Project: Build a Superhet Receiver

FT-2200 2m Mobile reviewed

Geoff Arnold G3GSR says 'How I got started'

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New Maplin Catalogue

The 1994 Maplin Electronics catalogue is now available and is now in full colour, it also has £50 worth of money off vouchers inside valid until September 1994. As well as several hundred new products, you'll find the whole spectrum of electronics in its pages from capacitors to calculators, PCBs to PCs, resistors to receivers, and solder to security. In response to customer requests, the reference index is now fully comprehensive, with new sections such as Entertainment and Leisure, Security and Computers. In general, retail consumer items are located at the front of the catalogue, with components towards the back. Special items are highlighted in each section together with a regular sprinkling of Hot Tips and editorial. The catalogue is available over-the-counter at their shops or W. H. Smiths at £2.95, or £3.95 mail order from Maplin's head office. For further information contact Maplin Electronics.

New Yaesu HF Transceiver

Due for UK launch at this year's Leicester Exhibition is the new FT-840 HF transceiver from Yaesu. South Midlands Communications Ltd. tell us it blends the high performance digital frequency synthesis techniques from the FT-880 with the operating convenience and affordability of the FT-747GX, and that the FT-840 adds a choice of two optional remote automatic aerial tuners plus a wealth of convenient functions. It may be used either as a compact base or mobile station, and as a first-time rig, back-up or main station transceiver, the FT-840 has plenty of features that both beginners and seasoned operators should appreciate. You'll see a review of course in these pages very soon. For further information contact South Midlands Communications Ltd.

Outbacker Mobile HF aerials

Manufactured in Australia and now available in the UK from Nevada Communications, the Outbacker is a rugged, easy to use multi-band HF mobile aerial. Nevada tell us that full amateur band coverage is made easy by simply selecting the appropriate socket along the aerials length, there are no coil or whip changes required, and that the shaft is constructed of fiberglass with a copper helical winding that is covered with smooth epoxy resin for strength, durability and protection. There are five aerials in the range, prices start from £179.95 and we've a sample here for test, we'll let you know how we got on! Further details are available from Nevada Communications.

1993/4 Babani Book Catalogue

The new 1993/4 Bernard Babani catalogue is out now, featuring all the books they publish with many new titles, their costs ranging from 80p to a maximum of £7.95. We regularly feature their books, which are available from several radio and electronics dealers, and they all seem very good value for the information provided. To get your free copy of the catalogue, contact Bernard Babani (Publishing) Ltd. in London.

PC 705 Quick Power Checker

The PC 705 quick power checker is new from Revex in Japan. It simply fits on top of your handheld transceiver in place of the aerial, and shows power on a series of red LEDs. As well as using it for test purposes, we're told it can also be used as an aerial for short range communication. We've tested one here at HRT and find it could be a very handy 'pocket sized' checker for out-and-about use as well as from home - great for clubs and emergency communication groups! The price is £34.95 and available from Waters and Stanton Electronics.
Ten-Tec Scout HF transceivers

The Ten-Tec Scout comes as a single band transceiver, with a 40m plug-in module fitted as standard. This module plugs into the front face, much like the old HRO receivers, and if you want another band, you purchase an extra module (£35 each, 160 to 10m including WARC bands), remove the 40m module and just slide in the new one. Included as standard is their patented variable crystal filter, which is continuously adjustable from 2.5k Hz to 500 Hz making it useful on both SSB and CW. An electronic keyer is built in, and when you flick the front panel switch you can read the keying speed, which is variable by moving the paddle left or right.

The rig has a variable output power of 5 to 50 Watts, built-in VSWR meter, large green LCD readout, and an adjustable SWR, receiver frequency is variable by using the ROT control. The rig costs £589 inc VAT and is available from Waters and Stanton Electronics.

HF Aerial Analyst Unit

The new AEA SWR-121 gives a graphical display of your HF aerial's performance over its operating spectrum. Its SWR scaling is automatic, and the display also gives SWR and return loss at the centre frequency and the current scale factor. It also features completely adjustable sweep and SWR ranges, and can be used to test coax by measuring return loss. An RS-232 interface allows for remote control, remote display, and saving of plots (PC software optional). Compact and battery powered, the AEA SWR-121 features automatic battery saver functions and is ready to go anywhere. Its frequency range 1 to 32 MHz, and is priced at £396 inc VAT. For further details contact the UK distributors, ICS Electronics.

Voice Mail System for Repeaters

Do you fancy adding a 'voice mail' system to your repeater? Well the US firm of Digital Communications Inc. has just the thing. In the form of a plug-in PC card which fits into an IBM PC or clone, the card in turn connecting to the repeater's audio circuitry. Individual messages are recorded by each user, for replay under command to others, and each hour's worth of speech requires around 20MB hard disk space with no other limit on the total length of messages able to be stored. The board itself is the DCS-100, priced at US$199, the accompanying DCS-Multimbx speech mail software being US$60. Further information from Digital on Tel. INT+ 1 604 820 1162, or fax INT+ 1 604 826 0704.

New Mobile Aerials

There's now a new range of mobile HF aerials available in the UK, manufactured by Pro-am of the USA. The single band series are low cost helical whips with adjustable resonators, with models for each band from 160 to 10m, with prices starting at £19.95, and a five band version is also available with auto switching. Power rating is 250W PEP and a range of matching mounts for hatch-back, gutter, boot and magnetic mount are also available. A range of on-glass aerials from the same company are also available, comprising 2m half wave, 2m/ 7cm dual band and wideband scanning models, a quick removal and re-mounting kit is also available. For further information contact Waters and Stanton Electronics.

New ex-PMR Dealer Opens Up

If you're wondering who's taken over Martin Lynch's old shop at 286 Northfield Ave, Ealing W5 (West London), well from 1st November it'll be Trade Centre PMR, run by Richard Allport. Richard tells us he'll be stocking plenty of used PMR gear, together with aerials, computers, and other goodies. He adds that he welcomes part exchange on any radio gear, and if you're in the professional comm's business and you're disposing of old PMR gear he'd like to hear from you, so the likes of us radio amateurs can benefit! The shop will be open 10.00am-6.00pm 6days a week, you can contact Roger during these times on 01815856566, or 24hrs on 0426 934804.

Morsor Magnificat

The August 93 issue of MM, with seven pages of Morse news from around the world and seven pages of readers' letters on a variety of Morse subjects, once again provides an invaluable source of interest, reference and record on the traditions and practice of all aspects of Morse telegraphy, past and present. Geoff Arnold G3GSR tells us it's of interest to all Morse operators whatever their ability, the highlights of the latest issue being; "PA-CW-Test" - an interesting article by Monika Pouw-Arnold, PA3FBF, describing her experience in taking the Morse test in Holland; the concluding part of the fascinating article "Who was at the key?" by Louise Moreau, W3VRE, who tells more stories of the Morse operators who first sent out the reports of famous events; Frederick O. Maia W5YI with 'Everything you ever wanted to know about Morse code..' a comprehensive summary of international law as it relates to amateur radio, Morse code knowledge and testing requirements. The Morse keys showcase presents a selection of photos of readers' interesting keys, and plenty more...

The magazine is published bi-monthly, available only by post, from G. C. Arnold Partners, 9 Wetherby Close, Broadstone, Dorset BH18 8JB, England. Tel/Fax 0202 658474. Sample copies are available and cost £2.20 (Overseas surface mail £2.25 or US$5.00 cash).

