Nicholas St, Radford, Coventry.  
Harrow RS: Activity night at the Roxteth Room, Harrow Arts Centre, High Road, Harrow Weald from 8pm
- 9 Apr** Sutherland DARC: **NEW CLUB! Bring & Buy Sale. Contact John Cormack, G4MOHBI on (04083) 3197 for details.**
- 10 Apr** Lough Erne ARC: Mobile Rally, Killyhelvin Hotel.
- 11 Apr** Sutton & Cheam RS: Inter-club quiz, CATS vs Sutton & Cheam RS at St Swithins Church Hall, Grovelands Road, Purley.  
Atherstone ARC: Talks 'VHF then and now' and 'The RSGB VHF Awards' by Jack Hum G5UM. Held at the Physics Laboratory, Atherstone Upper School, Long Street, Atherstone.
- 12 Apr** Keighley ARS: Natter night.  
Rugby ATS: AGM
- 12 Apr** Wakefield DRS: AGM  
Ealing DARS: Talk 'The Radio Interference Service' by L. Nobotham G8KLH 7.30pm The Community Centre, 71a Northcroft Road, Ealing.  
Delyn RC: Quiz — vs. Alyn & Deeside ARS. 8pm Daniel Owen Centre, Mold, Clwyd.  
Verulam ARC: Activity evening 7.30 for 8.00 at RAF Assoc. HQ, New Kent Road, off Marlborough Road, St. Albans.  
Malvern Hills RAC: Talk '50MHz & 70MHz' by G4BUY
- 13 Apr** Willenhall DARS: Project night. Cross Keys Inn, Ashmore Lake Rd, Willenhall, W. Midlands. Info - Dave Jackson, GOEGG (0902) 734475  
Cheshunt DARC: Talk 'Satellite TV' by G4VBN. Church Room, Church Lane, Wormley, Nr. Cheshunt, Herts, 8pm  
Fareham DARC: Demonstration of measurements. 7.30pm. Portchester Community Centre, Westlands Grove, Portchester, Hants.  
Wirral DARC: Members 'Film Night' at the Irby Cricket Club, Irby Mill Road, Irby. 8.00pm start.  
S Bristol ARC: Top Band Activity evening at Whitchurch, Bristol.
- 14 Apr** Bredhurst RTS: 'Surprise event' by Trevor G6YLW.  
Salop ARS: Natter night.  
North Wakefield RC: On the air. G4NOK. Details — Steve Thompson, G4RCH. Leeds 536633.  
Barry College of Further Education RS: Video 'The Story of electrons'.  
Yeovil ARC: Talk 'Simple HF antenna' by G3GC at 7.30pm, Recreation Centre, Chilton Grove, Yeovil.  
Edgware DRS: Talk 'Digital Transmission for Amateurs' by Nick Davis. At Walting Community Centre, 145 Orange Hill Road, Burn Oak, Edgware.  
Mid Sussex ARS: Surplus Equipment and Junk Auction at Marle Place Adult Education Centre, Leylands Rd., Burgess Hill. Start at 7.45pm.  
Southgate ARC: Grand surplus equipment sale at Holy Trinity Church Hall (upper), Green Lanes, Winchmore Hill, London N21. Doors open 7.45pm.
- 15 Apr** Sutton & Cheam RS: Junk Sale at Downs Lawn Tennis Club, Holland Avenue, Cheam.  
Coventry ARS: Mini lectures. 8.00pm. Baden Powell House, 121 St. Nicholas St. Radford, Coventry.  
Harrow RS: Talk 'Cables' by Tony Armstrong GODIN at Harrow Arts Centre, High Road, Harrow Weald from 8pm.
- 18 Apr** Midland ARS: Talk 'Chassis bashing' by John Harris G8HJS.
- 19 Apr** Rugby ATS: Construction competition judging.  
Ealing DARS: Open evening. 7.30pm. The Community Centre, 71a Northcroft Road, Ealing.  
Burnham Beeches RC: Quiz — vs. Maidenhead ARC. 8pm Maidenhead Club QTH.  
S Powys ARC: Social evening.  
Fylde ARS: Informal Meeting at The Kite Club, Blackpool Airport.

