

# HRT

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SCANNERS**

## HAM RADIO TODAY

DECEMBER 1993 £1.70

**Project-Build  
a Superhet Receiver**

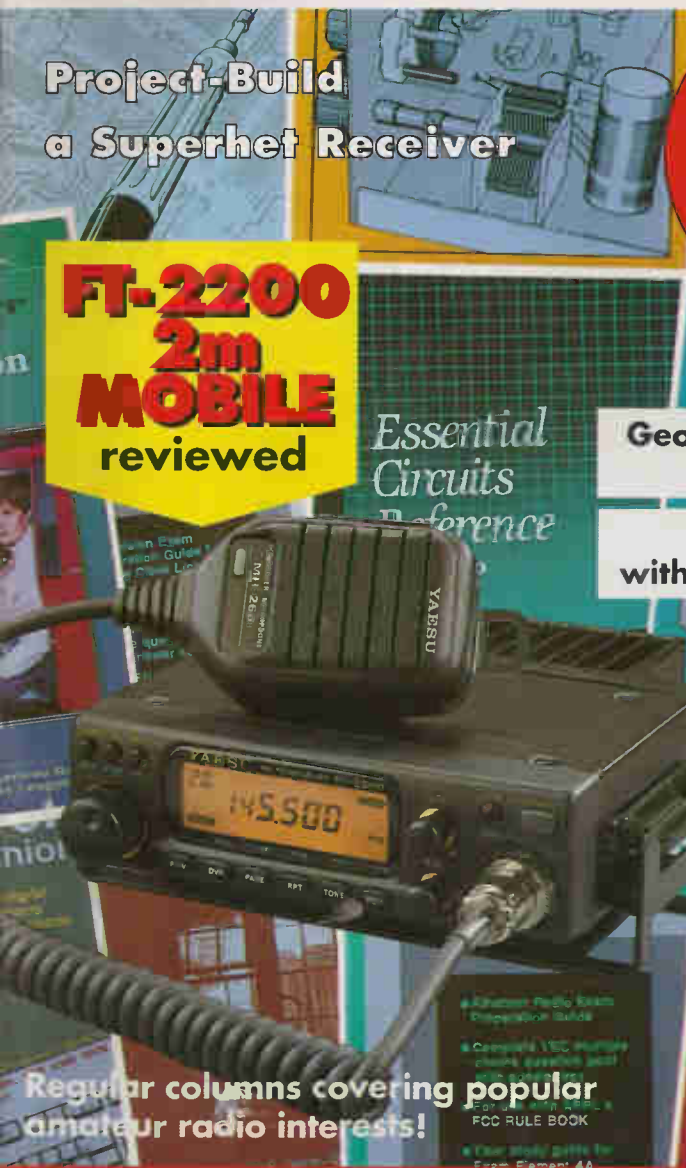
**Radio book  
reviews  
for winter  
reading**

**FT-2200  
2m  
MOBILE  
reviewed**

**Geoff Arnold G3GSR says  
'How I got started'**

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- Clear study guide for Exam Element 4A

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## KENWOOD RADIO

### Kenwood TS50



Just arrived. This new 'micro' 100 watt HF mobile rig is in short supply because of its popularity. We have purchased large quantities - call for info or part exchange price on your old HF rig. **£999**

### Kenwood Radio

RS502 5.7Watt Bnc 150KHz - 30WHz	£939 00
TS950SDX HF Triens auto ATU & DSP	£3475 00
TS850SAT HF with auto ATU	£1695 00
TS450SAT Mobile HF with auto ATU	£1400 00
TS6905 Mobile HF & 6m	£1400 00
TS14DS Budsig HF Transceiver	£845 00
TH4732E 2m/70cm Twin Mobile	£699 00
TR751E THE BEST 2m/M Mode	£705 00
TH79E Twin Band Handheld	£440 00
TS790E Tri-Band Base 2700/Op. 23cm	£1690 00

### Kenwood Accessories

PS52/53 Mevia PSU Full Duty	£269 00
TR922 HF 2W amp	£1645 00
MA5 5-Band Mobile HF Ant	£119 00
AT50 Matching Auto ATU for TS50s	£279 00
SM230 Stereo Spectrum Display	£795 00
HS5 Deluxe Coaxial H/Plugs	£45 00

### Kenwood Microphones

MC50 Desk Mic	£84 95
MC50A Desk Mic (Pre-Amp'd)	£99 95
MC80 Elceter Desk Mic	£159 95
MC85 Deluxe Desk Mic	£119 95
MC435 Dynamic H/Mic	£22 95
MC44E H/Mic Pre Amp	£29 95
MC45E H/Mic M. Pre Amp	£29 95
MC44DME H/Mic DTMF	£45 95
MC45DME H/Mic DTMF	£49 95

## DRAKE



**Drake R8E** - To own one of these receivers is a dream in itself - everything you could ever want in facilities and performance is in the R8E. Drake are no newcomers to radio - they have been No 1 in the USA since 1943! Unlike other expensive receivers the Drake has all its filars fitted and standard. Therefore, there are no hidden extra costs. Its performance is truly staggering! With an excellent dynamic range coupled with superb filtering it takes a lot of beating! Multiple scan facilities, easy use 1000ch memory, all mode coverage and synchronous detector for improved AM reception are just a few of its extensive range of facilities.

H Term VFO's H Selectable AGC	
H Passband Tuning	
H Timer Function H RS232 Interface H Built-in pre-Amp H Dual Noise Blanker H Non-Volatile Memory H100Hz - 30WHz Wide Coverage	

### Options

Attenuating Switcher	£49 95
P.C. Data Software	£59 95
Full VU/Stop Monitor	£29 95
VHF Converter (optional)	£225 00

## ICOM RADIO

### icom IC737

A new full coverage HF transceiver with Auto ATU, Electronic Keying, good receiver and a host of extras	
IC735 HF all band mobile	£1425 00
IC737 HF 100w Mobile	£1135 00
IC737HF 100w Mobile	£945 00
IC729 HF Plus 6m Mobile	£1230 00
IC220E 2m FM Mobile	£369 00
ICP2ET 2m FM Handheld	£303 00
ICP4ET 70cm FM Handheld	£360 00
ICV41E 2m/70cm FM Handheld	£425 00
100 Mobile Receiver	£595 00
R7100 Wide Band Base RX	£1375 00
R72E HF 5.7Watt Receiver	£815 00

### NOW IN STOCK

### THE NEW IC707 HF TRANSCEIVER

100 watt RF output

All have transit price 500Hz to 30MHz Rx

Price only **£895** or pay by 3 instalment direct - deposit of £198.33 worth. See right hand page for details.

