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A useful piece of test gear which avoids the pitfalls of the early designs
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.
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.
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 £1,395.00 including 6 metres.

COMPARE PRICES WITH OTHER 'IMPORTERS'!

JST125T 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
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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!

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

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

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- Epson or IBM/Amstrad Compatible (specify which).
- Ideal for use with PAKRATT PK-232.
- 1 Year Parts & Labour Warranty.
- LOW PRICE ONLY £22.95 incl. VAT
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- Available NOW!

HAM RADIO TODAY MAY 1988
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!

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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).

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DUAL WATCH PRIORITY CHANNEL.

PROGRAMMABLE CALL CHANNEL ON BOTH BANDS.

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UPGRADE NOW.
THE NEW STANDARD C-500.
Now available from stock.

£369.00 incl VAT.
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
DVS1 Voice Memory Unit ...................... £79.00
FTS12 CTCSS Unit .............................. £60.38

BEST VALUE ON 2M, 70CMS & 23CMS

★ 45(35)*/(10)$/5(4)*/(1 or 5)$ WRF OUTPUT
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★ Ten memories (independent Tx & Rx)
★ Switchable 12.5/25kHz steps
★ Priority channel monitoring
★ CCC/w Hand mic and mobile mounting bracket

OPTIONAL ACCESSORIES

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<tr>
<th>Model</th>
<th>Accessory</th>
<th>Price</th>
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<tr>
<td>SP55</td>
<td>External Speaker</td>
<td>£19.55</td>
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<td>YH1</td>
<td>Headset/C/W Mic</td>
<td>£19.99</td>
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<td>SB10</td>
<td>PTT Switch Unit</td>
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<td>MH 10F8</td>
<td>Speaker/Mic</td>
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<tr>
<td>MH 1A8</td>
<td>Speaker/Mic (C/W Tone Burst)</td>
<td>£23.00</td>
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<td>MF 1A3</td>
<td>Boom Mic (Via SB10)</td>
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Belfast, N. Ireland
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SMC (Birmingham)
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AYMCC (Axminster)
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Axminster
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Ham Radio Today May 1988
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- FULL DUPLEX CROSSBAND OPERATION
- MEMORY STORAGE OF UP TO 230 FREQUENCIES
- KEYPAD FREQUENCY ENTRY
- FOURTEEN VFO'S
- GLOBAL CALL CHANNEL
- PROGRAMMABLE CHANNEL STEPS
- ELECTRONIC KEYER OPTION
- REMOTE PREAMPLIFIER SWITCHING
- TXC 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 80 and 160 MHz bands, respectively.)

Continuing convention is maintained on all RF transceivers, such as front panel adjustable IF shift and RF notch, a noise blanker, all-mode VOX and three-speed selectable AGC are included. GaAsFET 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 PMR (Programmable Memory Limit Scanning) on each band, two special purpose full duplex vfos, and up to four clarifier memories, one per band.

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 to provide full duplex 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 FT-736R, the FT-736R contains all manner of convenient features for both FM simplex and repeater operation, like a dedicated audio expansion interlinking system, special narrow FM mode (to cut adjacent channel interference in crowded areas) and Automatic Repeater Shift when tuned to 2-meter repeater subbands.

The FT-736R also includes a 1/4-switched DC supply line for mainhead preamplifiers, activated from the face panel, and digital input connection directly to the modulator for high performance packet radio terminal interfacing (a, who, personal computers and packet transceiver is not supplied by Yaesu).

FT736R RRP £1450 c/w 2m & 70cms

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HAMS RADIO TODAY MAY 1988
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THE PROFESSIONAL SCANNER
- Basic coverage 26-520MHz
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- Expandable from 100kHz to 1.4GHz with SSB and CW
- Computer control options
- IF output terminals
- Specifications set by professionals

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- Scan, search, priority

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THE SUPERIOR SCANNER
- The choice of the professionals
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- Covers: 25-68MHz
- 106MHz, 500-514MHz
- AM & NFM on all bands
- Positive action keyboard
- 16 memories
- 12V dc & 240V ac

[Price: £325]

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MAIN DISTRIBUTOR OF REVCO PRODUCTS. PRICES INCLUDE UK VAT AND 15% VAT. Ask for details of our free CREDIT SCHEME.

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Slim, unobtrusive
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- Telescopic and Tilt-over
- Self-supporting

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HAM RADIO TODAY MAY 1988
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TX-3 RTTY/CW/ASCII TRANSCEIVE

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

For VIC20 we have our RTTY/CW transceive program. Tape £20.

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

TIF1 INTERFACE Perfect for TX3 and RX4, it has 2-stage RTTY and CW filters and computer noise reduction for excellent reception. Transmit outputs for MIC, PTT and KEY. Kit £15 (assembled PCB + Cables, Connectors) or ready-made £25, boxed with all connections. Extra MIC leads for extra rigs £3 each. State rig(s).

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technical software (HRT)

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Tel: 0286 881886
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 such as to ‘connect’ 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-FMR 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, 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 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

Frently I would think that about 80% of the South African population would need an amateur radio licence about as much as a horse 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 silencing its internal opponents.

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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 GOAQI 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 amateurs 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.

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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

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 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 readout 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.

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
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 in 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 you 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 a 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 on the 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 and computer enthusiasts and anyone interested in electronics or the media, is broadcast on Thursdays, about twenty minutes into the programme (after the news and Newslime — 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 hobby-sits. 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).

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).
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

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 280 — 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 irritatating 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 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 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 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, its ‘one-way’ action preventing the former and allowing the latter, see Fig. 1b.

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 1/8 inch — 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.

please mention HRT when replying to advertisements.

HAM RADIO TODAY MAY 1988
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 its position for the moment — Fig. 2. Prepare a 10 in length of (preferably) mauve wire with 1/8 in bared and tinned 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 roundhead 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 setscrew 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
"... OK on first being licensed in 1932 and this is your latest project but you're still on the WRONG FREQUENCY . . ."

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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please mention HRT when replying to advertisements.
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!).

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 select-
able memory channels, controlled
by a pair of small push buttons
together with the channel step fre-
quency control switch. 'VFO' fre-
quencies 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
by a pair of small push buttons.