- 20 Apr** Chestnut DARC: Natter evening. Church Room, Church Lane, Wormley, Nr. Chestnut, Herts. 8pm.  
Lough Erne ARC: Talk 'Secure your rig'. 8pm Railway Hotel, Enniskillen, Co. Fermanagh.  
S Bristol ARC: 2m CW activity evening at Whitchurch Folk, East Dundry Road, Whitchurch, Bristol.
- 21 Apr** Bredhurst RTS: Construction & natter night.  
Salop ARS: Video night — basic circuitry contd.  
North Wakefield RC: Natter night. Deals — Steve Thompson, G4RCH. Leeds 536633.  
Yeovil ARC: AGM at 7.30pm, Recreation Centre, Chilton Grove, Yeovil.  
Mid Sussex ARS: Night on the air at Marle Place Adult Education Centre, Leylands Rd., Burgess Hill. Starts at 7.45pm.  
E Kent RS: RSGB Video and members demonstration at Parkside Lodge, Kings Road, Herne Bay.  
Vale of Evesham RAC: Ragchew evening at the Gardeners Arms, Charlton 8.00pm.
- 22 Apr** Loughton DARS: Club project. Building night. Loughton Hall, Rectory Lane, Loughton, Essex.  
Coventry ARS: Night on the air & morse tuition. 8.00pm. Baden Power House, 121 St. Nicholas St, Radford, Coventry.  
Harrow RS: Activity night at the Roxteth Room, Harrow Arts Centre, High Road, Harrow Weald from 8pm
- 24 Apr** **Swansea ARS: 7th Annual Rally. Traders, bring 'n' buy, bookstall, refreshments, bar, HF station. Talk in by GB2SWR 10.30am-5pm. Venue — Swansea Leisure Centre on A4067 Swansea — Mumbles coast road. Details from Roger Williams, GW4SHS on (0792) 404422. BATC: Crick Rally. Talks & demos including 'Satellite TV'. Marquee trading. Bar & restaurant. Free admission. Venue — Northampton/Rugby Hotel (few hundred yards along J18 off M1). Details from Trevor on (0532) 670115.**
- 25 Apr** Atherstone ARC: Club night on the air. Held at the Physics Laboratory, Atherstone Upper School, Long Street, Atherstone.
- 26 Apr** Ealing DARS: Talk 'Operating new equipment' by Martin G4KHS 7.30pm The Community Centre, 71a Northcroft Road, Ealing.  
Delyn RC: Demonstration & talk — 'Computers in Radio'. 8pm Daniel Owen Centre, Mold, Clwyd.  
Verulam ARC: Talk 'RSGB into the 21st Century' by David Evans G3OUF. 7.30 for 8.00pm at RAF Assoc. HQ, New Kent Road, off Marlborough Road, St Albans.
- 27 Apr** Chestnut DARC: Construction contest. Church Room, Church Lane, Wormley, Nr. Chestnut, Herts. 8pm. Fareham DARC: Talk 'HF Aerials' by G3SED. 7.30pm. Portchester Community Centre, Westlands Grove, Portchester, Hants.  
Wirral DARC: 'The Great Egg Race' at the Irby Cricket Club, Irby Mill Road, Irby. 8.00pm start.  
3 Bristol ARC: Amateur Television activity evening at Whitchurch Folk House, East Dundry Road, Whitchurch, Bristol.
- 28 Apr** Bredhurst RTS: Inter club quiz.  
Salop ARS: Talk 'Weather & Propagation' by Jim Bacon G3YLR.  
North Wakefield RC: Monthly meeting. Details — Steve Thompson, G4RCH. Leeds 536633.  
Barry College of Further Education RS: Tape slide presentation — 'DX-Pedition to St Pierre et Miquelon Island'.  
Yeovil ARC: Natter night at 7.30pm, Recreation Centre, Chilton Grove, Yeovil.
- 28 Apr** Edgware DRS: Informal meeting and scanner demonstrations. At Walting Community Centre, 145 Orange Hill Road, Burnt Oak, Edgware.  
Mid Sussex ARS: Talk 'Mechanical TV' by Dave Summer at Marle Place Adult Education Centre, Leylands Rd., Burgess Hill. Starts at 7.45pm.  
Southgate ARC: Informal meeting at Holy Trinity Church Hall (upper), Green Lanes, Winchmore Hill, London N21. Doors open 7.45pm.
- 29 Apr** Coventry ARS: DF Finding contest (Cup qualifier). 8.00pm. Baden Power House, 121 St. Nicholas St, Radford, Coventry.  
Edgware DRS: Straight Key evening. At Walting Community Centre, 145 Orange Hill Road, Burnt Oak, Edgware.  
Harrow RS: Chairmans Lecture 'Impedance matching' at Harrow Arts Centre, High Road, Harrow Weald from 8pm.
- 30 Apr** Burnham Beeches RC: Spring DX Picnic till 2nd May.
- 2 May** **Dartmoor RC: Annual Mobile Rally at the Town Hall, Princetown, Devon. 10.30am through till 5.00pm. Usual traders, display stands for RAYNET and local repeater groups, bring & buy, refreshments and ample parking. There will be a small entrance fee and talk-in will be on S22.**  
Sutton & Cheam RS: Natter night in the Downs Bar, Downs Lawn Tennis Club, Holland Avenue, Cheam.
- 3 May** Fylde ARS: Equipment Sale at The Kite Club, Blackpool Airport.
- 4 May** Chestnut DARC: Natter evening. Church Room, Church Lane, Wormley, Nr. Cheshunt, Herts. 8pm.  
Wirral DARC: 'Treasure Hunt' at the Irby Cricket Club, Irby Mill Road, Irby. 8.00pm start.  
S Bristol ARC: DX TV demonstration by Ron Gardner at Whitchurch Folk House, East Dundry Road, Whitchurch, Bristol.
- 5 May** Bredhurst RTS: Construction & natter night.  
Horsham ARC: Talk 'ITV Presentation' by G3GOP. Guide Hall, Denne Rd, Horsham.  
North Wakefield RC: Talk 'The police' by PC Workman Details — Steve Thompson, G4RCH. Leeds 536633.  
Yeovil ARC: Talk 'Is SWR harmful?' by G3GC at 7.30pm, Recreation Centre, Chilton Grove, Yeovil.  
Mid Sussex ARS: Informal evening at Marle Place Adult Education Centre, Leylands Rd., Burgess Hill. Starts at 7.45pm.  
E Kent RS: HF Antenna Symposium — problems solved at Parkside Lodge, Kings Road, Herne Bay.  
Salop ARS: Natter night.
- 6 May** Loughton DARS: Planning for Aylmers Farm Field Weekend. Loughton Hall, Rectory Lane, Loughton, Essex.  
Coventry ARS: Night on the air & morse tuition. 8.00pm. Baden Powell House, 121 St. Nicholas St, Radford, Coventry.  
Harrow RS: Activity night at the Roxteth Room, Harrow Arts Centre, High Road, Harrow Weald from 8pm  
Vale of Evesham RAC: Visit to Pebble Mill.
- 8 May** **Drayton Manor Rally**  
Yeovil ARC: 1988 Yeovil QRP Convention, opens 9am at Preston School, Preston, Yeovil.
- 9 May** Atherstone ARC: DTI rig testing service. Held at the Physics Laboratory, Atherstone Upper School, Long Street, Atherstone.
- 10 May** Delyn RC: Treasure hunt. 8pm Daniel Owen Centre, Mold, Clwyd.  
Malvern Hills RAC: Visit by new RSGB RLO.

**11 May** Willenhall DARS: Natter night. Cross Keys Inn, Ashmore Lake Rd, Willenhall, W. Midlands. Info — Dave Jackson, G0EGG (0902) 734475  
 Cheshunt DARC: Talk. 'QRP' by G4VBN. Church Room, Church Lane, Wormley, Nr. Cheshunt, Herts. 8pm.  
 Fareham DARC: Talk 'Mystery of microwaves' by Bob G8VOI. 7.30pm. Portchester Community Centre, Westlands Grove, Portchester, Hants.  
 Wirral DARC: Quiz night vs Wirral ARS at the Irby Cricket Club, Irby Mill Road, Irby. 8.00pm start.  
 S Bristol ARC: Club project construction evening at Whitchurch Folk House, East Dundry Road, Whitchurch, Bristol.

**12 May** Bredhurst RTS: Junk Sale.  
 North Wakefield RC: On the air. G4NOK. Details — Steve Thompson, G4RCH. Leeds 536633.  
 Edgware DRS: Antenna Surgery. At Watling Community Centre, 145 Orange Hill Road, Burnt Oak, Edgware.  
 Mid Sussex ARS: Construction contest at Marle Place Adult Education Centre, Leylands Rd., Burgess Hill. Starts 7.45pm.  
 Salop ARS: DF Hunt second qualifier.

**13 May** Loughton DARS: Field Weekend at Aylmers Farm up to 15th.  
 Harrow RS: Talk 'Access Control using LF Transponders' at Roxteth Room, Harrow Arts Centre, High Road, Harrow Weald from 8pm.

**15 May** Mid Sussex ARS: Sunday foxhunt at Marle Place Adult Education Centre, Leylands Rd., Burgess Hill. Starts at 7.45pm.

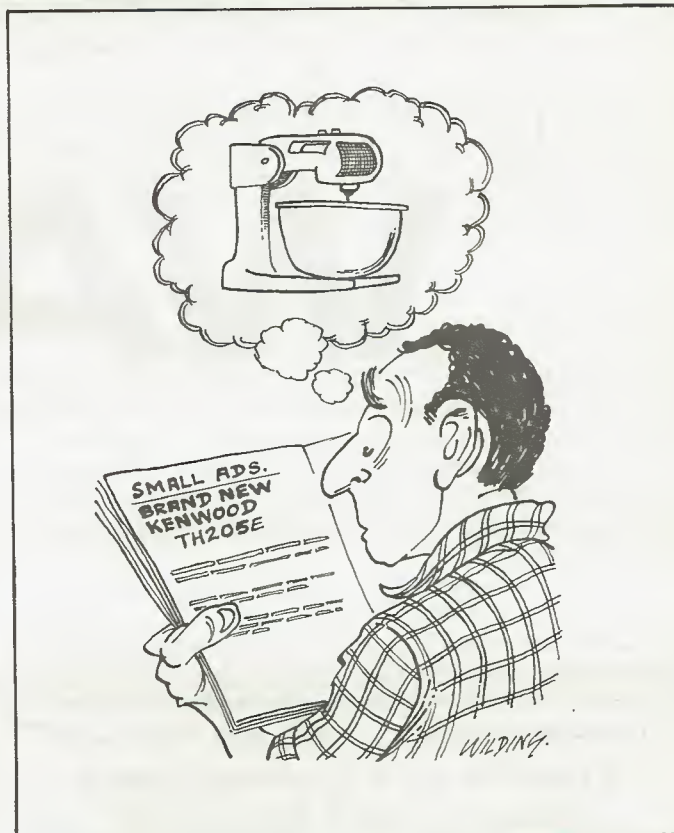
**16 May** Burnham Beeches RC: Compter night. 8pm Haymill Youth & Community Centre, Burnham Lane, Slough.