New G0UAA-UZZ QSL Sub-Manager

An RSGB QSL Sub-Manager has been appointed for the new G0UAA to UZZ callsign series. He is Mr. A. J. Adams G3DXQ, Brooklands, Chestnut Garth, Roos, Hull HU12 0LE
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Yaesu FT-2200 Review

Chris Lorek tests Yaesu’s new full-function 2m mobile

You may have read about the FT-2200 in our ‘Friedrichshafen Show Report’ in the Oct 93 issue, as it was at that show where it was revealed for the first time in Europe. We told you there was a full review coming up, so here we go once again with another ‘complete HRT technical review….

It Gets to the Parts….

The FT-2200 gives a maximum output of 50W on transmit, and that’s high. In fact, the manual warns that 50W can cause a RF burn to anyone touching the aerial during transmission! But this amount of power should let you get to those distant stations you may otherwise not have been able to. It certainly did when I tested it, as you’ll read later. You don’t need to run 50W all the time of course, as ‘Mid’ and ‘Low’ power modes of 25W and 5W respectively can be switched in for when you don’t need such ‘ether burning’ power.

The set can either cover 144-146MHz, or an ‘extended range’ of 140-174MHz, and pressing the ‘Call’ and ‘MHz’ buttons when switching on can extend this further on receive down to 110MHz, with automatic AM receive capability switched in below 140MHz for civil airband listening in countries where this is allowed.

Fully Featured

The FT-2200 has all the ‘bells and whistles’ of the best, including built-in CTCSS (sub-tone) encode for UK and US repeater access as well as 1750Hz toneburst for pan-European use, a built-in DTMF selective calling and paging, 53 memory channels plus a further ‘call’ channel, and all the usual scanning modes including two ‘frequency scan’ ranges with programmable lower and upper frequency limits in four of the memory channels, priority channel monitoring, selectable scan resume modes, the list goes on. In either the ‘VFO’ or ‘programmed frequency scan’ modes you can select an automatic repeater shift, which selects a –600kHz transmit shift for you whenever you’re in the 145.600-145.850MHz sub-band, thus saving you fumbling with buttons while you’re on the move. As an alternative to the set displaying your operating frequency, you can instead select a large ‘channel display’ on the set’s LCD, i.e., CH-15, CH-20 etc. corresponding to the memory channels you’ve programmed, for possibly easier use on the road where you don’t want to be looking at the frequency display and then converting this into S15, S20, or whatever.

Internal options include a CTCSS decoder for ‘quiet monitoring’, a hands-free boom microphone and PTT switch box, plus mobile headset if required, and even a Digital Voice Storage unit with remote control facilities for the real ‘gadget freaks’ amongst us. A built-in transmission timer, programmable from 5 minutes to 60 minutes in 5 minute steps, can be switched in to save you accidentally leaving the set in transmit mode for long periods (yes, some of us have heard the ‘stuck mic PTT’ on air!).

DTMF Paging

This uses a common 3-digit DTMF (‘touch-tone’) system to those on other
transceivers from the major manufacturers for both 'individual' and 'group' paging codes, and the FT-2200 displays the ID of the station calling you when a call is received, a paging bleeper can also be set to sound if you wish. Indeed you can even compose your own 'melody' for this if you like, from the musical tone range given in the manual! Four different paging transmit delays can be programmed to account for repeater access times, 'battery savers' on other rigs, and the like. The set can also be commanded to automatically 'transpond' its ID back to the calling party's page where this is allowed, to let them know you've received their call in case you're away from the set, or just not in a position to reply at the time. A 'trigger pager' mode may also be switched in, where when two Yaesu rigs with this system are in communication after an initial 'page', your set automatically switches to 'code squelch' mode if you reply within three seconds of the code being sent. This saves you having to do an amount of 'button pushing' to manually switch to this mode, which may be difficult if you're on the move.

Alternatively, of you're away from the rig but somewhere nearby and carrying a paging-equipped portable rig, but out of the coverage area of the station calling you due to your portable's limited range, in 'Auto-Page Forwarding' mode you can command the FT-2200 to automatically re-transmit the same paging call to your handportable, again where this is allowed in your licence conditions, to let you know someone's after you. Of course, you could go one further....

Digital Voice Storage

You're away from the car, or indeed away from your shack if you've installed the set at home, but you're expecting a call from your DTMF equipped partner. With the optional DVS unit fitted inside the FT-2200 you can let the set digitally record the voice message for playback when you return! All your partner needs to do is press a few DTMF digits on his rig, then go ahead and leave the message. Where allowed, your rig can even send back a voice acknowledgement over the air, and if you wish (again where allowed) you can even remotely access your rig with a handheld to retrieve your message(s) You can also manually record, either using your mic or directly from the set's receiver, for transmission by the set. The FT-2200 allows up to 128 seconds of recording, in 1-8 'segments' of multiples of 16 seconds each. I could go on, but take a look at my review of the FT-212 in the May 88 issue of HRT for an idea of the performance and flexibility of this system.

For real remote-control enthusiasts, a CAT (Computer Aided Transceiver) remote control facility is fitted as standard on the set, where you can connect your computer up to the mic plug via an optional interface and control the set's operating frequency, TX/RX switching, high/medium/low power level, and CTCSS facilities. The mic plug also has receive audio output as well as TX audio input and PTT, for connecting a packet TNC or other remote accessories.

On The Air

Well, after reading about all those mind-boggling 'bells and whistles', I thought I'd better try the set out on air to see what its 'radio' performance was like! It comes with a quick-release mobile mounting bracket, making fitment and removal of the transceiver a ten-second affair (mainly plugging and unplugging the DC power and aerial leads) after you've fitted the supplied bracket, useful if you like to remove the set when you're not using it in the car. A hearty length of thick DC power cable is supplied, fused at the 'far' end for connection to your battery. The set itself measures a compact 140mm (W) x 40mm (H) x 160mm (D) which should allow its fitment into cars with even the smallest amount of 'accessory' space. In use, I installed this in my favourite position on top of the dashboard, thus giving minimum eye travel distance between the rig and the road ahead.

The suppliers of the set also loaned me a very inconspicuous 50cm long 2m70cm dual band magmount (the magnet itself being only 34mm diameter) to 'try out to see if I liked it', which I used for the mobile tests. This came...
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SMC price £499

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SMC price £599

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8M MOBILE

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SMC price £459

**FT290R2**

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The news is out. And it's too exciting to keep under your hat.

Kenwood's new TH-22E (144MHz) and TH-42E (+430 MHz) redefine handheld communications, with a palm-size format and impressive performance.

They're small and light enough to carry anywhere, but offer over 5 watts output (with a 9.6V battery) and long hours between charges. The secret's in the FET power module, a world first in this class for sophisticated power management.

Other features? From the user friendly menu system to the 40 EEPROM memory channels, Kenwood's new handheld FM transceivers offer numerous category-leading features and first-class performance. So it's hats off to Kenwood — the transceivers that cap the rest.

KENWOOD
with a 90cm length of thin (2mm diameter) coax at the magmount end, allowing it to pass through door seals etc., before it 'expanded' to the usual (5mm diameter) coax for the remainder of its length.

On the road, I found the FT-2200 was very easy to use, and gave ample receive audio from its internal speaker. The 1750Hz toneburst button was sensibly mounted on the supplied fist microphone, and I normally just operated the set in 'memory channel' mode or 'programmed scan range' mode in conjunction with the automatic repeater shift, using the microphone mounted up/down and PTT buttons for channel selection and scan start/stop. I must confess that I used the latter quite often, as with the 'extended coverage', which the review rig had fitted, I quickly filled up a lot of memory channels! Each of these however are fully tuneable, i.e., if I selected a given channel, then pressed the 'MHz' button on the set, I could tune or scan away from these to my heart's content to have a listen above and below the memory channel frequency, retaining any programmed repeater shift etc.