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 automatic-
ically 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, re-
peater 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 beep 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 what-
ever. 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 rela-
tively large size of the set, this being
similar to it's predecessors, but then
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sizeable aspect of the set, this being
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 that 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 woffle-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 collinear aerial with the set powered from an external 13.8V source, this way I could woffle 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-round 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 23.16MHz and 455kHz, demodulation being performed by the much-
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 microprocessor. 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, i.e. 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 wafflers 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.
R. N. Electronics

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Reviewed in February issue HRT

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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 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 106MHz 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

Now there’s a car radio sized scanner with a built-in memory jogger. Chris er... Lovek tries it out
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 up the set, the first thing that occurs is a microprocessor ‘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 12.6kHz 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.
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 propaga-

dana 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

noise, and if a strong signal was recovered audio level, which was

dropped in sympathy with the present large S-Meter reading. I also noticed this with it, but it was slightly irritating at too high a level. I managed to live the front end stages possibly being HF in comparison to weak inter-

ference, even on weak HF AM signals, which is very good.

**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 panel provided a surprisingly neat fixture as well as preventing damage from vibration effects. I initially connected the rear-screen 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 internal VCO via an MB501 dual-

FET mixer with HF side injection. Following this came the narrowband signal being fed to a pair of VCOs to give the wideband FM the discrimination is

performed at 10.7MHz, the final IF modulus ECL prescalar.

The 1st IF signal is amplified by a 3SK131 dual-gate MOSFET follows, with a 2SK302 summer mixer with HF side injection from a pair of VCOs to give the 45.75MHz IF. An MB86008 synthesiser controls the two HF VCOs, together with the VHF/UHF tuner's internal VCO via an MB501 dual-modulus ECL prescalar.

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 pro-

grammes 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 being divided into 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 MB86008 synthesiser controls the two HF VCOs, together with the VHF/UHF tuner's internal VCO via an MB501 dual-modulus ECL prescalar.

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.*

---

**Table: Laboratory Test Results**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>10MHz</th>
<th>145MHz</th>
<th>435MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>51dB</td>
<td>64dB</td>
<td>62dB</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency</th>
<th>10MHz</th>
<th>145MHz</th>
<th>435MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>65dB</td>
<td>10dB</td>
<td>89dB</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spacing</th>
<th>12.5kHz</th>
<th>25kHz</th>
<th>50kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>34dB</td>
<td>40dB</td>
<td>41dB</td>
</tr>
</tbody>
</table>

**Sensitivity: Input level (in μV pd) required to give 12dB SINAD:**

<table>
<thead>
<tr>
<th>Freq MHz</th>
<th>AM</th>
<th>FM-N</th>
<th>FM-W</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>2.51</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1.0</td>
<td>1.28</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2.0</td>
<td>0.791</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4.0</td>
<td>1.41</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6.0</td>
<td>0.891</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8.0</td>
<td>2.24</td>
<td>-</td>
<td>-</td>
</tr>
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<td>10.0</td>
<td>1.11</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>15.0</td>
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<tr>
<td>50.0</td>
<td>5.01</td>
<td>1.41</td>
<td>-</td>
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<tr>
<td>80.0</td>
<td>6.31</td>
<td>0.355</td>
<td>-</td>
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<tr>
<td>90</td>
<td>-</td>
<td>-</td>
<td>1.12</td>
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<td>110</td>
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<tr>
<td>140</td>
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</tr>
<tr>
<td>160</td>
<td>6.01</td>
<td>0.281</td>
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<tr>
<td>180</td>
<td>6.09</td>
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<tr>
<td>200</td>
<td>6.17</td>
<td>0.355</td>
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<tr>
<td>250</td>
<td>6.02</td>
<td>0.546</td>
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<td>300</td>
<td>6.08</td>
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<td>0.453</td>
<td>-</td>
</tr>
<tr>
<td>400</td>
<td>6.12</td>
<td>0.803</td>
<td>-</td>
</tr>
<tr>
<td>435</td>
<td>-</td>
<td>-</td>
<td>1.09</td>
</tr>
<tr>
<td>450</td>
<td>-</td>
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<td>0.686</td>
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</tr>
<tr>
<td>700</td>
<td>-</td>
<td>0.928</td>
<td>1.61</td>
</tr>
<tr>
<td>800</td>
<td>-</td>
<td>1.02</td>
<td>1.38</td>
</tr>
<tr>
<td>800</td>
<td>-</td>
<td>2.12</td>
<td>6.02</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Freq</th>
<th>Mode</th>
<th>Distortion</th>
</tr>
</thead>
<tbody>
<tr>
<td>10MHz</td>
<td>AM</td>
<td>5.40%</td>
</tr>
<tr>
<td>120MHz</td>
<td>AM</td>
<td>7.00%</td>
</tr>
<tr>
<td>90MHz</td>
<td>FM-W</td>
<td>0.57%</td>
</tr>
<tr>
<td>145MHz</td>
<td>FM-N</td>
<td>1.00%</td>
</tr>
</tbody>
</table>
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 Lork, 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. 041-946 2828
Darlington: 56 North Road. Tel. 0326 486121
Cambridge: 168 High Street, Chesterton. Tel. 0223 311230

Cardiff o/c South Wales Carpets, Clifton Street. Tel. 0222 494154
London: 283/285 Field End Road, Eastcote, Middlesex. Tel. 01-429 3266
Bournemouth: 27 Gillam Road, Northbourne. Tel. 0202 577760

Note: All our shops open Tuesday to Saturday inclusive.

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 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.

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

Why are we going on about a receiver 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 as "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

LOWE ELECTRONICS LTD.
Chesterfield Road, Matlock, Derbyshire DE4 5LE
Telephone 0629 580800 (4 lines) Fax 0629 580020

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." Mr. Angas Mofokeng

"I tuned straight to the 40 metre amateur band to see how it stood up to the battering from high powered transmitters, and was disappointed to find it had not been possible to draw it out of the testing regime in time. 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 £1195 inc. VAT. Need I say more?
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 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.