**17 May** Wakefield DRS: Junk Sale.  
 Midland ARS: Junk sale & Natter night.  
 Fylde ARS: Informal meeting at The Kite Room, Blackpool Airport.

**18 May** Cheshunt DARC: Natter evening. Church Room, Church Lane, Wormley, Nr. Cheshunt, Herts. 8pm.  
 Lough Erne ARC: Talk 'Can you read a map'. 8pm. Railway Hotel, Enniskellen, Co. Fermanagh.  
 S Bristol ARC: 20m activity evening at Whitchurch Folk House, East Dundry Road, Whitchurch, Bristol.

**19 May** North Wakefield RC: Visit to Jorvik Viking Centre, by coach (total cost £5) Details — Steve Thompson, G4RCH Leeds 535533.  
 Barry College of Further Education RS: Video 'JARL DX-Pedition to China'.  
 Mid Sussex ARS: Night on the air at Marle Place Adult Education Centre, Leylands Rd., Burgess Hill. Starts at 7.45pm.  
 E Kent ARS: Operating evening at the radio shack, former coastguard look-out at Bishopsstone.  
 Salop ARS: Talk 'Contest working' by Ron Stone G3YDX.

**20 May** Sutton & Cheam RS: AGM at Downs Lawn Tennis Club, Holland Avenue, Cheam.  
 Loughton DARS: Informal evening. Loughton Hall, Rectory Lane, Loughton, Essex.  
 Coventry ARS: Night on the air & morse tuition. 8.00pm. Baden Powell House, 121 St. Nicholas St, Radford, Coventry.  
**Swindon DARC: Radio, Electronics and Hobbies Fair at the Science Museum, Wroughton, Swindon, Wilts. Opens at 10am, Wroughton Airfield, 5 miles South of Swindon. The large museum collection of aircraft, fire engines, and hovercraft will be the back-drop to traders and exhibitors stands in several heated and well-lit hangers.**



**23 May** Atherstone ARC: DF Hunt No. 1. Starting from the Physics Laboratory, Atherstone Upper School, Long Street, Atherstone.

**24 May** Delyn RC: Talk of RADAR. 8pm Daniel Owen Centre, Mold, Clwyd.

**25 May** Cheshunt DARC: Portable on Baas Hill.  
 Fareham DARC: Talk by Len G6N2. 7.30pm. Portchester Community Centre, Westlands Grove, Portchester, Hants.  
 Wirral DARC: Talk — by 'Mr X' at the Irby Cricket Club, Irby Mill Road, Irby. 8.00pm start.  
 S Bristol ARC: Microwave activity evening at Whitchurch Folk House, East Dundry Road, Whitchurch, Bristol.

**26 May** North Wakefield RC: Monthly meeting. Details — Steve Thompson, G4RCH. Leeds 536633.  
 Mid Sussex ARS: Talk 'Contest Operating' by Al Slater G3FXB at Marle Place Adult Education Centre, Leylands Rd., Burgess Hill. Starts at 7.45pm.  
 Salop ARS: HF night on the air.

**29 May** Plymouth Radio Club Mobile Rally at Plymstock School, Church Road, Plymstock. Opens at 10am. Large free car park, refreshments, raffle, trade stands & demos. Talk in on S22. Further details from Joe GIRXR on (0752) 662511.  
 Burnham Beeches RC: Thames TV Special event station, GB0TTT Haymill Youth & Community Centre, Burnham Lane, Slough.  
**East Suffolk Wireless Revival at the Civil Service Sportsground, Straight Road, Bucklesham, Ipswich. Featuring traders, RSGB bookstall, aerial testing range, packet radio demo, bring & buy, car boot sale, rig clinic, CW pile-up competition, vintage radio display. Admission £1 (including car parking) refreshments, talk-in on S22, GB3PO and GB3IH. Further details from Jack G4IFF on (0473) 464067.**

**30 May** Sutton & Cheam RS: Cheam & Worcester Park Fete Special event station.

# METRE WAVE

Throughout the second half of last year, and well into this, a question constantly asked has been: "Although I've been on 2 metres until now I am rather keen to have a go at 6 and 4 metres. Are there any problems and if so, what?"

When this question is put there is only one thing to do when in search of an answer and that is to evaluate the bands which are available to (especially) Class B licensees but to neglect any consideration of 2 metres

---

*"A new band to try . . . yes, but which one?"  
A question which is constantly put is  
discussed by Jack Hum, G5UM*

---

because most of the fraternity have plenty of experience of that band anyway.

People replying to the "Which band shall I try next?" enquiry have been heard to say "Try Six or Four because, praise be, there are no repeaters there," which of course entirely misses the point that repeaters are established for the good of all. Any adverse reputation they acquire derives solely from the way they are used.

So let's forget the presence or absence of repeaters (at least for the moment) when it comes to suggesting which new band or bands our enquiring friends should take up.

### Three Considerations

There are three basic considerations to look at. They are:

First, how many "bangs per buck?" which, translated into English, means: "How many QSO's may I expect per pound expended on equipment for my new band?" Then Secondly, *how much* indeed to expend; and Thirdly, what aerial? How conspicuous will it be remembering there are neighbours? How much will it load existing mast facilities? How much coaxial feeder will be needed and how much will this add to the overall cost?

It is amazing how many hams fail to take these three basics into account before committing themselves to substantial expenditure. All too often an impulse-buy at an exhibition or rally places a beautiful Japanese artefact into a ham's hands but doesn't guarantee that it will give him rewarding results when he gets it home. Why? Because he has neglected two of the above basic considerations of "How many QSOs can I expect now I've bought the thing?" and of course that antenna factor.

### The Case For Six

Take Six first. In spite of the enthusiasm of its protagonists it has turned out to be a disappointment to many people solely because not enough users press the transmit button. Here is a little story (and it's true) that sums up the present situation:

Four hams visited the showroom of a well-known emporium which advertises in *HRT*. All fell to discussing 6 metres. In came a fifth and, overhearing the conversation, joined in. He was immediately recognised, or rather his voice was, by the other four: "We've heard you a lot on 'Six'," they said almost in unison. "But I've never worked any of you," replied the fifth. The truth of the matter was that the four had never bothered to press their transmit switches when only a "local" was to be heard on the band.

That is "no way to run a railway": it neglects the truth reported here in December in *The Review* of 1987 that "Six" is primarily a VHF band and should be used as such.

From time to time its DX potential becomes undeniable when, given the right conditions, it produces regular — not just sporadic — contacts over immense distances. Stateside and other transatlantic stations will be workable in such numbers (and not just those two-kilowatters of 1987) as to become almost routine. The MUF (maximum useable frequency) may even extend into the upper 51-52MHz section of the band and the DX to be workable on FM. This would be quite a phenomenon: experience dating back forty years to when the band was first used in the UK showed that the MUF would extend upwards from 28MHz into only a *part* of the 50MHz area and that there would be a marked cut-off at that point. This might happen again. But the MUF might go right into the top meg. And other, less understood modes of propagation will add to the excitement.

