Cirkit has introduced a new rechargeable soldering iron, which is ideal for soldering CMOS and other static sensitive devices and for site work where no mains supply is available.

Rated at 12W, with fast warm-up time and small 2mm diameter tip, the unit comes complete with mains charger, wall mounted socket and a 12V car charging lead which is connected via the vehicle's cigarette lighter. Up to 200 standard joints can be made from one charge of 12 hours.

Featuring an illuminated tip, for which spares are readily available, the soldering iron also has a safety hood for protection during operation.

For further information please contact: Cirkit Holdings PLC, Park Lane, Broxbourne, Hertfordshire EN10 7NQ. Tel: (0992) 444111.

### REPLACEMENT TIPS

A range of replacement tips, with diameters of 1.0, 2.4, 3.2 and 4.8mm have been announced by Freetrade (TEP) Ltd for the Portasol portable gas powered soldering iron.

The tips are easily fitted and include the patented catalytic converter that generates heat right at the tip for maximum efficiency. Powered by gas cigarette lighter fuel, the Portasol has a variable temperature range of up to 400°C - equivalent to an electric iron's output power from 10 to 60W. One filling of gas gives up to 60 minutes of continuous operation.

No larger than a felt-tip pen, Portasol can be carried in a top pocket and has a clip-on cover with a built-in igniter. The powerful gas-operated heater gives a stable output that is superior to battery-operated portable types. This frees the user from having to work near a mains power point or bother with extension cables.

For further information please contact: Freetrade (TEP) Ltd, Moor Lane, Witton, Birmingham B6 7HH. Tel: (021) 356 2582.

### PORTABLE SIGNAL GENERATOR

Now available from Electronic Brokers is the Marconi Instruments 2022A, a lightweight, rugged RF signal generator which has a 10kHz to 1000MHz frequency range. The 2022A is ideal for radio service and maintenance applications, and is also suitable for use in education, training and production. The instrument's wide frequency range includes all the radio communication bands from HF to UHF including IF stages. Measurement on narrow-band receivers is enabled by a 10Hz carrier frequency resolution. Amplitude, frequency, and phase modulation are available for comprehensive tests on most types of radio; external modulation extends these facilities.

Features of the RF signal generator include harmonically related signals of typically -35dBc; non-harmonically related signals of better than -70dBc at offsets greater than 3kHz from the carrier; and sub-harmonics of -20dBc for carriers above 500MHz. The residual frequency modulation is less than 10Hz equivalent peak deviation in a 300Hz to 3kHz bandwidth at 490MHz.

The 2022A also has a frequency modulation resolution of 10Hz up to 9.99kHz and 100Hz above 9.99kHz, and a phase modulation resolution of 0.01 radians (both figures accurate to within ±5% of deviation). The amplitude modulation has a depth of 0-99.5% with a 0.5% resolution, and an accuracy of better than ±4%.

Other features include a non-volatile memory with 100 settings; logical, colour-coded keys to enable easy fixing of parameters; and a large liquid crystal display (LCD) readout to show all settings. The output level is set up and displayed in a variety of units for operator convenience, with single key conversion of units. Parameters may be incremented in user-defined steps, thus enabling rapid manual measurements.

Easily portable, the 2022A RF signal generator measures just 152 x 256 x 367mm (excluding handle), and weighs 7.5kg. A range of optional accessories are available including GPIB module, RF connecting cable, GPIB lead, and double and single rack mounting kits.

For further information contact: Electronic Brokers Limited, 140-146 Camden Street, London NW1 9PB. Tel: 01-287 7070.
A 13.8V 20A PSU

Pakratt’s PK-232 reviewed

HF antennas for small gardens

On test: Kenwood TW-4100E FM mobile and the Sony ICF Pro-80 ‘World Radio’
R. WITHERS COMMUNICATIONS LTD
Manufacturers, importers and suppliers of world famous communications products
584 HAGLEY ROAD WEST OLDURY, WARLEY, BIRMINGHAM B68 0BS
021-421 8201/2/3. VODAFONE 0836 504587. PRESTEL MBX 214218216 FAX 0214214668

THE TECHNICALLY ORIENTATED RADIO COMMUNICATIONS SPECIALISTS.

YAESU SPECIAL
WHILE STOCKS LAST!!

FT757G x Mk 1 ........................................ £799.00
plus £10.00 carriage                      £799.00

FT726 R/2 mtr ........................................ £799.00
plus £10.00 carriage                      £799.00

FT209 R/FNB3  inc wall charger and postage  £189.00
FRV8800 VHF converter                     £79.00
postage £5.00

PLEASE CALL FOR OTHER SUPER BARGAINS THIS MONTH

* SCANNING RECEIVERS *
WE OFFER THE LARGEST RANGE AND OPTIONS

YAESU FRG9600 MK1 60-905 MHZ .......................... £459.00 P/P £10.00
YAESU FRG9600 MK2 60-950 MHZ .......................... £499.00 P/P £10.00
YAESU FRG9600 MK3 100 KHZ-950 MHZ ................. £599.00 P/P £10.00

YAESU FRG9600 MK3 PACKAGE:  *
MK3 Receiver, ICOM AH7000 Super Discone Antenna, PA4C AC Adapter, 1/2 size GS5V Complete
Hf-LHf Broadcast/Amateur/FMR Receiving Station £699.00 inc. carriage. Options: PAL Video Unit (In £275.00,
BBC CONTROLLER PROG. £49.50 inc. post. Existing owners please note we offer extended coverage, improved sensitivity. Hf
mod, sae or phone for more details.

* ICOM ICR7000E *
25-1300MHZ SPECIAL PRICE £862.50 carri. £10.00. ICR7000E with AH7000 antenna at £942.50. carri. £10.00.

THE WORLD'S BEST KNOWN SCANNERS, DIRECT FROM THE DISTRIBUTORS
Bearcat Scanners are value for money and the most popular.

* BEARCAT *
UBC100XL LB/AIR BAND VHF-UHF Handheld          £219.00 POST FREE
UBC175XL as above, desk-top FREE DISCONE         £209.00 POST FREE
FDK AIR BAND SYNTHESIZED H H 118-136 MHZ         £139.00 POST £3.00
FDK VHF-FM SYNTH. H H ELD 119-174 MHZ           £145.00 POST £3.00
REGENCY HF850 AM-FM VHF-UHF H H SCANNER         £235.00 POST £3.00
REGENCY MK7000 AM-FM VHF-UHF TO TOP SCANNER.   £399.00 POST £5.00
(Coverage the same as the AOR2002)

WE STOCK ALL CURRENTLY AVAILABLE MAKES OF SCANNING RECEIVERS

* SPECIAL MOBILE ANTENNA OFFER *
SUN KG309SE2 5/8 Ant c/w Moulded SO239 Lead and guttermount assy. .................. £20.00 inc post

* 6 METERS *

SPECIAL OFFER for PYE A200 Linear Amplifiers. We have various models available. Tested working with 3 month guarantee. For 4m, 6m
and 2m. 5W to 10W input. 10-60W output. All modes. mod kits available for 6m conversion
Prices range from.
6M DIPOLE KIT ........................................ £39.00 P/P £3.50
6M DIPOLE KIT ........................................ £9.50 P/P £3.00

Important. Please confirm your order before sending payment as we do not wish you to be disappointed if the model you require is sold out or the price has gone up! Special offers are subject to change without prior notice.

ALL PRICES CORRECT AT TIME OF GOING TO PRESS.

Tel: 021 421 8201 (24hr answerphone)
Telex: 337676 G TELEX-G

World Radio History
6 Straight and Level
All the latest news, comment and developments on the amateur radio scene

12 DX Diary
Don Field G3XTT with this month’s DX news

14 HF antennas for small gardens
A new series to help you get the best out of your rig, no matter what your QTH is

19 Angus McKenzie Tests
This month G3OSS reviews the new Kenwood TW4100E mobile dual bander and the Sony ICF Pro-80 World coverage receiver

26 SWL
Trevor Morgan GW4OXB introduces newcomers to the different aspects of listening

28 Friedrichshafen 1987
A look at what the DARC Amateur Radio Exhibition had on offer

32 A complete 13.8V 20A PSU
Build a Power supply to power your linear or HF rig without breaking the bank

38 Pakratt PK232 - user review
Ken Michaelson looks at one of the multimode controllers now available on the market

42 50MHz – expectations realised
Ken Ellis G5KW reports on the wealth of contacts made during the lifting conditions

45 Morse Report
Tony Smith G4FAI takes his bi-monthly look at the world of dots and dashes

46 Project Book
Martyn Williams discusses suitable aerials to get you onto the 6m band

48 On the Beam
Glen Ross G8MWR with all the latest news from VHF, UHF and microwaves

49 Coming next month
What’s in store for you

50 Secondhand
Don’t give up on an intermittent repair, follow G3XSE’s methods for a quick solution to the problem

53 Free Classified Ads
The market for buying and selling

SERVICES
11 Back issues order form
37 Subscription order form
51 Newsagents order form
52 Radio and Electronics World subscription order form
55 Free Classified Ad order form
58 Advertising rates and information
**P.M. COMPONENTS LTD**

**SELECTION HOUSE**

**SPRINGHEAD ENTERPRISE PARK**

**SPRINGHEAD ROAD**, **GRAVESEND**, **KENT**, **DA11 8HD**

**TELEX**

966371

**TOS PM**

---

**INTEGRATED CIRCUITS**

<table>
<thead>
<tr>
<th>AN103L</th>
<th>99.50</th>
<th>L100</th>
<th>99.50</th>
<th>TA1000</th>
<th>79.50</th>
</tr>
</thead>
<tbody>
<tr>
<td>AN103H</td>
<td>99.50</td>
<td>L101</td>
<td>29.50</td>
<td>TA1001</td>
<td>79.50</td>
</tr>
<tr>
<td>AN103G</td>
<td>99.50</td>
<td>L102</td>
<td>29.50</td>
<td>TA1002</td>
<td>79.50</td>
</tr>
<tr>
<td>AN103F</td>
<td>99.50</td>
<td>L103</td>
<td>29.50</td>
<td>TA1003</td>
<td>79.50</td>
</tr>
<tr>
<td>AN103E</td>
<td>99.50</td>
<td>L104</td>
<td>29.50</td>
<td>TA1004</td>
<td>79.50</td>
</tr>
<tr>
<td>AN103D</td>
<td>99.50</td>
<td>L105</td>
<td>29.50</td>
<td>TA1005</td>
<td>79.50</td>
</tr>
<tr>
<td>AN103C</td>
<td>99.50</td>
<td>L106</td>
<td>29.50</td>
<td>TA1006</td>
<td>79.50</td>
</tr>
<tr>
<td>AN103B</td>
<td>99.50</td>
<td>L107</td>
<td>29.50</td>
<td>TA1007</td>
<td>79.50</td>
</tr>
<tr>
<td>AN103A</td>
<td>99.50</td>
<td>L108</td>
<td>29.50</td>
<td>TA1008</td>
<td>79.50</td>
</tr>
</tbody>
</table>

---

**DIODES**

<table>
<thead>
<tr>
<th>BYX13-150</th>
<th>9.50</th>
</tr>
</thead>
<tbody>
<tr>
<td>BYX13-100</td>
<td>7.95</td>
</tr>
<tr>
<td>BYX13-50</td>
<td>6.35</td>
</tr>
<tr>
<td>BYX13-35</td>
<td>6.35</td>
</tr>
<tr>
<td>BYX13-30</td>
<td>6.35</td>
</tr>
</tbody>
</table>

---

**FUSES**

<table>
<thead>
<tr>
<th>0.10 grains</th>
<th>0.15 grains</th>
<th>0.25 grains</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.25 inch 0.10 grain</td>
<td>1.25 inch 0.15 grain</td>
<td>1.25 inch 0.25 grain</td>
</tr>
</tbody>
</table>

---

**ZENER DIODES**

| BZT611 Series | 0.15 |
| BZT618 Series | 0.15 |

---

**EHT MULTIPLIERS**

| General Tripler | 5.45 |
| Decou 68 | 6.95 |
| Decou 90 | 6.95 |
| Decou 95 | 6.95 |
| Decou 96 | 6.95 |
| Decou 97 | 6.95 |
| Decou 98 | 6.95 |

---

**VIDEO HEADS**

**NEW RANGE -- LOWER PRICES**

| If in doubt please phone quoting your model number and we will confirm the head you require. |  |
| 3HEV | For National Panasonic/Philips | 27.50 |
| 3HES | For National Panasonic/NTV/NTV/300 | 29.50 |
| 3HSH | For Hitachi | 38.00 |
| 3HSE | For National Panasonic | 30.00 |
| 3HSA | For Sharp | 30.00 |
| 3HSS | For National Panasonic Industrial | 39.50 |
| 3HST | For Fujitsu/Fisher | 39.50 |
| 3HSM | For Amsted/Smith & Trumph | 39.50 |
| 3HSA | For Sony SL/O.6 etc | 39.50 |

---

**VIDEO BELT KITS**

| 2000/5000/50000 | 0.25 |
| 2000/50000 | 0.25 |
| 2000/500000 | 0.25 |

---

**VARICAP TUNERS**

| EL2COS4000 | 8.55 |
| EL2COS4000 | 8.55 |
| EL2COS4000 | 8.55 |
| EL2COS4000 | 8.55 |
| EL2COS4000 | 8.55 |

---

**CATHODE RAY TUBES**

| 3608/3608 | 0.15 |
| 3608/3608 | 0.15 |
| 3608/3608 | 0.15 |

---

**A SELECTION FROM OUR STOCK OF BRANDED VALVES**

| BC207 | 2.75 |
| BC206 | 2.75 |
| BC205 | 2.75 |
| BC204 | 2.75 |

---

**PUSH BUTTON UNITS**

| GCE048 | 6 way | 9.50 |
| GCE048 | 6 way | 9.50 |
| GCE048 | 6 way | 9.50 |
| GCE048 | 6 way | 9.50 |
| GCE048 | 6 way | 9.50 |

---

**TV MAIN SWITCHES**

| Matsushita CV650 | 1.00 |
| Matsushita CV650 | 1.00 |
| Matsushita CV650 | 1.00 |

---

**WIREWOUND RESISTORS**

| 0.1 watt | 2.75 |
| 0.1 watt | 2.75 |
| 0.1 watt | 2.75 |

---

**THERMISTORS**

| 10K | 0.25 |
| 10K | 0.25 |
| 10K | 0.25 |

---

**TV Antenna/Arm & Poles**

| 70cm | 0.75 |
| 70cm | 0.75 |
| 70cm | 0.75 |

---

**CDU/CUMB**

| BC151 | 2.75 |
| BC151 | 2.75 |
| BC151 | 2.75 |

---

**OTHER**

| 4000/4000 | 0.25 |
| 4000/4000 | 0.25 |
| 4000/4000 | 0.25 |

---

**VIDEOLAND/VIEW**

| 4000/4000 | 0.25 |
| 4000/4000 | 0.25 |
| 4000/4000 | 0.25 |

---

**AMATEUR RADIO**

- Please mention AMATEUR RADIO when replying to any advertisement.
**A SELECTION FROM OUR STOCK OF BRANDED VALVES (Contd)**

<table>
<thead>
<tr>
<th>Valve</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECC83</td>
<td>3.95</td>
</tr>
<tr>
<td>ECC81</td>
<td>2.50</td>
</tr>
<tr>
<td>E8100</td>
<td>25.00</td>
</tr>
<tr>
<td>ECC81</td>
<td>12.00</td>
</tr>
<tr>
<td>ECC81</td>
<td>1.50</td>
</tr>
<tr>
<td>EC811</td>
<td>1.10</td>
</tr>
<tr>
<td>E182</td>
<td>1.75</td>
</tr>
<tr>
<td>EC818</td>
<td>0.85</td>
</tr>
<tr>
<td>E102</td>
<td>6.00</td>
</tr>
<tr>
<td>E101</td>
<td>1.50</td>
</tr>
<tr>
<td>E101</td>
<td>0.75</td>
</tr>
<tr>
<td>E101</td>
<td>0.50</td>
</tr>
<tr>
<td>E101</td>
<td>0.40</td>
</tr>
<tr>
<td>E101</td>
<td>0.30</td>
</tr>
<tr>
<td>E101</td>
<td>0.15</td>
</tr>
<tr>
<td>E101</td>
<td>0.05</td>
</tr>
</tbody>
</table>

**SELECTRON HOUSE**
GRAVESEND, KENT DA11 8HD

**TELEX**
966371

**PHONE**
0474 60521

3 LINES

---

SEPTEMBER 1987 please mention AMATEUR RADIO when replying to any advertisement
Telecomms are pleased to announce the launch of their new Nevada 1kW all band ATU, model TM1000. The unit is a natural extension of their Nevada Professional Series of discrete ATU components, i.e. the roller coaster, turns counter and variable capacitors, that they have released over the last nine months.

The ATU is continuously variable from 1.8-30MHz and uses a transmatch circuit that allows for maximum flexibility. The unit can handle a wide range of antenna impedances.

At £125 (including VAT), the TM1000 is priced very competitively.

For those who still wish to construct the ATU, Telecomms are offering the unit in kit form, which includes: the empty case (pre-drilled), 2 capacitors, 1 roller coaster and 1 turns counter, at a cost of £100 (including VAT).

Telecomms have already received many enquiries from around the world for this unit, and one sample has already been sent to the Flying Doctor service in Australia where it will be used for emergency communications.

For further information contact: Telecomms, 189 London Road, North End, Portsmouth, Hants PO2 9AE. Tel: (0705) 662145.

**IMPROVED FT767**

Ray Withers Communications Ltd have done it again with another World first with their popular series of modifications. The FT767 is a very attractive set, giving a host of features at an economical price when compared to its competition. It is, however, let down by its lack of dynamic range due to synthesizer phase noise (see December 1986 review). This now means that the RWC FT767 Mk2 has the best performance for a multiband base station radio in this class.

Extensive laboratory development work has resulted in an add-on PCB modification improving the dynamic range by up to 20dB. This results in better DX receiving capability in the presence of heavy QRM, which of course is very important on today’s crowded bands. The modification at present is not available in kit form. Normal warranty is not affected on sets purchased from RWC Ltd.