### POWER SUPPLIES

Standard 3 Amp UK Spec	£17 95
Standard 7 Amp UK Spec	£29 95
Standard 10 Amp UK Spec	£39 95
HP125 12 Amp Twin Meters	£79 95
HP1205 30 Amp Twin Meters	£139 00
HP1205S 50 Amp Twin Meters	£220 00

### ANTENNAS

#### SAGANT Antennas

Using Vinyl coated annealed copper wire - supplied with matching unit for coax lead - high quality Japanese made

3.5 MHz (30 mtrs long)	£79 95
7.0 MHz (20 mtrs long)	£79 95
14.0 MHz (9.9 mtrs long)	£79 95
Trap Dipole 40/80	£180 95
Pair 40 mtr Traps	£19 95
2xV Balun 1:1	£29 95

#### HARI HIGH QUALITY WIRE ANTENNAS

Constructed using heavy duty multi-stranded aluminium coated wire - professional standards. These Antennas are built to last

G5 RV (80-10m) 1KW full size	£30 95
G5 RV (40-10m) 1KW A size	£34 95
V3 D2Z (80-10m) 200W Dipole	£79 95
V3 D2Z (40-10m) 1KW Dipole	£99 95
WARC Trap Dipole (200W)	£79 95
Broadband RX Antenna (1-30MHz)	£59 95
Windom (80-10m) Full size 1KW	£79 95
Windom (30-10m) Full size 200W	£59 95
Windom (40-10m) 3 size 1KW	£69 95
Windom (40-10m) 3 size 200W	£49 95
Balun 1:1 100W	£29 95
Balun 1:1 200W	£24 95

#### TONNA VEE BEAMS

2m 9 Ele. Portable Beam (13 1dB)	£49 95
2m 9 Ele. Ground Beam (13 1dB)	£86 95
2m 11 Ele. Beam (14 1dB)	£77 95
70cm 9 Ele. Beam (13dB)	£43 95
70cm 19 Ele. X Beam (16 2dB)	£61 95
2m/70cm Circular Special (19/19 dB)	£85 95

#### DIAMOND BASE

X50 2m/70cm base vent	£79 95
X300 2m/70cm higher gain vent	£129 95

#### OUTBACKER MOBILE ANTENNAS FROM AUSTRALIA

Outbacker 300W 80 thru 10m	£189 95
Outbacker (T) inc top band	£219 00
Outbacker Junior 100W	£179 95
Peak 300W 80 thru 10m	£199 95
Perik (T) inc top band	£235 00
Heavy duty bass spring	£59 95

## SCANNING RECEIVERS

We are probably the UK's largest direct bulk stocker of scanning receivers - we have found there a few of the popular models, but for full information why not send in £2 for our full colour catalogue.

Yuchetu	
MV7100 hand-held	£399 00
MV7800 mobile	£389 00
MV71000 hand-held	£369 00
MV73100 NEW MODEL	£199 00
VF17500	£189 00
VF125 airframe	£189 00
VF225 cv/1m airband	£269 00
AOR	
AR3000A base/remote	£899 00
AR1500 hand-held	£339 00
AR2500 base	£399 00

### Commet

COMA 102 marine Plus	£99 95
COMA 203 hand-held	£213 00
COMA 204 hand-held	£249 95
COMA 205 base	£344 00

### Fairmate

HP2000 hand-held	£299 00
MS1000 base	£399 00

### icom

R1 hand-held	£95 00
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### Black Jaguar

B200 HWV	£129 95
B1300 NEW	£199 95

### Beccart

BC300KT NEW hand-held	£165
BC890KT NEW base	£279 95
BC200KT	£249 95

### Accessories

JIM M25 preamp	£79 95
JIM M100 preamp	£89 95
StateMaster 8725 preamp	£59 95
Scanmaster mobile hand	£19 95
Scanmaster base hand	£4 95

### Scanmaster Antennas

Beam 500Hz - 150MHz	£39 95
Diapole 25 - 100MHz	£29 95
Double diapole 100 - 300MHz	£19 95
Mobile 25 - 1000 Hz	£14 95

### NEW

## EXTENDAMAST TO METRE RETRACTABLE MAST

NEW! The Extendamast is a 10m retractable mast that may be used at home or for portable use. Easy to erect in minutes, your antenna will stay independent of trees, buildings and other mast lifting points. The steel spring tips are corrosion protected to provide years of service. Because individual requirements may vary, options are not included. A booby fitting plate is available on an extra charge.

**Introductory Price £69 Plus £8 Carriage**

## THIS MONTH'S BEST BUY

£30

Electronics VC3000LP Canadian-built ATU with a host of features:

- 1.8 - 30MHz
- 150W (300W PEP)
- 4:1 Balun
- 300W dummy load
- Peak/average power
- Dual reading SWR/power meter
- 3-way antenna selection
- Illuminated meter

Due to bulk purchase .....Special offer **£129.95 + £4.75 p&p**

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# STARTEK

## FREQUENCY COUNTERS

SAY GOODBYE TO RANDOM COUNTING AND FALSE READINGS WITH THE ATH™ SERIES



**Model ATH-50**  
 • 5Hz - 280MHz  
 • High speed  
 • Bar graph read to 4GHz  
 • One Shot input hold and display freezing

£289

A new range of advanced inexpensive, portable counters from the U.S.A. All come complete with telescopic antenna and UK power supply.

### New ATH™ Series - features include:-

**HANDS FREE** operation to automatically read and hold a signal within 80m/seconds. The counter is super fast because it does not require the additional time for multiple readings like digital frequency techniques

**ONE SHOT** feature enables signals to be captured, locked and displayed as a single reading. This facility can be set to trigger and display a frequency even when the counter is left unattended.

A full range of accessories is available - send for our leaflet.