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 awareness 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.

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 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 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.

So much interest was shown “over the air” that a broad-sheet
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 affect 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 hole 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 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 masthead system to eliminate feeder loss.

External Switching
Some means of remote switching for external amplifiers, and masthead 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. 8 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. IDss = The maximum Drain — Source current when the Gate — Source voltage is zero.
2. Vgp = 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 (IDss) quickly since after switch-on there is some thermal drift due to internal heating of the device, causing a shift in the IDss 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 (Vgp).

Having completed this procedure for each device, select the example that had the highest Vgp. It is likely, but not necessarily so, that this example also had the highest IDss value.

**Mixer Modifications**

1. Remove R10 (220ohm) 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 220ohm 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 T072 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
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.

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).

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

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

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.

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.

Eighteen general-purpese 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 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, i.e. when the receiver squelch raises, and resumes either when the signal disappears or 5 seconds after the scan halts regardless of whether

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

the signal is there or not, dependant upon the pre-set 'pause' mode pro-
grammed by the operator. As well as all this, a 'Priority' channel
monitor facility is selectable where the set briefly samples memory
channel every five seconds, opera-
tion shifting onto that frequency
for as long as a signal is present on
it. Musical dual-tone bleeps accom-
pany 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 instruc-
tion book with block and circuit dia-
grams, 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 con-
nector may also be used for memory
'cloning' between one set and
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 micro-
phone 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 play-
back and record when commanded
over the air.

Eight separate storage 'seg-
ments' may be used either separ-
ately 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 recorded 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 hiliarities 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 (trusty) 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 facia, 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-

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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 providing 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 lop-sided 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.

Conclusion

In all, a very nice, small set that should fit very easily on top of or beneath many crowded dashboards in today's 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

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>Input level required to give 12dB SINAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freq.</td>
<td>Level</td>
</tr>
<tr>
<td>144MHz</td>
<td>0.186uV pd</td>
</tr>
<tr>
<td>145MHz</td>
<td>0.188uV pd</td>
</tr>
<tr>
<td>146MHz</td>
<td>0.186uV pd</td>
</tr>
</tbody>
</table>

Squelch Sensitivity

| Threshold  | 0.141uV pd |
| Level      | 8dB SINAD  |
| Maximum    | 0.407uV pd |
|            | 28dB SINAD |

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

<table>
<thead>
<tr>
<th>Spacing</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>+12.5kHz</td>
<td>55.0dB</td>
</tr>
<tr>
<td>-12.5kHz</td>
<td>13.5dB</td>
</tr>
<tr>
<td>+25kHz</td>
<td>76.0dB</td>
</tr>
<tr>
<td>-25kHz</td>
<td>13.5dB</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Spacing</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>20/50kHz</td>
<td>72.0dB</td>
</tr>
<tr>
<td>50/100kHz</td>
<td>72.0dB</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Load</th>
<th>Output (RMS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3kHz</td>
<td>1.20W</td>
</tr>
<tr>
<td>9kHz</td>
<td>1.05W</td>
</tr>
<tr>
<td>18kHz</td>
<td>0.65mW</td>
</tr>
</tbody>
</table>

Image Rejection: Increase in level of signal at first IF image frequency over level of on-channel signal to give identical 12dB SINAD signals 86.0dB.

S-Meter Linearity

<table>
<thead>
<tr>
<th>Indication</th>
<th>Sig. Level</th>
<th>Rel. Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>0.30uV pd</td>
<td>-14.6dB</td>
</tr>
<tr>
<td>S2</td>
<td>0.37uV pd</td>
<td>-12.7dB</td>
</tr>
<tr>
<td>S3</td>
<td>0.44uV pd</td>
<td>-11.2dB</td>
</tr>
<tr>
<td>S4</td>
<td>0.54uV pd</td>
<td>-8.6dB</td>
</tr>
<tr>
<td>S5</td>
<td>0.65uV pd</td>
<td>-7.8dB</td>
</tr>
<tr>
<td>S6</td>
<td>0.84uV pd</td>
<td>-5.7dB</td>
</tr>
<tr>
<td>S7</td>
<td>1.01uV pd</td>
<td>-4.1dB</td>
</tr>
<tr>
<td>S8</td>
<td>1.26uV pd</td>
<td>0dB ref</td>
</tr>
<tr>
<td>S9</td>
<td>2.09uV pd</td>
<td>+2.3dB</td>
</tr>
<tr>
<td>S9+</td>
<td>3.09uV pd</td>
<td>+8.6dB</td>
</tr>
<tr>
<td>S9+++</td>
<td>5.81uV pd</td>
<td>-11.1dB</td>
</tr>
</tbody>
</table>

Transmitter

<table>
<thead>
<tr>
<th>TX Power and Current Consumption:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free Hz</td>
</tr>
<tr>
<td>Power</td>
</tr>
<tr>
<td>10.6V Supply</td>
</tr>
<tr>
<td>13.9V Supply</td>
</tr>
<tr>
<td>15.6V Supply</td>
</tr>
<tr>
<td>Low</td>
</tr>
<tr>
<td>40.7W/5.85A</td>
</tr>
<tr>
<td>25.8W/7.40A</td>
</tr>
<tr>
<td>52.8W/7.38A</td>
</tr>
<tr>
<td>High</td>
</tr>
<tr>
<td>39.9W/6.65A</td>
</tr>
<tr>
<td>51.7W/7.20A</td>
</tr>
<tr>
<td>52.7W/7.18A</td>
</tr>
<tr>
<td>145</td>
</tr>
<tr>
<td>Low</td>
</tr>
<tr>
<td>5.0W/3.30A</td>
</tr>
<tr>
<td>5.0W/2.36A</td>
</tr>
<tr>
<td>5.0W/2.35A</td>
</tr>
<tr>
<td>5.0W/2.34A</td>
</tr>
<tr>
<td>High</td>
</tr>
<tr>
<td>38.9W/6.54A</td>
</tr>
<tr>
<td>41.9W/6.50A</td>
</tr>
<tr>
<td>51.9W/7.00A</td>
</tr>
<tr>
<td>52.9W/6.95A</td>
</tr>
<tr>
<td>146</td>
</tr>
<tr>
<td>Low</td>
</tr>
<tr>
<td>5.01W/2.30A</td>
</tr>
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<td>5.01W/2.30A</td>
</tr>
<tr>
<td>5.01W/2.29A</td>
</tr>
<tr>
<td>5.01W/2.28A</td>
</tr>
</tbody>
</table>