Latest SMD type 'chip component' technology has been employed in the modification board to provide the required performance and reliability. This mod is now fitted as standard to all FT767s supplied by RWC, and may be fitted at a cost of £49.50 (including return carriage) to models previously also purchased from RWC.

So now discerning radio amateurs can have the ultimate in performance as well as a host of operating features without needing a sympathetic bank manager!

For further information please contact: R Withers Communications Ltd, 584 Hagley Road, West Oldbury, West Midlands B68 6BS. Tel: (021) 421 8201.

**REPLACEMENT NICADS**

Withers have also brought out a new range of cost effective replacement NiCad battery packs, empty cell cases and desk-top chargers for the Icom, Kenpro, and CTE range of hand-held transceivers.

Two fast charge fully compatible models are available for business and professional uses, designated 10AF (10V @ 800mAh) and 12AF (12V @ 550mAh). These are directly
equivalent to the icom range of NiCads and can be fast charged in the icom BC35 and BC60 chargers.

The new Raycom NC580 desk-top charger has been designed to charge all icom type NiCad packs over 400mAh capacity, and has two switchable charging rates available as standard.

For further information please contact: Electronic & Computer Workshop Ltd, Unit 1, Cromwell Centre, Stepfield, Witham, Essex CM8 3TH.

CAPACITANCE METER

Levell Electronics are pleased to announce the new digital capacitance meter, type 7705, which has 0.1pF resolution and is priced at £49 plus VAT.

The hand-held capacitance meter has a 3½ digit, 0.5in high, liquid crystal display with ranges from 200pF to 2000μF. Accuracy on most ranges is ±0.5% reading + 1 digit; The test voltage is 3.2V peak with input protection fuse and a measurement rate of 2 per second. The meter is powered by a PP3 type battery. Indications of low battery and overrange readings are provided on the display.

The 7705 weighs only 350gm, has a high impact ABS case, 180 x 87 x 42mm, and is provided with a tilt stand for bench use.

For further information contact: Levell Electronics Ltd, Moxon Street, Barnet, Herts EN5 5SD.

HAND-HELD MULTIMETER

Electronic Brokers offer the Fluke 8060A series of hand-held digital multimeters, the first digital hand-held test instrument to offer frequency measurement capabilities. Ranges include 200Hz, 2000Hz and 200kHz, all of which are fully autoranged, thereby enabling easy servicing of a wide range of communications equipment. The instruments are also suitable for other applications in design, manufacturing and field servicing.

With a basic dc accuracy of 0.04%, the multimeter measures ac and dc voltages and currents, resistances, and continuity, and includes a diode test function. The 8060A has a 10μV, 10nA and 10mΩ sensitivity with excellent stability to the least significant digit. A wideband true rms ac capability enables accurate measurements of non-sinusoidal signals from 12Hz to 100kHz.

The 8060A DMM also features a relative reference capability that provides for relative or offset measurements in any function or range. Readings are displayed as a + or – deviation from the stored value. The 8060A will remember the proper function and range for the value stored, even if the user changes functions.

Other features include overload protection to 1000V dc, or 750V ac and to 500V (resistance), a sophisticated self-diagnostic procedure; and the ability to display ac or dc voltage measurements directly in dB, dBm (referred to 0dBm), or relative dB, thus allowing simplified amplifier gain tests.

For further information contact: Electronic Brokers Limited, 140-146 Camden Street, London NW1 9PB. Tel: 01-267 7070.
National car boot sale

The National Amateur Radio Car Boot Sale is being held at the Shuttleworth Collection, Old Warden Aerodrome, on Sunday 13th September.

Each year Dunstable Downs Radio Club organises and runs the event, which has become a very popular rally. Although termed as a rally, it is really quite different from other rallies throughout the year. One of the main reasons for this is that although there are many traders, the event caters mainly for amateurs selling to amateurs.

Over 250 stalls were present last year, and with more than 2,500 visitors a great atmosphere has been created with people selling almost every conceivable item from new transceivers, computers and televisions, to components, kits, aerials and yes, some plain old 'junk, but all at real bargain prices. Two comments heard were that 'It's a true amateur radio rally, not just a shiny black box sale', and 'Just how rallies used to be, it's great'.

In fact the Dunstable Downs RC has managed to provide a great day out for the whole family, as the event is held at one of this country's famous aircraft and motor museums – The Shuttleworth Collection, located at Old Warden Aerodrome, near Biggleswade, Bedfordshire. The museum has aeroplanes dating back to the pioneers of aviation, and many of these planes are still in regular flight today. Combine this with a restaurant, souvenir shop, bar, and children's playground all set in the Bedfordshire countryside and you only have to ask those who have attended this event previously to see that it is one of the most unique, interesting and probably the largest event of its kind in the country.

This is now the fourth year that the event has been run, and it will be open from 10am till 5pm, and admission is only 50p (parking free). Old Warden is about 2 miles west of Biggleswade and is easy to find as it is well signposted from all major routes.

Enquiries about the event can be made to Wendy on (0582) 451057, or Clive on (0582) 27907.

29th Harlow Mobile Rally

This year the Harlow Rally on 27th September returns to its traditional date on the last Sunday in the month, and will take place as usual at the Harlow Sports Centre.

Expansion at the sports centre will mean better facilities for this year's rally. A new second hall has been added that will enable a larger number and a greater variety of traders to be accommodated. They have also been informed that the catering facilities will be much improved over last year.

The sports centre has easy access from either the M11 (Junction 7) or the A1, and will be fully signposted with talk-in by G6UT on S22. As usual, ample free parking will be available adjacent to the sports centre.

As last year, Morse tests will be available and there will be exhibits by a number of special interest groups. There will be reserved parking for the disabled and also the separate entrance for bring and buy sellers.

The entry price has been held at £1 for the third year, with accompanied children free. Details are available from G4KV (0279) 22365 (daytime and evenings) and G3UEG (0279) 27786 (evening and weekends).

Midlands VHFA Convention

The RSGB Midlands VHFA Convention is being held on Saturday 10th October 1987, at Madeley Court Centre, Telford, Shropshire. The main part of the Convention will start at 1100.

The Convention program includes the following: 1200-1330, RSGB RMG Open Forum; 1330-1345, Opening Address by Malcolm Appleby G3ZNU; 1345-1445, Advanced Long Yagi Design by Ian White G3SEK; 1455-1605, Design of Commercial Equipment for The Amateur Market; 1605-1715, The ins and Outs of the Modern Amplifiers by Barry Chambers G8AGN; 1715-1900, VHF Forum. The Forum will be followed by an evening buffet with bar until 2200. There will be lunchtime catering (snacks and bar).

There will be a small trade show, bring and buy stall and book stall, Admission is £1.20, and evening buffet tickets, price £5.50, are available by advance booking. There is ample free parking. The Convention site is readily accessible via the M54 motorway, and talk-in will be provided (details later). A how-to-get-there map is available from the organisers for a stamped, addressed envelope.

The RSGB Midlands VHFA Convention provides an excellent opportunity to meet fellow VHFA (and UHF/Microwave) enthusiasts in comfortable, uncrowded surroundings.

Further details, etc are available from the secretary to the organising committee at 28 Langley Road, Amersham, Bucks, HP7 9LH.

The Sheffield Award

The Sheffield Amateur Radio Club is going on a day trip to the Lincoln Hamfest on Sunday 13th September, finishing a busy day with a meal at the Old Barn Restaurant, Dunham Bridge. Later in the month it is hoped that Peter Sheppard G4EJP will be able to give a talk on Raynet.

The club is also announcing the re-introduction of the Sheffield Award, originally given to any station who has been able to make a contact to the Lincoln Hamfest. The Award will also be given to any station who has worked five Sheffield stations on the bands from 1.3GHz up.

Sheffield stations are those found within the Metropolitan District. Club meetings are held every Monday at 8pm in the Firth Park Pavilion, Sheffield. Tuition takes place between 7 and 8pm.

SMC Open Day

On 30th August SMC are holding a special open day to celebrate the opening of their new premises. Although they have held open days annually in the past, this will be an event not to miss, as the opening of new premises is not likely to occur annually.

To celebrate the occasion, SMC are offering 10% off of all new equipment of cash purchases (except masts), and there will be many ex demo and secondhand bargains and odd lengths of cable at half price. There will also be coupled with numerous other prizes, and a free radio specification check between 1.8-430MHz.

There will be an opportunity to win an FT250R and numerous other prizes, and a licensed bar will be available for refreshments. All this coupled with numerous local attractions make it a good opportunity for a day out with the family. Talk-in will be available on S22.

For further information contact: South Midlands Communications, SMC, School Close, Chandlers Ford Industrial Estate, Eastleigh, Hampshire SO5 3BY. Tel: (0703) 255111.

Wimbledon quiz

Wimbledon and District Amateur Radio Society is holding its annual bazaar on September 11th. A quiz with CATS is scheduled for
September 14th – this is an away meeting. G3JUL is giving a talk later in the month, on September 25th, on 'The Science Museum Radio Station'. All WDARS meetings are held on the second and last Fridays of each month at 7.30pm in St Andrews Church Hall, Herbert Road, Wimborne, London SW19. Enquiries should be referred to the hon secretary, George Cripps G3DWW, tel 01-540 2180.

FT102 users group
Those who own the Yaesu FT102 HF rig may be interested to know that a user’s group has been formed. Don Quinn G14PCO explains that this is intended to provide an information exchange for fault diagnosis, maintenance hints and so forth. The group hopes to have an occasional newsletter and a regular net on-air. Anyone interested should write to Don at 58 William Alexander Park, Belfast BT10 0LX.

Desert Rats calling
Special Event Stations will be on the air at the El Alamein reunion of the 8th Army veteran’s association. This is taking place at the Great Hall, Town Hall, Hove, Sussex in the presence of the Mayor of Hove and Brighton. The callsign is G88EAR, which will be operating on 144MHz. This event takes place on October 24th, and all ex-service personnel are welcome. Send a remittance of £4.00 per person and an SAE for tickets to EJ Pretty. The Garage, Partridge Green, Horsham, West Sussex, RH13 8JS or D Dacey, 87 Staplefield Drive, Brighton BN2 4RH.

A further special event station will be set up at the Winter Gardens, Blackpool on October 31st, again run by the Royal Signals Amateur Radio Society to work other RSARS/RAFARS/RNARS members. The callsign will be G88AER.

Rainbows and doves
An attractive event is being organised by the Loughton and District Amateur Radio Society, who are holding their Rainbow and Dove weekend at Hastingwood Common, Harlow, Essex on September 5th and 6th. On a more down-to-earth note, an HF DF hunt is taking place on September 11th, from 7.30pm for a 7.45pm first call. The frequency is 1.905MHz ± ORM. The call-sign is G40NP. An informal night on the air is also scheduled for September 25th, club callsign as above.

All events are held at the Loughton Hall, Rectory Lane, Loughton, Essex (unless stated otherwise). Details can be obtained from John Ray GB8DZH, 9 Albion Hill, Loughton, Essex IG10 4RA.

RSGB key-in
The RSGB is holding a Straight Key Day on Saturday October 10th, which is sure to be popular with many radio amateurs. The HF Committee is keen to encourage the use of CW by newcomers to HF amateur radio, although it is hoped that ‘oldtimers’ will also participate.

The event will take place on 80 metres to ensure full UK coverage. Participants are asked not to stray into the DX portion of the band, nor into the QRP area around 3560kHz, though QRP operators are welcome to participate in the event. Normal QSO information will be expanded to include details of the key being used, such as its age and any interesting history. Photos of keys used would be welcome for inclusion in any later write-ups. The event takes place from 8am to 9pm, 3515-3555kHz.

For further information contact Don Field G3XTT on 01-631 2002.

BARTG AGM
BARTG are holding their AGM on Saturday, November 7th at 2pm in the Churchill Room, London House, Mecklenburgh Square, London WC1 (close to Kings Cross). All members are welcome, one topic for discussion being the annual subscription rate, which is currently £7 for UK members, £10 for Europe and overseas surface post and £16 for overseas airmail. To apply for membership, contact Mrs Pat Beedie G1BEU (left), outgoing president, congratulates EI6BUB, the new president of the IRTS
London Morse tests

Since the Radio Society of Great Britain began administering Morse tests for radio amateurs, on behalf of the Department of Trade and Industry, it has been difficult to find suitable accommodation in central London.

Consequently, many amateurs have had to travel long distances to sit the examination.

However, the BBC Club’s Ariel Radio Group has now been able to negotiate with the Senior Examiner and arrange for tests to be conducted in Shepherd’s Bush on a trial basis, commencing in about eight weeks, subject to official confirmation between the RSGB and the BBC.

Bob Simmons, Ariel’s station manager at Woodlands, Wood Lane, W12, said he was delighted that this facility was available, not only to BBC Club members, but to other amateurs living in London. I am very pleased that the BBC Premises Department has been able to assist like this,' he said.

Bob had to travel some distance to take the test himself, and decided that he could take some action to help others in the same predicament.

The RSGB will be advertising the details in due course, although it is expected that the tests would run from 9.30am to 4pm one Saturday a month, and that all candidates’ tests would be by prior appointment.

Further details about the Ariel Radio Group are available from the Hon Secretary, Trevor Butler, Room 33a Broadcasting House, London W1A 1AA. Tel: 01-927 4372 and 01-747 0624.

Kent Repeater Group

The Kent Repeater Group was formed in 1974 and supports the following repeaters GB3KN and GB3KS on 2 metres and GB3CK, GB3EK, GB3NK, GB3RE and GB3SK on 70cm.

GB3RE was commissioned on July 5th 1987 and is sited at Chattenden near Rochester to give coverage of the Medway valley. The group would be welcome to G4AKO, the repeater manager.

The recent Annual General Meeting saw some changes on the committee with G4RVV taking over as Chairman and Kelvin Fay G0AMZ Secretary.

Further information on the group is available from the secretary on (0534) 379991.

Belle Vue exhibition

Readers will probably be aware of the Belle Vue exhibition which is organised each year by over 40 amateur radio societies in the North West of England. This year marked the Silver Jubilee of the exhibition and was an overwhelming success, with an attendance of more than 3500 people.

Unfortunately, the Belle Vue site has been sold, requiring a new venue to be found for 1988. The search for a large enough complex has been undertaken by NARSA and only one site in the North West has proved to be suitable for all aspects of the exhibition. This is the purpose built centre at the Northbreck Castle Hotel, Blackpool.

The NARSA exhibition is normally held in mid-March but this is not possible next year due to prior bookings of the new venue. Therefore it has been necessary to bring forward the date by six weeks, just for 1988, to January 31st.

Further information is available from the Evening Centre, 46CGF, Tel: (051) 6305790.

Verulam trip

Dunstable Downs Radio Club’s Verulam trip is going to take place on September 8th, starting a hectic month which continues with the fourth National Amateur Radio Car Boot sale, on September 13th. G3WLM is giving a talk on Operating, on September 18th, and on September 20th there is a DF Hunt. Certainly there is plenty to keep club members busy!

Meetings are held every Friday at 8pm, at Chews House, 77 High Street South, Dunstable, Beds. Details are available from the Secretary, Tony GoCOQ on (0582) 508259.

Worthing workshop

Worthing and District Amateur Radio Club has recently introduced Workshop evenings, arranged by G3YHM, which have covered subjects such as capacitors, resistors, inductors and even valves. Future programmes include a surplus equipment sale, a visit by Microwave Modules, and a treasure hunt.

The club meets every Tuesday evenings at 7pm and 9pm.

Further details about the Worthing workshop can be obtained by phoning (0606) 41511 between 12.30 and 1.00pm and asking for Dave Wood (course tutor).

More Stockport courses

Two courses of interest to radio enthusiasts in the Greater Manchester area are being run this year.

Both of the courses will begin at the start of the September term at the Reddish Vale Evening Centre, Reddish Vale Road, Stockport SK5 7HD. Enrolment for both of the courses will take place on 14th, 15th and 17th September between 7pm and 9pm.

The RAE Exam Course, a course of 25 sessions, leads up to the exam in May 1988, but facilities will be available to sit the December 1987 exam as a re-sit, or for those wishing to obtain the licence quickly. The lessons will run on Monday evenings between 7pm and 9pm.

The Morse Code Course of 25 lessons is for all levels of ability up to about 17wpm. Several tutors will be available to assist. The lessons will run on Thursday evenings between 7pm to 9pm.

Further details can be obtained by phoning (0606) 41511 between 12.30 and 1.00pm and asking for Dave Wood (course tutor).

NEW AMATEUR RADIO BACK ISSUES SERVICE

TO: Back Issues Department • Amateur Radio • Sovereign House • Brentwood • Essex • CM14 4SE
NAME
ADDRESS
POSTCODE
PLEASE SUPPLY: (state month and year of issue/s required) NOTE: Only issues from August 1986 are available
PAYMENT ENCLOSED: £ at £1.40 each
PAYMENT ENCLOSED: CREDIT CARD PAYMENT: EXPIRY DATE
SIGNATURE

SEPTEMBER 1987
Fortunately, radio propagation has been rather better than the weather over the summer period, with plenty of DX to be worked on all bands. I write this piece as the Market Reef expedition is in full flow, using the special callsign OFOMA. I have heard lots of G stations working them, especially on ten metres, which is very gratifying. In fact, during late July the sunspot count went well above the 100 mark, and Central and North American stations were being worked quite regularly on ten.

**X-Head?**

At the time of writing there was some uncertainty about the S0 expedition which I have mooted in earlier columns. If you remember, there was an expedition planned to the Saharan Arab Democratic Republic by the Lynx DX Group of Spain, in the hope that this disputed area of southern Morocco would be recognised as a separate country for DXCC purposes. During July, much to everyone's surprise, a German group, including well-known DX operator DJ6SI, travelled to Algeria with the intention of beating the Spanish group to their goal. Callsigns S0DX and S0CW had been issued to the Germans, but in the event their gear was impounded in Algeria so they were unable to go ahead with their operation.