How many bangs per buck then, on Six when the DX is *not* there? Very few, unless the band is taken in hand by its occupants and used as a metrewave band *should* be used, and that is for inter-UK working and by the establishment of many more occupancy-enhancing FM nets than exist at present.

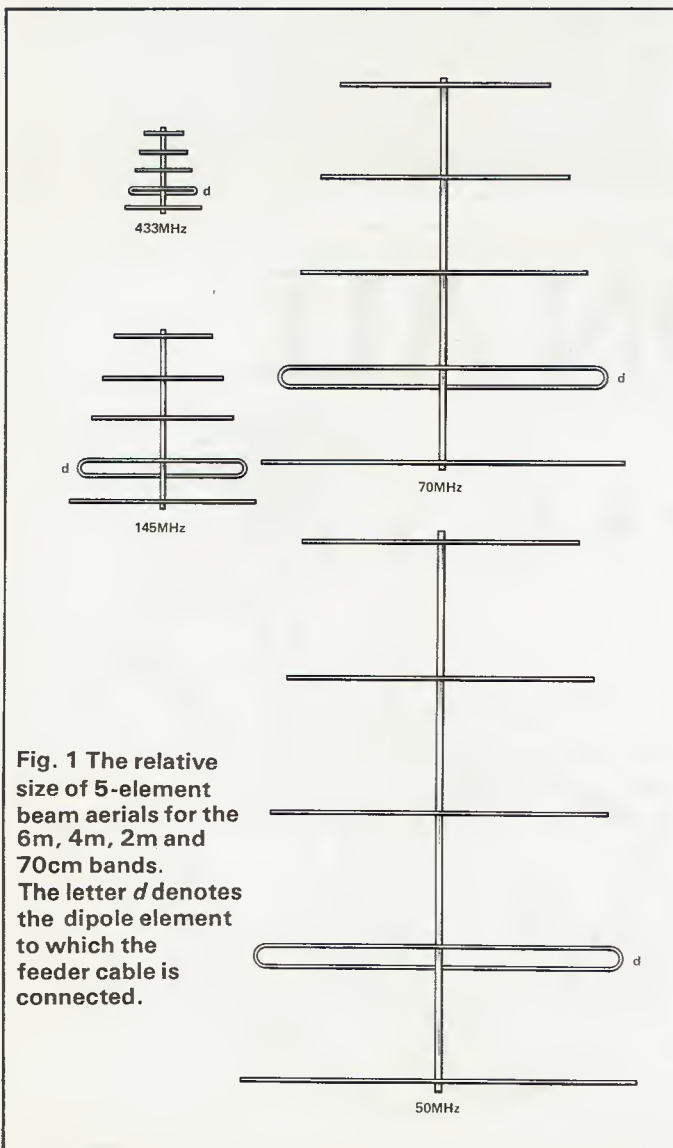
And "How much?" This depends on what you want to do. To make the most of the DX when it eventuates means having A1A and J3E. To make best use of it under localised-QSO conditions means having FM on board. This suggests you will need a multi-mode rig, some of which, with facilities for all three modes plus say 2 metres and/or 70cm can deplete you by a four-



figure sum. You will pay less if you restrict your modes to fewer than these three — but you will then miss out on either the DX or the localised FM, and you will be truncating your enjoyment of the band accordingly. You will pay less still if you decide to transvert from an existing rig, as many people do.

Thirdly, "How much antenna?" The much favoured 4-element Yagi looks a bit of a bedstead up aloft, and because of its mast-loading and conspicuousness in the eyes of neighbours tends to be a bit off-putting. No wonder many hams wishing to give "Six" a whirl opt for the more modest dipole, often in the roofspace. Even such exiguous aerials proved adequate when during the middle of 1987 "the Yanks were coming through." A dipole is costless if you fashion one from a length of stiff wire: the feeder is the dearest part about it. For most of the time the dipole's limitations are all too evident, as indeed they are whenever indoor antennas are used on *any* VHF band.

Summing up "Six," then, means perhaps £600 for a transceiver, £40 for antenna and feeder, and in ordinary conditions not many QSOs per pound expended to show for it all — yet an ever-present hopeful anticipation.



**Fig. 1** The relative size of 5-element beam aerials for the 6m, 4m, 2m and 70cm bands. The letter *d* denotes the dipole element to which the feeder cable is connected.

## Next Band Up

The "next band up" from the 50MHz allocation is 70MHz, that band peculiar to the British which attracts no Japanese importers simply because likely world sales will be negligible. Main sources of supply for "Four" are some rather effective British-made transverters, which can cost you plus-or-minus £100 according to spec, and some equally effective redundant PMR transceivers.

If you want SSB/CW on Four a transverter is the route to take. If FM-only meets your needs try an ex-PMR: it will cost you only a few tens of quid, and the four crystals you will need for the most-used channels will probably cost you more than the rig! Say £50 the lot. There's a snag: ex-PMR rigs need tweaking to get them on to 70MHz.

If you intend to "tweak" then you must know what you are doing. This normally postulates the availability of a signal source for 70MHz, but not always: it is remarkable how many enthusiasts find themselves able to "pull" such equipments on to the 4 metre band with the crudest of home-built equipment that vindicates the "self training" ethic of amateur radio.

The availability of ex-PMR transceivers at knock-down prices has persuaded large numbers of Class B operators to choose Four rather than Six as their preferred new band since the Great Emancipation of June 1, 1987. By doing so they forego the DX facility provided by CW/SSB. But in terms of contacts-per-quid the increase in FM activity on Four has been nothing short of remarkable.

An additional attraction of Four is that mobile activity has been allowed from the start, and today is widely in evidence, with of course vertical antennas on vehicles.

What of Consideration No 3, the home aerial for Four? If you want to work the DX you will need a multi-element Yagi, the price of which with feeder will not be a lot less than its 50MHz equivalent. As 70MHz develops as 2 metres and 'Seventycems' have done, with many mobiles to be heard, a vertical has increasingly become a must if you want to talk with them. To the horizontal for the DX CW/SSB requirement you should add a cheap and cheerful vertical, again just a length of wire-dipolery in the roofspace if you must but obviously much better outside if you can manage it.

Better still, if you can afford to install a Yagi outside positioned vertically and operated by a rotator (accepting its prominence and possible neighbour-resistance) the mobiles will bless you for giving them a signal dramatically enhanced over what can be achieved with a basic dipole.

Summing up Four, then, is almost as difficult as summing up Six: it all depends on what you want to do and how much you want to spend. What is apparent at the present stage of the game is that you will derive more 'bangs per buck' on 70MHz than on 50MHz.

## There's Still A Third Band . . .

Now a look at the third band available to the metrewave person wishing to strike out a bit from Two, and this means 70cm. Here you won't work Yanks and you won't work much DX out of the UK unless you have

SSB/CW and a largish horizontal Yagi. You *will* work large numbers of stations on FM within your radius of action — and you will have the additional service, missing from 6 metres and 4 metres, of an extensive repeater chain which, blanketing the country, readily generates simplex QSOs (real ones instead of assisted ones!).

How much for the rig? As with Six a multi-mode will set you back a lot of money; but recognising that the preponderance of activity on 70cm is FM you can safely buy yourself a much less expensive FM-only box and derive an enormous amount of satisfaction from it. How many contacts per pound expended? A lot, both simplex and through-repeater.