Harmonics/Spurii:

<table>
<thead>
<tr>
<th>Harmonics/Spurii</th>
</tr>
</thead>
<tbody>
<tr>
<td>-89dB</td>
</tr>
<tr>
<td>3rd Harmonic</td>
</tr>
<tr>
<td>-89dB</td>
</tr>
<tr>
<td>All other harmonics and spurii</td>
</tr>
<tr>
<td>&lt;90dB</td>
</tr>
<tr>
<td>Peak Deviation</td>
</tr>
<tr>
<td>0.77kHz</td>
</tr>
<tr>
<td>Toneburst Deviation</td>
</tr>
<tr>
<td>4.73kHz</td>
</tr>
</tbody>
</table>

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Ham Radio Today May 1988

Please mention HRT when replying to advertisements.
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 multivibrator circuits locked to the crystal. . . ugh, the number of times we have calibrated equipment only to find 11 markers between the 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 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.

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.

NOTE: IC2, 5, 7 = 74LS00  IC3, 4, 6 = 74LS90  Q1, 2 = BC183  REG1 = 7805 5V  XTAL = 10MHz

NB. APPROPRIATE 'SELECT' LINE IS EARTHED TO CHOOSE OUTPUT FREQUENCY
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.
<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Apr</td>
<td>Coventry ARS: Night on the air &amp; morse tuition.</td>
<td>Baden Powell House, 121 St. Nicholas St, Radford, Coventry</td>
</tr>
<tr>
<td>4 Apr</td>
<td>Burnham Beeches RD: Easter Monday family foxhunt.</td>
<td>Baden Powell House, 121 St. Nicholas St, Radford, Coventry</td>
</tr>
<tr>
<td>5 Apr</td>
<td>Wakefield DRS: Night on the air.</td>
<td>Baden Powell House, 121 St. Nicholas St, Radford, Coventry</td>
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<tr>
<td>4 Apr</td>
<td>Burnham Beeches RD: Easter Monday family foxhunt.</td>
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<td>Sutton &amp; Cheam RS: Natter night in the Downs Bar.</td>
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<td>7 Apr</td>
<td>Bredhurst RTS: Construction &amp; natter night.</td>
<td>Horsham Open meeting, Guide Hall, Denne Rd, Horsham</td>
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<td>8 Apr</td>
<td>Loughton DARS: AGM.</td>
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<td>10 Apr</td>
<td>Lough Erne ARC: Mobile Rally, Killyhelvin Hotel.</td>
<td>Baden Powell House, 121 St. Nicholas St, Radford, Coventry</td>
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<tr>
<td>11 Apr</td>
<td>Sutton &amp; Cheam RS: Inter-club quiz, CATS vs Sutton &amp; Cheam RS.</td>
<td>Baden Powell House, 121 St. Nicholas St, Radford, Coventry</td>
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<tr>
<td>12 Apr</td>
<td>Keighley ARS: Natter night.</td>
<td>Rugby ATS: AGM</td>
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**HAM RADIO TODAY MAY 1988**

please mention HRT when replying to advertisements.
<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>Details</th>
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<tbody>
<tr>
<td>20 Apr</td>
<td>Chestnut DARC: Natter evening. Church Room, Church Lane, Wormley, Nr. Chestnut, Herts. 8pm. Lough Erne ARC: Talk 'Secrets of your rig'. 8pm Railway Hotel, Enniskillen, Co. Fermanagh. S Bristol ARC: 2m CW activity evening at Whitchurch Folk, East Dundry Road, Whitchurch, Bristol.</td>
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<tr>
<td>23 Apr</td>
<td>Ealing DARS: Talk 'Operating new equipment' by Martin G4KHS 7.30pm The Community Centre, 71a Northcroft Road, Ealing. Delyn RC: Demonstration &amp; 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.</td>
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<tr>
<td>27 Apr</td>
<td>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 &amp; buy, refreshments and ample parking. There will be a small entrance fee and talk-in will be on S22. Sutton &amp; Cheam RS: Natter night in the Downs Bar, Downs Lawn Tennis Club, Holland Avenue, Cheam. Tyfle ARS: Equipment Sale at The Kite Club, Blackpool Airport.</td>
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<td>28 Apr</td>
<td>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. 3 Bristol ARC: DX TV demonstration by Ron Gardner at Whitchurch Folk House, East Dundry Road, Whitchurch, Bristol.</td>
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<tr>
<td>29 Apr</td>
<td>5 May Loughton DARS: Club project. Building night. Loughton Hall, Rectory Lane, Loughton, Essex. Coventry ARS: Night on the air &amp; Morse tuition. 8.00pm. Baden Power House, 121 St. Nicholas St, Radford, Coventry. Harrow RS: Activity night at the Roxeth Room, Harrow Arts Centre, High Road, Harrow Weald from 8pm. E Kent RS: HF Antenna Symposium — problems solved at Parkside Lodge, Kings Road, Herne Bay. Salop ARS: Natter night.</td>
<td></td>
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</tbody>
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11 May
Willenhall DARS: Natter night. Cross Keys Inn, Ashmore Lake Rd, Willenhall, W. Midlands. Info — Dave Jackson, G0EUG (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 G8V01. 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.

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13 May
Loughton DARS: Field Weekend at Aylmers Farm up to 15th.

23 May
Atherstone ARC: DF Hunt No. I. 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 Bass 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: Microwaves 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 Marie Place Adult Education Centre, Leylands Rd., Burgess Hill. Starts at 7.45pm.
S Bristol ARC: Microwave activity evening at Whitchurch Folk House, East Dundry Road, Whitchurch, Bristol.

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.