Subsequent to this, the Lynx group announced that it would delay its operation, even though much of the gear had already been assembled at Madrid Airport. Apparently, the abortive attempt by the Germans had queued their pitch with the authorities. Whether they will have managed to carry out the operation by the time this appears in print remains to be seen. On the other hand, even if they do it seems highly unlikely that the ARRL would count it for DXCC, although OH2BH, who was involved with the planning of this operation, is known to have travelled recently to the ARRL HQ in Connecticut, presumably to put the case for it counting.

Meanwhile, the saga continues. The moral, as always, is that you hear an S0 callsign on the bands, work it first and worry later.

**Walvis Bay**

While on the subject of what may or may not count as a DXCC country, how about this one? Walvis Bay is a small South African enclave on the coast of West Africa, completely surrounded by Namibia. Walvis Bay is a valuable port, and has been administered directly by South Africa for many years. As such, being separated from South Africa by 'foreign land', Walvis Bay ought to count separately for DXCC. The ARRL is reluctant to do this, on the basis that Namibia itself is not fully independent but its government is very much under the influence of South Africa.

The ARRL can't have it both ways. It recognises Namibia as a separate country, so ought to recognise Walvis Bay as separate. Meanwhile, according to the US 'DX Bulletin', the ARRL is taking a head in the sand attitude and pretending that Walvis Bay doesn't exist. QSL cards for contacts with it are rejected as not counting for anything!

Still on the subject of new countries, I see from the press that India and Sri Lanka are talking about granting independence to the Tamil area of Sri Lanka which, were this to happen, would mean that this area would presumably count as a new one. However, that's still some way into the future.

**Satellites**

The new Russian amateur radio satellite carrying the RS10 and RS11 transponders has been at the centre of some controversy since it commenced operation in July. This is due to one of its modes involving an uplink on 21260 to 21200kHz, a fairly heavily used part of the 15 metre band. The downlink operates simultaneously on 29360 to 29400kHz and 145860 to 145900kHz. There are four modes of operation, three of which involve the 15 metre uplink.

Presumably, the idea of the satellite was to generate increased activity on fifteen and ten during the sunspot minimum. As such, it seems to have arrived about a year too late.

**Straight Key Day**

To encourage CW operation in the traditional way (i.e. with a straight key), the RSGB HF Committee is sponsoring a Straight Key Day, to be held on 10th October from 0800 to 2100GMT on 80 metres (3515 to 3555kHz). As well as the usual QSO information, participants are encouraged to exchange details of the key being used. No awards are planned, other than the satisfaction of having taken part, but comments, especially on the best 'firsts' heard during the event, are welcome and should be sent to Colin Turner G3VTT at his callbook address.

**HF Convention**

I am delighted to be able to confirm that LA1EE will be coming along to the HF Convention (see last month for details) to talk about the 3Y1 operation from Peter 1st Island. There will also be a buffet supper after the event at your scribe's OTH, for those wanting to rub shoulders with the great man (LA1EE, not me!). Cost will probably be £4, and tickets must be obtained from me beforehand as numbers will be limited.

The latest news release from the 3Y operators makes interesting reading. About 1000 QSL cards had to be returned to sender as 'not in the log', apparently due to some pirate 3Y stations which were on the bands at the time. Of the cards which did pass scrutiny, a large number had the GMT time incorrect by one or more hours, and some even had the date out by one day. None of this makes the QSL manager's job any easier, of course.

Incidentally, and I don't know whether it applied to this operation, many UK amateurs are getting a bad reputation by sending self-addressed envelopes to QSL.
managers (implying that they want a direct reply) but not enclosing return postage. This is extremely selfish, to say the least.

To raise some cash to pay off an award for the YL group are selling Peter 1st coffee mugs and stamped postal covers which were flown to the island by helicopter to be franked. These various items are available from the LA-DX-Group, c/o B Eriksen LA4HF, Likollen 51, N-1481 LI, Norway.

New Announcements

Maltese amateurs now have use of the 18 and 24MHz bands and, from 8th July, Romanian amateurs have been able to use Top Band on a regular basis (the occasional contest operation has been permitted previously).

Anniversaries

This seems to be a year of anniversaries. Apart from the Jubilee of the DXCC, several other anniversaries have been announced.

The Danish National Society celebrates its 60th anniversary this year and is issuing an award for working Danish stations. Score 1 point for every ordinary Danish station worked and 5 points for each club station. 60 points are required in all to qualify. Send log details and 6 IRCs to OZ1ACB.

The Luxembourg Society celebrates its 50th anniversary this year. Score 10 points for their award by working LX stations (1 point each) and the special stations LX0RL and LX50RL (5 points each). The award costs 5 IRCs and is available from The Awards Manager, PO Box 981, Muscat. Sultanate of Oman.

Obtain the award send log details plus 10 IRCs to The Awards Manager, PO Box 981, Muscat. Sultanate of Oman. The society also sponsors an award for working A4X stations in the Sindbad Net which meets on 14200kHz on Tuesdays from 1200 to 1400GMT. Work 5 different A4X stations on 5 different days on the net to qualify. The award costs 1 point and 5 IRCs for the other ROARS award.

In recent years the number of awards available to radio amateurs seems to have increased considerably. Many seem to be sponsored by clubs as an easy way of raising funds or, at least, of generating some publicity for the club. However, with so many awards around, the effect tends to get rather diluted. Only a limited number of major awards stand the test of time. DXCC itself is the main one, of course, plus the CQ Magazine Worked All Zones awards. In the UK, the RSGB awards are popular, as are the WAB awards.

In fact, I sometimes find myself in great demand on the bands because I am the holder of one of the earliest WAB books. I remember in my college days running the WAB net on 40 metres during my vacations using my DX-100U AM transmitter. The net had to follow me up and down the band as my transmitter drifted. Those were the days!

Expedition Time

Now for news of forthcoming DX expeditions. Richard G3CWI/CMB hopes to operate from Wollaston Island off Chile from 14th September to 11th October. G3ZAY will handle the QSLs.

The Indian group who operated from the Andaman and Nicobar Islands earlier in the year have tentative plans for a further operation some time after 1st September. They have funds set aside to assist any Indian amateurs who are available to take part in the operation. These amateurs will have to be proficient in both SSB and CW operating, and will also be expected to give radio training to the residents of the islands. It is hoped that some suitable candidates will come forward.

KA2IJ hopes to lead a 3 man expedition to Iwo Jima (JD1) starting on 2nd November. As well as himself, the operators will include 7J1ADJ and HL9TM. At one time, KA call signs were restricted for use by US servicemen in Japan — but are now also used on the US mainland, which causes a certain amount of confusion. Apparently, those KA amateurs who do operate from Japan are rather restricted in terms of the power they can use and also by the fact that they cannot work regular Japanese amateurs.

Incidentally, the frequencies announced for the operation from Iwo Jima are somewhat unusual. For example, on 20 metres the group plans to transmit on 14140kHz and receive between 14240 and 14250kHz.

An early warning now, with the news that F6CZB (ex-J28EI) will be the next operator on Amsterdam Island (F8Z) from December and plans to be operational on all nine HF bands, mainly on CW. If his excellent operation from Djibouti is anything to go by, he should be much in evidence on all bands, enabling everyone to get FT8Z in the log.

Look out for the Liverpool and District Amateur Radio Society from the Isle of Man from 4th to 14th September. This will be their 7th operation from the island, and will include RTTY on 10-80 metres.

Other News

Several stations seem to be active from Iran at the moment, with EP2DL being particularly in evidence.

QSLS have been received from these stations, but it is not yet known whether they will count for DXCC.

DX News Sheet reports that the only stations active from the Vatican are HV1CN and HV2SJ. Similarly, the only stations active from Saudi Arabia at the moment are HZ1AB, HZ1HZ, HZ1FM, HZ1TA and HZ1HA.

KC7UU, who was very active from West Africa last year, is now based in Cyprus for two years and has been much in evidence on 20 metres CW as KC7UU/SB4. However, he still manages to get around and has also shown as JYSAD from Jordan.

W2MZV, who used to be the QSL manager for 4U1UN, has become a silent key. The QSL chores have apparently been taken over by W1XX.

Contests

Finally, remember that the major contests in September are the Worked All Europe SB8 Contest (12/13th) and the Scandinavian Activity Contests (CW on 19/20th and SSB on 26/27th). The latter ones run for 27 hours each, from 1800GMT on the Saturday to 1800GMT on the Sunday. Remember also the new CQWW RTTY Contest on 26/27th September, which I mentioned in the July column. Full details of known expeditions scheduled to coincide with the CQWW SSB Contest in October will appear next month. Until then, 73 and good DXing.

Attractive cards from the recent Revilla Gigedo DXpedition (bottom) and the earlier Market Reef operation site as seen by the operators (1981)

Please mention AMATEUR RADIO when replying to any advertisement.
Quite frequently I get letters from readers of my DX Diary column asking what antennas I recommend for the small garden. Some readers think that, from the typical British garden, it can't be possible to work the various DX that is mentioned in my column.

What I aim to do in this and subsequent articles is to show that, even where space is at a premium, quite surprising results can be achieved on the HF bands. Certainly, when I have lectured on the topic, my audiences seem to have gone away with plenty to think about! These articles, then, are a response to enquiries I have received, and draw upon feedback from those who have heard me speak on the subject, to whom many thanks are due.

Before starting on this series of articles, I looked back at what has previously been published here in Amateur Radio. G3BDQ, G3AAG, and others have provided some useful material, especially on wire antennas, and I don't intend to duplicate what they have done. What I will do is to give some practical information on antenna design and construction relating particularly to the more ambitious antennas for the HF bands. Just because space is at a premium doesn't mean you should set your sights too low!

Just to give you some idea of what can be achieved, I worked my first 200+ countries on HF from a typical housing estate plot with 30ft square back garden, and came within a whisker of achieving 5 band DXCC from the same site before my job forced a change of QTH. Admittedly all this was around the last sunspot peak, but band conditions over the next few years should improve quite rapidly to allow similar achievements. I know of several UK amateurs who have worked 300+ countries with wire antennas from small plots, admittedly taking many years in the process.

What targets?

The first question to ask, though, is what you hope to achieve on HF. This question is vital when space is at a premium. If you have acres of land, then it is quite possible to put up a variety of antennas for each and every band without any significant interactions. From a small plot, putting up a multitude of antennas will not only look unsightly (!), but will be counter-productive because they will tend to interact with each other, causing a drop in performance.

Now, there are some folk who sell their services to the amateur radio community, offering to design the optimum antenna system for your QTH. I intend in these articles to put those folk out of business by giving you enough basic information to do the job yourselves. So let's make a start with a few examples.

Let's suppose, firstly, that you are interested in working new countries. At the present state of the sunspot cycle this probably indicates concentrating on 40, 20 and, to a lesser extent, 15 metres. Fifteen will become more important over the next few years, and ten will probably be your best DX band in 3 or 4 years time. In fact, at the moment 40 might be the band to concentrate on. Why? Because even those with room for an HF beam often have to resort to simple antennas on the lower bands, so you will be able to compete on an equal, or almost equal, footing, whereas on 20, unless you have room for a beam, you may find yourself losing out more often in pile-ups. Either way, for DX working you are looking for an antenna with a low angle of radiation in order for your signals to propagate as far as possible between reflections from the ionosphere (Figure 1). A high dipole, a small beam of some kind, or a vertical antenna might be appropriate.

A different example

Let's take a different example. Suppose you want to chase squares for the Worked All Britain Award. This involves working around the UK, so a high rather than low angle of radiation is the order of the day. A low dipole on 80 metres would probably be favourite, even if the ends had to be bent to fit it into the space available.

Thirdly, let's suppose that you are keen on contest operating. Now, this opens up a host of possibilities. Even the longest contests only last for 48 hours, so in this case it is possible to contemplate putting up antenna systems on a temporary basis, the kind of antennas that you wouldn't dare to leave up all the time! I remember one American who, while living over here, showed the Gs a thing or two by taking this approach. He lived on a housing estate in one of our 'new' towns, where antennas were restricted but, on the Friday before the contest, up would go the aluminium lattice tower, light
enough to put up single-handed, but strong enough to support a triband beam plus various LF wires. With this arrangement he was able to put in some very creditable scores.

Before I go on, I should say that I am taking it for granted that you are prepared to put some effort into making the most of your small garden. This may mean running full legal power to make up for any deficiencies in the antenna system, and being prepared to tackle any TV problems which rear their heads. It may mean having to go ahead and get planning consent for a tower of some sort, and I am in the process of writing an article for Amateur Radio about this very subject.

It may mean being prepared to put in a lot of work on a good earth system. Just remember that nothing comes free in this life, and if you want to put out a decent signal a little effort will be required. You can’t be a successful fisherman if you are not prepared to sit out in the rain occasionally, and you can’t be a successful radio operator without remembering that nothing comes free in this life, and if you want to put out a decent signal a little effort will be required.

Full-size systems

What I will do is to cover various types of full-size antenna and then go on to describe how size reduction can be achieved while not compromising too much on performance. Remember, though, that the laws of physics are inviolate, despite the claims made by some antenna manufacturers! When all is said and done, a half-wave dipole on 20 is 33ft long! Yes, of course it is possible to load up a dipole of less than a half wave or a vertical of less than a quarter-wave, but matching will become more difficult and resistive losses will start to become significant.

This will not be too important for a receiving antenna, and there are some very nifty little active receiving aerials around these days. They incorporate an amplifier to make up for losses due to the small size and low radiation resistance of the antenna. For transmitting aerials, though, the degree of size reduction which is realistically achievable is a lot less.

Anyway, enough of this preamble. Let’s get on to some practical antenna systems. When talking about full sized antenna systems, the three basic types are the half-wave dipole, the full-wave loop, and the quarter-wave vertical. Table 1 shows the dimensions for each of the HF amateur bands. These dimensions are calculated on the following basis:

Length of half-wave dipole (in feet) = 468/frequency in MHz. Length of full-wave loop (ft) = 1005/frequency in MHz. Height of quarter-wave vertical (ft) = 234/frequency in MHz.

Remember though that with all antenna work calculated dimensions are only a starting point. When space is limited this inevitably means that your antenna will be close to other metal objects, such as drainpipes or TV antennas, and this will affect the resonance. So the best approach is to cut the antenna to slightly greater than the theoretical dimensions and then trim it a little at a time, watching the SWR meter for resonance (ie lowest SWR). Even better, use a GDO or a noise bridge and receiver to determine the resonance (more about this approach in a later article).

The humble dipole

Starting with the humble dipole, this can be supported at either end as a horizontal dipole, or can be supported at the centre so that it becomes the classic inverted vee. The height at which you erect a dipole may well be determined by practical considerations of what supports you have available. Remember, though, that a dipole will need to be at least a half wavelength above ground to achieve a reasonable amount of low angle radiation, as needed for DX working. For short haul (up to, say, 1000 miles) a lower dipole will actually be more effective.

The radiation pattern of a dipole is well known. Maximum radiation is broadside to the antenna, with minimum radiation from the ends. So when siting your dipole it is important to consider what will be your preferred directions. For most people this will be East-West, given that the majority of HF operators are concentrated in Japan, Europe and the USA.

A wire beam

Now, a dipole is all very well, but some 3dB of gain is possible by adding a parasitic element. This will have the effect of concentrating the power in one direction. For maximum gain, this parasitic element will be a reflector where the spacing is around a quarter wave but, when close spacing is employed, the use of a parasitic director is preferable.

Adding a parasitic element doesn’t necessarily mean having to go to the trouble and expense of making or buying a traditional plumber’s delight Yagi. It is quite possible to make a wire Yagi which will perform as well as a beam made out

Table 1

Dimensions for Basic Antennas

<table>
<thead>
<tr>
<th>Frequency (MHz)</th>
<th>Half-wave dipole</th>
<th>Quarter-wave vertical</th>
<th>Full-wave loop</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.825</td>
<td>256ft 5in</td>
<td>128ft 3in</td>
<td>550ft 8in</td>
</tr>
<tr>
<td>1.9</td>
<td>246ft 4in</td>
<td>123ft 2in</td>
<td>528ft 11in</td>
</tr>
<tr>
<td>3.525</td>
<td>132ft 9in</td>
<td>66ft 5in</td>
<td>285ft 1in</td>
</tr>
<tr>
<td>3.65</td>
<td>126ft 3in</td>
<td>64ft 1in</td>
<td>275ft 4in</td>
</tr>
<tr>
<td>3.795</td>
<td>123ft 4in</td>
<td>61ft 6in</td>
<td>264ft 10in</td>
</tr>
<tr>
<td>7.05</td>
<td>66ft 5in</td>
<td>33ft 2in</td>
<td>142ft 7in</td>
</tr>
<tr>
<td>10.125</td>
<td>46ft 3in</td>
<td>23ft 1in</td>
<td>99ft 3in</td>
</tr>
<tr>
<td>14.05</td>
<td>33ft 4in</td>
<td>16ft 8in</td>
<td>71ft 6in</td>
</tr>
<tr>
<td>14.2</td>
<td>32ft 11in</td>
<td>16ft 6in</td>
<td>70ft 9in</td>
</tr>
<tr>
<td>18.1</td>
<td>25ft 10in</td>
<td>12ft 11in</td>
<td>55ft 6in</td>
</tr>
<tr>
<td>21.05</td>
<td>22ft 3in</td>
<td>11ft 1in</td>
<td>47ft 9in</td>
</tr>
<tr>
<td>21.2</td>
<td>22ft 1in</td>
<td>11ft 0in</td>
<td>47ft 5in</td>
</tr>
<tr>
<td>24.94</td>
<td>18ft 9in</td>
<td>9ft 5in</td>
<td>40ft 4in</td>
</tr>
<tr>
<td>28.05</td>
<td>16ft 8in</td>
<td>8ft 4in</td>
<td>35ft 10in</td>
</tr>
<tr>
<td>28.5</td>
<td>16ft 5in</td>
<td>8ft 3in</td>
<td>35ft 3in</td>
</tr>
<tr>
<td>29.5</td>
<td>15ft 10in</td>
<td>7ft 11in</td>
<td>34ft 1in</td>
</tr>
</tbody>
</table>
HF ANTENNAS

of tubing and which will be much less visible to the neighbours. Of course, it won’t be possible to rotate it, but with a little imagination it should be possible to arrange to ‘flip’ it over when required in order to change the direction of radiation by 180 degrees.