How big the aerial? It can be a lot bigger electrically than aerials for the lower metrewave bands simply because, being virtually invisible, it may wear many more elements. The accompanying diagram shows just *how* invisible. What of its cost? A 9-element for 433MHz at less than £30 (or you can make one out of discarded television aerial rods) will provide 5db more gain compared with the 4-element devices for the lower bands. Against this advantage must be set the greater feeder loss likely on 70cm (not if you buy decent quality stock — but there go the pounds again).

It is also held that path loss at 70cm is greater than that on Two or Four or Six. In practical amateur day to day operation this disadvantage is not apparent and Seventy often gives startling results because of what seems to be its greater penetrative power. Note that you *must* use a small beam to achieve such results:

those dreadful omnis prevalent on Two perform even more poorly on Seventy.

### "Pays Your Money . . ."

What has been said resembles a Which? report in its discussion of various criteria. But it cannot give a "best buy." There are too many imponderables to take into account. Could it be that for maximum QSOs, minimum expenditure, and a virtually invisible aerial, the 433MHz band has most going for it? Readers might like to say.

#### GUIDE FOR FM USERS ON 50, 70 and 433MHz

##### Channelising yourself on Six

51.51MHz calling frequency  
51.41 to 51.59MHz, a spectrum 180kHz wide, and no repeaters to take into account!

##### Channelising yourself on Four

70.26MHz calling frequency  
70.45MHz alternative calling frequency  
70.425MHz working frequency for QSY  
70.475MHz working frequency for QSY  
Available spectrum for FM: 240kHz

##### Channelising yourself on Seventy

433.5MHz calling frequency  
433.4 to 433.775MHz  
Available spectrum for FM: 375kHz

**Note 1:** There are large QSY areas on both 6 metres and 70 centimetres clear of the above channels.

**Note 2:** The cw/ssb section of each band is at the low end in each case.

**Note 3:** For metrewave bandplans in detail see Handbook Section of the RSGB Callbook

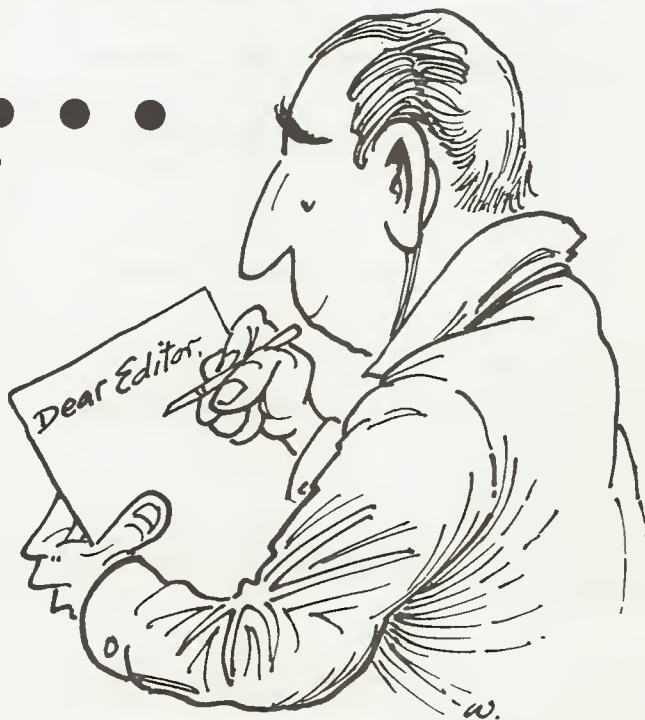
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# Free Readers Ads!

## FOR SALE

**FOR SALE** standard C5800 2MTR multi mode. 25 watts, 10 memories, all usual micro proc facilities, C/W mobile bracket, manual, original packaging. Good condition £250 ovno including Securicor delivery. GW1FJL QTHR. Tel. 02912 2808 (Gwent).

**FOR SALE** FT780R 70cms multimode mobile 10 watts in excellent condition, has not been used mobile only as a base station £350 o.v.n.o. Nato 2000 working on 10 metres, multimode AM, FM, SSB, CW, 28MHz to 29.700MHz in 10KHz steps £150 o.v.n.o. Tel: Mike 0895 443524.

**HY-GAIN** antenna TH5 5-Ele Tribander v.g.c. C/W Bencher Balun + manual £200. Tel: 0206 851343 Colchester.

**OPPORTUNITY** to own an HP8407A network analyser. Also Marconi TF2002B 10-72m signal generator and TF2170B Lock box, Philips PM3250 20m oscilloscope, Marconi TF2604 AF Voltmeter. All come with manuals. Reluctant sale hence sensible offers required. 01-868-6647 (Middx.)

**PHILIPS D2999** computer controlled general coverage communication receiver, new £255. Grundig satellit 3000 general coverage communication receiver digital mint condition £145. Realistic DX100L m/l wave 1-30MC 5 bands BFO. Powerful £30. Exchange Sony 320 receiver. Phone 01-571 5759.

**SMC 10FM** £40 - course Hi-Tek computer & communications in 5 binders also national radio school R.A.E. Course in 20 books, very good. TS120S used daily 200 W. Pep Solid State Digital readout nearest £300 G4YUG (0473) 830147 anytime.

**FOR SALE** microwave modules MMC 432/144S UHF/VHF converter. Mint condition, £25. Pedley, 53

Junction Road, Leek, Staffs. ST13 5QN.

**ICOM IC-2E** 2m handheld. 12v DC adaptor. Boxed mint condition, £150. Alan G6NRF Tel: 0904 768626 after 6pm.

**SONY U-Matic** VCR1810, G.W.O. + 30 tapes + service manual £150.00. Portable PA System 12v, 100w amplifier + 6 horn speakers and stands £150.00. Lots of other items SAE list. Would consider swop for ZM 70cm or HF Tx/Rx WHY?

**FOR SALE** Superstar 360FM features include five bands legal forty alpha channels five KC. Shift connector for frequency counter original mic and box very good condition £130. John 0734 411501.

**FREQUENCY** galore one radio not scanner a dial L.W. S.W. .520 to 31.50MHz on AM, USB, LSB, CW, VHF 29.125 53.10MHz & 65MHz 139MHz & 142MHz to 179MHz UHF 425MHz to 475MHz £250.00. All on L.C.D. not UHF Ring GICVR 0282 37768, £250.00.

**FOR SALE** Ham International Concord 2 AM/FM YSB/LSB/CW good working order £65. Convertable 10m Greed 444 Teleprinter £15.00. 104 Everill Gate Lane, Broomhill, Wombwell, Barnsley, S. Yorks. S73 0YJ. **SALE** Swan 700CX TRCVR (needs) attention Swan 230X PSU bands 80/40/20/15/10m plug in crystal oscillator, ten crystals OPS manual SSB/CW?AM. Box spare valves £250, buyer collects. Ring 0202 579115 anytime. **FT726R**, fitted 2m, 70cm, 6m and satellite unit, £675, Racal RA17 and preselector unit £200. Tibbert, 32 Prescut Close, Micklevier, Derby. Tel: 515212.

**SUPERSTAR** 360FM suitable for conversion £90 o.n.o. also Zetagi BV 130 200w linear, new valves fitted, £80 o.n.o. also Betamax video recorder with remote control, hardly used £100 o.n.o. Phone Kevin 0229 689009 after 6pm.

**RC PACK** for AOR2002 scanning receiver, £200 o.n.o. Tel: 01 379 7311 ext. 3695 during office hours. Ask for John Wilson.

**PLESSEY HF RX** PR1553 solid state digital to 10HZ v.g.c. £325. Racal RA17L v.g.c. £175. Scope telequipment D32 dual beam portable mains or internal nicads £100 all with info Hanson 0952 815861.