#### Model ATH-30

- 1 - 280MHz
- High speed
- Bar graph read to 4GHz
- Extra bright LED display
- One Shot feature

£269

#### Model ATH-15

- 1 - 150MHz
- High speed - 0.6 fast gate time
- Bar graph read to 4GHz
- Extra bright LED
- Automatic clean dropout

£199

#### Model 1350

- Counts 1 - 1300MHz
- 3 gate filters - An only built counter - Her offers excellent value for money

£129

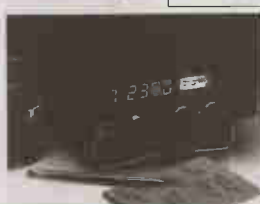
# THE NEW SCOUT 555

## Simplicity at its best!

£585

Direct from the Ten-Tec factory in America comes this new concept in mobile HF communications. An SSB/CW transceiver that utilises easy plug-in band modules. It's small enough to fit in a briefcase yet packs an impressive 50 Watts punch. For those keen CW operators, there's even a built-in Iambic Keyer and unique and revolutionary patented "Jones" filter with variable bandwidth control from 500Hz to 2.5kHz.

- ★ Complete with 40m band module
- ★ Legendary QSK and superb electronic keyer
- ★ Multi function signal meter
- ★ Easy plug-in band module (inc. WARC bands)
- ★ Superb sensitivity and dynamic range
- ★ Full range of optional accessories available
- ★ Electronic keyer employs "Curtis type B chip"
- ★ No need for expensive optional filters
- ★ Simple, affordable and fun to use



## PAY BY POST DATED CHEQUES - INTEREST FREE

Simply divide the price into 3 equal payments. Write 3 cheques dated in consecutive months starting with todays date. Write your telephone number and cheque card number/expiry date on the back of each cheque. Post them to us enclosing your name & address and we shall (subject to status) send your goods immediately. The hardest part is deciding what to buy!

## LOW LOSS CABLE

The best quality low loss cable available. Full and broad bandwidth. Suitable for high speed digital transmission. For particular low loss cables. All high quality. All high speed. All high frequency up to 3GHz.

50dB (0.1mm - 0.05mm)	£0.75/mtr
80dB (0.1mm - 0.03mm)	£1.79/mtr
100dB (0.1mm - 0.03mm)	£2.75/mtr

Losses quoted at 100MHz

## EARTALKER

A completely new concept in microphone technology. The EarTalker is a combination of earphone and microphone which is worn within the ear. It provides outstanding transmitted audio quality and is suitable for all leading brands of hand-held (Call for details on your particular model). Separate volume, PTT switch and control box. £29.95

## TRADING POST

We buy as well as sell new and used radio equipment, please feel free to call Paul or John on our Hotline for an instant quote on either P/X or Buy-Ins.

Scanning receivers	
Alrica D311 hand-held, vgr	£215
ACR 1700 base scanner 20 channels	£199
ACR 181000 hand-held, 1000 channels	£185
Beacon 500L 10 channels, hand-held	£75
Beacon 2000L hand-held, c/w 900kHz	£165
Formosa HF 100 scanner	£175
FRX 6450 2m, 2nd receiver	£65
Ham 8100 mobile scanning EX	£475
Hamwood K21 mobile scanner	£319
Yaesu FR6900 scanning EX	£365
Yaesu FR7110 almost new	£315

Shortwave receivers	
Dada DSE 2000 condition	£750
Icom 7711 shortwave medium	£675
Icom 87000 wideband EX, inc. HF	£735
Hamwood K2000 EX w/HF cover	£575
Hamwood K5000 S/H receiver	£495
Hamwood K210 base S/H receiver	£375
Sony SW55 portable EX	£219
Tao R5500/5 base S/H EX	£195
Tao R1000 general coverage receiver	£295
Yaesu FR5 EX, all band feature	£195
Yaesu PR1000 good starter	£245
Yaesu PR2700 digital S/H EX	£425
Yaesu PR5700 shortwave EX	£295
Yaesu PR5800 (w/40 & 8m det)	£400

HF Transceivers	
Dada 187+P50/P50/S50 Sdk	£1125
Icom 701 HF and matching PSU	£545
Icom K275 mobile HF TX	£675
Icom K230 mobile HF TX	£495
Icom K731 evidence in case	£1375
ST 135 HF TX/EX 150W PEP	£675
Hamwood TS400/5 HF TX	£775
Hamwood TS500/5 HF TX	£569
Hamwood TS600 HF TX	£389
Hamwood TS1405 AM, AMU, AMUO	£1495
Sonotronics FT1012	£1495
Taiyo HT115 15m transmitter	£195
Yaesu FT One HF base TX	£295
Yaesu FT707 HF mobile TX	£495
Yaesu FT726 with 2m/70cm mode	£375
Yaesu FR9200M HF base TX	£425

Handhelds	
Alrica D1560 dual band hand-held	£340
Alrica 3550 dual band hand-held	£385
CTE Soudley 145 2m hand-held and mic	£155
Kango KT22 2m hand-held, vgr	£115
Hamwood K215 2m hand-held	£135
Hamwood PR18 2m hand-held, base, vgr	£155

Mobile Transceivers	
Hamwood TR271E 2m 25W mobile	£315
General CS800 2m mobile EX/TX	£195
Starcraft K7800 70cm mobile, 25W	£185
Yaesu FT277 monomorse 2m mobile	£185
Yaesu FT20R TX, remote, base	£175
Yaesu FT290 2m, gov/remote	£225
Yaesu FT290 2m c/w 40mhz base and	£330
Yaesu FT390 Alrica Amp, Mod Base	£345
Yaesu FT40R 2m w/micro	£375

## Station Accessories/Microphones/Amps/Speakers

Alrica AA500 dual inc. base	£75
Hamwood SP100 speaker	£45
Microvox mobile 144/7005	£95
Microvox mobile 2m transmitter	£85
Microvox mobile 70cm transmitter	£75
Novelty HA1000 HF power amp	£35
Taiyo 2m 100W, base	£165
Taiyo HL16/4 6m high power amp	£895
Technics VC300 ATU-power amp	£85
Yaesu FT302 ATU base	£39
Yaesu FT302 ATU	£145
Yaesu FT900 101 matching ATU	£195
Yaesu FT10000 HF amplifier	£340
Yaesu FT10010 HF amp (14W PEP)	£575
Yaesu SP102 speaker	£30

Call us now - even if we haven't listed your radio, for what we know to be unbeatable P/X deals.

## 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 editorials. 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-890 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 (ofcourse) in these pages very soon. For further information contact



South Midlands Communications Ltd.

## Outbacker Mobile HF aeriels

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 fibreglass 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 facia, much like the old HRO receivers, and if you want another band, you purchase an extra module (£39 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 2.5kHz to 500Hz 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 analogue S-meter, receiver frequency is variable by using the RIT 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 is 1 to 32MHz, and is priced at £395 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 re-

corded 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 DCI-100, priced at US\$199, the accompanying DCI-Multimix 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, boat and magnetic mount are also available. A range of on-glass aerials from the same company are also available, comprising 2m half wave, 2m/70cm dual band and wide-band 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 comms 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 6 days a week, you can contact Roger during these times on 081 566 5666, or 24hr on 0426 934804.