The set's LCD backlight had a useful 'auto-dimmer' facility, where it varied the backlight intensity over four levels, dependant upon the ambient light. As I had the set 'up high', this saved me being dazzled by it at night without the

The inconspicuous dual band mobile magmount used for on-air mobile tests need for more button-pushing, very useful.

One (daytime) journey I made during the review period was to the BARTG Rally one Sunday morning, travelling north on the M3 from its start point up to the M25. Just after passing Winchester in Hampshire, up came the GB2RS news on S21 loud and clear, but the newsreader was in Tring, Hertfordshire! I carried on receiving him at solid copy all the way up the M3, eventually giving him a quick call (he was running 200W) and receiving a 'fully readable' report back from my 50W. We were both surprised at how well we were copying each other. It looks like the FT-2200's 80W combined with the inconspicuous magmount whip (which stayed put throughout my high-speed motorway journeys) was working extremely well.

A test at home using my rooftop aerial system showed very few problems on receive with the many other strong VHF signals present in my location, and the set's high transmit power let me get a good signal to those 'dis-
LABORATORY RESULTS:

All measurements taken on 145MHz with 13.2V DC supply, using supplied DC cable, high power TX, otherwise stated.

RECEIVER:

<table>
<thead>
<tr>
<th>Sensitivity;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input level required to give 12dB SINAD;</td>
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<tr>
<td>144MHz; 0.137μV pd</td>
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<td>145MHz; 0.135μV pd</td>
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<td>146MHz; 0.136μV pd</td>
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</table>

<table>
<thead>
<tr>
<th>Squelch Sensitivity;</th>
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<tr>
<td>Threshold; &lt;0.06μV pd (&lt;2dB SINAD)</td>
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<tr>
<td>Maximum; 0.21μV pd (21dB SINAD)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reading</th>
<th>Level</th>
<th>Rel. Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.463μV pd</td>
<td>-15.3dB</td>
</tr>
<tr>
<td>3</td>
<td>0.892μV pd</td>
<td>-12.0dB</td>
</tr>
<tr>
<td>5</td>
<td>1.199μV pd</td>
<td>-7.2dB</td>
</tr>
<tr>
<td>7</td>
<td>1.965μV pd</td>
<td>-2.8dB</td>
</tr>
<tr>
<td>9</td>
<td>2.720μV pd</td>
<td>0db ref.</td>
</tr>
<tr>
<td>+</td>
<td>3.51μV pd</td>
<td>+2.2dB</td>
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<tr>
<td>++</td>
<td>4.52μV pd</td>
<td>+4.4dB</td>
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<tr>
<td>+++</td>
<td>5.89μV pd</td>
<td>+6.7dB</td>
</tr>
</tbody>
</table>

TRANSMITTER

<table>
<thead>
<tr>
<th>TX Power and Current Consumption;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freq.</td>
</tr>
<tr>
<td>144MHz High</td>
</tr>
<tr>
<td>Mid</td>
</tr>
<tr>
<td>Low</td>
</tr>
<tr>
<td>145MHz High</td>
</tr>
<tr>
<td>Mid</td>
</tr>
<tr>
<td>Low</td>
</tr>
<tr>
<td>146MHz High</td>
</tr>
<tr>
<td>Mid</td>
</tr>
<tr>
<td>Low</td>
</tr>
</tbody>
</table>

Frequency Accuracy; 0.05µHz

Peak Deviation; 4.9kHz

Harmonics;

<table>
<thead>
<tr>
<th>Harmonic</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>2nd Harmonic</td>
<td>-76dB</td>
</tr>
<tr>
<td>3rd Harmonic</td>
<td>-76dB</td>
</tr>
<tr>
<td>4th Harmonic</td>
<td>&lt;90dB</td>
</tr>
<tr>
<td>5th Harmonic</td>
<td>&lt;90dB</td>
</tr>
<tr>
<td>6th Harmonic</td>
<td>&lt;90dB</td>
</tr>
<tr>
<td>7th Harmonic</td>
<td>&lt;90dB</td>
</tr>
</tbody>
</table>

Toneburst Deviation; 2.3kHz

UK 2m repeater access for example, rather than it being an 'optional extra'. All in all, I found the set easy to use on air, with a good performance on both transmit and receive.

Conclusions

I found the FT-2200 to be a very flexible 'all-round' 2m rig, its high transmit power combined with its good receiver performance allowed me to get to places on air that I often found marginal with 'earlier generation' rigs. The facility of the built-in DTMF paging with 'portable page forwarding' could be very useful where this is allowed, and options such as the Digital Voice Storage unit can make the set very versatile indeed!

The FT-2200 currently sells for around £300-£435, and my thanks go to South Midlands Communications Ltd. for the loan of the set and accompanying mobile aerial.
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Welcome to HRT’s new ‘problem page’, where, each month, we hope to provide answers to readers’ general queries on amateur radio matters. These can be either technical or non-technical, simple or high-level. In each case, we’ll ensure that an answer is provided through these pages, either through our own in-house staff (remember, we publish several other radio, electronics, and computer magazines ‘in-house’ at Argus Specialist Publications with, of course, plenty of expert knowledge to call upon) or when needed by calling upon other recognized experts in the field.

As this is the first month, we’re going to start off with our Consultant Technical Editor (the letters after his name are longer than his name itself) who I’ve arm-twisted into putting together some of the many general queries we receive on ex-PMR conversions.

Please do write in with your questions, on any amateur radio related subject. Even if you feel they’re too ‘simple’, we’ll try to give you an answer, because if you’re having problems with something we’re sure others might also be in the same position.

Question:
I’m always being told that I should use a non-metallic adjusting tool to adjust the ferrite cores in my rig with, rather than a jeweller’s screwdriver. But many of the cores are too tight and just break my adjuster, what should I do?

Answer:
This is a common problem, as, over a period of time, the lubrication oils that are often applied to the threads of these cores when the sets are made gets ‘waxy’, and sometimes it even sets hard. One trick here is to heat the core up as much as you can, to hopefully loosen the waxy oil. Try using a fine-tipped soldering iron bit, applying this to the slot in the core, taking care not to damage the coil former. Alternatively, another solution which I read but haven’t tried myself, is to use some form of solvent to free the cores, a small drop of turpentine substitute down the core may be one method as long as you take the necessary precautions such as ventilation and ensuring as little as possible gets onto the PCB, then thorough cleaning after use.

Question:
What happens if I find my rig already has a number of broken ferrite cores in the adjusting coils?

Answer:
These often break by someone forcing them with a hard tool, as ferrite is very brittle. If you’re lucky, it’ll just be the slot in the top of the core’s broken, and you’ll be able to adjust the core from the bottom if you can get to the underside of the PCB, which will often have a hole in line with the core. Otherwise, unsolder the coil former and unscrew the core from the bottom, turn the core over, and resolder the coil former making sure you put it back the same way round. It’ll often have a ‘notch’ on one side of the former base. If, however, the core is cracked throughout most of, or all of, its length, you’ll have to try (carefully) get it out by ‘crumbling’, then with a suitable metal instrument, then replacing it with a similar core, adding a thin strip or string or whatever along its length if you find the threads are different.

Question:
Can I easily fit a synthesizer as a ‘crystal replacement’ to my rig to save the cost of buying more crystals for extra channels?