Adding a close spaced parasitic element will reduce the feed impedance of the antenna to quite a low level, so the answer to this is to replace the dipole element with a folded dipole, which will bring the feed impedance back to a suitable level to match to coax. You can use 300 ohm ribbon to make the folded element, or any other method which is convenient. The spacing of the two wires in the folded dipole is by no means critical. Using a two element wire beam of this kind on twenty, I have been very pleased with the results, even when the antenna was only about a quarter wavelength above ground. I have also used a forty metre version from the G6UW contest QTH and, beamed on the USA, this has helped us keep up an excellent QSO rate while the band was open to the West.

A third element can also be added without too much trouble, and now you have a full size, 3 element Yagi which will out-perform a commercial tribander with its lossy traps. Of course, you have only a single band antenna, and cannot rotate it to all points of the compass, but think of the money you have saved! And if, for example, your main interest is in morning skeds to Australia, then a fully rotatable system would be an expensive luxury.

G4ZVB described a 20 metre wire beam along the above lines in this journal in November 1985. For convenience, though, Figure 2 shows the basic constructional details, and Table 2 gives the dimensions, not only for 20 metres, but for some other bands too. At the moment we are not allowed to use ‘gain’ antennas for transmitting on 18 and 24MHz, but hopefully the time will come when this restriction is lifted.

Of course, even where space is limited it is often possible to put up a full size rotary beam for 10 metres. A two element version is not much bigger than some VHF antennas and can be turned by a VHF grade of rotator. So don’t discount beams just because space is short. Ten metres may not be doing much at the moment, but in a year or two it will once again be carrying the majority of DX traffic. My most successful 10 metre Yagi was built from the damaged parts of a commercial tribander. As a monoband beam it outperformed (on ten metres of course!) any tribander I have ever used and was much lighter, smaller and easier to handle.

Enough, then, of Yagi antennas. Next time I will turn to quads and to vertical arrays, both of which offer useful amounts of gain, while not demanding too much in the way of space.

<table>
<thead>
<tr>
<th>Band</th>
<th>Director (A)</th>
<th>Dipole (B)</th>
<th>Reflector (C)</th>
<th>Spacing (D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>62ft 9in</td>
<td>66ft 5in</td>
<td>70ft 7in</td>
<td>16ft 0in</td>
</tr>
<tr>
<td>30</td>
<td>43ft 8in</td>
<td>46ft 3in</td>
<td>49ft 1in</td>
<td>12ft 0in</td>
</tr>
<tr>
<td>20</td>
<td>31ft 3in</td>
<td>33ft 1in</td>
<td>35ft 2in</td>
<td>8ft 0in</td>
</tr>
<tr>
<td>17</td>
<td>24ft 5in</td>
<td>25ft 10in</td>
<td>27ft 6in</td>
<td>7ft 3in</td>
</tr>
<tr>
<td>15</td>
<td>20ft 10in</td>
<td>22ft 1in</td>
<td>23ft 6in</td>
<td>6ft 6in</td>
</tr>
<tr>
<td>12</td>
<td>17ft 9in</td>
<td>18ft 9in</td>
<td>19ft 11in</td>
<td>5ft 0in</td>
</tr>
<tr>
<td>10</td>
<td>15ft 6in</td>
<td>16ft 5in</td>
<td>17ft 5in</td>
<td>4ft 0in</td>
</tr>
</tbody>
</table>
JUST PUBLISHED

THE SECRET OF LEARNING MORSE CODE

By Mark Francis

A COMPLETE COURSE – OVER 90 PAGES – SEMI/STIFF BOUND

A brand new book covering a subject that causes many people problems. The author, Mark Francis, breathes new life into the subject and provides fresh hope for all those that are having difficulties with Morse or thought the code was beyond them. This book has been long overdue. It treats the subject of learning the code in a simple, but comprehensive manner. The recommended methods ensure that anyone can learn Morse code in the minimum of time. The title is well chosen and really does explode some of the pitfalls and myths surrounding the learning of Morse. The book forms a complete course with many practice passages for both sending and receiving. It also goes beyond the initial learning stages and takes you through your first QSO’s, covering abbreviations, procedures etc. Running to almost 100 pages with plenty of illustrations, this book looks set to fill a big gap in the market.

£4.95 + 90p p&p

4 PUBLICATIONS
YOU SHOULDN’T BE WITHOUT!

UK LISTENERS CONFIDENTIAL FREQUENCY LIST LATEST EDITION

This publication has now sold well over 3500 copies since it was advertised only a few months ago. Now the recent updated version is selling even better. No self respecting listener should be without a copy. If you enjoy exploring the short wave bands then this publication will add to your enjoyment. It covers the hf spectrum from 2 to 30 mHz and gives details of transmissions outside the amateur bands. Specially designed for the UK and European listener it sets out in a very easy way a comprehensive list of hundreds of interesting transmissions that will keep you occupied for days on end! Only a fraction of the cost of other similar publications it contains details of Marine, Air, Military, Embassy, Press and News agencies. Many listings have time schedules included together with comprehensive RTTY details. It tells you the frequencies used by civil and military aircraft whilst flying the Atlantic, when and where to pick up the press bulletins, long distance marine traffic etc and much more. Send today for your copy of this worthwhile publication.

£5.95 p&p 90p

NEW 4th EDITION VHF-UHF AIRBAND FREQUENCY LIST

This frequency manual is without doubt the most comprehensive list of VHF/UHF aircraft listings available in the UK. Of vital importance to the airband enthusiast or indeed any keen VHF/UHF listener it sets out in a very easy to follow manner full details of a whole host of stations. Every known UK airfield frequencies, etc. Included are Civil, RAF, USAF, MOD, Naval fields on both VHF and UHF bands. There are also air to air frequencies, the Red Arrows frequency, and much more. Send today for your copy and find out just how much you have been missing!

£5.95 p&p 90p

THE COMPLETE UHF-VHF FREQUENCY GUIDE 26-2000 mHz

Many listeners have asked for a guide to the wide VHF/UHF spectrum and to meet this request we have recently published this frequency manual. It covers the range 26 to 2000 mHz and has been specially prepared for the UK listener. Anybody who has used a scanning receiver will know that the wide frequency range involved means that it is difficult to know exactly where to listen. This guide takes all the guessing out of monitoring. It lists all the services throughout the spectrum together with both simplex and duplex frequency splits. If you’ve spent your hard earned money on a scanning receiver or are considering buying one you’ll find that this publication contains a wealth of information that has previously remained unpublished!

£4.95 p&p 75p

HF OCEANIC AIRBAND RADIO SUPPLEMENT NEW SECOND ADD.

Prepared in response to many requests for more information about the air traffic on the hf bands this little guide sets out to explain to the beginner how the hf band works in relation to air traffic. It contains full details of the world aircraft frequency bands in the range 2 to 23 mHz together with control frequencies and those commonly used for Oceanic control. Also included are many VOLMET frequencies, the Search and Rescue frequencies used by RAf helicopters and Nimrods, the HF RT network, London Company frequencies, European control centres etc. An ideal companion for the hf airband listener. Send today for your copy.

£2.95 p&p 60p

18-20 MAIN ROAD, HOCKLEY, ESSEX – 12 NORTH STREET, HORNCHURCH, ESSEX.
MAIL ORDER TO: 18-20 MAIN ROAD, HOCKLEY, ESSEX TEL: (0702) 206835

please mention AMATEUR RADIO when replying to any advertisement
MATMOS LTD, 1 Church Street, Cuckfield, West Sussex RH17 5JZ. Tel: (0444) 414494/454377.

DATA GENERAL EMC CISO SYSTEM comprising: ECLIPSE personal word processor, REMARK 8025 8020 type floppy disc drives Model M002. DATA PRODUCCTS line printer. Sanyo 2.5FS 5.25IN floppy disc drives Model M005. Sanyo typewriter £150.00

WIRERWY 5 72MHz 80286 processor Offers AT/Personal System 2 accelerator card for IBM PC & compatibles With 8kbytes RAM, dual 50MHz floppy disc drives, & comprehensive software. £295.00

TOSIBBA Mod 7900 PC/O System 500 (5MHz) based system with 16kbytes memory, 3 x 51/2IN floppy disc drives each of 560kbytes capacity (including 1 x 5IN drive), resolution green display 240x128 pixels. £1478.00 & VAT

HEWLETT PACKARD Model 100 5160 8050A VDU. 24 x 80 intelligent VDU with integral keyboard For character addressing and for character attributes as far as the full 8-bit repertoire. £2448.00

DATA GENERAL MODEL 8220 Winchester drive, 800mb £12110.00

BEEBEI. Phoenix 14in cartridge disc drive Model 6050 60Megabytes fixed • 64kbyles core memory magnetic tape drive Model 6021 2 9track 8599 2x50megabyte cartridge disc drives Model 6067-4 DATA DRIVES. Includes 2 magnetic tape drives, 64kbyles switch for HP-IB. £3115.00

SPEECHLABS Model T2500B 5160 8050A VDU. 24 x 80 intelligent VDU with integral keyboard For character addressing and for character attributes as far as the full 8-bit repertoire. £2448.00

Vanguard Works

18 please mention AMATEUR RADIO when replying to any advertisement SEPTEMBER 1987

CENTRE ELECTRONICS

1920s onwards, headsets, cables, circuit boarding, etc, etc. Your electronic component specialist for Avon, TEL: 0225 24811

MATMOS LTD, COMPUTER APPRECIATION, 9am-9pm Each Day TEL: 0676 32560

K W TEN-TEC LTD

TRANCEIVERS

CORSAIR II

ARGOSSY II

CENTURY 22

LINEAR AMP

TRITON

ANTENNA TUNER

MODEL 229A

COMPUTER APPRECIATION, 111 Northgate, Canterbury, Kent CT1 18H. Tel: (0227) 470512. Tax: 966134COMPAG G

KW TRAPS, K W TRAP DIPOLES, BALUNS, ANTENNA SWITCH, PRECISION MORSE KEYS

LATEST NEWS FROM K W FRITZEL BALUNS, H.F. BEAMS & VERTICAIS NOW IN STOCK. (EXCELLENT GERMAN ENGINEERING)

A NEW TRANSCIEVER – IN ADDITION TO THE CORSAIR II, ARGOSSY II, & CENTURY 22, the “PARAGON” IS EXPECTED SHORTLY. THIS IS A 200 WATT INPUT TRANSCIEVER WITH GENERAL COVERAGE RX/0235/FSK/38KHZ (OPTIONAL) AND MANY ADDITIONAL FEATURES.

Write or 'phone for Price Lists and/or brochures – K W TEN-TEC LTD Vlaarder Works Jenkins Dale, Chatham, Kent ME5 3RT Tel: (Medway) 0634-815173; Telex: 965834
ANGUS McKENZIE

TESTS

This innovative rig is the successor to the Kenwood TW4000A, reviewed very favourably nearly four years ago in this magazine. The 4000A's main competition was the Yaesu FT2700 and the Icom IC3200E. There are very considerable differences between these models, which you may find it convenient to refer to my Buyer's Guide to Amateur Radio (published by the RSGB) or back issues of this magazine for comparative details. I have actually used a TW4000A for four years now, and have always been delighted with its performance. I found two snags with it, however; the lack of 12.5kHz channelling on 2m and a memory to VFO function, which are occasionally rather annoying.

There was considerable talk about the Kenwood TW4100E over six months ago, and it is not altogether clear why its release was held up. However, I suspect that it may have been due to an original lack of 12.5kHz channelling, despite this requirement having been mentioned time and again to Trio Kenwood in Japan for four years. Note that modifications have also had to be made by Kenwood to the TH215E for it to incorporate 12.5kHz channelling. At the time of writing, Lowe Electronics are putting in the modifications for this on request, but fairly soon, I understand, they will be put in by Kenwood at the factory.

It is quite clear to me that this rig has been well worth waiting for, and I have been able to work it very hard indeed over the extended period of my holiday in Scotland and the North of England.

The rig's facilities

The rig covers 2m from 144 to 146MHz, and 70cm from 430 to 440MHz. Other variations cover complete coverage to 148MHz for the US market for example, and also the US 70cm band, which is different to ours. Considering the size of the unit (only 150mm W by 50mm H by 214mm D [including projections] and weighing 1.8kg excluding mobile mount), the maximum available output power of 50W on 2m and 35W on 70cm is quite astonishing.

The front panel facilities include push-button microprocessor control for selecting the single VFO or memory channel operation, selectable tuning steps with the normal tuning knob and a 1MHz button which allows 1MHz steps to be given for quick band QSY. A row of five buttons is used for writing into memory or placing memories in order for presetting modes. Having selected the required one, you then press the 'select' button until you see the frequency displayed normally and hear a long toneburst simultaneously.

There are 10 memory channels, memories 0 to 7 being conventional, holding frequency, toneburst on-off and repeater shift information, while memories 8 and 9 can have any required separate Tx - and Rx frequencies inserted. Memories 2 and 7 also have special functions when DCL is in use. Normal up and down scanning can be selected, and when a busy channel is found, the rig can stay on it and then resume scanning a few seconds after the channel becomes vacant. A touch of the PTT, etc, stops scanning. If the memories are selected, then memory scanning occurs when the scan button is depressed. There is provision for locking out any unwanted channels during memory scanning.

Duplex operation can be selected by means of the mode selector button, and in this mode you can receive on one band while transmitting on the other. This works extremely well in either direction from band to band with the rig on low power, but I found that when on high power, noise and harmonics from 2m Tx could more easily block the 70cm receiver, especially if a single dual band antenna was in use with a duplexer or the antennas were fairly close together.

The small volume control includes the 13V dc on/off switch, and also a push changeover switch which selects low or high power operation. In the low power position, the rig delivers approximately one tenth of full power. By its side is the squelch control which, when lightly pressed in on a spring-loaded switch, causes a speech frequency readout to occur, provided the optional speech board, type VS-2, is fitted.

The front panel display shows frequency, memory channel, shift, tone and other status functions. The display is black on a green background and is easy to see over a fairly wide angle. The normal Kenwood 8 pin mic socket is fitted on the front, and a hand mic is supplied with the rig, having up and down buttons and a PTT lever.

Case and rear panel

The internal speaker is mounted underneath the rig, so you will need to use an external speaker if you use the rig as a base station, unless you raise the front quite a lot. A mobile mount is supplied, and it is quite easy to slide the
I had the opportunity of using the rig on virtually all of the 2m and 70cm repeater channels as our journey took in the Midlands, the North and most of Scotland, just excluding the West, the South East and North of Inverness. I noted a number of annoying spurious on both bands, the frequencies of these including 144.475, 144.7, 144.925, 145.625, 145.85, 431.3 and 438.7MHz. By far the most serious of these were of course 144.7 and 145.625, the latter being absolutely maddening as it frequently almost obliterated the Isle of Man repeater which I was picking up fairly weakly when we were staying in Cumbria. I had to put the squelch on quite hard if I was monitoring this repeater channel, but not actually QSO.

Eventually turned out that the problem was due to pick up from the DCL modem option board, and when this was removed the CR was okay. Low Electronics have now designed a fix for the problem, but this was not available in time for my subjective trial. I had not have the rig in a well ventilated position in the car, and it did get rather hot if I was on high power in a ratio of 50/50 Rx/Tx for more than 40 minutes or so. The heat build-up first showed up as crackies on the speech readout when it was recalled, but a minute or two later the crackles changed to complete gobbledegook, and I could only describe as speech from outer space! It was totally incomprehensible, and not even Japanese, which one can actually intentionally select with an internal link! The artificial speech board is supplied with instructions for altering the speech rate, and we found after much fiddling that the instructions were incorrect; funnily enough this has always been the case with earlier Trio boards. In order to get the fastest speech speed we found it necessary to join 1, 2 and 3, representing the ratio of 50/50 Rx/Tx for more than 40 minutes or so. The heat build-up first showed up as crackies on the speech readout when it was recalled, but a minute or two later the crackles changed to complete gobbledegook, and I could only describe as speech from outer space! It was totally incomprehensible, and not even Japanese, which one can actually intentionally select with an internal link!

The artificial speech board is supplied with instructions for altering the speech rate, and we found after much fiddling that the instructions were incorrect; funnily enough this has always been the case with earlier Trio boards. In order to get the fastest speech speed we found it necessary to join 1, 2 and 3, representing the ratio of 50/50 Rx/Tx for more than 40 minutes or so. The heat build-up first showed up as crackies on the speech readout when it was recalled, but a minute or two later the crackles changed to complete gobbledegook, and I could only describe as speech from outer space!
channelling, although a little marginal for 12.5kHz spacing, the rig being fitted with an F filter. However, the sample might have been slightly on the wide side of the specification.

I found one operation of the memories and the facility of transferring from memory to VFO to be much better than the facilities of the TW4000, but there were one or two strange changes in the facilities of the TW4000, but I found that memories 8 and 9, the channels that accept separate Rx and Tx frequencies, could be set to Rx and Tx on different bands. I tried to use these memories for strange functions, including duplex, but I could not find a way of doing it.

Working out the problem
Returning to the auto repeater mode, it actually took me a considerable time to work out how to avoid a ridiculous situation which occurred when I first used it. Having set up a 70cm simplex frequency and dialled in duplex on 2m as instructed, I found that the transfer from 2m to 70cm was normal, but from 70cm to 2m (when it worked) the 2m shift came in and so the transmission was 600kHz low. It took me a long time to realise that one had to temporarily put the repeater shift frequency at 0kHz specifically for this operation and I feel Kenwood should have avoided this problem with more suitable internal software, as the facility itself is obviously of very great use in an emergency, and may well be used by many amateurs with extremely low power hand-helds on 70cm, especially if we are one day officially allowed to transmit on more than one band at once.