30 May
Sutton & Cheam RS: Special event station. GBOTTT 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) 662511.

30 May
Sutton & Cheam RS: Cheam & Worcester Park Fete Special event station.
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 51-52kHz 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.

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

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

Channelising yourself on Seventy
433.5 MHz calling frequency
433.4 to 433.775 MHz
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.

ATTENTION ALL WRITERS . . .

. . . or just readers who sometimes think "I could write that!"

We're looking for authors to help us keep 'Ham Radio Today' at the forefront of the radio scene. So if you've designed some novel or cost-effective gear, you've done something that is of interest to other amateurs, or you've got a controversial axe to grind, we'd like you to contact us!

If you're interested in writing for us, send us an outline of any ideas you might have and tell us a little about yourself. Write to: The Editor (submissions), Ham Radio Today, ASP Ltd, 1 Golden Square, London W1R 3AB.

Please note that we cannot be held responsible for the loss of unsolicited manuscripts. We advise all authors to keep a copy of any articles they send us.
HAM RADIO TODAY MAY 1988

FOR SALE

FOR SALE standard C8800 2MTR multi mode. 25 watts, 10 memories, all usual micro proc facilities, C/W mobile bracket, manual, original packaging. Good condition £250 o.n.o including secure delivery. GW1FJ 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 £250 o.v.n.o. Nato 2000 working on 10 metres, multimode AM, FM, SSB, CW, 28MHz to 29.70MHz in 10KHz steps £150 o.v.n.o. Tel: Mike 0885 443624.

HY-GAIN antenna TH5 5-Ele Tri-band v.g.c. P/C W Bercher Belu. £200. Tel: 0206 661343 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.)


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 G6NF Tel: 0904 766826 after 5pm.

SOUND U-Matic VCR1810, £900. com £200 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 swap for ZM 70cm or HF Tx/Rx WHY?

FOR SALE Superstar 380FM satelit includes five bands fully 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.才会等 Frequency counter original mic and box very good condition £130. John 0734 411501.

SUPERSTAR 360FM suitable for conversion £50. 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 689090 after 6pm.

RC PACK for AOR2002 scanning receiver. £200 o.n.o. Tel: 01 379 7311 ext. 2505 during office hours. Ask for John Wilson.

PLESSY HF RX FR1553 solid state digital to 10HZ v.g.c. £325. Racial RA17L v.g.c. £175. Scope tequipement D92 dual beam portable mains or internal niacid £100 all with info Hanson 0952 815861.

REALISTIC DX 300 comms Rx, AM, USB, LSB, CW 10KHz to 30MHz, mainly 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 PC11 GCC. Datong Dipole AD370 Datong RFA preamp. Tokyo HRA-2m mesethead preamp. MM-144-12V preamp, Drea wave meter, Matsui MR-4099 receiver. MMC-144/28 converter. Maldoi HS-770 (144/435) multiplex monitor. Daiwa CS401 joy match ATU. Offers Sae: Tel: 01 423 3884.

CQ OPEN University students and staff suggest 80m net 3.665MHz +/- 5kHz from 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.


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CQ OPEN University students and staff suggest 80m net 3.665MHz +/- 5kHz from 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.

For sale realistic PRO-2009 programmable scanner covering 68-88, 144-174, 401-512MHz with 8 memory channels. Perfect condition £60.国旗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, 9 x 6AC7, 7 x 6A8, 8 x 7E6, 3 x 6AS7, 4 x 12AT7, 2 x 2C26, 1 x 6B4G, 2 x 0295/10, 1 x 6D6, 1 x CV1150. All in original box. £20. The lot. £30 plus postage. Please send list of your wants in vales S.A.E. please to: W. Lee, 8 Bronheugh, Cowling, 119 Agar Road, Ilkley, West Yorkshire, LS19 7SU.

FT77 100W (variable) all mode TCVR with Tx/ Rx TM221E 3 months old, 14 mems priority channel scan etc. plus Daiwa 3-15V 10amp metered PSU £350.00 and exchange for FT77, FP77, W.T.A. Also wanted FT7700 and C.W. Filter DC.8.9HCN. Phone Keith 0543 360372.

BCB A + Acorn DFS +400k 40/80TR drive + Acorn speech, max desktop, joystick & lots software, £350. Also Tono 9000E communications computer, TR/RY CW/TV-700 & picture Rx/Tv (including lightening). Is also word processor, offers. Write, William Cowling, 119 Agar Road, Illogan Highway, Redruth, Cornwall, TR15 3FE.

Yaesu FRG7700 HF receiver 150KHz 30MHz all mode integral clock-converter plus FRV 7700(C) converter very good condition £280. Tel: 0592 629236 evenings.

For Sale RT7730 2m transceiver 6/5 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 inc. carriage. Tel: 0792 892908 after 5pm.

RTTY Station, microwave 4001 with RCA keyboard interfaced with Tandy printer and complete with Pyle monochrome monitor and cables ready to go. £195.00 o.n.o. Tel: David 0223 861153 4GPOK GTHR.

ICOM 781A with extra cost £2000, offers £1500. Trio 440S with extra cost £1340, offers £1000. Tono 5000E data terminal cost £1200, offers £750. Trio 9130 £350. Withers Mk3 8800 £400. BNC LPM 14-100 £275, other items. Private. Tel: Dronfield 413413.

280 HC25 PMR Xtras mostly high band many frequencies duplicated, 70 HC80 Xtras 9-37MHz. SAE for frequency list or offers for the lot. G3DOV GTHR 0953 882876.

FRG7700M good condition £220 carriage paid or exchange for Atari 520 ST FM computer cash adjustment if necessary. Phone Sean 0436-7118.

For Sale air sevenSony scanner £150 7600HF VHF scanner £100 with Nicads PSU together £250 Yaesu FT203R case Nicads extras £160. FT280R Mutek Nicads charger £275. Phone Derby 768048 c/o G8UFK.

For Sale Datong Mk Morse keyboard v.g.c. £60.00 o.n.o. or exchange, for 2M FM Trans. Tel: 0305 813202.

Telerader CWR-7565P for receiving RTTY CW (Baudot, ASCII, morse) with 55" screen built in as new, would cost £500. bargain at £350, also Yaesu FRG7700 with memories - also FT7700 tuner, very good condition £250. Phone Marlborough (0672) 52571.