**REALISTIC DX 300** comms Rx, AM, USB, LSB, CW 10KHz to 30MHz, no gaps, mains, 12v, battery built in morse practice oscillator. Telescopic antenna etc. excellent condition complete with box and manual, £140 o.n.o. or part exchange for FT77 (0709) 862871 after 5.30pm.

**SILENT KEY** sale TS-780 (2m/70cm) multimode. Datong PC1 GCC. Datong Dipole AD370 Datong RFA preamp. Tokyo HRA-2m masthead preamp. MMG-144v preamp, Drae wavemeter, Matsui MR-4099 receiver. MMc-144/28 converter. Maldol HS-770 (144/435) duplexer. Daiwa CS401 joy-match ATU. Offers Siva. Tel: 01 423 3884.

**CQ OPEN** University students and staff suggest 80m net 3.665MHz +/- 5KHz 10.00 local time daily, also 40m 7.065MHz +/- 5KHz 11.00 local time daily, call CQ OU. The agenda is open for discussion all faculties welcome.

**MAPLIN** keyboard metal cased £20. Heathkit service scope OS2 spare tube etc. Needs slight attention £35. Heathkit R-C Bridge C-3U £30 ST5C RTTY kit. Bartag case PCB components. PCB 90% populated requires wiring testing £55 o.v.n.o. Collection or carriage extra. Mr. D.F. Thompson, "Four Winds", 131 St. Johns Road, Exmouth, Devon EX8 4EW.

**MARCONI** CR100 Com. Rx fully functional from WWII era collectors piece, buyer collects. Offers phone 01-508 0881 or 4707 evenings. **FRG7700** and **FRV7700**

boxed mint condition with RX-4 (CBM64) software and TiFi Interface £295 the lot. Phone (Essex) 0376 43666.

**SONY ICF** Pro 80 receiver/scanner, 150KHz - 108MHz, 115.15MHz - 223MHz with converter, LW, MW, SW (SSB), FM, AIR, boxed with manual, 6 months old, £220. S. Hancox, 11 Burbury Close, Marston Vale Estate, Bedworth, Warks, CV12 8DU. Tel: 0203 310211.

**BNOS** 2 metre linear amp, 10W in 100W out, pre amp, £85. Telephone Ian, G4UWK 062-982-3072 after 6.00pm.

**KENWOOD** TS930S still under warranty boxed in new condition with workshop manual etc. £1350 o.n.o. Extras available if required part exchange considered for TS440S or similar buyer inspects and collects QTHR Tel: Stourbridge (0384) 392147 anytime.

**TRIO** TS700S 144-146 multimode base. Digital/Analog. VFO + Xtal chs. 240/12v internal PSU. built in receive pre-amp. No mods, £350. Part exchange considered for Yaesu FC901 ATU. FV901DM VFO, FTV901 transverter. YO901 monitor. GWOHHW QTHR 0286 872056.

**BIRD** Model 43 complete with 50w and 1,000w slugs for 100-250MHz sensible offers only to G6JNS Q.T.H.R. or phone 0905 620041 and leave a message if I am out. **IC-R7000** Icom Scanning Receiver the best on the market. Brand new, unopened unwanted present, £775 o.n.o., covers CB, TV emergency services amateur bands above 30MHz. Call Tom 0483 62586 evenings, 01-324-8349 day.

**FRG7700** receiver Boxem like new, **FRT7700** **FRV7700B** both as new boxed, excellent value £260. Telephone 0663 65191 after 6.30pm.

**10 METRE** conversion board to fit Cobra 148 Mk2 unused with full instructions £10. Phone 031 668 3451 6pm.

**HANDHELD** Pye P5002 VHF 4 channel aligned 2 metres xtalled S16 with handbook extra antenna battery also TV rotator new in box suit VHF UHF beam wanted SEM Z match or KW EZEE match also 2B RA17 KW202 KW77 Jerry LTOAED Tel: 0485 43074.

**AOR2002** VHF/UHF scanning receiver, mint condition 25-550MHz 800-1300MHz unwanted present, boxed, £350 o.n.o. Telephone Dover (0304) 201541.

**EDYSTONE** GEN-COV receiver, excellent overhauled, £135. KW2000B transceiver, excellent overhauled by KW £198. Trio R600 near mint GEN COV receiver, £235. Tel: Wood 04446 - 41567 evenings.

**FOR SALE** realistic PRO-2009 programmable scanner covering 68-88, 144-174, 410-512MHz with 8 memory channels. Perfect condition £90. Signal 528 Airband scanner plus 16 crystals, case, rubber duck, telescopic aerial, perfect condition £70. Pedley, 53 Junction Road, Leek, Staffs, ST13 5QN.

**VALVES** 12 x CV1091, 6 x 6H6, 8 x 6AC7, 3 x 6J6, 6 x 6SJ7, 4 x 12AT7, 2 x CV286, 1 x 6B4G, 2 x QS95/10, 1 x 6D6, 1 x CVX850. All in original box. £30 the lot. Plus £3 postage. Please send list of your wants in valves S.A.E. please to: W. Lee, 8 Bronheulog, Bodfordd, Isle of Anglesey LL77 7SU.

**FT77** 100W (variable) all mode TCVR with FM. Warc bands, scanning mic, market, 29.000 xtal narrow CW filter, FV707DM, manuals SEM ATU. 30 amp PSU, v.g.c. boxed £600.00. Reg. 0904 (York) 768545.

**YAESU** FRG7700 general coverage receiver, boxed manual v.g.c. recently overhauled £245. Phone home 021-355-1648, work 0922-52110.

**TRIO** VT108 high impedance voltmeter £20. Labgear CM6028/CB television crosshatch and colour bar signal generator £30. Telephone 0454 773387.

**KW AMATEUR BAND** receiver with manual excellent side band performance £65 No Offers. Phone 01-699-4413 after 6pm.

**6V 12AH** lead acid batteries. New condition, dry charged, 4½L 5¼H 2¼W £5.75 cash. Shop price £14. Buyer collects. AVO40 multimeter £49 good condition. Phone Worthing Sussex 501896.

**SONY** ICF2001D receiver 150KC to 30MHz FM and air band AM USB, LSB, Sync. 32 memories, £220 or exchange for Bearcat DX1000, Trio R-1000. Trio R-600 or similar receiver with cash adjustment. Phone Richard 0535 600667. Keighley, after 7pm.

**ICOM** ICB1050 10 metre FM with Xtal filter £25. Cobra 148GTLDX ideal for 10 metre conversion £100. Wanted HF multiband multimode for around £350 after 6pm GINZS Telford 607542.

**2 MTR FM** 45 watt Tx/Rx TM221E 3 months old, 14 mems priority channel scan etc. plus Daiwa 3-15v 10amp metered PSU £350.00 or exchange for FT77, FP77, W.H.Y. Also want FTV700 and C.W. Filter DC.8.9HCN. Phone Keith 0543 360372.

**BBC B + Acorn** DFS +400k 40/80TR drive + Acorn speech, max desktop, joystick & lots software, £350. Also Tono 900E communications computer, TRRY/CW, ASCII & picture Rx/TV (including lightpen). Is also word processor, offers. Write, William Cowling, 119 Agar Road, Illogan Highway, Redruth, Cornwall, TR15 3FE.

**FRG7700** HF receiver 150KHz 30MHz all mode integral clock-timer plus FRV 7700(C) convertor very good condition £280. Tel: 0592 269236 evenings.