Even allowing for the many improvements in this model as compared with the earlier TW4000A, and after considering everything, I still miss a second running VFO, which could have been selected by a simple in/out button. This would have allowed immediate change of band, and would have made the setting of duplex frequencies much quicker and simpler. One has to concentrate much harder when setting up duplex etc with the rig as

All the scanning modes worked well and I found the reverse repeater switching particularly useful as it could be set one way or the other, rather than just reversing when the button was held down. I found that memories 8 and 9, the channels that accept separate Rx and Tx frequencies, could be set to Rx and Tx on different bands. I tried to use these memories for strange functions, including duplex, but I could not find a way of doing it.

12.5kHz on 2m on my return to London. The different repeater frequency shifts are not necessary on 2m (other than 0kHz for the auto repeater function as well as the normal 600kHz). However, various different repeater shifts are in use around the world on 70cm, eg Germany uses 7.6MHz. It is a very simple matter to change the settings if you take the rig to Europe.

I found I became used to the operation of all controls more quickly with this rig than some of its predecessors, and so I feel the ergonomics are basically very good. One or two minor problems did crop up, though, when I used duplex modes. Obviously, when transmitting on 2m and receiving 70cm, one has to avoid trying to receive on, or near, harmonics. However, I found that there was considerable densensitising when I was using high power on 2m, and the slightly poor intercept point on 70cm is probably the culprit here. Even so, I found that it was possible to use low power duplex with the external Kenwood duplexer and dual-band antenna, and the performance was quite impressive. It was only necessary to use the reverse button to swap Rx and Tx over, and the performance was generally better when transmitting on 70cm whilst receiving on 2m.

I tried out the auto repeater function, and found that it worked superbly well when receiving 2m and transmitting 70cm, but for some extraordinary reason, the review sample only seemed to want to receive 70cm and transmit 2m when it was very cool. After just a few minutes of operation, it would hunt continuously when receiving a 70cm carrier and send rows of the letter ‘O’, refusing to lock into the retransmit mode. Lowe Electronics informed me that a modification has been sorted out in Germany for this, which occurs with just the odd sample, and so the problem can be solved.
it is, and there are more operation steps required to set up duplex working.

I am also surprised that Kenwood have omitted a rear multipin socket which could have had receive and transmit audio pins, as well as other control lines, to give the rig much more flexibility, especially in an emergency. How convenient it would be to interface the gear with an external data set-up or a telephone line using the usual external patching circuits. Perhaps the facilities may be introduced soon in a new Kenwood dual-band multimode base station—we will just have to wait and see.

I did not do any lengthy tests on the DCL system as it seems that very few users are interested in it, and I have never heard anyone actually using it myself, other than one or two friends of mine who have been trying it out with me and who quite like it. Maybe it could be useful one day, but the big drawback is the lack of standardisation between Kenwood, Icom and Yaesu. It is just like quadraphonic discs—they never really took off because there were at least three systems being marketed, and the mass confusion eventually resulted in quadraphonic sound virtually disappearing from the marketplace. Many of us are getting thoroughly fed up with the NIH (‘not invented here’) attitude of so many Japanese manufacturers.

As far as I can ascertain, Kenwood were the first to market a DCS/DCL system on amateur radio equipment, but Yaesu and Icom went their own way. I do feel that Kenwood’s DCL system is a very good one, however, and could be most useful to Raynet, so you may find it worth investigating.

**Receiver lab tests**

The RF front ends are very sensitive, although they are no more so than the TW4000 was. The RF input intercept point is somewhat inferior to the TW4000 on 2m and a long way inferior on the 70cm bands, and the measurements were quite a surprise to me. In practice, they should be good enough for normal use, but duplex working may produce more desensitisation than usual under some circumstances. The selectivity measurements were excellent for 25kHz channelling, but it seemed that the F filter in this receiver sample was a little wide as measurements with modulation on both the wanted and unwanted carriers gave fairly poor figures, although the test is a very difficult one for close channeling. The selectivity was in any case very slightly uneven close in.

The S meter gave 14dB difference between S1 and 9 and required only a 3dB increase to hit the top of the shop, so although this is not the worst FM S meter, there are many better ones indicating a much better range. The meter is in the form of pairs of black bar segments appearing on the display just above the S meter scale. These were quite clear and easy to read, and the sensitivity ranges about the same for S9 etc on both bands. The capture ratio measured unusually well, indeed as well as I have yet measured on any narrowband FM system rig. This coincides with excellent limiting, showing very good discriminator design. The effect will be that the set discriminates better than usual between stronger and weaker stations on the same frequency.

Audio distortion was at fairly low levels, and the maximum audio output available, whilst being average into 8 ohms, showed a useful and substantial increase into 4 ohms which might be useful. The received overall audio response on a pre-emphasised signal showed an extremely good compromise, low frequencies rolling off very rapidly below 350Hz or so, whilst the high end only started significantly rolling off above 3kHz, being 12dB down at 5kHz. The pre-emphasis used was 750uS so the responses indicated show the system response was excellent. We did not note any significant improvement to sensitivity when returning the signal generator slightly off channel, and so receiver frequency accuracy was good.

**Transmitter tests**

We had a long look for any transmit spurii, first looking close in, and then on harmonic frequencies of both bands. Perhaps the facilities are much better and the performance was uniform, although this is not the worst FM S meter, nevertheless a useful range. The meter is in the form of pairs of black bar segments appearing on the display just above the S meter scale. These were quite clear and easy to read, and the sensitivity ranges about the same for S9 etc on both bands. The capture ratio measured unusually well, indeed as well as I have yet measured on any narrowband FM system rig. This coincides with excellent limiting, showing very good discriminator design. The effect will be that the set discriminates better than usual between stronger and weaker stations on the same frequency.

Audio distortion was at fairly low levels, and the maximum audio output available, whilst being average into 8 ohms, showed a useful and substantial increase into 4 ohms which might be useful. The received overall audio response on a pre-emphasised signal showed an extremely good compromise, low frequencies rolling off very rapidly below 350Hz or so, whilst the high end only started significantly rolling off above 3kHz, being 12dB down at 5kHz. The pre-emphasis used was 750uS so the responses indicated show the system response was excellent. We did not note any significant improvement to sensitivity when returning the signal generator slightly off channel, and so receiver frequency accuracy was good.

**Transmitter tests**

We had a long look for any transmit spurii, first looking close in, and then on harmonic frequencies of both bands. No spurious were noted above a level of 75dBc and harmonics were all below −70dB, the limit of the analyser used.
Maximum power output was reached between the bottom and the centre of the 2m band, at 52W, well above the specified 45W. Low power was just below 5W, an excellent compromise. On the 70cm band, high power averaged 35W in midband, but was very marginally higher at 431MHz, and by 439MHz power had dropped just a little to 32W. Low power was typically 3.5W across the band. These measurements were taken at 13.8V dc and the average current was 10 to 11A on high power.

The frequency accuracy on both bands was excellent, and even after 20 minutes of transmission time the worst error noted was 240Hz on 2m and 330Hz on 70cm. The repeater shifts were very accurate, and the toneburst frequency well within specification. There was no way of holding the toneburst on continuously, and it was not long enough to allow easy measurement of precise frequency and deviation, but I did not have any problem with it in the UK. Maximum deviation on 2m was around 4.6kHz at 1kHz audio. Higher modulation frequencies limited at lower deviations, which is excellent as it will avoid transmission spreading. Transmitted distortion was only 1.7% at 3kHz deviation, but rose rapidly by 4kHz deviation (15%), the distortion being primarily that of the limiting system. At lower levels, distortion was very low indeed. Modulation characteristics were very similar on 70cm, most of the measurements actually being taken on 2m. The transmitted signal-to-noise ratio approached 47dB ref 4kHz deviation, and this is satisfactory.

The transmitted audio response was checked with a Marconi 2305 modulation test set, the Hewlett Packard audio analyser generator feeding into a mic socket adaptor. There was a fairly rapid roll-off below 300Hz, which is most appropriate, whilst the response was remarkably flat between 300Hz and 3kHz. Above 3kHz the response was attenuated very rapidly indeed, and could hardly be more satisfactory, once again helping to avoid any splatter. This should help a lot when the rig is used with 12.5kHz channeling, although you might have to take down the deviation a bit.

Conclusions

Although I am impressed with this new dual bander, as most of the performance parameters measured up very well and it is the most powerful model of its type so far, it is not quite ideal. However, I have to admit I am rarely completely satisfied. The biggest surprise was the poorer front end intermodulation performance, especially on 70cm, as compared with some of the competition, although the sensitivity was very good.

The rig's relatively small size will allow it to fit into spaces that are not large enough for other dual banders, but you will most certainly have to provide excellent ventilation at the back to avoid serious heat build-up when you are on high power.

The rig includes some unique features and is very highly recommended for Raynet members. If you want the auto repeater function, don't forget to specify it when you purchase it and to check that it operates properly when repeating from 70cm to 2m. The normal duplex working will also be useful for Raynet because it could be used for talk through from one band to the other continuously, the operator's microphone mixing in with the talk through signal. I very much enjoyed using it for a prolonged period, and I conclude by giving it a warm recommendation.

Very many thanks to Lowe Electronics for the loan of the review sample, and to Fiona for all her help with the review.

SONY ICF Pro-80

World coverage radio

Last year I gave a recommendation to a previous Sony 'World Radio', the ICF2001D, as it was reasonably priced and offered quite a good performance for what it was, although I did explain that it could not come up to the performance of a proper communications receiver.

Sony's 1987 effort, the ICF Pro-80, breaks interesting new ground, for one only has to look at its facilities to realise how much Sony have crammed into such a small case. The radio is easily portable, and is supplied with a carrying strap, a plug on VHF converter and a large pull out whip antenna fitted, most unusually, with a TNC plug and socket arrangement, which is like a BNC but with a screw thread instead of a bayonet fixing. The radio tunes from 150kHz to 108MHz with continuous coverage, and the VHF converter then enables the combination additionally to tune 115.15 to 223MHz.

Facilities

The radio incorporates a large matrix button pad on the front, which is laid out slightly haphazardly. There are 40 memories, arranged in four switchable banks of 10, and you can place frequency and mode in memory. On most frequencies you can select AM narrow or wide, SSB and narrowband FM. Wideband FM is also available for selection between 50 and 75MHz and 165 to 223MHz. Frequencies in the range 76 to 108 and 191 to 223MHz can only be received on wide FM. The set is synthesizer controlled, the step being 3kHz on long wave, 9 or 10kHz (switchable internally) on medium wave, 5kHz on short wave and VHF, and 50kHz on wide FM where applicable. Almost all of the facilities are selected by the appropriate use of 'enter', 'function', 'programme', 'direct', 'priority', 'key', and 'execute', usually used in combination with second functions of the numerical matrix pad keys.

On the top of the radio is the TNC socket for the antenna (there is an internal ferrite rod for long and medium wave) and miniature 3.5mm jacks for connecting an external loudspeaker or headphone. Also, independently, there is a feed for a tape recorder, which unfortunately is at a very low audio level. The main rotary volume control introduces a degree of HF cut when pushed into its recess, and by its side is a variable squelch level control which can be set to auto squelch when recessed. To the right is a four position rotary switch for selecting one of the memory banks, and concentrically mounted with this is a small pot which varies the frequency ± around 6kHz or so from the centre nominal. This can be set to operate either on AM or on SSB. This, therefore, allows tuning in between the 5kHz synthesizer steps on HF.

The radio is normally powered by four AA type cells which fit into the back panel within a battery box, which you
This can be rather awkward and the instructions make it quite clear that you only have three minutes to change the batteries before all memories vanish. In the most unbelievably inconvenient place, inside the radio and behind the battery box are two switches, one of them being extremely important, and labelled 'normal' or 'shift'. This switch has to be changed over when you want to go to VHF converter operation, or return to normal operation from it. The other switch selects 9 or 10kHz medium wave channelling for different parts of the world.

The VHF converter

The screw on converter connects to the top of the radio and a supplied whip then screws on to the top of the converter. There are two switches on it which turn a 30dB antenna attenuator on and off, and also select two VHF ranges, 115.15 to 174MHz or 174 to 223MHz. Note that there is a gap between 108 and 115.15MHz, but this frequency region is of no interest to most users.

In order to use the VHF converter correctly and to obtain the appropriate frequency display, you also have to go through an annoying rigmarole to programme in 115MHz so that the microprocessor can select the appropriate receiver frequency for the one entered in on the number pad. You have to do this every time you have plugged in the converter, as well as opening up the battery compartment and changing the internal switch. This is quite the most ridiculous piece of bad ergonomics I have encountered in years; Sony should have built the converter into the set, with a disabling 'secret' inner jumper to be used when the set is sold in some countries that do not allow VHF listening, eg Japan.

Memories and scanning

Entering frequencies into the memories and accessing the memories rapidly is very simple, and about the only part of the ergonomics that I can actually praise. It was splendid to have 40 memories available. There are three scanning modes selectable as a second function on the numerical pad, these governing the events occurring after scanning stops. Mode 1 is a complete stop when a station is found, 2is a temporary stop for two seconds when a station is found and 3 is as 1, but with a scan restart when the carrier is dropped. You can also programme in scan start and stop frequencies so that the set will scan between them. It is also possible to select priority operation.

Modes and tuning

The matrix pad offers six operational modes, and you select these by first pressing and holding down the small 'function' button followed by numbers 4 to 9 as required. This allows you to select a normal or narrowish AM filter, NBFM, wide FM, SSB and fine tuning on/off for use with AM. Two buttons control up or down synthesizer steps, and of course you get search if you hold one of these buttons down. If you have also switched on the squelch and you push one of the up/down buttons, the set tunes until it receives the next station.

Entering frequency is quite simple once you know the form, and you always have to press 'direct' first, followed by numbers, then 'key' and 'execute'. This is rather laborious, and I intensely dislike up and down buttons rather than a proper tuning knob, as found on the 2001D. However, it is convenient that you can tune away from an accessed memory frequency.

Subjective tests

I used this set in many parts of the UK, and found it very useful indeed because of its wide scope, but despite my being delighted with its coverage I was constantly infuriated by the dreadful ergonomics, and I am totally unable to understand how the Sony engineers could not have applied more thought to operational convenience. For a start, the frequency display is dreadful, being extremely difficult to read, and you also have to learn the meaning of various combinations of symbols.

There is a push-button which is supposed to brighten up the display, but this is completely useless unless you are in almost total darkness. Sony should take a leaf out of one of the Japanese amateur radio manufacturers' books to see how good displays can be.

It was fun being able to hold a little portable and tune up and down the HF bands while listening to SSB. The snag is that the very small range of adjustment of the fine tuning knob meant that I was for ever moving up and down 5kHz steps, while at the same time twiddling the fine control. This is absolutely maddening if you are trying to find a precise frequency. The SSB filter is far too wide, and there is no discrimination between the upper and lower sidebands, requiring more twiddling to get the pitch correct.

The sensitivity, even on the ordinary pull out whip, was surprisingly acceptable, but when I put the rig on an external aerial it almost jumped off the table! I was surprised to find that the overload performance was quite good on an external aerial, and excellent on the internal ferrite rod or the screw on whip. The VHF converter seemed very sensitive.

On the RSGB VHF field day, I tuned around the 70MHz band whilst I was relaxing at G3JYP's OTH in Appleby, Cumbria, and at ground level I picked up over half a dozen SSB and CW stations in just ten minutes of tuning. Down in London, I have picked up many 6m stations on the set, whilst on 2m the set seems to have about the same sensitivity on SSB as the Mk1 FT-290, despite the bandwidth being around double that of the Yaesu. This rather infers that the VHF noise figure is actually better than the Yaesu's.

I was at first baffled when trying to receive Radio 4 in the Scottish Highlands when I wanted to hear The Archers (for I certainly did not want to listen to Gaelic on Radio Scotland!). I could not get the set to go to 200kHz, and it kept selecting 198, the new frequency that the BBC long wave transmitters will be changing to early next year. A quick perusal of the 'destruction' book showed me that I should select second function 6, which allows fine tuning, and I was then able to tune in R4 LW very well.

The AM bandwidths offer a good compromise between selectivity and quality and I was impressed with the sound of AM, although the set excluded the synchronous AM detector that Sony
incorporated in their 2001D. SSB also sounded good, apart from the AGC speed being much too fast. This produced a lot of pumping, and I am surprised that Sony did not provide an attenuator switch for use on the HF bands.

NBFM was not quite narrow enough for CB, but was satisfactory around 29.6MHz. It was easily good enough for 25kHz channelling on VHF, but the set's performance on 12.5kHz channelling was very poor as there was no facility for fine tuning between the 5kHz steps, and the filter was too wide anyway.

Wide FM on Band II broadcasting was quite adequate, but not only is there rather a lack of available volume, but there is a complete lack of bass frequencies as well. The tiny loudspeaker is mounted behind a narrow grille running across the lower end of the front panel. The set sounded a lot better into an external speaker, but this has to be very close to the device in question because of the limited audio output power capability.

The set received air band and PMR frequencies very clearly, and it was very useful to be able to switch mode. The unit could make a very good interference source detector because of its wide frequency coverage and switchable modes. It would be quite simple to make a variable attenuator for use in the aerial feed, but there is no S meter, so you would have to use your ears.

I was not happy with the set’s performance on 1.9MHz when using the whip, as the sensitivity appeared to be very low here. This was probably due to a complete lack of input matching on the LF bands but, strangely, matters were much better on 80m and up. There did not seem to be too many spurious around and it was useful to be able to access amateur bands and modes direct from memories, which made the set very flexible in its operation. The battery life was acceptable, but was not particularly long.

**Brief lab checks**

The average RF sensitivity on SSB between 3 and 60MHz was very similar to that of the average modern communications receiver with the latter’s pre-amp switched off. However, sensitivity dropped off quite rapidly below 2.5MHz, and whilst it would be adequate with a long wire antenna on Top Band, the set’s own input sensitivity fell short of ideal when used with its own whip. Sony have clearly made a bad design mistake here for it is obviously due to the ferrite rod/antenna socket crossover filter being much too gradual. There should have been a very steep high pass filter switching in and out when tuning either side of 1.8MHz, and this could have allowed for a much higher sensitivity around 1.9MHz.