Answer:
You can, but often not very easily, and it may not be very cost effective either! Unless you’re skilled in ‘rig rebuilding’ techniques (i.e., removing the crystal multipliers and injecting at ‘final frequency’), you’ll normally need two synthesizers because of the different multiplication factors of the crystals originally used. If you’d like to have a go though, then a good starting point would be the Cirkit MC145156 synthesizer development board, which is a ‘complete’ breadboard with built-in HF VCO. However, a possibly more cost-effective solution would be to use your present rig on the channel it’s on at the moment, and spend the money instead on a convertible ex-PMR rig that’s already synthesized.

Question:
Where can you buy all this cheap ex-PMR gear? I rarely see any advertised.

Answer:
There are plenty of firms who carry ex-PMR gear, although you’ll often find that it’s difficult to advertise who’s got what in stock because it changes very rapidly! The best thing really is to ring around the ex-PMR dealers who’ve seen advertising themselves as a source of such gear in HRT over the last year or so (remember to look in the ‘retail network’ and ‘classified’ sections as well), and simply ask what they have in stock.

Question:
I bought a set very cheaply but didn’t look at the label before I got it, and I’ve found it’s an AM set. Can I convert it to FM?

Answer:
Yes you can, but it often isn’t economic to do so. Spectrum Communications have ‘mod kits’ to add FM to AM-only HF transceivers, which may be suitable for some models of ex-PMR gear. This may be the easiest way if you don’t fancy building your own FM discriminators and FM modulators.

Question:
Where can I get conversion information on this set I’ve just picked up?

Answer:
Ham Radio Today publishes plenty of PMR conversions onto amateur bands, and we’ve a lot more ‘in the pipeline’ waiting to go in. We publish conversions on most of the popular sets, but of course we can’t cover every single set (like those you only see one or two of for sale). In this case, try sending an SAE to Bob Gant, who runs an ‘ex-PMR club’ (see HRT ‘Helplines’ for details), and he may be able to put you in touch with someone who has the information you need.
Long, Medium, and Short Wave Superhet Receiver

Raymond Haigh describes a wide coverage AM/SSB/CW receiver project

Many amateurs are reluctant to attempt the construction of a superhet, despite the fact that even a basic circuit of this kind can outperform simple direct conversion and straight receivers. Alignment, especially when a calibrated signal generator is not available, is usually perceived to be the main problem.

The receiver described here can be aligned without special equipment. Almost any transistor portable will serve as a means of setting up the IF stages, and aligning the short wave front end circuits is no more difficult than adjusting a TRF receiver. Alignment of the long and medium wave front-ends is less straightforward, but, with care and patience, even this can be achieved without recourse to a signal generator.

Coverage of the short wave bands is comprehensive, and provision is made for resolving and fine tuning amateur SSB transmissions. These features have been incorporated without making construction difficult or complicated. Indeed, the basic circuit is simpler than the set manufacturing industry's standard design for domestic receivers.

The Circuit

Mixer/Oscillator Stage. The complete circuit of the receiver is given in Fig. 1, where TR1 is arranged as a conventional, self oscillating mixer. Tuned radio frequency transformer, L1/L2, couples the aerial to the base via DC blocking capacitor, C5. TR1 emitter and collector are connected to oscillator coil windings, L3/L4, which are phased to ensure positive feedback. A number of frequencies, including the received signal and an oscillation 470kHz or so higher, combine at the collector and are fed to IFT1 via R5.

Changes in supply voltage cause noticeable drift in simple transistor mixers (the effect of aging batteries will show up clearly on a calibrated dial), and R3 and zener diode, D1, are incorporated to minimise this. The arrangement is inevitably a compromise between long-term stability and current drain through the zener, but its inclusion is worthwhile if the receiver is to be calibrated. Different values of dropper resistor, R3, and zener voltage, are required to optimise the circuit for medium and short wave coverage. A zener diode is not included in the front end circuit for long waves. Long term drift is less noticeable at these frequencies, and most amateurs are not too concerned about the extreme accuracy of long wave dial markings.

These components (other than C1, C4, C12 & S1) mounted on RF PCBs, (one per band) —— These components (other than R7, R11, R14, S1, S2, R25, C30) mounted on IF/AF PCB

please mention HRT when replying to advertisements
Base bias resistors, R1 and R2, have the same values for all coil ranges, but emitter bias resistor, R4, and its RF bypass capacitor, C7, are reduced in value to optimise the circuit for short wave reception. The inclusion of R5 helps to ensure consistent oscillation over the tuning capacitor swing, its value is the same for all ranges.

Main Tuning System.

The RF and oscillator coils are tuned by ganged, air-spaced variable capacitors, C4 and C12. A swing of 10-300pF provides the necessary coverage on long and medium waves, but results in an excessive overlap on the higher frequency short wave ranges. With the SW1 coil, oscillation ceased when the value of C12 approached 300pF, and oscillation was not sustained at lower values of C12 with the SW2 coil. The value of the variable capacitors clearly needs to be tailored to ensure reliable oscillation with all five coils, and to avoid excessive overlap on short waves. This is achieved by placing fixed capacitors, C3 and C11, in series with the tuning capacitor gangs to reduce their swing, trimmer capacitors C2 and C8 are included for each range. On long and medium waves, trimmer C9 is wired across the oscillator frequencies to help optimise tracking.

The IF Amplifier Stage

IFT1 tuned winding, L5, is coupled to the base of the IF amplifier, TR7, by L6. This simplified superhet circuit does not incorporate automatic gain control. Instead, IF gain is adjusted manually by R7, a panel control which varies the bias on TR2. Manual control of RF or IF gain is very desirable when provision is made for connecting long-wire ariels to simple front end circuits, and there has to be some means of adjusting the strength of signals reaching the detector.

The Regenerative Detector

The collector of TR2 is coupled to a regenerative detector by IF transformer, L7/L8. This inductor must have a fairly high 'Q', and the coupling between the windings, and the tapping position, are critical if the detector stage is to work well. The construction of this coil is fully described later. The application of positive feedback to L8 increases its 'Q' from something less than 200 to a figure approaching 8000 at the onset of oscillation. Sensitivity and selectivity are thereby greatly enhanced, and this makes it possible to reduce the number of IF stages. If feedback is increased to the point where the circuit oscillates, the detector will restore the carrier missing from SSB and CW transmissions and they can be clarified without the need for an additional BFO (beat frequency oscillator) stage.

Regenerative detectors are overloaded by strong signals, and audio quality deteriorates when they are operated close to the onset of oscillation. With this design, the inclusion of IF gain control, R7, resolves the overloading problem, and some reduction in audio quality is not too high a price to pay for obtaining high selectivity and sensitivity when searching for weak signals. R14 controls the positive feedback, applied via a tapping on L8, by varying the gain of MOSFET, TR3. Preset R19, adjusts the source bias to compensate for any spread in the characteristics of TR3 and optimises the performance of the detector.

Overall Circuit Diagram
The IF signal is applied to gate 1 of the MOSFET, via C19, and the audio output is developed across drain load resistor, R17. Residual RF is filtered out by R20, C23 and C24.

The Fine Tuning System

Capacitors C15 and C16 tune L8 to the intermediate frequency, and varicap diode D2 with potentiometer R11 enable the IF frequency to be shifted slightly, thereby affording a means of fine tuning the input signal. Unlike the conventional arrangement of low-value bandspread capacitors across front end tuned circuits, the tuning rate of this system is constant over all bands.