## Morsum 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 present and future. 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 the key?' by Louise Moreau, W3WRE, 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-Man-

ager 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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Amateur Radio  
Communications Ltd



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Customers have always told us we have the largest selection of goods, both new and secondhand, that they have ever seen in an Emporium. New visitors say it is refreshing to find an Emporium that offers exactly what it says in the adverts - we don't make unsubstantiated claims nor do we over exaggerate our stock level. You know the saying 'the customer is always right' so why not pay us a visit?

73 ELAINE

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*I love taking mail order enquiries, so please keep the phone ringing. Remember, mail orders received before 3 o'clock same day despatch providing ex stock . . . . Elaine*



*Just working out another special deal for some lucky customer (notice the whip on the wall, that's to keep the staff in line!) . . . Peter*

*Not only do we have all the current range of new equipment on display, but also an exciting selection of secondhand/commission items, all fully checked out by Frank, our Engineer.*



*We pride ourselves in providing a relaxed and comfortable atmosphere where Richard is always eager to demonstrate equipment (it means he can sit down for 5 minutes!)*



*We hope nothing does go wrong with any of your equipment, but rest assured, if it does we have one of the best equipped workshops in the country, 98% of all our servicing is done in-house. We find customers appreciate the fact that, if possible, their equipment will be repaired while they wait . . . Frank*



*Always a good range of accessories on our shelves. We are authorised dealers for:*

- \* YAESU \* ICOM
- \* STANDARD \* REVCO \* G WHIP
- \* DRAE \* STAR MASTERKEY
- \* WELZ \* DATONG \* I C S
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- \* SANDPIPER \* BNOS \* AKD
- \* REVEX \* MFJ \* ERA\*

**WE WISH ALL OUR FRIENDS AND CUSTOMERS A MERRY CHRISTMAS AND A HAPPY AND PROSPEROUS NEW YEAR**

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1 MILE FROM J23,  
M6 and 4 MILES  
OFF J9, M62**

**Amateur Radio  
Communications,  
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**OUR AIM IS 100% SATISFACTION!**

# BRIGHTEN UP THOSE LONG WINTER EVENINGS WITH A NEW BASE STATION FROM

# RADIO HAMSTORES



**ICOM IC-737** This compact HF transceiver has met with rave reviews! Sept. Road Comm. is the state-of-the-art digital technology to introduce to the first time, stereo prod. D85R, auto-attenuator selector and auto-cut VFO's. The new IC-737 has a wide frequency range and is the best set up and easy to use on portable or mobile operations. With a choice of CW filter, the IC-737 is an ideal transceiver for taking on the CW band.



**ICOM IC-970** Enjoy those top bands 144, 430 and 1.2MHz. Full mode operation with the futuristic IC-970. This transceiver incorporates today's finest analog technology to introduce a true top performance. Includes a DCL system to improve the SSB signal and a built-in auto-tune. Built-in auto-tune is an 89MHz crystal with each band. Full mode operation is made easy with the built-in memory of memory function.



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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.

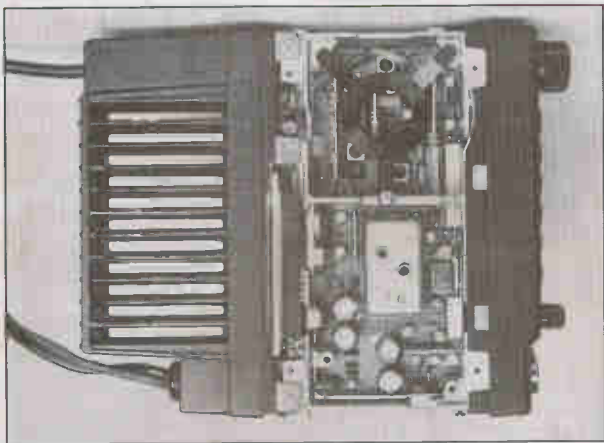
Internal options include a CTCSS decoder for 'quiet monitoring', a hands-free boom microphone and PTT switch box, plus mobile headset if required, and even a Digital Voice Storage unit with remote control facilities for the real 'gadget freaks' amongst us. A built-in transmission timer, programmable 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 that 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, if 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 hand-portable, 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 fitting 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 2m/70cm 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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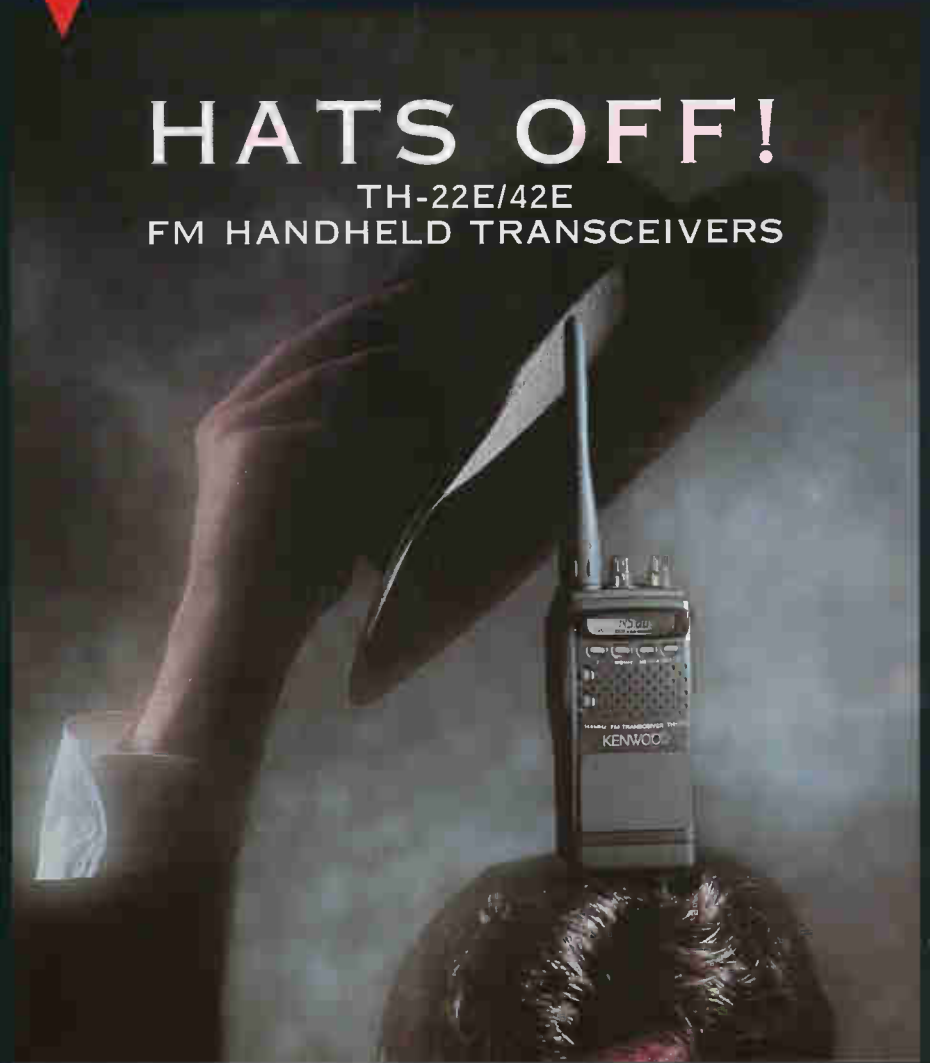
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# HATS OFF!