The 50MHz band sensitivity was remarkably good, but by 70MHz it had fallen quite a lot, although it was quite good again on Band II wide FM. The sensitivity of the VHF converter was surprisingly good, and roughly comparable to that of the AOR2002 and the other better quality scanners. The set worked well with a discone external antenna and also with its telescopic whip.

I thought I had better have a brief look at the RF input intercept point and this actually measured quite well on the HF bands, rather better than many amateur radio transceivers of a few years ago, because of the incorporation of a high first IF and not too much gain in front. It is, of course, much poorer than today’s big rigs, but one would not normally be using this set with huge external antennas.

You should not have any troubles on HF when using the whip, but on VHF you might have some RF1M problems if you are close to strong stations. For the VHF intercept point is only as good as that of average VHF hand-helds. Audio distortion at average levels was around 1% THD on WFM, and the set did indeed prove to have a very limited power output. I was, however, surprised that the frequency response through to an external speaker on WFM was actually very good indeed, being within ±1dB or so from 30Hz to 10kHz ref 1kHz.

I was astonished to measure as much as 70dB signal-to-noise ratio on WFM ref 45kHz deviation when the input RF level was at 300uV. This was measured in the band 10Hz to 30kHz, showing no breakthroughs of the nasty synthesizer tones which beset some scanners.

**Conclusions**

This set is, for the time being, unique as a portable with its amazingly wide frequency coverage, and I must therefore give it very high praise, especially as it is a multimode. The problem is that I rapidly lost enthusiasm (as you might) once I actually started using it in earnest, for Sony seem to have completely ignored ergonomics at the expense of marketing ‘specmanship’ and facilities.

If one bears in mind that the 2001D was a lot better than its immediate predecessor, which left out flywheel synthesizer tuning, then I am tempted to suggest that you should wait for the 1988 or ‘89 models from Sony, which might put matters right, or alternatively some other make, which is almost bound to appear one day. On the other hand, I am sure that thousands of short wave enthusiasts and radio amateurs the World over will be tempted to buy this set, for it does work well. I admit to having had a lot of fun with it and it will be very useful to have around.

Although I recommend purchase of this set, if you require all its facilities I urge you to play with it for some time before making your final decision, for you may find the tuning ergonomics and display problems so annoying as to put you off. What at first may seem to be rather swish looking front panel button positions will in time become an irritation. Be careful to avoid an impulse buy, for the set, priced at £350 inc VAT, is, I feel, overpriced as it stands, although I would have been a lot happier with this price if I had not had to niggle about the lack of a tuning knob, etc. However, this is an absolutely fascinating product that certainly deserves attention.

Very many thanks to Sony UK Ltd for the loan of one of the first samples to come into Europe, and to Fiona for helping with the review and for suffering my occasional bad temper when using the set initially!
As a result of writing this column for over two years, I have had many letters from readers asking how one gets into the hobby of short wave listening and what sort of equipment is needed, etc.

On the surface, simple enough questions, but ones that require careful consideration before answering as there are various fields within the hobby that affect the type of equipment that is needed, and depend on the time and effort the newcomer is prepared to put into the hobby. Probably the main consideration is the type of listening to be undertaken, and there are a number of choices.

Casual listener

The casual listener is the easiest to cater for. Usually mainly interested in the broadcast bands, the equipment need not be expensive and, quite often, the normal ‘domestic’ receiver can be utilised if the required bands are covered. Many have only the medium and VHF/PM bands, sometimes long wave and, if short wave is covered, it is only to a limited amount. Even so, a lot of interesting stations can be heard with such basic equipment and it shouldn’t be shunned out of hand.

However, if a domestic receiver is not available, or is part of the family entertainment, a reasonably cheap receiver, such as the Russian Vega or the MBR 7 that have been previously mentioned in this column, would provide a good start to listening and will pay back the small cost in enjoyment over the years.

Although this type of listening is done in a random manner, maybe due to domestic or work considerations, it can still be interesting and made all the more so by making up a logbook of the stations heard. Over a period, reference to the log will give an insight into the habits of stations using certain frequencies at certain times of the day. Using the standard reporting codes (see panel), changes in propagation conditions and how they affect reception can also be observed.

The monitor

The monitor is the chap who takes his listening very seriously. Once more, usually broadcast band biased, he gets the utmost from whatever equipment he has. Station equipment can also vary from the simple communications receiver, often second-hand, to the very sophisticated set-ups, with some stations having receivers set up for specific frequently monitored frequencies.

Logging procedures are religiously followed and regular schedules of stations are always to hand. All this means having a lot of spare time or regular periods that can be set aside for monitoring. Some broadcast stations encourage regular reporting and appoint official station monitors from senders of regular reports on their broadcasts.

The DXer is the listener who is interested in logging those stations situated in far off locations or in areas that are rarely heard, such as exotic islands or usually unhabited areas. Many of these listeners are more interested in the amateur bands, but not all of them are, by any means. Successful DXing results from careful planning, not only in the station itself, but in studying propagation conditions and information available from publications or DX orientated broadcasts. Many broadcast stations, such as HGU (Quito, Peru) and Radio Sweden have weekly programmes giving details of stations likely to be heard during the coming weeks, and amateur ‘nets’ often give similar information.

Accurate log keeping is essential in DXing, as is accurate reporting. The simple report or QSL card is just not good enough. From the volume of reports these stations receive, they are well aware of where their signals are being received, so it is far better if the station is logged over a period, so that comparisons can be made, and your own comparisons of that station’s signals with others in the same area can be of interest to the operator.

Whatever area you choose as your particular interest, the most important item in the station is the aerial. Whether it is a simple end fed wire arrangement or a sophisticated broad band set-up, they must be suitable for the frequencies to be monitored, and it doesn’t matter how super your receiver is, unless you can get the signals to it efficiently, you’ve wasted your money.

Aerials are affected by external influences, not least of which is the ground over which they are erected, so what may appear to be the ‘cat’s whiskers’ down at Fred’s place, may be next to useless at yours. Moist ground is far better than well drained soil, and it is a lucky DXer who lives over a salt marsh! However, even the flat dweller can improve his situation by careful siting of the aerial itself and provision of a good earth and counterpoise wires to complement it.

Experimentation

Experimentation with different configurations or positioning of the aerials over a period of time pays dividends. The use of an antenna ‘tuner’ is essential, particularly when experimenting with random lengths of wire, so the investment in a good ATU, either home brewed or ready made, is money well spent. They are not difficult to make, and can make the difference between a mediocre log and one filled with interesting stuff.

Every station, whatever the interest, should have a couple of books that I would consider essential reading for anyone interested in listening seriously. They are The Complete Short Wave Listener’s Handbook and Simple Low Power Wire Antennas (from RSGB), but these are expensive to buy. If you are on a thin budget alternative titles to consider are An Introduction to DXing and Aerial Projects by Babani (from Maplin or other dealers). Also get a proper log book to record those details.

30th Longleat Rally

This year, the Bristol and District RSGB Group celebrated their 30th Longleat Rally. This is one rally that I haven’t missed for years and this year was no exception. Despite a few hiccups, Vernon GW0DST and myself made it by 0930 and were quickly ushered to a vacant spot in one of the marquees, right by the entrance to the tent so we couldn’t easily be missed. The stand for the International Listeners’ Association was set up and our plan was to take turns in manning it while one of us did the rounds. My son had come along to take some pictures and have a look around Longleat itself… he’s not into radio like dad!

The Longleat Rally is one of those rallies where there is something for all the family, so the XYL and the children can leave dad to dig in the endless line-up of boxes and piles of junk to his heart’s content. This rally was up to its usual high standard and well organised but, as at Swansea earlier this year, the many stalls seemed lacking in good secondhand receivers. There were some overpriced Eddystones and RA17s but little in the way of general coverage stuff.

As far as the ILA stand was concerned, it was a great success. We had a modest show consisting of a display of our awards and maps showing the distribution of our membership. We also had the MBR 7 receiver monitoring the local airports. As a result, membership increased to over 220 and we had some nice chats to members, other listeners and licensed amateurs. To all those who
visited us, thanks for stopping

...see you next year.

Prefix Award claims

So to our Amateur Radio Prefix Award winners this month. Roy Clayton G4SSH made the Gold this month for working 100 prefixes on CW only. Amongst the logs were AA1, AB2, AC2, BY2, BY5, CG9, CR7, J28, J42, KN7, KP5/K51, LU/K5, T26, VP2, VQ6, Z23, ZR0, ZS6, ZY3, ZY6, ZY8, ZS6, SP9, SN1 and 9Y/81. Roy stated that he thoroughly enjoyed the scheme and regards prefix hunting as an excellent basis for most of the amateur radio awards and has DXXC, SJC, JT5, ZW1, WAE, EU-DX-D, WPX and EU-PX-A, as well as our awards. His equipment consists of the Century 21 with the HF5 vertical, which he has used since starting the prefix hunt, but his recent addition was an FT757GX to give general coverage.

Joan Slater ILA185 of Matlock claimed the Silver award for mixed bands and Bronze for 20 metres, and included AD1, AH6, AZ2, CO2, HK1, KH6, KZ1, PP1, PS8, T4J, VP9, VK9, WY7, ZP9, 5J4, SL6 and 5N9 amongst a couple of super lists. As she says in her letter, 'It's a nice feeling to have achieved something'. I understand she's taking up award framing at the local tech, so I fully expect her Gold claim very soon.

Martin Domen ONL6945/ILA043 from Belgium, who claimed the Gold award this month with a superb list including 38B, 3XO, 4M0, 4S7, 4X85, SN22, ST5, 6W2, 6Y5, 733, 8P9, 8U5, AP2, BV2, CO7, CQ9, DU9, FY7, HP3, HW5, J37, J41, LX50, RT0, SW2, X4J, XJ9, YT9, ZD7 and Z25.

Colin Blunn G1RFL, of Stony Stanton, was next in with his claim for Bronze on Morse only. He has been listening to the Morse to help with his mastering of the code for the test, so thought he'd put the time to good use. Amongst the catches were WP4, 1Y3C, FM5, PJ2, P21, PT2, PP5, LU1 and TF3. Good luck with the test, Colin.

Another multiple claim this time from Dave Stott of Fishbourne, who claimed Silver and Bronze for all bands and Bronze for twenty metres. Dave uses a GEC 402F general coverage receiver which he says was a wise choice as it was cheap, works well and is too heavy for the XYL to throw out! Included in the loggings were A2B, AC7, C31, CP7, DU7, DX7, H97, HP6/MM, J37, PR8, VS6, XE3, YC6, ZB2, ZA2, ST5, 8P6 and 9J2.

Stan Taylor IALA070 of Hartlepool has got his Silver claim in. He was particularly interested in getting confirmation from 4U1V1C whom he'd heard before on 80m, so logged him at 18:02 on 18/4/87 on 20m and sent his card off. He had his confirmation back within seven days! John, the operator at 4U1V1C deserves congratulations on a quick and courteous service.

Also worthy of mention were the Easter special event stations from Israel, 4X2J, 4X3N and 4X9B. A few days later, 4X391D was logged celebrating the 39th anniversary of Israel's Independence. Nice logging Stan!

Too quick for me

It's funny, as soon as I introduce a new award, there's always one who has got a claim in before I've had a chance to dry the ink on the certificates! Chris Gibbs IAL086 of Camberley was the guilty party this time with a claim for the Medium Wave DXers Award. Chris sent in a superb list of stations logged on this band... and all verified too! Apart from the seventeen Canadians and nineteen Americans, Chris offered Andorra, Antigua, Azores, Canaries, Cayman Islands, Madeira, Monaco, Oman and St Kitts. Not satisfied with getting that one, Chris also claimed the Gold Prefix award for twenty metres only (just to fill in a gap on the wall!)... OK, Chris, I surrender!

A new book has just been released by Heinemann/Newnes which is of particular interest to those into broadcast receiving. It is the nineteenth edition of their Guide to Broadcasts, which has been completely updated and a very useful book it is too. Apart from the obvious listings of the World's broadcast stations, both geographically and frequency wise, the book also contains a wealth of other information supplied by such well known names as Pat Hawker and Jonathan Marks, and an excellent article on choosing a receiver by Richard Lambley. The book also covers reception reporting, computer usage, and a list of clubs. At a cover price of £6.95, this is one of the best books of its type available and is highly recommended for serious broadcast monitors.

From books to computers. It's a fact of life that, when you make a comment about something, someone will get the wrong end of the stick and start to beat you over the head with it. Such, unfortunately, was the case in my review of John Pearson's SSTV transceive program which I reviewed recently. The offending comment, which a couple of readers pointed out, was that, in my opinion, using computers in this way was not real SSTV.

Apologies due

Before explaining my comment, I must apologise to John for any adverse effect this comment may have had regarding his program. As an SSTV program, it is the best which I and other reviewers have had the pleasure of testing.

Since the review, I have had many QSOs using it and conducted many tests with DJ0KD which were monitored by G8PX, and I thank Clarence for his patience during some horrible conditions over the couple of days we were testing.

Clarence was using a Robot 400 'clone' and our exchanges were frequent. I was normally sent and received a copy of the receive program which I started to beat you over the head with it. Such, unfortunately, was the case in my review of John Pearson's SSTV transceive program which I reviewed recently. The offending comment, which a couple of readers pointed out, was that, in my opinion, using computers in this way was not real SSTV.

That's the lot

Well, that just about wraps it up for this month. Thanks again to all those who visited us at the ILA stand at Longeat and to those who sent in listening reports... please keep them coming in. Good progress until next month. Please address all mail to 1 Jersey Street, Hafod, Swansea SA1 2HF.
Over 15,000 people were estimated to have attended this year's DARC Amateur Radio Exhibition held at Friedrichshafen on 19th-21st June, 1987. Visitors were mainly from Germany, but included people from the USA, Austria, Italy, France, Switzerland, Scandinavia and the UK. The total floor space at the show was an outstanding 5,000 square metres, with much more for the 'flea market'. Over 100 exhibitors from several European and overseas countries showed and ably demonstrated their latest products.

Friedrichshafen is a beautiful, quiet town of just a few thousand population, being the home of the ill-fated GRAF Zeppelin of bygone days. There is even a Zeppelin Museum next to the show's venue.

Nestling on the shores of picturesque Lake Constance, close to the border with Switzerland, it is an area of scenic beauty for the European holidaymaker and a popular weekend retreat for wealthy Germans. Enhanced by the snow capped mountain peaks of NE Switzerland, which are clearly visible from the harbour area, it is an excellent venue for the visitors from adjacent countries.

The writer travelled by jet (Heathrow-Zurich), train (to Romanshorn) and car ferry to Friedrichshafen across Lake Constance. If you consider it next year, British Airways do a weekend special for around £125 (return). For the UK radio amateur it is a must. A vast wealth of both European, German and overseas manufactured equipment is available - with over 100 manufacturers - you've quite a choice!

Why is it the Germans seem to have an obsession for aerials and experimenting with them? It may well be something to do with the theories of Max Planc (Institute of RF Technology) in West Berlin. Suffice it to say that at Friedrichshafen there must have been just about every configuration, size and shape you can think of - with a predominance of VHF/UHF antennas. Verticals, Rhombics, Quads, Windoms, and just about every variation on a theme you could conjure up were there! Many at crazy prices - high and low. There seems however to be a noticeable lack of 5RVs in Germany - they just don't seem too impressed with them.

There was the usual formidable display of the latest state-of-the-art equipment from Japan viz Yaesu, Icom and Kenwood, each having stands with equipment ready to try, with private headphones provided. I particularly liked the Ham Radio Manfred Neugebauer stand, which had a compact section devoted to products from the Japan Radio Company (JRC); notably their JST125D all band transceivers for 160m-10m, including the latest WARC bands. A whole host of first class options were available, such as an auto antenna tuner which facilitates all band operation on one antenna, plus the RS232C interface for remote control by personal computer.

In addition to the regular Tokyo imports described above a number of other stands offered products which were in a sense 'innovative' or a good alternative to equipment available from the UK's regular sources.

SSB Electronic
Another German based producer whose wares must include the VHF/UHF/SFH enthusiasts dream. Precision built pre-amps, linears, converters, transverters, Yagis, plugs, mobile antennas, portable antennas and many other accessories and equipment were on view, all made in West Germany.

The company, run by DK8DD and DK1VA, also produce a range of satellite receiving equipment with associated options. Their brochure of 170 pages lists all products with photographs and circuit diagrams etc, which is available from SSB Electronic, Pan Zermacherstrasse 5, 5860 Iserholm, West Germany.

WIMO Electronic
Although a fairly unobtrusive stand together with a poorly produced brochure, I felt this company had some very interesting and practical products on offer - obviously of high engineering standards.

Some examples include a 2m/70cm stick-on window car antenna, BNC 2m antennas starting from just 5cms long (!), various centre loaded whips, a clip-on mobile antenna tuning indicator - a clever gadget that clips on the radiating whip, and makes various measurements. The company also manufactures various antenna co-ax switches and associated accessories. Further details are available from Hans Geraldystr 14, 6742 Herxheim, West Germany. Tel: (07276) 8978.

Kurt Fritzel
Obviously the king of the HF antenna scene (certainly at Friedrichshafen at any rate) is the Fritzel Company. Run by Kurt Fritzel, they offer a fascinating range of single element, vertical and
more importantly beam antennas (up to 6 band and 7 element).

Two massive trapped beams were on display inside the exhibition hall—a standard trapped rotary beam and its (very much smaller) equivalent version with folded elements—thus dramatically saving space. Fritzels' 3band 2element folding beam sells at approximately 516DM (£170).

For further information, contact Kurt Fritzels, Siemenstrasse 2, 6708 Neuhofen/Pfalz, West Germany. Rather surprisingly there were a number of Italian exhibitors marketing high power lines mainly for HF use. RAKE is one manufacturer who utilises 3CX800A7 tubes creating 2kW for between 160 and 10m.

For details write to RAKE LINEARS, 51019 Ponte Buggianese, Italy. Tel: (0572) 636196.

Fibreglass Teleskop mast

If you have problems of space and nothing to tie your antenna to, or nothing high enough to mount it on, this company is for you! Walter Speith DK9SQ has a really super light weight fibreglass mast that can go above 12m on offer.