Sony ICF2001D broadcast receiver with cash adjustment if necessary. Phone Richard 0535 600667. Keighley, after 7pm.

ICOM IC81050 10 metre FM with Xtal filter £25. Cobra 148GLTX ideal for 10 metre conversion £100. Wanted HF multiband Multi-mode for around £350 and 6pm GINZS Telford 076542.

2 MTR FM 45 watt Rx/Tx TM221E 3 months old, 14 mems priority channel scan etc. plus Daiwa 3-15V 10amp metered PSU £350.00 and exchange for FT77, FP77, W.T.A. Also wanted FT7700 and C.W. Filter DC.8.9HCN. Phone Keith 0543 360372.

BCB B + Acorn DFS +400k 40/80TR drive + Acorn speech, max desktop, joystick & lots software, £350. Also Tono 9000E communications computer, TR/RY CW/TV-700 & picture Rx/Tv (including lightening). Is also word processor, offers. Write, William Cowling, 119 Agar Road, Illogan Highway, Redruth, Cornwall, TR15 3FE.

YAESU FT757GX FC7000ATU 30amp PSU 3 months old, 9 months guaranteed Y38S desk mike plus hand mike G-whip mobile antenna all boxed FSM with modification. Used mainly for receiver, bargain £750.00. Truro, Cornwall 710064 all mint condition, Cheshire.

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

Trio 781E 2 metre multi-mode as brand new complete with box all accessories £495. SSB electronics 23/24sms transmit/local oscillator 2 metre IHF 560xmc out £136, ICS/AEA CPI RTTY terminal unit, BBC Eprom driver £65. Phone Paul G4XHF (0293) 515201. Sale ex-lab PSU 0-20v 0-40A fully metered 240v AC input AC/DC output large heavy duty buyer collects. Peter 0642 415327 £60 (Daytime only).

VERSATOWER P30, including head unit, tilt/overground post v.g.c. £250. Disc drive interface kit for BBC computer all chips including Eprom and 8271, £40 PK232 software, serviceable for BBC £20. Telephone 0234 768477 (home) 0682 27462 ext. 216 (work).

YAESU FRG8800 communications receiver, 150KHz, etc.

please mention HRT when replying to advertisements.

HAM RADIO TODAY MAY 1988
WANTED National receivers type 1-10, SW3, HR07, HR050, HR0500, HR0600, 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, connectors, cables, manuals and accessories. £150 for German, Japanese WWII copies HRO. Tel. St. Albans 39333.

WANTED: Marine VHF receiver. S9 or similar. Must be reasonably priced and in working order. G4HHN, 41 West Drive, Edgbaston, Birmingham B5 7RR. Tel. 021 472 3845.

WANTED: Any pictures of FL508 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 316690 any time.

WANTED QSL cards and postcards relating to wireleses, radars, amateurs and radio stations etc. (pre-1950). Also for service sheets and service manuals pre-1950. Contact Tom Valentine, 38 Grampian View, montrose, Angus DD10 9SX Scotland (GM1HXH). Tel. 0674 76503.

ICOM IC7000 must be A1 condition. Also SWR meter for 70cms and 8-12 amp power supply. Tel. 0533 774506 (Leicester).


WANTED Collins R386/URR receiver in mint unmodified condition with service manual. Please phone Sutton on Sea, Lincolnshire 41681.

WANTED Yaesu FT2 or FT2F 2M FM rig in good condition with mike and manual etc. Will pay up to £50. G1SFS Pete, 23 Chesnut Walk, Bishopsworth, Bristol, Avon BS13 7RJ.

WANTED Tandy TRS80 Model 100 portable computer with disc drive/printer if possible. Model 102 or 200 also considered. Contact G4HHN. Tel. 021-474 3845.

WANTED FT775 wanted in any condition, without PSU or ATU, also Metron MA1000 mobile HF AMP or any other QRO AMP. Phil G4ZOW, 6 Sandmere Close, Hempstead, Herts, HP2 4RW.

KENWOOD VF0520S, DG5 digital display, HC50 base microphone, YG3395C filter. £350. Ask for Jim G4VO QTHR.

HELP. FT757 wanted in any condition, without PSU or ATU, also Metron MA1000 mobile HF AMP or any other QRO AMP. Phil G4ZOW, 6 Sandmere Close, Hempstead, Herts, HP2 4RW.

STOP! Are there any scanner stations etc. (pre-1950) and postcards relating to wireleses, radars, amateurs and radio stations etc. (pre-1950) for the Swansea area? Write: Phil Lee, Codar AT5 Tx’s with AC/PU, modified condition with serial number. Rogers Taday 07356 2476.

WANTED Yaesu FRG7700 receiver, memory if possible, accessories, would consider comparable Icon or Trio Kenwood. Digital not analogue readout, box and instructions book if possible please, good price offered. Please telephone Kevin on Okehampton (0387) 4683, Devon, after 9pm please.

WANTED computer book complete ZX81 ROM disassembly by Ian Logan also thermal paper for Alphacom 32 printer. Phone 081-236 6601 evenings, ask for Ian Pepper or write Chandos Hall, Granby Row, Manchester M1 3QJ.

WANTED clean copy of "Wireless for Beginners" by C.L. Boltz possibly published by lliffe before or during Wii 0202 36046 after 20.00hrs.

WANTED, has anybody got a printer for a Commodore VIC20 to sell also has anybody got old issues of Radcomm which they would sell cheaply, please contact Adrian McGonigle, 30 Gilsland Road, Durrphanhill Carlisle, Cumbria CA1 2XG (0228) 41093.

WANTED Yaesu FL101 with or without matching FR101 preferably prestige (for display station)also 2m/6m/FR101. Also fully equipped FR1015/D/DD etc also pristine FT101 any mark all to good home. 07989 841286.

WANTED HRO power supply No. 697 230w 75ma 6.2v 3.5A in working condition. I have spare type 80 valve. Phone 09323 47297 (pm).