**FOR SALE** TR7730 2m FM transceiver 5/25 watts never used mobile 25KHz or 5KHz step digital VFO system five memory channels red LED frequency display hand mic up/down switch v.g.c. £156 incl. carriage. Tel: 0792 892908 after 5pm.

**RTTY** Station, microwave 4001 with RCA keyboard interfaced with Tandata printer and complete with Pye monochrome monitor and cables ready to go. £195.00 o.n.o. Tel: David 0223 861153 G4POK QTHR.

**ICOM** 751A with extra cost £2080, offers £1500. Trio 440S with extras cost £1340,

offers £1000. Tono 5000E data terminal cost £1200, offers £750. Trio 9130 £350. Withers Mk3 9600 £400. BNOS LPM 144-10-180 £275, other items. Private. Tel: Dronfield 413413.

**280 HC25** PMR Xtals mostly high band many frequencys duplicated, 70 HC60 Xtals 9-37MHz. SAE for frequency list or offers for the lot. G3DOV QTHR 0953 882076.

**FRG7700M** good condition £220 carriage paid or exchange for Atari 520 ST FM computer cash adjustment if necessary. Phone Seon 0436-71181.

**FOR SALE** air seven Sony scanner £150 7600D HF VHF scanner £100 with Nicads PSU together £250 YAESU FT203R case Nicads extras £160. FT290R Mutek Nicads charger £275. Phone Derby 768048 c/o G8UFG.

**FOR SALE** Datong MK Morse keyboard v.g.c. £60.00 o.n.o. or exchange, part exchange, for 2M FM Trans. Tel: 0305 813202.

**TELEREADER** CWR-675EP for receiving RTTY CW (Baudot, ASCII, morse) with 5½" screen built in as new, would cost £500. bargain at £350, also Yaesu FRG7700 with memory - also FRT-7700 tuner, very good condition £250. Phone Marlborough (0672) 52571.

**SONY** ICF2001D broadcast bands only 150 to 26100. No SSB or Air Band Far East model £140. 021 378 1791 Birmingham.

**TEN TEC** Century 22 as new keyer module and CW filter fitted silent key, sale £225 o.v.n.o. Peter G3JXR 0908 642398.

**70cm's - FOR SALE** boxed Yaesu FT709 handheld, almost as new condition complete with charger Nicad pack speaker/mic rubber helical case etc. only £170. Brian Barwick GOHRF, 100 Westwood, Golcar, Huddersfield HD7 4JY. Tel: 0484 846253.

**TOWER** 30ft free standing built in ladder complete with rotator and support bearing £190. Burndept BE600 UHF handheld with circuit diagram easily converted to 70cm's has 6 channels, offers or exchange. Yaesu

FT211RH few month's old £250 o.n.o. Tel: 0742 465145.

**V.C.R. RABBIT** £60 sends video audio signals from your VCR to any TV set in your home. Also for sale TR-84--70cm FM transceiver with Kenwood PSU built in speaker and back-up £150. David GO-HSH QTHR Croydon Tel: (0689) 42157.

**APR-4Y** Receiver £45. Tuning units available 36MHz - 12GHz. TS-323/UR frequency meter 20MHz - 480MHz TS-382 audio generator 10 CPS - 200KHz 0-10V output. TS-497B/URR signal generator 2MHz-400MHz. Wanted: HRO/Hallicrafter's, Stoddart radio units, Panoramic adapter. 247 Sandy Lane, Hindley, Wigan. Tel: 55948.

**YAESU** FT757GX FC700ATU 30amp PSU 3 months old, 9 months guarantee YM38 desk mike plus hand mike G-whip mobile antenna all boxed FM band with modification. Used mainly for receiver, bargain £750.00. Tommy, Runcorn 710054 all mint condition, Cheshire.

**Kenwood** TS-530SP HF Transceiver, AT-230 plus additional mic (Desk) MC-60 pristine condition underworked, hence sale £750 Dave GOGK Burnham-on-Sea 788970.

**Trio** 751E 2 metre multi-mode absolutely as brand new complete with box all accessories £495. SSB electronics 23/24cms transmit/local oscillator 2 metre IF 500mw out £135. ICS/AEA CPI RTTY terminal unit, BBC Eprom driver £85. Phone Paul G4XHF (0293) 515201.

**SALE** ex-lab PSU 0-20v 0-40A fully metered 240v AC input AC-DC output large heavy unit. Buyer collectors Peter 0642 456327 £60 (Daytime only).

**VERSATOWER** P30, including head unit, tiltover groundpost v.g.c. £250. Disc drive interface kit for BBC computer all chips including Eprom and 8271. £40 PK232 software and cable for BBC £20. Telephone 0234 766477 (home) 0582 27462 ext. 216 (work).

**YAESU** FRG8800 communications receiver, 150KHz,

30MHz, AM, LSB, USB, CW, NBFM, key pad frequency entry. Twelve memories. Three types scanning. £400. Cash only please. Buyer must test and collect. Phone Huddersfield (0484) 843388.

**FT-7B HF** Multimode mobile rig 100 watts, boxed v.g.c. £350. 88 Sprowston Road, Norwich, Norfolk NR3 4QW. Works No. 626903 ask for Mr. Cook.

**SPECTRUM 48K** boxed as new, all leads and manuals, includes twenty tapes (half educational) £55. Sharp 12" B&W TV v.g.c. £25. Phone Norwich 890553.

**BEGINNERS KIT** - realistic DX300 general coverage receiver. Sony ANI active antenna. Maplin headphones, loads of components £200.00 Lyme Regis 3008 evenings.

**RACK** mounting Hammarlund SP600 good working order. Panel Shabby £70. Also Rediffusion R52 offers. Both property of deceased SWL. Buyer collects. Alan Tel: 061 445 7274 (Manchester).

**AVO** Test meter, model 8 MK3, approx 1970, v.g.c. for age. Very clean, complete with instruction book. Offers around £50.00 o.n.o. Also have bought mobile shack (Caravan) so many camping items available cheap. Chris. Tel: 023-57 (Wantage) 2205.

**FT980 HF** Transceiver. All Mode. General coverage receiver including technical supplement. Narrower filters fitted for FM use on 29MHz or transverting, excellent condition. Very little used on transmit. Sensible offers. Interconnecting cable assembly FT980-757AT £20. Contact Mick G49ITF 0705 - 386184.

**TR9000** Multimode, boxed, complete with unused mobile mounting bracket. Shack clearance bargain 0935 815616 (Dorset) £300.

**D40'** West Tower hinged base buyer to unbolt the four 10' sections £80. Three Teac FD55FV-13-U Disc drives new boxed, no cases £75 each. Richard Benstead TG4FKB QTHR. Phone Stone, Staffs. 817975.

**ALINCO** 2 metre (140-160MHz) coverage 3 watt

O/P Nicad pack charger case, speaker mic, mini R/Duck, many features including LCD display ten memories battery save, boxed under guarantee £230. Exchange FT790 FT690 W.H.Y. 70cms/6m small cash adjustment if required. Ian G1HQK 01-517 8277 2pm-6pm ONLY.

### WANTED

**WANTED** National receivers type 1-10, SW3, HRO7, HRO50, HRO60, HRO500, HRO600, FB7, FBXA, all other national receivers, transmitters, equipment, working or not wanted. Plus original manuals, catalogues. Will pay £150 for German, Japanese, Australian WWII copies HRO. Tel. St. Albans 39333.