These excellent telescopic masts with associated multiband centre and fed trap dipoles are ideal for field days. Selliing them 'off-the-back-of-a-lorry' possibly didn't do justice to this organisation, but it was the first item that caught my eye at the show on walking through the entrance gate.

Write to them (they speak English), and the modest prices start at around DM26 (£8.50) plus postage etc. The address to contact is: Walter Speith DK9SQ, Fibreglass-Teleskop-Masten, Antennentechnik, Plochingenstr 160, 7300 Esslingen, West Germany. Tel: (0711) 314099.

Wrasse

I was very impressed with this company's products and with their promotion material. The company specialises in weather satellite receivers which are less expensive, easier to set-up and better in quality than you thought.

Official weather forecasts, if available, can never be as up to date and detailed as your own critical eye, watching the momentary weather development at your location viewed and transmitted directly from space.

'Sky-Scan/C Packag is a complete system package with all cables and a high resolution colour monitor, ready to receive METEOSAT and all polar-orbiter weather satellites. With weather-inmotion capability! The package includes: parabolic dish antenna; low-noise S-band converter; VHF-satellite receiver; omnidirectional VHF antenna; videoconverter model; and high-resolution colour monitor. The package sells at 5.980.00DM, so perhaps this will have to wait until next year!

For details of this and a range of other Satellite/FAX/SSTV equipment contact: Wrasse, Kronberg 10, D-2300 Altenholz/Kiel, West Germany. Tel: (0431) 35228. It must be good equipment, the US Army have just made a major purchase.

My special thanks go to the very co-operative and helpful staff of the DARC, especially to Heinz Camper DL4El of Head Office for giving me a 'potted' guide of the show. Heinz says there are approximately 50,000 German radio hams compared with the UK's 37,000 plus.

The West Germans really do it in style, which was especially evident at Friedrichshafens. Superb organisation, impeccable standards, and fine engineering. What really was a noticeable point for such an exhibition was the ability to move around so easily. There was lots of space and no queues, even in the massive flea market.

Judging by the interest at the special RSBG stand, it was well worth the trip made by David Evans (Secretary) and Joan Heathershaw (President). It was so good to see a well organised, friendly and efficient RSBG stand flying the flag for Britain. The Austrian, Omani and Swiss equivalent of RSBG were also present with stands.

One well known British company present was BNOS, with Andy Sharpe, the 'S' of the BNOS acronym, being looking very pleased with himself and the response received.

On my way back to the hotel, while waiting in the rain for the bus, I heard the unmistakable voice of an Englishwoman (with a Lancashire accent). It was none other than our own Joan Heathershaw (G4CHH) RSBG President, who was also waiting for the never arriving bus with SM0HDP. Sweden's Club President. Quick thinking made me suggest a shared taxi, and in the process I gave my captive audience a brief interview.

Mrs Heathershaw obviously has the interests of RSBG members at heart, and I was impressed with her enthusiasm for what must be a very demanding job. In the brief time I had to speak to her she briefly mentioned that although the RSBG would like to run an equivalent exhibition at the NEC, we've not yet got the same support as the Germans have. However, she hopes to press for the possibility of camping nearby the RSBG National Exhibition/Convention as the Germans have. It is also hoped that next year, the RSBG's 75th Anniversary will contribute to a 'real show' at NEC, possibly with Prince Philip (RSGB Patron) opening the event.

She is also very concerned to encourage more young people into the hobby, with perhaps some form of 'novice licence' to help in this direction. At present amateur radio is seen as the older persons hobby (ie few young people attend the clubs), and she would dearly love to change this view.

The ultimate aim would be to encourage novice licences initially to take the RAE and then the Morse test to gain full Class A status.

All in all I felt that my trip to Friedrichshafen was most worthwhile and I thoroughly recommend it for next year. Remember, this is Europe's largest convention. You'll be surprised at how many exhibitors speak good English. It's an ideal opportunity to make new friends, enjoy stimulating conversations with people of a similar interest and . . . who knows who you'll meet on the way home!
Reduced size yet high performance HF antennas are becoming increasingly popular among today's radio amateurs and ICOM is proudly responding to those needs with a deluxe antenna system. The AH-2. This all band and fully automatic antenna package is especially designed for luxury style mobile portable activities such as vacationing or operating from environmentally sensitive areas such as apartments.

Mobiles in top fashion haven't been more attractive and ICOM is all in one, teaming numerous advantages over conventional mixed-technology antenna packages. Whether part of a fixed station or mobile, the flexibility and conveniences of this fully automatic and axially tuned antenna provide new horizons in limited antenna HF operations. Since the AH-2 system is packed with unique features and ideas, we would like to discuss its innovative designs in a step-by-step manner.

There are five components in the ICOM AH-2 System. The package can be purchased complete or minus the mobile mount and whip, for use as a fixed station or unitized portable. The main system consists of: a) a small unit attached control unit, b) a remote actuated and microprocessor-controlled antenna tuning unit, c) an approximately nine foot stainless steel whip, d) a universal and heavy-duty auto frame mount, and e) an interconnecting cable set.

An optional OPC-137 cable interface is available for the IC-721 or IC-725 HF transceivers. When using the system's stainless steel whip, operation on all amateur bands between 1.8 and 30 MHz is possible. When the stainless steel whip is replaced with a random wire, 1.8 MHz to 30 MHz operation is also possible. During operation, you merely select a band and frequency, push the remote unit's 'tune' button and one of over 260,000 LC combinations is digitally selected for optimum transmit antenna performance. Tuning actions require only ten watts of RF power and the resulting SWR is 1.1:1. Typical tuning time is less than six seconds. The antenna tuning unit's microprocessor stores one of eight internal memories, that information is recalled in less than two seconds. When the HF transceiver tunes a preselected range, the system automatically tunes to the nearest selectable frequency.

Notice the tuner's capabilities are used during both transmit and receive. Its four sensors (impedance, phase, and reflected power) are designed to optimize both antenna and transceiver performance. Notice also the precision of its microprocessor-selected tuning capacitor, is often a distinct advantage. The overall concept provides superb antenna tuning and the highest possible performance.

The system's whip and mount truly prove ICOM's design philosophy. The whip's unique tuning circuit, its unique uses, its heavy-duty stainless steel construction, and the antenna's overall design, make it the perfect choice for the mobile environment. The whip's length is fully adjustable to suit various cars. The antenna base section, incidentally stands 21 inches tall and weighs approximately nine pounds. Rugged is truly an understatement.

Whether assembled as an all-band mobile or employed in fixed station use, the AH-2 is also a versatile antenna system. It can be quickly installed on a TV mast, boat or car. The mount's bracket bolts to an existing hole in an auto's rear frame. The antenna's pipe mounts and the antenna's length is fully adjustable to suit various cars. The antenna base section, incidentally stands 21 inches tall and weighs approximately nine pounds.

Telephone us free-of-charge on: HELPLINE 0800-521145.
Where to find

in the U.K.

You can find ICOM Amateur radio in use throughout the world. Here in the U.K. ICOM is available from an extensive dealer network across the country. Just visit your local emporium and you will probably find that they are ICOM dealers. Authorised ICOM dealers will provide information on the entire ICOM range of Amateur equipment backed-up with good after-sales service.

If you are a licensed Amateur or short wave listener ICOM have a complete product range from HF to Microwaves to suit your needs. Should you have difficulty in locating your nearest ICOM stockist contact us at the address shown at the bottom of this page.

Avon
Booth Holding (Bath) Ltd., Bristol
02217 2402

Berk.
Anthony Richards Electronics Ltd., Ascot
0990 20324

 Bucks.
Photo Acoustics Ltd., Newport Pagnell
0908 610626

Caithness
Highland High Technology, Wick
0865 4696

Cambs.
Link Electronics Peterborough
0733 45731

Channel Islands
Radio & Electronics Services, Guernsey
0411 28037

Cheshire
Hobbytronics, Knutsford
0565 4040

Clywyd
SMC (TMP), Buckley
0244 549956

Derbyshire
SMC (Jack Tweedy) Ltd., Chesterfield
0246 453340

Devon
Reg Ward & Co Ltd., Axminster
0928 34349

Dorset
Poole Logic, Poole
0203 583903

Essex
Arrow Electronics, Nr. Chelmsford
0245 331673

Gloucestershire
L. A. M. Electronics, Cheltenham
0452 855339

Glamorgan
Transworld Comms (Neath) Ltd
0639 52374

Hampshire
Farnborough Comms., Farnborough
0252 518009

Humberside
Farnorpe Ltd., Hull
0482 233906

Isle of Man
Isled (Island Telecomm) Ltd., Douglas
06242-21962

Kent
Scrab City, Gillingham
0634 570441

Lancashire
D.W. Electronics, Widnes
051 420 2559

London
Amcom Services Ltd., Acton
01 992 5765

Lincolnshire
AXC Communications, Grimsby
0522 420256

Midlothian
Scotcomms, Edinburgh
031 657 2430

Norfolk
D.P. Hobbs, Norwich
0603 615796

Nottingham
R.A.S. Nottingham
0603 280287

Northumberland
A.H. Electronics, Rugby
0788 76473

Northern Ireland
George Moore Electronics, Belfast
023 658206

Perthshire
Axton T.V. Services, Perth
0736 327453

Staffordshire
MRZ Comms, Newcastle-under-Lyme
0782 6169558

Surrey
Bredhurst Electronics, Handcross
0444 400798

Sussex
Southdown Radio Supplies, Eastbourne
0323 629515

Tynne and Wear
Alytronics, Newcastle
0632 711002

Warwickshire
A.H. Electronics, Rugby
0788 76473

West Midlands
Ray Wither, Warley
021 421 8201

Yorkshire
A.J. Hooker, Doncaster
0302 65690

Harewood Radio, Scarborough
0123 365996

Dawley Electronics, Stourbridge
0384 360053

Hampshire Electronics, Bradford
0274 852206

S.M.C. Leeds, Leeds
0532 782324

Northern Ireland
George Moore Electronics, Belfast
023 658206

S.M.C. (N.Ireland), Bangor
0247 466875

Tyrone Amateur Electronics, Omagh
0662 4043

Eire
Radcom Electronics, Midleton Co Cork
0103531 632725

Western Comms., Kilgolgan, Co Galway
010353 96206

ICOM (UK) LIMITED
Dept AR, Sea Street,
Herne Bay, Kent CT6 8LD.
Tel: 0227 363859.
A COMPLETE 13.8V 20A PSU

Over the years there have been many articles in the radio/electronic journal's dealing with fixed voltage high current power supplies. Most of the articles have been excellent when dealing with the theory and specifications of such units, but are badly let down when describing the construction, and often suggest that most of the components needed are available in the reader's junk box. This may be so for the minority, but many readers are left wondering whether a particular component he or she may have is suitable for the circuit described.

Most readers of this magazine are only interested in the 13.8 volt 20 amp PSU which is suitable for powering the average solid-state HF rig, or 100 watt VHF/UHF linear. Not wanting to purchase a commercial unit, which would cost about £150, I set out to build such a supply. The main control board which contains the main regulator, over and under voltage protection, current limit, short circuit protection and the circuit breaker relay, which will remove the mains supply in the event of a fault occurring.

Once the main control board has been made up, it is up to the constructor how big or how small the final power supply will be. The final choice of transformer, rectifier, smoothing capacitors and pass transistors will determine the final current rating of the supply. With the transformer, bridge rectifier and smoothing capacitors specified and using six pass transistors the supply should be capable of producing 25 to 30 amps at 13.8 volts output.

What follows is a brief circuit description and some notes to help the constructor when choosing components. It will help to refer to the block and circuit diagrams and each will be described in box form, also see the component notes for stock numbers, suppliers etc.

Box 1

The mains input can be taken to a 6 amp mains filter. This filter is optional and was not used in the prototype. The filter is designed to filter any interference on the mains supply, and the RS type 238-536 will operate over a frequency range of 600kHz-100MHz and provides approximately 30dB attenuation.

Box 2

Protection for the PSU is provided by a relay, which in the event of a fault, will disconnect the mains supply. This relay must have a 24 volt coil, and the recommended type is a Vero 258-51195F, which is rated at 16 am at 360 volts ac; this will also fit the PCB layout. In the event of a fault the thyristor TH1 grounds the coil, opening the relay contacts and disconnecting the mains, in turn the smoothing capacitors are discharged through R13 and TH1.

To start the supply, SW2 is pressed. This is a push to make switch and must be of a good quality type. When pressed it shorts out the relay contacts and mains voltage is allowed to flow to the mains transformer T1 via the 50 ohm resistor R15. The job of R15 is to limit the in-rush of current on switch on. The in-rush of current happens because the smoothing capacitors are empty of charge and R15 allows charging to take place slowly thus protecting the bridge rectifier BR1.

Box 3

The recommended mains transformer is rated at 16.5 volts, 42 amps, and is of the toroidal type. It is made up of two 21 amp windings which must be wired together to provide 16.5 volts at 42 amps. A considerable saving can be made here by purchasing a mains transformer from a local rally. I would not recommend a secondary voltage of more than 18 volts, because the more the secondary voltage is, the more the pass transistors will have to drop to provide the 13.8 volts needed at the output. When high current is drawn, a lot more heat will have to be dissipated by each transistor if the secondary voltage is high. With the recommend transformer and four pass transistor, the heatsinks only run warm to the touch when running 100 watts of SSB from my TS440S.

Box 4 & 5

The output of the transformer is passed onto the bridge rectifier BR1 which converts the voltage from ac to dc. The rectifier can be of almost any type as long as it is rated higher then the expected current output. In the prototype the type used was a 35 amp 200 volt bridge RS 262-523. If wished individual power diodes can be used, but in either...
by Steven G4KUB and John Goodier G4KUC

case a heatsink will be needed. The bridge rectifier can be bolted to the chassis, and the output from the bridge rectifier is passed onto the main smoothing capacitors C1 and C2. A good rule of thumb here is to use 2000 to 3000µF per amp, so for a 30 amp PSU a value of approximately 60,000µF should be ample.

Box 6

Voltage regulation is provided by the widely popular LM723, which has appeared in many power supply designs over the years. It has a maximum input voltage of 40 volts, and very few external components are needed to get the IC up and running. It is also capable of providing current limiting, and the IC is supplied in a 14 pin DIL package. The 723 is only capable of supplying about 150mA, so a pre-driver transistor is needed to ensure there is enough current gain to drive the pass transistors. This is taken care of by TR1, which is a TIP3055. The output voltage is set by the resistor combination R3, R4 and VR2. R3 is connected to the output to sense any voltage drop and VR2 is used to set the output voltage, the output voltage swing should be in the region of 12 to 15 volts.

Box 7

All the current provided by the power supply is handled by the pass transistor TR2, 3, 4 and 5, although in practice, for a 25 to 30 amp supply, six transistors are recommended. It is up to the constructor how many transistors are used, and in turn this depends on the output current required. For example, in a 10 amp supply, only two devices need be used. The transistors used are 2N3055s, which can handle a maximum current of 15 amps. The bases and collectors of each transistor are wired together, and each emitter has a 0.1 ohm 3 watt resistor in series with it to ensure current sharing. The devices need to be bolted to hefty heatsinks to ensure cool running, but it must be said that when drawing 20 amps or more continuously they will run fairly hot. The 0.1 ohm resistors are made up from two 0.22 ohm 3 watt wirewound resistors wired in parallel.

Box 8

The outputs from the pass transistors are taken to the output terminals on the front or back panels of the case. The outputs can be taken to red and black terminal post, and Maplin or RS Components both stock suitable types. A red 'ON' LED indicator is also wired to the front panel and this is taken from the main PCB. There is also a 0.1µF capacitor wired across the output. Sense wires are also taken back to the over and under voltage circuits.

Box 9

Current limiting is controlled by VR1, and this facility is offered by the LM723 voltage regulator IC. Current limiting sets the maximum amount of current that the power supply will deliver, and protects from excessive currents.

Box 10

If there is a short circuit between emitter and collector on any of the pass transistors, then the un-regulated supply will appear at the output terminals. Therefore, it is important we have some form of overvoltage protection. This is provided by IC2, an MC3423 overvoltage crowbar protector, RS 307-890. Voltage is fed back from the output to pin 2 of IC2 via the resistor network R5, R6 and VR3. The setting of VR3 determines the firing voltage, usually 15 volts for a 13.8 volt power supply.

To prevent false tripping the MC3423 has a programmable delay feature. C7 determines the minimum duration of the overvoltage condition which will trip the overvoltage protector, with the value in circuit this will be about 1ms. A value of 0.01µF will give a delay of about 0.1ms. When voltage rises above the pre-set level, pin 8 goes high and fires the thyristor TH1, which in turn grounds the relay coil, removes the mains supply and C1 and C2 are rapidly discharged via R13.

Box 11

An under-voltage circuit has been added to detect any drop in output voltage, which could indicate a fault in either the power supply or the supplied equipment. It will also detect a short circuit on the output, and in turn switch the supply off. The detector is built around a 741 op-amp, IC3. A reference voltage is generated via R9 and D2 and applied to pin 3, the non-inverting input. The output voltage is sampled by R10 and applied to pin 2. When the voltage drops below the reference voltage set by D2, pin 6 goes high firing the thyristor TH1.

Component notes

A full list of components for a 20 amp power supply is shown in the table. Most components are easily obtained, and to help with some I have given the RS/Electromail, Maplin Electronics or the Verospeed stock number. The Electromail catalogue can be obtained from Electromail, PO Box 33, Corby, Northants NN17 9EL. Tel: (0536) 204555. Price £2.50. This company stock a full range of RS components.

The Maplin catalogue can be obtained from Maplin Electronics Supplies Ltd, PO Box 3, Rayleigh, Essex SS6 8LR. Tel: (0702) 552911. Price £1.50. This can also be obtained from W H Smiths.

The Verospeed catalogue can be obtained from Verospeed, Stansted Road, Boyatt Wood, Eastleigh, Hants SO5 4ZY. Tel: (070) 644555. This catalogue is free.

The transformer can be obtained from Jaytee Electronic Services, 143 Reculver Road, Beltinge, Herne Bay, Kent CT6 6PL. Tel: (0227) 375254. The price is £35.45 including VAT and postage. This price drops to £23.15 for six or more, but contact them first.