Audio Amplifying and Filtering Stages

Audio from the detector is applied to the base of TR4 via DC blocking capacitor, C25, and the amplified signal is developed across collector load, R22. The slider of the volume, or AF gain, control, R25, is connected to the input pin of I2C, a TBA280M integrated circuit audio power amplifier. This device is capable of supplying about 1.5W into the 3 ohm speaker when connected to a 9V supply. In this application, the ripple rejection capacitor normally connected to pin 8 is unnecessary and component count has been further reduced by connecting one of the speaker leads to the positive side of the 9V supply.

Under no-signal conditions, current demand is very modest, typically 6mA. This rises to peaks of about 100mA when the receiver is operated at loud volume levels. Swings of this kind cause significant voltage fluctuations, especially when the batteries are aging, and the tuner and power amplifier sections of the receiver are accordingly fed from separate battery supplies.

Audio filtering

Clarity of speech under noisy conditions is enhanced if audio reproduction is confined to the band of frequencies between 300 and 3000 Hz, and more complex communications receivers usually incorporate filters to restrict the response in this way.

Even simple forms of processing can help clarify weak signals and render them audible against a noisy background. The audio response of this receiver has been tailored by an appropriate choice of values for coupling, feedback and bypass capacitors, and extra filtering can be switched in.

Coupling capacitors C25, C27 and C35 have been reduced in value in order to limit response to low audio fre-

---

Table 1. RF/Oscillator stage component values

<table>
<thead>
<tr>
<th>Band</th>
<th>Long wave</th>
<th>Medium wave</th>
<th>SW1</th>
<th>SW2</th>
<th>SW3</th>
</tr>
</thead>
<tbody>
<tr>
<td>TR1</td>
<td>BF241</td>
<td>RWR 33102</td>
<td>KANK 333R</td>
<td>KANK 333R</td>
<td>KANK 333R</td>
</tr>
<tr>
<td>L1/L2</td>
<td>CANIA 350E</td>
<td>(red core)</td>
<td>(violet)</td>
<td>(yellow)</td>
<td>(pink)</td>
</tr>
<tr>
<td></td>
<td>or</td>
<td>or</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ferrite loop</td>
<td>ferrite loop</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2-22pF</td>
<td>2-22pF</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>RF Trimmer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C2</td>
<td>RWR 33102</td>
<td>YMR 580046N</td>
<td>KANK 3426R</td>
<td>KANK 3337R</td>
<td>KANK 3428R</td>
</tr>
<tr>
<td>L3/L4</td>
<td>(red core)</td>
<td>(blue core)</td>
<td>(white)</td>
<td>(green)</td>
<td>(blue)</td>
</tr>
<tr>
<td>Osc. Trimmer</td>
<td>5-60pF</td>
<td>2-22pF</td>
<td>2-10pF</td>
<td>2-10pF</td>
<td>2-10pF</td>
</tr>
<tr>
<td>C9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Osc. Freq. preset</td>
<td>5-60pF</td>
<td>2-22pF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C10</td>
<td>363pF</td>
<td>680pF</td>
<td>1000pF</td>
<td>2200pF</td>
<td></td>
</tr>
<tr>
<td>TR1 Emitter Bias</td>
<td>2k2</td>
<td>2k2</td>
<td>820 ohm</td>
<td>820 ohm</td>
<td>820 ohm</td>
</tr>
<tr>
<td>R4/C7</td>
<td>10kF</td>
<td>10kF</td>
<td>4n7</td>
<td>4n7</td>
<td>4n7</td>
</tr>
<tr>
<td>Supply Dropper</td>
<td>2k7</td>
<td>1k2</td>
<td>100 ohm</td>
<td>100 ohm</td>
<td>100 ohm</td>
</tr>
<tr>
<td>R3</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Zener Diode</td>
<td>6V2</td>
<td>8V2</td>
<td>8V2</td>
<td>8V2</td>
<td></td>
</tr>
<tr>
<td>D1</td>
<td>300pF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tuning cap. swing reducers</td>
<td>365pF</td>
<td>1800pF</td>
<td>1800pF</td>
<td>330pF</td>
<td>270pF</td>
</tr>
<tr>
<td>C3 and C11 for various tuning capacitor values</td>
<td>500pF</td>
<td>750pF</td>
<td>750pF</td>
<td>270pF</td>
<td>220pF</td>
</tr>
</tbody>
</table>
quencies, and C23, C24 and C26 shunt the higher frequencies. The feedback capacitor, C34, on IC1, has been increased in value from 220pF (which gives a flat response to 20kHz) to 2n2 in order to further curtail upper audio response.

Switching in the filter formed by L9 and C28 peaks the audio response at around 1300Hz and improves the clarity of speech, especially when reception conditions are poor. The switched filter capacitor, C30, provides additional top cut. Resistor R24 matches the filter insertion loss, and prevents large output changes when the unit is switched in and out of circuit.

**Components**

Toko coils and IF transformers are available from Circit. The former for IFT2 is a short length of the plastic overflow pipe sold by plumbers' merchants and most DIY stores. The other components are retailed by a number of suppliers. Metal cased BC108 transistors must be used for the SW1 and SW2 front ends, and they must be specimens falling within gain group C. Do not attempt to substitute the plastic cased variant, BC648. Samples tested were not as active as the metal cased originals.

The specified VHF tuning diode is available from Circit, but almost any device of this kind should be satisfactory. Small silicon rectifier diodes, such as the IN4001, will also act as variable capacitors when the junction is reverse biased. Several were tried and found to be effective in this circuit.

Filter inductor L9 is the primary of a transistor push-pull audio driver transformer. Items of this kind can be salvaged from old portables, but if difficulty is experienced, the LF44 transformer listed by Maplin and others would be suitable.

Decent air-spaced tuning capacitors can likewise be salvaged from older valve and transistor radios (the author used a 300pF unit from a valve portable), and a good quality 10-365pF variable is retained by at least two major component suppliers. If a salvaged component is to be used, remove any built-in trimmers and make sure that the unit is clean and dry, and that the vanes do not short together.

A six pole, six way Make-switch assembly was used for wave changing. The small size of this component enables RF wiring to be kept short and stray capacitance is minimised. Some form of slow motion drive must be fitted to the variable capacitors or tuning the receiver will be extremely difficult. A 36:1 epicyclic drive was used for the prototype. These are not readily available, but Maplin list miniature 10:1 reduction drives. Two of these in tandem would give a ratio of 100:1 and this would be ideal.

We continue next month with the construction stages.
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HAM RADIO TODAY DECEMBER 1993
From the Editor’s Desk

In the last week I’ve read about a couple of prosecutions regarding the use of scanners for listening into police frequencies. One was at the Kilmarnock Sheriff Court, where the youth involved was fined several hundred pounds, and his scanner ordered to be destroyed, the other was in Manchester and involved an unemployed man who was fined £200 plus £30 costs.

I also recently read the following, you can probably guess the occupation of the writer: “We prosecuted a scanner wacker on my patch last week when the wally turned up at a shout. Unfortunately for him, he’s known to us anyway, so when he failed to give a reasonable excuse for coincidently turning up his car was searched and two handheld scanners found. Most unfortunately for Mr. Scannman, when the officer turned it on he could hear his mates just down the road dealing with the incident. And when, out of curiosity, he twiddled another knob the radio room at Scotland Yard burst forth.”