TH-22E/42E  
FM HANDHELD TRANSCEIVERS



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 50W 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-

tant' stations who normally copy my usual 10W noisily (until I switch my Dressler D-200 linear in!). I felt that the set's extended receive coverage would have been quite useful at home, as I live close by an international shipping port (156MHz marine band) and international airport (civil airband). But of course we're not allowed to listen to those things over here, are we? (what a stupid law, are you listening, RA7).

The DTMF facilities worked very well, and I used the CTCSS encoder to good effect on air. One day maybe all VHF rigs may have this fitted, for better

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.

ter harmonics were well suppressed.

## Laboratory Tests

The accompanying results show the set's receiver to be quite sensitive, matching the transmitter's high power. I found the latter to be slightly low, although within measurement accuracies of the specified 50W. This was well regulated with increase in voltage, as were the mid and low power levels. The receiver gave a good account of itself in terms of strong signal rejection, and the frequency accuracy was very good. The transmitter deviation was accurately set at just below the 5kHz absolute maximum level, and the transmit-

## 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 £400-E435, and my thanks go to South Midlands Communications Ltd. for the loan of the set and accompanying mobile aerial.

## LABORATORY RESULTS:

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

### RECEIVER;

#### Sensitivity;

Input level required to give 12dB SINAD;

144MHz;	0.137µV pd
145MHz;	0.135µV pd
146MHz;	0.136µV pd

#### Squelch Sensitivity;

Threshold; <0.06µV pd (<2dB SINAD)  
Maximum; 0.21µV pd (21dB SINAD)

### S-Meter

Reading	Level	Rel. Level
1	0.46µV pd	-15.3dB
3	0.68µV pd	-12.0dB
5	1.19µV pd	-7.2dB
7	1.96µV pd	-2.8dB
9	2.72µV pd	0dB ref.
+	3.51µV pd	+2.2dB
++	4.52µV pd	+4.4dB
+++	5.89µV pd	+6.7dB

#### Maximum Audio Output;

Measured at 1kHz on the onset of clipping, 8 ohm load;

2.77W RMS

#### Adjacent Channel Selectivity;

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

+12.5kHz;	36.9dB
-12.5kHz;	36.5dB
+25kHz;	70.2dB
-25kHz;	70.0dB

#### Image Rejection;

Increase in level of signal at first IF image frequency (-35.4MHz), over level of on-channel signal, to give identical 12dB SINAD signal;

98.2dB

#### Blocking;

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

+100kHz;	91.1dB
+1MHz;	96.7dB
+10MHz;	96.1dB

#### Intermodulation Rejection;

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

25/50kHz spacing;	78.8dB
50/100kHz spacing;	75.0dB

## TRANSMITTER

### TX Power and Current Consumption;

Freq.	Power	10.8V Supply	13.2V Supply	15.6V Supply
144MHz	High	37.0W/7.50A	45.4W/8.25A	45.7W/8.40A
	Mid	21.9W/5.70A	22.0W/5.80A	21.9W/5.95A
	Low	4.67W/3.00A	4.67W/3.00A	4.64W/3.05A
145MHz	High	37.0W/7.35A	45.7W/8.05A	45.9W/8.30A
	Mid	21.9W/5.55A	21.9W/5.75A	22.1W/5.80A
	Low	4.67W/2.90A	4.67W/3.00A	4.67W/3.00A
146MHz	High	36.8W/7.45A	45.4W/8.2A	46.2W/8.25A
	Mid	22.1W/5.55A	22.1W/5.75A	22.1W/5.75A
	Low	4.67W/2.95A	4.67W/3.00A	4.64W/3.00A

#### Harmonics;

2nd Harmonic;	-76dBc
3rd Harmonic;	-78dBc
4th Harmonic;	<-90dBc
5th Harmonic;	-82dBc
6th Harmonic;	<-90dBc
7th Harmonic;	<-90dBc

#### Toneburst Deviation;

2.31kHz

#### Frequency Accuracy;

-59Hz

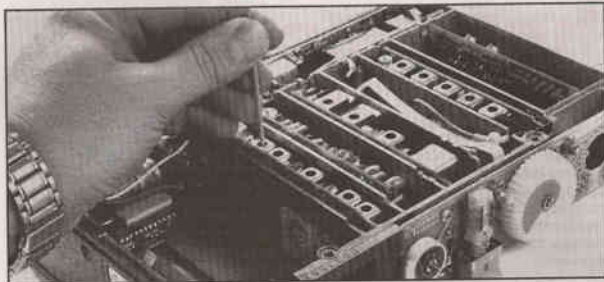
#### Peak Deviation;

4.94kHz



# Problem Page

*Our new 'problem page' kicks off this month, with a sample of the many general queries we receive on ex-PMR conversions*



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 recognised 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 that's broken, and you may 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 to (carefully) get it out by 'crumpling' it 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 replacing' to my rig to save the cost of buying more crystals for extra chan-

nels?