**WANTED** 'Command' receivers, transmitters, modulators, racks, control boxes, drive cables, connector cables. Dynamotors, manuals and accessories. Also BC348 and BC342 receivers, transmitters, modulators, racks, dynamotors, cables, connectors, manuals and accessories. £150 for German, Japanese WWII copies HRO. Tel. St. Albans 39333.

**WANTED:** Marine VHF receiver. SR9 or similar. Must be reasonably priced and in working order. G4HNN, 41 West Drive, Edgbaston, Birmingham B5 7RR. Tel. 021 472 3845.

**WANTED.** Any pictures of FL50B transmitter or any circuit diagrams to convert FR508 receiver to also cover other bands. Please send to Mr. P. Smith, 13 Barnes Avenue, Cefn Glas, Bridgend, South Wales.

**AR88D** receiver wanted. Good price paid for model in vgc. Will collect 100 miles Bristol. Tel. 0454 315690 any time.

**WANTED** QSL cards and postcards relating to wire- lesses, radios, amateurs and radio stations etc. (pre-1950). Also trader service sheets and service manuals pre 1950. Contact Tom Valentine, 38 Grampian View, montrose, Angus DD10 9SX Scotland (GM1XHZ). Tel. 0674 76503.

**ICOM ICR7000** must be A1

condition. Also SWR meter for 70cms and 8-12 amp power supply. Tel. 0533 774506 (Leicester).

**WANTED** Ham Radio Today magazines. September 1986 to March 1987 inc. Also World Radio TV Handbook 1986 or 1987. 0926 498388.

**WANTED** Collins R388/URR receiver in mint unmodified condition with service manual. Please phone Sutton on Sea, Lincolnshire 41681.

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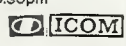

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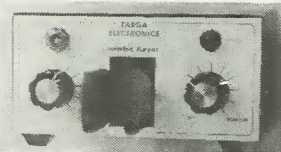
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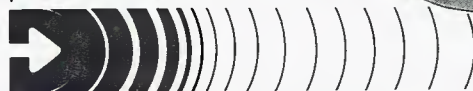
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or write with cheque or postal order to



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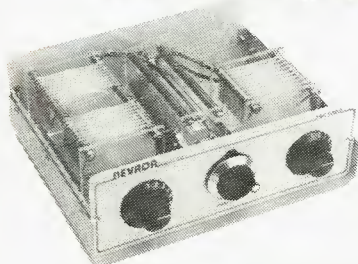
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# NEVADA

**HIGH QUALITY BRITISH MADE PRODUCTS**

## TM1000 1KW All Band ATU

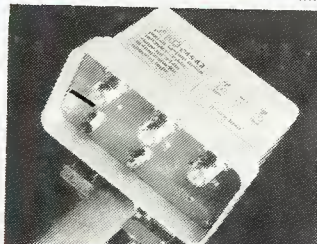


Our unique wide band roller coaster enables effortless matching of G5RV, LW, Vertical and Coax fed antennas with this unit.

Standard model ..... £139  
 For balanced feed ..... £165  
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 TM1000 Kit complete ..... £115  
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## BUILD YOUR OWN HIGH POWER ATU WITH OUR RANGE OF ATU COMPONENTS

Roller Coaster 1KW 30uH ..... £24.00 +£1 p+p  
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 TC48 Turns counter for RC26 ..... £12.95 +£1 p+p  
 Case (Pre-drilled for above) ..... £26.00 +£3 p+p



## U.H.F. REMOTE ANTENNA SWITCH

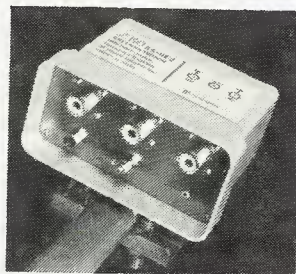
(For masthead mounting)  
 Freq: DC - 1.2 Ghz  
 Power: 300W P.E.P.  
 Insertion Loss: 0.19 dB at 900 Mhz  
 Connectors: Green Par 'N' Type

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ALLOWS SELECTION OF 2 ANTENNAS FROM 1 COAX FEEDER

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 Freq: DC - 185 Mhz  
 RF Power: 1KW P.E.P.  
 Insertion Loss: 0.15 dB at 144 Mhz  
 Connectors: SO239



**£39.95**

## 50 Mhz LINEAR AMPLIFIER

WITH HARMONIC FILTER

SPECIFICATIONS  
 Supply: 13 V DC  
 Input Power: 2.5 Watts  
 Output Power: 15 Watts  
 Freq: 50-52 Mhz  
 Power Gain: Approx 8dB

**£29.95**

+ £1 p+p

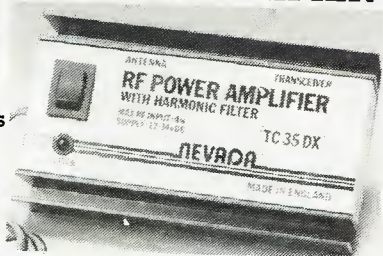
## 29Mhz FM R.F. POWER AMPLIFIER

WITH HARMONIC FILTER

SPECIFICATIONS  
 Supply: 13 V DC  
 Input Power: 1-4 Watts  
 Output Power: 25-30 Watts  
 ONE YEAR GUARANTEE

**£24.95**

+ £1 p+p

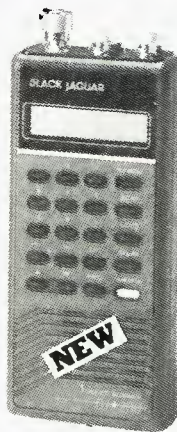


**THE UK'S SCANNER SPECIALISTS**

## BLACK JAGUAR MkII POCKET SCANNER

Switchable AM/FM.  
 Covers CB plus the following frequencies: 26-30MHz, 60-88MHz, 115-178Mhz, 210-260MHz, 410-520MHz.

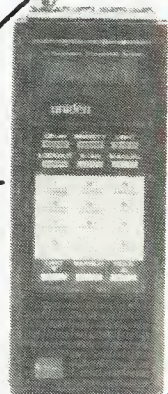
**£225**



## Bearcat 100 XL HAND HELD

Scanner with 16 channels memory scan covering 66-88 Mhz, 118-174 Mhz, 405-512 Mhz.  
 Super sensitive receiver.

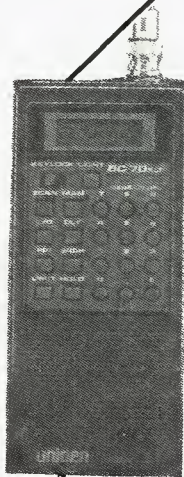
**£189.99**



## Bearcat 70 XLT

New pocket size scanner with 10 memories. Covers 66-88 Mhz, 118-174 Mhz, 405-512 Mhz.

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## Bearcat BC 50 XL

Handheld scanning receiver with 10 memories. Covers: 66-88MHz, 136-174MHz, 406-512MHz

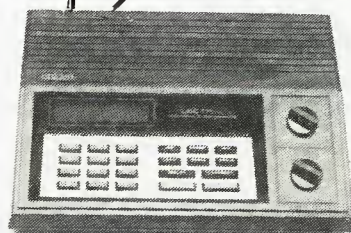
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## SCANNING ANTENNAS CTE DISCONE WIDEBAND ANTENNA

Receive: 70-700 Mhz  
 Transmit: 70-500 Mhz  
 Power: 500W  
 8 Element High Quality

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