WANTED FM antenna 25-1300MHz also diamond D130N Discone antenna 26-1300MHz. Must be in excellent order. Phone (0206) 394336 (Essex) after 7pm.
Buy, sell or exchange your gear through our free service to readers.

1. These advertisements are offered as a free service to readers who are not engaged in buying or selling the same equipment or services on a commercial basis. Readers who are should contact our advertising department who will be pleased to help.

2. Advertisements will be inserted as and when space becomes available.

3. The insertion of advertisements will be on a first come, first served basis, subject to condition 2. As a result, it will not be possible to guarantee the insertion of a particular advertisement into any particular magazine.

4. Readers should either write out their advertisement in BLOCK CAPITALS or type it. The first word will appear in bold.

5. The magazine cannot accept any responsibility for printers' errors in the advertisements. However, we will do our best to ensure that legibly written advertisements are reproduced correctly. In the event of a gross error, at the Editor's discretion, a corrected version of the advertisement will be printed (at the advertiser's request) in the earliest issue in which space is available.

6. The magazine or its publishers will not accept responsibility for the contents of the advertisements, and by acceptance of these conditions, the advertiser undertakes to indemnify the publisher against any legal action arising out of the contents of the advertisement.

7. The magazine reserves the right to refuse to accept or to delete sections of advertisements where this is judged necessary. Illegal CB equipment is not acceptable unless specified as suitable for conversion to amateur or legal CB frequencies.

8. Advertisements are accepted in good faith; however, the publisher cannot be held responsible for any untruths or misrepresentations in the advertisement, nor for the activities of advertisers or respondents.

9. Advertisers must fill in their names, addresses and (if available) telephone number in the space provided, and sign the form to indicate acceptance of these conditions (forms returned without a signature will not be used).

10. All that is to be reproduced in the advertisement should be entered into the space provided on the form printed in the magazine. A photocopy is only accepted if accompanied by the corner of this page. All advertisements must give either a telephone number or address for respondents to contact or both — these must be included in the advertisement.

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 CB Radios All Accessories,
 Reliable Speedy Repair Service.
 Used CB's Bought and Sold
 (Open 9-5 Mon.-Sat.) 1/2 mile town centre

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 Amateur Electronics/Holdings GSLL
 Yaesu, J.T.Y.25E, T15, Mures, Black Star Caters;
 Epic FT 101 Expert.
 (GSLL B0612. Original type approved
 see also Waddesdon West End F 100 RT-E
 S.A.S. Ltd. Full Terrestrial and Marine
 S.A.S. Ltd. Full Terrestrial and Marine,
 1 Mic. Free parking. Call, and Credit GSLL,
 or just drop in. We are open before closing.
 45 JUNCTION STREET, BLACKBURN BB1 1EF.
 (0254) 09956. CLEARED TUESDAY.

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 40/42 Portland Road, Worthing, Sussex
 Tel: 0903 34397
 Constantly changing stock of interesting items for
 callers. Receivers, test equipment, components
 etc. Pxe pocketfone PFI TX units with battery and
 circuits £15 inc. p.p. Racal RA17 and Eddystone
 730/4's NOW IN STOCK.

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 Ham Equipment urgently wanted!
 Open: Mon-Sat 9-6

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 Situated at the Southern end of M23. Easy
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 Phone us for the best deals on all
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 38 Bridge St, Earlestown,
 Newton-le-Willows, Merseyside.
 Phone Peter G4KKN on 09252-29881
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 129 Chillingham Road, Heaton, Newcastle upon
 Tyne, NE8 5XJ. Tel: 091 276 1002.
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 Access & Visa accepted

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 Agrimotors
 Merlon Garage & Post Office, Merton
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 Open 6 days 9-6
 (Sundays by appointment)
 Specialists in 934MHz
 Suppliers of all 27MHz and 934MHz equipment

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 Radio Mart
 Amateur Radio—CB Radio—Marine
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 25 Abbey Street
 RHYL
 Open Monday-Saturday: 11am-6.30pm
 All repairs and accessories available ex
 stock. Mail order welcome.
 Tel: 0745-51579

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 components.

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 Secondhand wanted

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 Open Mon-Fri 8am-8pm
 Tel: 0483-874494
 Secondhand wanted

SCOTLAND

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 Fife KY7 5GD
 Tel: 0959 789992
 Open: Tues-Sat 9-5
 Quality secondhand equipment in stock. Full
 range of Trico goodys. Jaybeam—Microwave
 Modules — LAIR.
HAM RADIO TODAY
CLASSIFIED

ACCESSORIES

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CB radios including new frequency
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G1TTY S1ST.V2/R1

& 95 SECOND S1ST. COLOUR TEXT & GRAPHICS TRANS.
MIGHTINESS-CONTRAST CONTROLS. FRAME STORES & TEXT MEMORIES.
£10 CASSETTE £12 MICRODRIVE

G1TTY RTTY/V2/R1

THE CLASSIC RTTY PROGRAMME. SPLIT SCREEN. TYPE AHEAD OPERATION. 45-110 BAUD
AMATEUR-COMMERCIAL RECEPTION. REVERSE CODE. TRANSCEIVER
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WRITE OR PHONE FOR FULL DETAILS. RETURN OF POST DESCRIBED ID.

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42 CHESTERFIELD ROAD, BARLBOROUGH, DERBYSHIRE
TEL: CHESTERFIELD (0246) 810652

PSSS... ALL THE SUPER BARGAINS ARE ON THE INSIDE-FRONT COVER OF THIS MAGAZINE!!

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For all Aerials & Lifshing equipment.
We are famous for the G5 RB antennas and the 6, 7, & 12 element ZL.
For Retail or Mailorder contracts:

TAR COMMUNICATIONS
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W. Midlands. DY8 4FZ
TELE: 0384 390944
NEW GM AERIALS NOW AVAILABLE

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(Open 6 days a week)

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you should advertise
in HRT

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accessories. Open Mon-Sat
10.30-6.00pm. Sun. 2.30-4.30. CB
Works. The Market Shop. Market
Place. Stanhope. Tel: (0388)
536464.