The UK police are well aware of the dangers that scanners pose, but most Scanners readers (from our last survey) use theirs for Airband and Marine listening, a hobby in itself. So if you want to carry on with your hobby, be careful that you don’t act stupidly by programming police frequencies into your scanner’s memories and then acting even more stupidly by having done so. Even though you may get away with airband listening (although the law in the UK currently prevents us doing even this), you won’t have her Majesty’s constabulary! Act sensibly, and hopefully it’ll only be the villains who get (rightfully) ‘banged up’.

New Products

We’ve just received a bundle of information about new products from Garex Electronics, here’s what we believe Scanners readers would be interested in;

**Tunable Aerial Filter**

Most scanners on the market now feature enormous frequency coverage in a very small package, but unfortunately selectivity and strong signal handling characteristics have been sacrificed to save space and cost, which means that unwanted signal breakthrough can be a major problem.

Attaching a microscopically handmade to a home-base aerial is often a good recipe for a disappointed listener. A good remedy is to use a notch filter, which is a high-Q tuned circuit which is plugged in line with the aerial and can be adjusted to attenuate an unwanted signal.

The new Garex product is packaged in a plastic die-cast box (79 x 61 x 41mm) with internal RF shielding and uses a high quality Jackson tuning capacitor for durability and RF efficiency. Input and output connectors are BNC. This filter simply fits in line with the aerial feeder and unwanted signals can be tuned out. Provided the interference is spaced more than 10MHz away, then there is negligible attenuation of the wanted signal. Around 30dB of rejection is achieved. The tuning range is 85-175MHz, which covers the major problem area of band II and also PMR signals such as paging and police, the price is £26.80 inc. post and VAT.

**Portable Scanner Aerial**

A lightweight design using ribbon cable elements so that it rolls up into a small bundle for ease of transport. It gives good VHF/UHF coverage and particularly offers a considerable improvement over the short flexible aerial supplied with handheld scanners. Installation couldn’t be easier, just hang it from the nearest tree, curtain rail, or washing line.

This low-cost, unobtrusive product could solve installation problems for flat-dwellers, travellers, holiday-makers, and those with restrictions on permanent aerial installations. It comes ready-for-use fitted with 4m of RG58/ U feeder and a BNC plug. Priced at £15.95 inc. post and VAT, we tried a sample here in the Scanners office, just strung up next to the window, and it certainly did work very well (the Tech Ed doesn’t want to give it back!).

**VHF Airband Preamplifier**

There are several wideband receiver preamplifiers already on the market, but problems can arise because strong signals outside the Airband can be amplified to such an extent that the receiver is completely swamped by unwanted signals.

The Garex VHF Airband Preamplifier is designed to cover only the 118-137MHz band, giving at least 10dB gain. Strong out-of-band signals are likely to be attenuated, giving further performance benefits. The product is packaged in a stove-enameled die-cast box 52x38x31mm with BNC connectors. A DC supply of 9-15V at a few mA is required, making it suitable for operation from a battery or many common mains adaptors. Priced at £25.95 inc post and VAT, we hope to feature a test of this in next month’s Scanners.

ScanMail

It is true that a communications receiver is better on HF than a handheld with SSB and a wide open front end, and if you connect a decent bit of wire to the latter, you may get the stronger SW broadcast stations and bags of noise elsewhere. However, a spot of aerial tuning or preselection can work wonders. At this station, an MVT-7100 was connected directly to the main station aerial. On 80m, nothing but upcomer, with or without attenuator.

Then through the tuner or switchbox, loud and clear SSB signals. Similar results were obtained on 40m, and 20m where the magnetic loop was also effective, all rather better than hoped for. The MVT-7100 could do with a narrower filter and the frequency indications on this one were off by 600Hz high on USB, 2kHz low on LSB, should it have been 1500kHz each way, but it is hardly fair to compare it with an IC-765 and look at everything else it does. It is suggested that anyone disappointed with a set of this kind on HF and who has not tried preselection should do so before spending too much money. After all, having regard to the PR150/HF150, it seems lowly thinking thus, albeit somewhat expensive! Try a tuner kit, or a tuned loop of your turn, or perhaps even the front end of an old trim radio, with advice, and probably attenuation.

What puzzles an old-dinner is, what with the batteries and the display and the speaker and all the logic in that tiny case, where does the radio go? And how to stop it being nicked?

Don’t have that problem with the HRQ. Alex Dick, ‘Sandy’ G8IDZ.

Editorial Comment

It’s certainly true that ‘do-everything’ receivers are often a compromise, but even the ‘better’ dedicated HF receivers (like the HF-150 you mention) can sometimes usefully use a preselector to add to the overall rejection of strong signals in other bands. For home constructors, we’ve the very thing here just waiting to be published in ‘Ham Radio Today’, a stand-alone tunable HF preselector by Raymond Hug. To accompany the HF multimode receiver project in the current mag.

Why not send us a letter for publication? Send yours to Sheila Loret, Editor Scanners/ HRT, Argus Specialist Publications, Argus House, Boundary Way, Henley Hemel, HP7 7TR, or you can fax your letter direct to the Editor’s desk on 0703 203429.
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Yaesu FT-2200 Reviewed

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HAM RADIO TODAY DECEMBER 1993
Yupiteru

MVT-3100 Review

Chris Lorek tests a newcomer from Yupiteru

Over the last few years, Yupiteru have become quite a well-known name in the scanner receiver field, and there's many a scanner hobbyist who'd love to own their 'top of the range' model, the MVT-7100 (reviewed in the April 1993 issue). Others in their range include the airband orientated VT-125 (civil) and VT-225 (civil and military) models, their latest 'niche market' set being the MVT-3100. This is designed primarily for marine, PMR and 900MHz coverage, the frequency coverage being 143.000 - 162.025MHz, 347.7125-452.000MHz, and 830.000-960.000MHz. The set uses FM throughout, with pre-programmed 10kHz and 12.5kHz tuning steps.

Features

The MVT-3100 has 100 memory channels arranged into 10 banks of 10 channels each, a further 'priority channel' memory, plus 10 independently programmed search bands. These bands and banks are labelled HAM V, FIRE, MARINE, POLICE U, TAXI, MCA, PERSONAL, BAND 1, BAND 2, and BAND 3 on the set's keypad, undoubtedly conforming to Japanese-used bands (which of course you can program to whatever you wish within the frequency coverage range). The set scans at around 30 memory channels per sec, and around 40 steps per second in 'search' mode.

A very useful facility is that of up to 100 'search pass' channels. Most scanners 'lock up' on a number of channels in 'search' mode, where you're searching across all channels between two programmed frequencies, either due to internally generated signals or external carriers. With the MVT-3100, all you need do if you come across a frequency which you'd like to automatically skip each time, is to press a couple of buttons and that frequency is stored in the set's memory. Each time it subsequently comes to that frequency, it simply passes it, no more button-pushing every few seconds as with many other scanners!

The MVT-3100 is powered either from four AA nicads or an external 12V DC source via an optional power lead (this also charging the nicads), and comes supplied with nicads ready-fitted and a plug-in wall charger, plus carrying aids of a metal belt clip and wrist strap. The set measures 59mm (W) x 147mm (H) x 38mm (D) and weighs 280g.

In Use

I started off by having a listen around the 2m and 70cm amateur bands, as the reception of my semi-local repeaters on these bands normally gives me a 'starting reference' as to how a scanner performs. Surprisingly, this is where I found I needed to look at the instruction book! This was well written (with only a few 'literal Japanese translations') and good instructions on how to use the scanner, although from this I found why I couldn't change the tuning step size from 10kHz (as pre-programmed for both the 2m and 70cm amateur bands) to 12.5kHz. Quite simply, I couldn't, 10kHz steps were 'hard programmed' over the 143-155MHz and 430-440MHz ranges. Ah well!