## **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 Cirket 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 you'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. Aligning 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

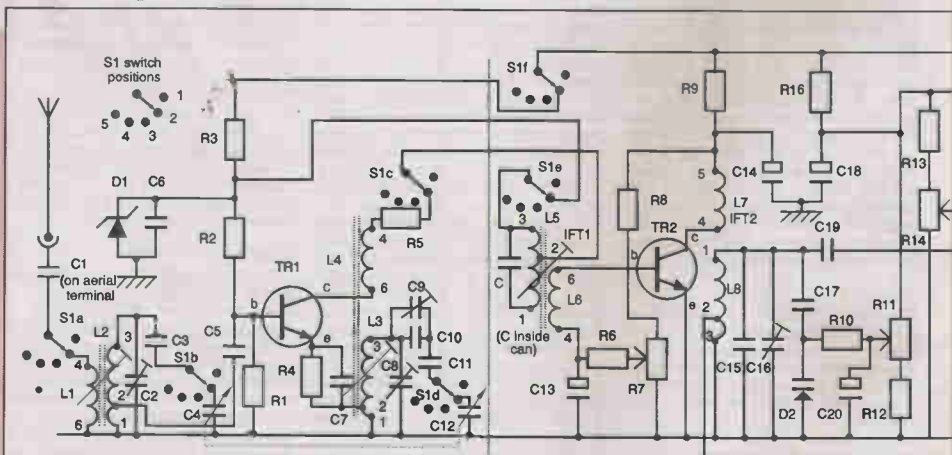
amateur SSB transmissions. These features have been incorporated without making construction difficult or complicated. Indeed, the basic circuit is simpler than the set manufacturing industry's standard design for domestic receivers.

## 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 worth while 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

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 range 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 aerials to simple front end circuits, and there has to be some means of adjusting the strength of signals reaching the detector.

### The Regenerative Detector

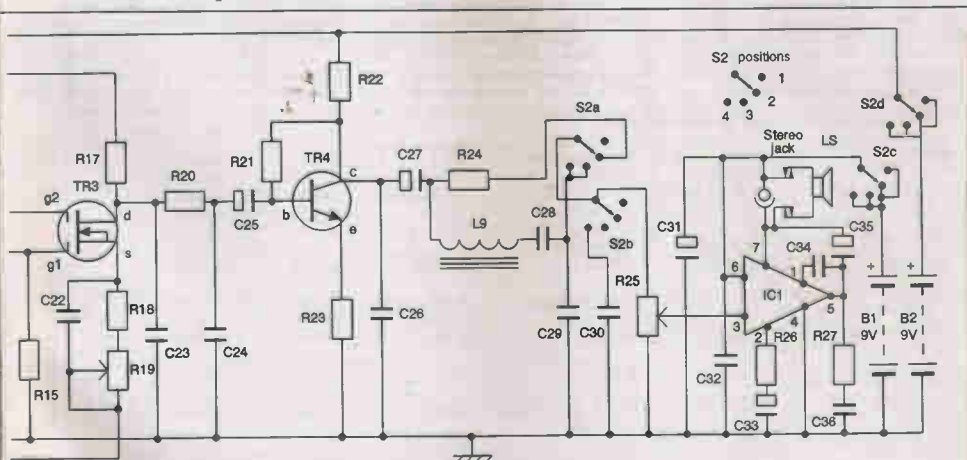
The collector of TR2 is coupled to a regenerative detector by IF transformer, L7/L8. This inductor must have a fairly high 'Q', and the coupling between the windings, and the tapping position, are critical if the detector stage is to work well. The construction of this coil is fully described later.

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

## Components List

### Resistors;

1/4 W, 5% carbon film.	
R1 (all ranges), R3 (LW).	2k7 (6 off)
R2 (all ranges).	6k8 (5 off)
R3 (MW)	1k2
R3 (SW1-3)	100R (3 off)
R4 (LW and MW), R18.	2k2 (3 off)
R4 (SW1-3)	820 (3 off)
R5 (all ranges), R9, R20.	1k (7 off)
R6, R12.	22k (2 off)
R7	22k lin. pot.
R8	100k
R10, R15	470k (2 off)
R11	100k lin. pot.
R13	47k
R14	10k lin. pot.
R16	220R
R17	12k
R19	10k preset
R21	2M2
R22	10k
R23	680R
R24	27k
R25	4k7 log. pot.
R26	47R
R27	1R

### Capacitors;

The values of C3 and C11 quoted in this list assume the use of a 365 + 365pF variable capacitor as tuning gangs of this kind are readily available. See Table 1 for C3 and C11 values to suit alternative tuning capacitors. All capacitors 16V working or greater. All electrolytics axial lead unless otherwise stated.

C1 82pF ceramic.  
C2 (MW and LW), C8 and C9 (MW) 2-22pF film dielectric trimmers (4 off)

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 IC1, a TBA820M 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

Band	Long wave	Medium Wave	SW1	SW2	SW3
TR1	BF241	BF241	BC108C	BC108C	BF241
RF Transformer L1/L2	CANIA 350EK (red core) or ferrite loop	RWR 331208 (red core) or ferrite loop	KANK 3333R (violet)	KANK 3334R (yellow)	KANK 3335R (pink)
RF Trimmer C2	2-22pF	2-22pF	2-10pF	2-10pF	2-10pF
Osc. Coil L3/L4	RWR 331208 (red core)	YMR 580046N (blue core)	KANK 3426R (white)	KANK 3337R (green)	KANK 3428R (blue)
Osc. Trimmer C8	5-60pF	2-22pF	2-10pF	2-10pF	2-10pF
Osc. Freq. preset C9	5-60pF	2-22pF	-	-	-
Osc. Frequencies C10	82pF	363pF (330+33pF)	680pF	1000pF	2200pF
TR1 Emitter Bias R4/C7	2k2	2k2	820 ohm	820 ohm	820 ohm
Supply Dropper R3	10nF	10nF	4n7	4n7	4n7
Zener Diode D1	2k7	1k2	100 ohm	100 ohm	100 ohm
Tuning cap. swing reducers C3 and C11 for various tuning capacitor values	-	6V2	8V2	8V2	8V2
	300pF	-	-	430pF (330+100pF)	330pF
	365pF	1800pF	1800pF	330pF	270pF
	500pF	750pF	750pF	270pF	220pF

C2, C8 (SW1-3)  
C8 (LW) and C9 (LW)  
C3, C11 (LW, MW and SW1)  
C3, C11 (SW2)  
C3, C11 (SW3)  
C4, C12

C10 (LW)  
C10 (MW)

C10 (SW1)  
C10 (SW2)  
C10 (SW3)

C5 (all bands), C7 (SW1-3), C26  
C6 (all bands), C22, C32  
C7 (MW and LW)  
C13, C25, C27