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Ham mini beard 10, 15, 20
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Service Manual and parts for
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Send a 4" x 4" SAE for list.
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CB radios including new frequency CEPT tranceivers, aerials, accessories - in stock now.
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FOR SALE

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CB radios including new frequency CEPT tranceivers, aerials, accessories - in stock now.
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Open Every Day. Fax Number: 061-445 0978

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KITS FOR THE CONSTRUCTOR
TOP BRAND TK37N1900, HRF ARTICLE, £13.50
SINGLE BAND RECEIVER, £17.50
DUAL BAND RECEIVER, £30 & 60, £36.50
DIGITAL DIAL COUNTER, £21.50
MARKET KIT, £10 - £105
OUR VERY POPULAR V42 42GHz, 80MHz SQUARE PCB, £8.50
£2000 ORGANISATION KIT, £27.50
£5.50. (some kits are supplied semi-complete)
PLEASE ADD 85p P+P
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Fast, Friendly Service, Competitive Prices, Widest Range & Latest Products
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IDEAS, INVENTIONS wanted. Call L.S.C. 01-434 1272 or write: Dept (ASP) 99 Regent St. London W1.

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DUAL BAND RECEIVER, £30 & 60, £36.50
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3 LIMES ROAD, FOLKESTONE CT19 4AU.

CLASSIFIED COUPON
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RATES: LINEAGE 51p PER WORD (VAT INCLUSIVE) MINIMUM £7.59 SEMI-DISPLAY £7.75 PER SINGLE COLUMN CM. NO REIMBURSEMENTS FOR CANCELLATIONS. ALL ADS MUST BE PRE-PAID.
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SIGNATURE .
P.O. BOX .
[ ] FOR SALE [ ] SOFTWARE [ ] WANTED
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IDEAS, INVENTIONS wanted. Call L.S.C. 01-434 1272 or write: Dept (ASP) 99 Regent St. London W1.

HAM RADIO TODAY MAY 1988
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### MAIL ORDER ADVERTISING

**British Code of Advertising Practice**

Advertisements in this publication are required to conform to the British Code of Advertising Practice. In respect of mail order advertisements where money is paid in advance, the code requires advertisers to fulfil orders within 28 days, unless a longer delivery period is stated. Where goods are returned undamaged within seven days, the purchaser’s money must be refunded. Please retain proof of postage/despatch, as this may be needed.

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If you order goods from Mail Order advertisements in this magazine and pay by post in advance of delivery, Argus Specialist Publications Ltd. will consider you for compensation if the Advertiser should become insolvent or bankrupt, provided:

1. You have not received the goods or had your money returned; and
2. You write to the Publisher of this publication, summarising the situation not earlier than 28 days from the day you sent your order and not later than two months from that day.

Please do not wait until the last moment to inform us. When you write, we will tell you how to make your claim and what evidence of payment is required.

We guarantee to meet claims from readers made in accordance with the above procedure as soon as possible after the Advertiser has been declared bankrupt or insolvent up to a limit of £2,000 per annum for any one Advertiser so affected and up to £4,000 per annum in respect of all insolvent Advertisers. Claims may be paid for higher amounts, or when the above procedure has not been complied with, at the discretion of this publication but we do not guarantee to do so in view of the need to set some limit to this commitment and to learn quickly of readers’ difficulties.

This guarantee covers only advance payment sent in direct response to an advertisement in this magazine (not, for example, payment made in response to catalogues etc., received as a result of answering such advertisements). Classified advertisements are excluded.

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    - Kit £139 + £2.50 Built £149 + £2.50 pp

- **KANTRONICS KPC 2**
  - Software Switchable between Tone Standards includes
    - Personal Mailbox and TCP/IP interface £159 + £2.50 pp

- **VHF + HF PACKET AND OTHER MODES**
  - KANTRONICS KAM (ring for details of FAX upgrade)
    - Packet operation on VHF
      - Packet/AMTOR/RTTY/ASCII/CW on HF
        - Simultaneous HF and VHF operation includes Mailbox and TCP/IP interface £265 + £3.50 pp

- **MEON Transverter kits still available for 50 MHz and 70 MHz**
  - FULL RANGE OF Q-WHIPS IN STOCK

**AMDAT**

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(0272) 699352/593938

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**HAM RADIO TODAY MAY 1988**
FM CONVERSION
FOR YAESU AND KENWOOD (TRIO) TRANSCEIVERS

FD311X RECEIVE BOARD £52.50
FD311X & FM2000 for FT101, 101B, 101E, 1012, 1012D, 901, 302, 107, 107M, 775, 77, 709, 200, 250, 78 All at £71.00
FD311X & FM3000 for TS120V, 120S, 130V, 130S, 520, 520SE, 530, 830, 930 All at £81.00

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RECEIVE CONVERTERS 4 or 6m antenna input, 10 or 2m i.f., variable gain 0-26dB, r.f. less than 3.5dB. Buffered local oscillator output. Types RC4-10, RC4-2, RC6-10 and RC6-2. PCB kit £17.25, PCB built and tested £24.50, boxed kit £29.25, boxed and tested £35.00.

TRANSMIT CONVERTERS 4 or 6m variable power 80mW to 2.5W, 2m or 10m drive 10mW to 100mW. Local oscillator input matches receive converters. Types TC4-10H, TC4-2H, TC6-10H, TC6-2H. PCB kit £27.50, PCB built and tested £37.75, boxed kit £39.50, boxed built and tested £43.00.

TRANSCIEVE CONVERTERS Single board version of receive converter and 500mW transmit converter. 10m drive 250mW to 500mW. Types TRC4-10 and TRC6-10. PCB kit £25.00, PCB built and tested £34.00, boxed kit £39.00, boxed and tested £43.25.

TRANSCIEVE CONVERTERS Separate receive converter and 2.5W transmit converter in a single boxed unit, 2m or 10m drive 10mW to 100mW only, requires r.f. sensing switch and attenuator for use with 2.5W 2m rigs. Types TRX4-10H, TRX4-10H, TRX6-10H and TRX6-2H. Boxed kit £38.00, boxed and built £59.50.

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Input Power: 2-5 Watts
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