However, the review period nicely coincided with the start of the Whitbread round-the-world yacht race from my local city of Southampton, and the VHF marine band was literally a hive of busy activity, if you saw the start on TV, you'll have seen the Solent waters described as 'worse than the M25 during rush hour'! But this was superb for trying out a scanner with a pre-programmed marine band! The set worked quite well, and I appreciated the 'search pass' facility which allowed me to 'lock out' various channels (such as Niton Radio carrying telephone traffic and other channels carrying routine commercial shipping traffic). The boat's VHF radio was on dual-watch channel 16 and 72 (channel 72 was used for overall yacht coordination that day, and yes, I do have a VHF Marine Certificate of Competence to use it!), however the scanner let me have a good 'nosey around' all the other channels from my top pocket, without missing possibly vital traffic on the main radio. The scanner's internal speaker gave very good audio, and the 5-meter allowed me to check the relative strengths of received signals, it's a pity all scanners don't have this facility.

Back at home, I found the 'pass' facility again very useful in 'locking out' various other unwanted signals. After some tests, I found the 900MHz range was around 10kHz off frequency on receive, a quick 'tweak'...
inside the scanner fixed this though. With the set on a tabletop, I found the LCD was very difficult to read from above, I had to tilt the scanner back to see what was going on. Another minor 'niggle' was that, with the metal belt clip attached making it 'top heavy', the set very easily toppled over with the slightest touch.

Technicalities

The MVT-3100 uses a triple conversion superhet receiver, with intermediate frequencies of 285MHz, 45MHz, and 455kHz. This gives it an excellent 'image rejection' performance, as you'll see from the lab results, unlike some other scanners where you often just have to put up with the unwanted interference or fit an external filter! The results also show the set is reasonably sensitive, and has 'tight' filtering giving very good rejection of adjacent 12.5kHz channel signals.

Conclusions

The MVT-3100 could prove quite useful for listeners interested in the VHF marine band, although the reminder of the set's coverage seems to be, in my opinion at least, rather unusual for UK monitoring use. The 'search pass' facility can be quite useful, for example in the 900MHz range, to 'get rid' of those constant signals you'd rather skip whilst being able to scan across a range of frequencies.

I found the set easy to use, light when carrying around, and certainly up to the quality and performance I've come to expect from Yupiteru sets. The MVT-3100 is currently priced at £199, including mains and charger, and my thanks go to Nevads Ltd., in Portsmouth for lending the set for review.

LABORATORY RESULTS:

All tests performed at 145MHz FM, using fully charged internal nicads, unless otherwise stated.

**Sensitivity:**

Input signal level in µV pd required to give 12dB SINAD;

<table>
<thead>
<tr>
<th>Freq.</th>
<th>Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>145MHz</td>
<td>0.21</td>
</tr>
<tr>
<td>150MHz</td>
<td>0.22</td>
</tr>
<tr>
<td>155MHz</td>
<td>0.23</td>
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<tr>
<td>160MHz</td>
<td>0.20</td>
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<tr>
<td>350MHz</td>
<td>0.16</td>
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<tr>
<td>375MHz</td>
<td>0.18</td>
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<tr>
<td>400MHz</td>
<td>0.16</td>
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<tr>
<td>425MHz</td>
<td>0.18</td>
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<tr>
<td>850MHz</td>
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<tr>
<td>875MHz</td>
<td>0.24</td>
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<tr>
<td>900MHz</td>
<td>0.36</td>
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<tr>
<td>925MHz</td>
<td>0.35</td>
</tr>
<tr>
<td>950MHz</td>
<td>0.39</td>
</tr>
</tbody>
</table>

**Squelch Sensitivity:**

Level of signal required to raise receiver squelch

Threshold: 0.13µV pd (4dB SINAD)

Maximum: 0.63µV pd (25dB SINAD)

**Maximum Audio Output**

Measured at speaker/earphone socket, 1kHz audio at the onset of clipping (10% distortion), 8 ohm resistive load:

156mW RMS

**S-Meter Reading**

<table>
<thead>
<tr>
<th>Indication</th>
<th>Level</th>
<th>Rel. Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.27µV pd</td>
<td>0dB ref.</td>
</tr>
<tr>
<td>2</td>
<td>0.47µV pd</td>
<td>+4.7dB</td>
</tr>
<tr>
<td>3</td>
<td>0.80µV pd</td>
<td>+9.3dB</td>
</tr>
<tr>
<td>4</td>
<td>1.77µV pd</td>
<td>+16.2dB</td>
</tr>
<tr>
<td>5</td>
<td>4.58µV pd</td>
<td>+24.4dB</td>
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</tbody>
</table>

**Current Consumption**

Scanning, no signal: 58mA

Receive, mid volume: 95mA

Receive, max. volume: 119mA
WANT a scanner or receiver, or have you got one to sell? Do you need some accessories, or simply want to advertise your local scanner/airband club? Then advertise free in our 'ScanAds' page! This is a free service only for reader's privately-owned scanner related products, and for non-profit enthusiast groups (for other equipment please use the 'main' magazine ads - thanks). Commercial or private ads may also be placed in the pre-paid classified ads section - call 0442 66551 for details.

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CLUBS

Medium Wave club, catering for all Medium Wave listening enthusiasts. Membership is £11.00 per annum, including their 20/24 page A5 magazine "Medium Wave News" by post. Contact Club Treasurer Alf Brimning, 43 Atwood Drive, Bristol BS1 0SR, Tel. 0272 823568 daily or evening, for details. Plymouth Scanning Club requires information on frequencies in the south west of England. Please send to PSC, 216 Wolseley Road, Plymouth PL2 2JA

FOR SALE
AR-2800 BFO, AM/FM/WFM, PSU, manual, original box, £390 ovno. DM1000 EasyreaderCV/RTTY/AMTOR/ SITOR TV interface, input AF level booster, (near Holywell). Tel. 0352 713207 answerphone, or 0244 611666 11.00 to 13.00 hours.
Kenwood RZ-1 wideband receiver, 504KHz-905MHz continuous, AM/NFM/ WFM, good condition, boxed, with mains transformer, half price, £240. (South Devon). Tel. 0626 862719

Realistic PRO-2006 400 channels, hyperscan, 4 months old, very little used, immaculate with handbook, bargain, £185 (Daventry). Mac. Tel. 0327 842285 anytime

Fairmate HP-100 handheld scanner, 15-550MHz, 805-1300MHz, AM/FM/WFM, 1000 channels, 10 search banks, lots of features, plus nicads, asking £185 (Shropshire). Tel. 0746 761996

Kenwood AT230 ATU, £80. Kenwood PS10 PSU with built-in speaker, £30, both mint condition. Roger Morgan G6NTQ (Dudley). Tel. 0384 211744

Yupiteru MVT-8000 8MHz to 1300MHz, AM, NFM, WFM, 200 channel memory, £280, (Derby). Tel. 0283 221870

Sony ICW-S7680 150kHz-30MHz AM/SSB, 88-108MHz FM stereo, mains adapter, aerial, boxed as new, £95 (Cheshire). Tel. 0457 863131

AR-2000 Handheld scanner, 0.5-1300MHz, boxed as new, £180. Realistic PRO-35 scanner, 66-88, 144-174, 108-136, 406-512MHz, £70 (Carlisle). Tel. 0228 48698

Yupiteru MVT-7100 scanner, as new, hardly used, £330 (Southend). Tel. 081 890 6452

AOR-3000A scanner (mint), under guarantee, £695. Icom AH-7000 omni wideband 50-1300MHz aerial (new), £60. SSB 50-1300MHz preamp (new), £100. Paul G4XHF (Crawley). Tel. 0293 515201

AOR-2800 Multimode scanner 0.5-600MHz, 800-1300MHz, AM/FM/WFM/SSB/CW, excellent condition, boxed with accessories, £350. Jim (Glasgow), Tel. 041 942 7872

Sony ICWPRO80 150kHz to 223MHz with all accessories and manual, £180 no offers (Edinburgh). Tel. 031 440 4418

FRG-9600 M1 scanning receiver 500KHz-1GHz in full working order, unmarked, includes mains adaptor and instruction manual, bargain price, £250.