C14

C15

C16

C17, C19

C18, C31, C33

C20

C21

C23, C24

C28

C29

C30

C34

C35

C36

2-10pF film dielectric trimmers (6 off)  
5-60pF film dielectric trimmers (2 off)  
1800pF 1% polystyrene (6 off)  
330pF 1% polystyrene (2 off)  
270pF 1% polystyrene (2 off)  
365pF + 365pF Type 02 Gang air-spaced variable

82pF close tolerance ceramic  
323pF (330pF 1% polystyrene + 33p close tolerance ceramic)

680pF 1% polystyrene  
1000pF 5% polystyrene  
2200pF 5% polystyrene

4n7 ceramic (9 off)  
100nF ceramic (7 off)  
10nF ceramic (2 off)

1μF electrolytic (3 off)

4μ7 electrolytic

22pF 5% polystyrene

3-90pF film dielectric trimmer

100pF polystyrene (2 off)

100μF electrolytic, radial lead (3 off)

2μ2 electrolytic

10μF electrolytic

1nF ceramic (2 off)

10nF mylar or polyester

22nF mylar or polyester

47nF mylar or polyester

2n2 ceramic

150μF electrolytic

220nF ceramic

#### Inductors;

Toko coils:

L1/L2 (LW)

L1/L2 (MW)

L1/L2 (SW1)

L1/L2 (SW2)

L1/L2 (SW3)

L3/L4 (LW)

L3/L4 (MW)

L3/L4 (SW1)

L3/L4 (SW2)

L3/L4 (SW3)

L5/L6 (IFT1)

L7/L8 (IFT2)

L9

CAN1A 350EK, or LW ferrite loop

RWR 331208, or MW ferrite loop

KANK3333R

KANK3334R

KANK3335R

RWR 331208

YMRS80046N

KANK3426R

KANK3337R

KANK3428R

YRCS11098AC

See text and Fig. 5.

Transistor AF push-pull driver transformer (see text)

#### Semiconductors;

TR1 (LW, MW and SW3)

TR1 (SW1 and SW2)

TR2

TR3

TR4

IC1

D1 (MW)

D1 (SW1, 2 and 3)

D2

BF241 or BF494 (3 off)

BC108C (2 off)

BF241 or BF494

3SK88

BC169C

TBA820M

6V2 zener

8V2 zener

BB405B varicap.

#### Sundries;

S1 a-f

6 pole, 6 way Maka-switch assembly (one way not used)

4 pole, 4 way switch

S2 a-d

38 SWG enamelled copper wire, length of plastic overflow pipe, stiff card and balsa cement, all for making IFT2 Printed circuit boards, Vero pins and IC holder. Slow motion tuning drive. Hook-up wire. Chassis, dial and case-making materials. Battery holders. Control knobs. Phone socket. Aerial and earth terminals. 3 ohm loudspeaker.

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 Cirkit. 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, BC548. Samples tested were not as active as the metal cased originals.

The specified VHF tuning diode is available from Cirkit, but almost any device of this kind should be satisfactory. Small silicon rectifier diodes, such as the 1N4001, 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 LT44 transformer listed by Maplin and others would be suitable.

Decent air-spaced tuning capacitors can likewise often 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 retailed 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 Maka-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.

quencies, and C23, C24 and C26 shunt the higher frequencies. The feedback capacitor, C34, on IC1, has been in-

creased in value from 220pF (which gives a flat response to 20kHz) to 2n2 in order to further curtail upper audio re-

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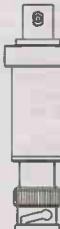


**AR1500EX** - The very compact AR1500EX hand-held wide range receiver offers all mode reception including SSB as standard. Newly designed printed circuit boards have been incorporated to ensure this new version offers the very best performance. Frequency range is 500 kHz ~ 1300 MHz without gaps (reduced sensitivity below approx 2MHz - all modes), all mode reception AM, FM(N), FM(W) & SSB (USB, LSB & CW - with BFO). The AR1500EX offers full coverage of the VHF, UHF and Shortwave Airbands plus Broadcast, Amateur band, Utility services etc. Many accessories included: NiCad pack, Charger, Dry battery case, DC lead, Soft case, Belt hook, DA900 VHF-UHF aerial, SW-wire aerial, Earphone. Comprehensive Operating manual... **Suggested Retail Price of £349.00 inc VAT.** (UK Carriage free)

**AR2000** - this popular receiver continues and remains a firm favourite with listeners and enthusiasts. There has to be a compromise in hand-held design when compared to base units such as the AR3000A receiver. However when compared to other wide range hand-held monitors on the market, the AR2000 provides the very best balance between sensitivity and strong signal handling. The AR2000 has a very wide frequency coverage from 500 kHz to 1300 MHz (1.3 GHz) with no gaps (reduced sensitivity below approx 2MHz - all modes). The modes available are: AM (Amplitude Modulation), FM (Narrow Band Frequency Modulation - N.B.F.M.) and WFM (Wide Band Frequency Modulation). Any available mode may be selected at any frequency within the receiver's coverage. For your convenience the search banks have been preprogrammed at the factory to largely suit the UK band plan, this allows you to switch on the AR2000 and immediately enjoy hours of no fuss listening. Of course the AR2000 is supplied with an operating manual showing examples of programming etc. There are 1000 memories arranged in 10 banks of 100 channels, there are also 10 additional programmable search banks. Supplied with: High Capacity NiCad batteries, AC charger, DC lead, DA900 VHF-UHF aerial, soft case with carry strap, belt hook, earphone and operating manual. **Suggested Retail Price £309.00 inc VAT.** (UK Carriage free)



### ABF-125 VHF Air Band Filter for better strong signal performance...



The ABF125 is a receive bandpass filter especially designed to improve the strong signal handling characteristics of receivers for VHF commercial Airband listening. The ABF125 is suitable for connection to most airband and wide range receivers on the market, it is not designed just for AOR branded products. The addition of this filter to the aerial signal path will provide additional selectivity which will enable the receiver's circuitry to cope much more easily with strong interfering signals such as Band-2 Stereo or Shortwave broadcast transmissions which can be manifest in many ways such as 'hissing', mixing of many signals together, music breakthrough and desensitisation of the receiver. The ABF125 is not an amplifier so will not 'boost' signals, however the additional selectivity offered can significantly improve reception in many situations by removing unwanted strong signals which may overload the receiver and reduce its effectiveness.

Note: Remember to remove the ABF125 from the aerial when monitoring signals other than VHF Airband or signal strength will be dramatically reduced. **Suggested Retail Price £24.50 inc VAT.** (UK Carriage £1.50)

With the AR3000A (base-mobile receiver) your listening horizons are truly extended providing receive coverage from 100 kHz all the way up to 2036 MHz without any gaps in the range. The AR3000A offers the widest coverage on the market today with a high level of performance and versatility from long wave through shortwave, VHF and onward to the upper limits of UHF and SHF. Not only will the AR3000A cover this extremely wide range it will allow listening on any mode: NFM, WFM, AM, USB, LSB and CW. The AR3000A also features an RS232C port for computer control. **Suggested Retail Price £949.00 including VAT.** (UK Carriage free)



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# SCANNERS

## 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 waffer on my patch last year 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 coincidentally turning up his car was searched and two handheld scanners found. Most unfortunately for Mr. Scanman, 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 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 with her Majesty's constabulary! Act sensibly, and hopefully it'll only be the villains who get (rightfully) 'banged up'.

## 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 uproar, with or without attenuator. Then through the tuner or matchbox, loud and

## 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 microscopic handheld 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, 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

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 (600Hz high on USB, 2.4kHz low on LSB, should it have been 1500Hz 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 more money. After all, having regard to the PR150/HF150, it seems Lowe is thinking thus, albeit somewhat expensively! Try a tuner kit, or a tuned loop type of aerial. Or perhaps even the front end of an old type radio, with advice, and probably attenuation.

What puzzles an old-timer is, what with the batteries and the display and the speaker and all the logic in that tiny case, where does

### 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 scanner, 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 16dB gain. Strong out-of-band signals are likely to be attenuated, giving further performance benefits. The product is packaged in a stove-enamelled 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 £28.95 inc. post and VAT, we hope to feature a test of this in next month's *Scanners*.

the radio go? And how to stop it being nicked? Don't leave that problem with the HRO. Alex Dick, 'Sandy' GM0IRZ.

### 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 Haigh to accompany the HF multimode receiver project in the current mag!

Why not send us a letter for publication? Send yours to Sheila Lorek, Editor *Scanners*! HRF, Argus Specialist Publications, Argus House, Boundary Way, Hemel Hempstead, Herts. HP2 7ST, or you can fax your letter direct to the Editor's desk on 0703 263429.

# HAM RADIO TODAY

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*Yupiteru  
MVT-3100  
Reviewed*



*Build a Long, Medium  
and Short Wave Superhet  
Receiver.*



# 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 marker' 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,

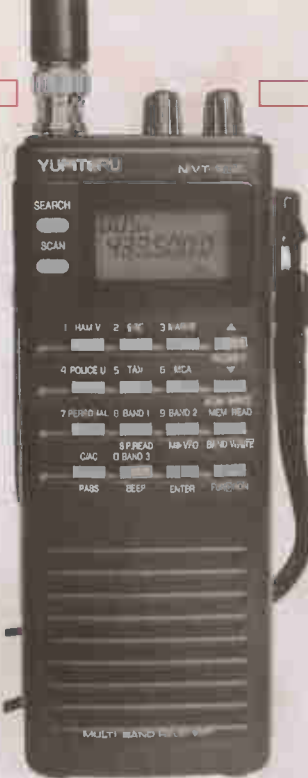
MCA, PERSONAL, BAND 1, BAND 2, and BAND 3 on the set's keypad, undoubtedly conforming to Japanese-used bands (which of course you can program to whatever you wish within the frequency coverage range). The set scans at around 30 memory channels per sec, and around 40 steps per second in 'search' mode.

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') with 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 S-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 remainder 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 90MHz 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 nicads and charger, and my thanks go to Nevada Ltd. in Portsmouth for loaning 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  $\mu\text{V}$  pd required to give 12dB SINAD;

Freq.	Sensitivity
145MHz	0.21
150MHz	0.22
155MHz	0.23
160MHz	0.20
350MHz	0.16
375MHz	0.18
400MHz	0.16
425MHz	0.18
450MHz	0.22
850MHz	0.18
875MHz	0.24
900MHz	0.36
925MHz	0.35
950MHz	0.39

### Squelch Sensitivity:

Level of signal required to raise receiver squelch

Threshold;	0.13 $\mu\text{V}$ pd (4dB SINAD)
Maximum;	0.63 $\mu\text{V}$ pd (25dB SINAD)

### Adjacent Channel Selectivity;

Measured on 145MHz FM as increase in level of interfering signal, modulated with 400Hz, at 1.5kHz deviation, above 12dB SINAD ref. level to cause 6dB degradation in 12dB on-channel signal;

+12.5kHz;	37.5dB
-12.5kHz;	37.7dB
+25kHz;	44.4dB
-25kHz;	47.0dB

### Blocking;

Measured on 145MHz FM as increase over 12dB SINAD level of interfering signal modulated with 400Hz at 1.5kHz deviation to cause 6dB degradation in 12dB SINAD on-channel signal;

+100kHz;	62.8dB
+1MHz;	77.4dB
+10MHz;	69.3dB

### Intermodulation Rejection;

Measured on 145MHz FM as increase over 12dB SINAD level of two interfering signals giving identical 12dB SINAD on-channel 3rd order intermodulation product;

25/50kHz spacing;	61.7dB
50/100kHz spacing;	59.5dB

### Image Rejection

Difference in level between unwanted (+/- 90MHz) and wanted signal levels, each giving 12dB SINAD on-channel 145MHz FM signals;

145MHz;	>100dB
435MHz;	58.9dB
935MHz;	>100dB

### 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

Indication	Level	Rel. Level
1	0.27 $\mu\text{V}$ pd	0dB ref.
2	0.47 $\mu\text{V}$ pd	+4.7dB
3	0.80 $\mu\text{V}$ pd	+9.3dB
4	1.77 $\mu\text{V}$ pd	+16.2dB
5	4.58 $\mu\text{V}$ pd	+24.4dB

### Current Consumption

Scanning, no signal;	58mA
Receive, mid volume;	95mA
Receive, max. volume;	119mA



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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



Geoff Arnold G3GSR

Geoff and Barbara Arnold are often seen at rallies 'flying the flag' for Morsum Magnificat and Radio Bygones



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 Postmaster General's Certificate, qualifying me to operate 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-105S 10W semi-kit HF transmitter, 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 on the air for some time. I'm just too darned busy, editing *Radio Bygones* and *Morsum Magnificat* magazines, attending rallies, writing articles and so on. One of these days, I promise myself.