Contact Darren G4VTQ (Burgess Hill, Sussex), Tel. 0444 8707961 after 6.00pm.

Realistic PRO-2022 base/mobile scanner, 88 to 980MHz, 200 memories, boxed as new, £120 ovno. Tel. 07667 73575

Yupiteru MVT-8000 wideband scanner, 8 to 1300MHz complete with discone and books, boxed and under guarantee, unwanted gift, cost £300 accept £150. Dave Jupp (Shoreham, Sussex), Tel. 0273 596938

Realistic PRO-9200 scanner, ideal for beginner, mains adapter, good coverage, airband, etc., bought May 1993, as new condition, little used, adapter for car included, with manual and original box, good saving on new, £75. Roy Greaves (Chester), Tel. 0244 381258

Yupiteru MVT-7100 handheld scanner, 1 to 1300MHz, AM, WBFM, NBFM, multiple airband, FM/WFM, rotary or keypad frequency control, fast scan, nicads and charger, excellent condition, boxed as new, £200. Keith Waterhouse (Sale, Manchester), Tel. 061 973 6778

WANTED
Scanner, no gaps 1300MHz, AR1500, MVTT100 or similar. Sale, exchange, transceiver, mobile 20m/80m, microphone, 20W output, solid state, well constructed by G3NXD. Ray Shuck, Tregarron, Lowe Lane, Wolverley, Kidderminster, Worcs DY11 5OR, Tel. 0562 850570

EXCHANGE
AOR-1000 handheld scanner, FM/AM/ WFM, nicads, charger, swap for base scanner with same coverage 0.5-600MHz and 805-1300MHz or near, WHY? Cannot travel far, (Derby). Tel. 0332 45071

Realistic PRO-34 handheld, boxed, as new, £135. Realistic PRO-2004 base model, Eric Calver (East Sussex), Tel. 0523 892663

2m Scanner wanted, exchange for Realistic PRO-39 scanner, boxed, straight swap. A. Hesketh, 3 Rutland St, Preston, Lancs, Tel. 701131

Will swap brand new Yupiteru MVT-7100 scanner with all accessories and cash for AR-3000 or AR-3000A, (Kettering.). Tel. 0536 522007

Amiga 500+ uprate 2Mb with colour monitor, manuals and 40 games, new condition, for MVT-7100 scanner or AR-1500X (Blackpool). Tel. 0253 48870 anytime.

Realistic PRO-2006 scanner, 4 months old, hardly used, boxed and immaculate. Wanted, good HF receiver, Eddystone 1830 or similar, or anything with full coverage, some cash adjustment available. Bill Symes GRAV, 135 Moreton Road, Upton, Birkenhead, Merseyside L49 4NT
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<th>Choice of hotel</th>
<th>Dates required</th>
<th>No in party</th>
<th>No of nights</th>
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Payment by: cheques ☑ Access ☑ Visa ☑ Diners ☑ AmEx ☑ My Credit Card No ☑

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How I Began

Our new occasional series of ‘How I Began’ starts this month with that well-known ‘personality in print’, Geoff Arnold G3GSR

I first became interested in radio at around the age of 8 or 9, when an aunt gave me a book entitled How it Works and How it’s Done. It was a marvellous collection of features on mechanical things plus electricity, telephones and ‘wireless’, and I read and re-read it from cover to cover.

Returning home to Southampton towards the end of World War II, I soon discovered that a couple of doors away there lived an electrician who worked in a local munitions factory, but repaired radio sets and domestic appliances in his spare time. Before long I was trying to cadge bits and pieces off him to build the spark transmitter described in my book. He tried to convince me that spark transmitters weren’t quite the thing for a young lad to be experimenting with, and diverted me into receivers and things electrical.

When my dad came home from the war, he had developed an interest in what we would now call medium wave DXing, and the front of our HMV domestic radio was soon festooned with lists showing the names and wavelengths of distant broadcasting stations. Somehow, we heard about ‘short waves’ and my dad bought a secondhand, 3-band broadcast receiver. It was on that set that I heard my first amateur stations (DSB AM), though I didn’t really understand what they were.

My hankering towards the spark transmitter had not been totally suppressed, and I got hold of a small induction coil which I connected to a long wire aerial running to a tree at the bottom of our garden. It worked a treat, and I was soon in contact with most of our neighbours! They protested to my dad, who rapidly put an end to my exploits with a clip round the ear and a copy of F. J. Camm’s Practical Wireless Circuits (I have it still) with lots of interesting circuits to build.

As my days at school were coming to an end, radio was my consuming passion, and combining it with a parallel interest in aircraft (fairly common in youngsters who’d lived through the war years), I was all set to join the RAF.

Somehow, I think as a result of an advert appearing in the local paper, I signed up instead for a course in Marine Radio at a college at Hamble, near Southampton.

The training there led first to a 2nd Class and then a 1st Class Postman General’s Certificate, qualifying me to open and maintain radio installations on board ship. Apart from the technical side, we had to learn to send and receive Morse at 25 words per minute, and how to handle telegrams.

A popular feature of the college was the amateur radio club, with a station comprising an Eddystone 358 receiver and an ex-RAF T.1154 transmitter. I was fascinated, and decided I wanted to get in on this for myself. From another student I bought the transmitter section of a B2 suitcase set, and from a surplus dealer I acquired the receiver section of an ex-army No. 18 Set.

At that time, there was a “dispensation” system, under which a person holding one of a wide range of military or seagoing qualifications could get a UK Amateur Licence without sitting the exam and/or Morse test. My 2nd Class PMG was accepted as sufficient evidence of ability, and I was soon on the air – CW of course. My first contact was on 40m (the only amateur band covered by my receiver) with a station on the other side of Southampton. Real DX!

When I went to sea, I let my amateur licence lapse, as there were no maritime mobile licences in those days, and precious little home leave between voyages. I did do a lot of broadcast and SW listening in my off-duty hours, and I realised my ambition of using a spark transmitter – a 300 watt emergency set! It was not until some thirty years later that the urge came to resurrect my amateur licence. By then the dispensation scheme had finished, and I had to take the RAE (one of the first multiple-choice exams) and the Morse test before getting my old callsign back.

By then I was Editor of Practical Wireless, and in the enviable situation of having a stream of different rigs to try out for review in the magazine. It only hurt when I had to hand them back at the end of the test period! Now, for my own station, I have a very nice little Shimizu SS-106S 10W semi-kit HF transceiver, a Lowe HF-150 receiver, an Eddystone 940 valved receiver and a small selection of Morse keys. My favourite modes have always been CW and QRP.

Although I still do quite a bit of SWL’ing, I regret to say that I haven’t been in the air for some time. I’m just too darned busy, editing Radio Bygones and Morris Magnificat magazines, attending rallies, writing articles and so on. One of these days, I promise myself.
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