A 350mm long x 230mm wide x 160mm high case may be obtained from Miniford Engineering, Sun Street, Festiniog, Gwynedd LL41 4NE. Tel: (076676) 2572. Contact them first.

The following notes may be of some help.

Resistors: All resistors are 1/4 watt 5%, apart from R13, R15 and R16 through to R19. R13 is an aluminium clad 2R2 25 watt resistor, Vero 90-36606E. R15 is also aluminium clad, but rated at 50R 50 watts, Vero 90-36678F. The current sharing resistors R16, 17, 18, 19 are made up from paralleled pairs consisting of two 0.22R 2.5 or 3 watt resistors available from Maplin or Verospeed.
Capacitors: All the capacitors are of common type. Smoothing capacitors can be obtained from local suppliers, and falling that RS can supply 33,000μF at 40 volts, RS 105-420. It must be said that the final value of C1 and C2 will depend on the final current rating of the supply.

Semiconductors: There should be no problem getting hold of any of the semiconductors for the project. Shop around for the MC3423 overvoltage chip as this can range in price. 12 and 13 amp thyristors are available from both RS and Maplin, Vero also stock a suitable item. Miscellaneous: The 6 amp mains filter is of a good quality. The relay RL1 must be fitted with a 24 volt coil, I used a 16 amp SPCO relay, as this can range in price. 12 and 13 amp thyristors are available from both RS and Maplin, Vero also stock a suitable item.

The mains transformer T1 is available from Jaytee Electronics Services, stock number 97845 'Marchwood' transformer. The solder, eyelets and push on connectors are available from RS (see page 150 of the Electromail catalogue). They are used to connect wires between the transformer, bridge rectifier and smoothing capacitors. The PCB is homemade and an easy way to make this will be described later on.

References

Marchwood Power Supply Unit by Nick Allen-Rowlandson BSc G4JET. Practical Wireless, June and July 1983.
RS Data Sheet 1303, July 1983, L723 voltage regulator.
RS Data Sheet 3396, March 1985, MC3423 overvoltage crowbar protector.

Construction

We have now outlined the basic needs of the high current power supply and dealt with the protection circuits needed for safe operation. We will now deal with the construction of the unit itself, including PCB layout, wiring diagrams and testing.

The printed circuit board

Most of the smaller components are mounted on a single sided printed circuit board. I have written this view of making PCBs, but during the construction of the prototype I developed a simple and sure method of producing reasonable quality home-made boards. Figure 4 shows the component side of the board and the positions of each component, it also shows the copper track pattern. The problem most people have is getting the track pattern off the paper and onto the board, whilst still maintaining a reasonable amount of accuracy. To make the PCB you will need a piece of single sided board 135mm long x 75mm wide, tracing paper, PCB pen and etch. The board was made using the following method:

1. Make a tracing of the pattern, and where a hole is to be drilled on each pad, mark with a pencil dot. Be careful to mark the positions of the ICs, preset resistors and relay accurately. When finished, turn the tracing paper over.
2. Clean the PCB with wire wool and then soak it in hot, soapy water. Phosphoric acid works well. Lay the tracing onto the board using sticky tape at the top so you are able to lift the tracing up like a flap.
3. The next job is to mark onto the board the position of each hole to be drilled; this is done by using a scribe or sharp pointed instrument. With the tracing flat onto the board place the scribe onto the PCB dot on each pad and gently tap it with a small hammer, this will make an indent on the copper board and will clearly mark each drilling position.
4. With a blunt instrument, Rub over all the pencil lines, this should reproduce a faint image onto the copper board. Every so often just lift the tracing paper up and check all is going well. It may be possible to place between the board and the tracing paper a piece of carbon paper and this produces a much better image.
5. When satisfied, remove the tracing paper and start to re-draw the pattern onto the board with a PCB pen. Be careful when drawing the IC pads and thicken up the lines as shown on the layout. A Staedtler Lumocolor 318 Permanent PCB pen, sold by Maplin Electronics, was used on the prototype board, but other types should work just as well.
6. The acid works from the edge inwards, and I would advise you to apply more ink to the tracks at the edge of the board than those towards the centre. When the ink has dried, etch the board following the instructions supplied with the acid. You will know when the acid is working as the uncovered copper starts to turn pink and slowly dissolves. When the board has etched, clean off the ink with wire wool and drill the holes.
7. The construction can be split up into four parts: 1. Wiring and testing of the transformer, rectifier and smoothing capacitors; 2. Construction and testing of the PCB; 3. Wiring of the pass transistors to the heatsinks; 4. Final wiring and testing.

The first job is to lay out the main components in the case to be used. Mark and drill all fixing points to the base, front and back panels; see Figure 6 for
layout details. The mains filter, if used, is a surface mounting type, and room can be made for this at the mains input. The heatsinks are held in place on the back panel with long bolts and are allowed to stand off 40mm or so; a large hole should be drilled in the back panel to allow wiring to pass through from the pass transistors. The heatsinks will overhang the case on either side.

When the holes have been drilled and the case painted and labelled, bolt into position the following components: Ti, BR1, C1, C2, R15, F1, and the two terminal blocks. To the front panel secure SW1, SW2, LP1, the output terminals and the LED. The PCB and heatsinks will be added later.

**Transformer wiring and testing**

We will start by wiring the secondary of the transformer, bridge rectifier and smoothing capacitors, but we will not be wiring the primary side yet. The secondary of the transformer used has two tappings, which must be wired together to produce 16.5 volts at 42 amps. I used a piece of plane Veroboard, and bolted to it a 30 amp terminal block, which was then fixed to the mounting bolt of the transformer. I then wired to it the output of the transformer as shown in Figure 6. Two heavy duty wires are then taken to the ac side of the bridge rectifier BR1, these are then fixed in place with push-on connectors. C1 and C2 must be wired in parallel, and this can be achieved by strapping the terminals of the capacitors together. I used two strips of aluminium, which are then bolted to the capacitor terminals. Make sure you bolt Positive to Positive and Negative to Negative. The positive and negative sides of BR1 can be wired to the respective sides of the capacitors. I used solder eyelets to make the connections to the capacitors, and push on connectors for BR1. Remember to connect R1 across C1 and C2. All the wiring for this section is shown in Figure 6. That completes the wiring of the first section and it can now be tested.

To test this section you will have to temporarily connect 240V ac to the primary side of Ti. First connect a voltmeter across C1 and C2, turn the power on and check the reading on the meter, this should read about 24 to 26 volts dc. If all is well, then switch off and allow the smoothing capacitors to discharge through R1. Never be tempted to discharge these capacitors by placing a screwdriver across them. A word of warning, you are now dealing with 240V ac which, if touched, could result in a very nasty accident. If in doubt get an experienced constructor to check your work.

**PCB construction and testing**

With the first part wired and tested we can now move on to the construction of the PCB. Figure 4 shows the components overlay of the board. Mount and solder all the components as shown. Take care to mount the diodes, electrolytic capacitors and semiconductors the right way round. You may have to enlarge the mounting holes to take R13. R13 is stood off the board and is held in place by thick copper wire. TR1 is best mounted in place with the heatsink already attached.

It is possible to test the board before finally wiring it into place. To test the board you will have to supply it with about 20 to 25 volts dc. But under no circumstances must you use the section already wired to supply this voltage. When testing the board you will simulate fault conditions, and at the moment there is no way of disconnecting the mains when a fault occurs; failure to remove the supply will result in the possible destruction of R13 and TH1. I used a 0 to 30 volt 1.5 amp variable power supply, which is based around an LM317K voltage regulator.

First set the preset resistors as follows: VR1 centre, VR2 centre and VR3 fully anti-clockwise. Next connect a wire between the sense output and the emitter of TR1. Bring in the supply wires and wire the positive to the '+' volts in' and the negative to '0 volts.'

Turn the supply voltage on, and if possible set the output to about 23 volts. The on board relay should 'pull-in', and if you check the output voltage at the emitter of TR1 it should read 13 to 15 volts. Rotating VR2 should adjust the output voltage. To test the under voltage stage, monitor the output and adjust VR2, when the output voltage reaches about 12 volts the relay should 'drop-out'. Under a fault condition the positive input voltage is almost shorted to ground via R13 and TH1, so make sure your variable supply is short circuit proof. Switch off and reset VR2 to about centre.

To test the over voltage stage, set the...
output voltage to 15 volts, then adjust VR3 until the relay 'drops out'. Switch off your supply and re-adjust VR2 to its centre position again. Switch back on and monitor the output, start to increase the output voltage via VR2, when it reaches about 15 volts the relay should 'drop-out'. Switch off and re-adjust VR2 to its centre position. Remove the link between the sense and TR1 emitter. This completes the testing of the PCB.

The relay specified has a coil voltage of 24 volts, but under operating conditions it has been found that a voltage as little as 13 volts will 'pull' the relay in. The operating voltage at which the relay will open or close can be increased by placing a resistor in line with the coil. The board has a link close to the relay, and this can be replaced with a resistor, the value of which can be between 100 and 560 ohms; a good starting point is about 220 ohms. You may not feel that this resistor is necessary, but if you think that the relay is operating in a sluggish manner, then add it. If the value is too high, then the relay will not pull in when SW2 is pressed.

**Pass transistors**

_Figure 5_ shows the pass transistors mounted on the heatsinks. These must be mounted using TO3 mounting kits. The amount needed depends on the final rating of the supply, and the diagram shows the six transistors needed for a 30 amp supply. Start by marking the position of each transistor on the heatsink; you can use the mounting kit insulator as a template. Drill all mounting holes and bolt all transistors to the heatsinks using the TO3 kits. Using an ohms meter, check that the relay is operating in a sluggish manner, then add it. If the value is too high, then the relay will not pull in when SW2 is pressed.

Next wire the transistors as shown in _Figure 5_. As already stated, the 0.1 ohm current sharing resistors are made up of 0.22 ohm paralleled pairs, and this is clearly shown in _Figure 5_. Use heavy current wire for the collector and emitter wiring.

All wiring is then taken into the case and coupled together via a 30 amp terminal block, see _Figure 6_.

**Main wiring**

You are now ready to couple together all the parts of the power supply to make one complete unit. The main wiring diagram is shown in _Figure 6_. A good idea here is to start to use colour coded wire to identify the voltage rails, perhaps green for the un-regulated supply, red for the 13.8 volt regulated output and black for negative rail. Suitable high current wire can be obtained from Maplin Electronics (see components list). Also use colour coded wire for the mains supply, ie brown live, blue neutral and green/yellow for the earth.

The first stage of the supply should already be wired and working, so it is just a matter of wiring the mains input, PCB and front and back panels. Follow the diagram carefully and double check all wiring. Put insulated sleeving on both sides of R15 and F1. If you are in doubt get a friend with a little more experience to check your work. This completes the wiring and the supply is now ready for testing.

**Final testing and setting up**

Give all wiring a final check, and if satisfied you are now ready to test the full supply. Fit the mains plug with a 5 to 7 amp fuse. If the PCB has not already been tested, then set the pre-set resistors to the following positions: VR1 centre, VR2 centre and VR3 fully anti-clockwise. Connect a voltmeter to the output, plug in and switch on. Pressing SW2 should cause the relay to pull in and the front panel LED to light. If the relay pulls in and quickly drops and again, then this could indicate that the output voltage is below 12 volts and firing the under voltage circuit. If this happens, then turn VR2 up slightly. If all is well then the output voltage should read between 13 and 15 volts. To test the supply the procedure is similar to that already described in 'Testing the PCB', but I will go through it again in a little more detail.

**Under voltage**: To test the under voltage stage, monitor the output and adjust VR2, when the output voltage reaches about 12 volts the relay should drop out and the mains supply switch off. Re-adjust VR2 to its previous position and re-start the supply by pressing SW2.

**Over voltage**: To set the over voltage trip, the output voltage needs to be increased to about 15 volts, or to the level at which the trip is needed. For a 13.8 volt supply this is usually about 15 volts. First make sure VR3 is fully anti-clockwise and then adjust the output voltage to the required trip level, say 15 volts. Adjust VR3 until the relay 'drops-out' and the supply is switched off. Re-adjust VR2 to about its normal operating position and re-start the supply by pressing SW2. Monitor the output and start to increase the output voltage again, at about 15 volts the over voltage should trip and the supply switch off.

The under and over voltage can be checked again if wished by simply turning VR2 down to about 12 volts, or up to 15 volts. At each level the protection circuits should trip and turn the power supply off. Don't forget to re-set VR2 to its normal position before re-starting the supply again. Finally, set the output voltage to the required level, ie 13.8 volts. _Current limit:_ The supply can now be tested on load and the current limit set. To do this you will have to find a resistive load which can draw the required...
current. To do this I used a 0.68 ohm 50 watt resistor and water cooled it in a bowl of cold water! Using Ohm's law, a 0.68 ohm resistor will draw about 20 amps, and a 0.47 ohm will draw about 29 amps when supplied with 13.8 volts. If you are going to set the current limit properly, you will need a current meter that can measure at least 30 amps.

Turn VR1 fully clockwise. Switch the power supply on and then connect the meter and load to the output; make sure that the load is submerged in a bowl of cold water before starting. When the supply is drawing full load, adjust VR1 until the output current drops back to about 20 amps. A suitable current meter was not available when setting up the prototype, so I placed a voltmeter across the output and on full load I set VR1 so that the output voltage fell back to 13.5 volts. If you set the output to fall below 12 volts, this will turn the supply off.

Short circuit: To test the short circuit protection you will have to place a short across the output terminals. Momentarily shorting the output should have no effect, but leaving the short on for more than half a second should cause the supply to close down.

The power supply is now set up and ready for use. Before putting it into full operation leave the supply switched on for about two hours, and every so often draw about 20 amps from it using the 0.68 ohm resistor. This should show up any faults before connecting it to the main equipment. The equipment powered must have its own in-line fuse, as the power supply has no internal fuse of its own.

Conclusion
The prototype has been in daily use now for about six months and has been faultless in operation. The prototype only used four pass transistors and it easily powers my TS440S with 100 watts output on FM.

When finished and working the power supply is a worthwhile and very useful addition to the radio shack. The main control board is very versatile and could be adapted for other uses. By changing the resistor network R3, VR2 and R4 a variety of output voltages could be obtained.

LOOK WHAT YOU GET EVERY MONTH IN

DX DIARY Don Field G3XTT with all the news of rare DX, contests and DXpeditions

ON THE BEAM Glen Ross G8MWR with all the news and comment from bands above 50MHz

G3OSS TESTS Angus McKenzie - the fairest, most comprehensive reviews available anywhere

MORE NEWS, MORE FEATURES, MORE FUN, MORE STYLE THAN ANY MAGAZINE AVAILABLE ON THE MARKET TODAY

Make sure of your copy by placing a regular order at your newsagents or by taking out a post free, inflation proof subscription, with early delivery to your door each month.

AMATEUR RADIO SUBSCRIPTION ORDER FORM

To: Subscription Department • Amateur Radio • 1 Clarendon Road • Croydon • Surrey • CR0 3ST Tel: 01-760 0409

NAME: ________________________________
ADDRESS: ________________________________

PLEASE SUPPLY: (tick box) for 12 issues, all rates include P & P
Inland World Surface Europe-Air World-Air
£16.80 £18.70 £22.45 £27.50

PAYMENT ENCLOSED: £___

CREDIT CARD PAYMENT □ □ □

EXPIRY DATE

Postcode: ________________________________

Signature: ________________________________

SEPTEMBER 1987 please mention AMATEUR RADIO when replying to any advertisement
PAKRATT PK232

multimode data controller

A user review by Ken Michaelson G3RDG

The PK232 is quite a box of tricks operating on transmit and receive in five modes: Packet, Amtor, RTTY, CW and ASCII, but for all that its dimensions are modest. It measures 11in (279.4mm) wide by 8.25in (206.6mm) deep by 2.5in (63.5mm) high, and weighs 3lbs (1.36kg). The LEDs on the front panels illuminate giving the particular mode/status operating at the time, and I found them very helpful in use. A LED labelled DCD (data carrier detect) lit every time the unit detected any data. Next to it was a control marked 'Threshold'. To its right was the very important ten segment discriminator-type bargraph indicator for HF tuning. At the far right of the front panel were two push on/push off switches, the right one being power and next to it the switch controlling Radio 1 or Radio 2 input. The rear panel has ten different inputs and outputs, from left to right these being power (2.1mm socket), speaker for Radio 1 (3.5mm socket), special 5 pin male socket for Radio 1 input/output, special 5 pin male socket for Radio 2 input/output, speaker for Radio 2 (3.5mm socket) and a 5 pin 180 degree DIN socket for oscilloscope Mark/Space signals and FSK keying output (normal or reverse), to an HF transceiver if required. The microprocessor is a Zilog 280. There are 16 kilobytes of RAM available, and up to 40 kilobytes can be used in ROM. The HDLC controller is a Zilog 8530 SCC, and there are 39 integrated circuits used in all. The particular version of the unit I had for review was intended for Europe and was adjusted to give the European (IARU) tones of 1460Hz for mark and 1260Hz for space. The nine mode LEDs are all labelled with their particular significance, as are the eleven applicable to status. The power requirements are +13 volts dc (12 to 18V dc) at 700mA.

Now to the operation. There are several leads to be made up and connected before the actual switch-on. The RS232 lead with a 25 way D connector at one end and a 5 way domino DIN plug at the other end is supplied by ICS, together with the EPROM to drive the unit from my BBC micro. There are two other leads supplied by the manufacturers, each having at one end the special 5 pin male plug mentioned above. These two leads are intended to be connected to the two radios which I was using. Both the radios had the usual 4 pin type microphone socket, although the main rig for HF, (a Trio TS820S) had different connections to the VHF unit which was an elderly FDK Multi II.

In both cases I had to solder the wires onto the plug, but take the speaker audio out again with a separate wire to plug into the extension speaker socket of the respective rigs. This meant, of course, that I couldn't hear what was going on. This trouble was easily overcome, because there are two speaker sockets on the rear panel, one for VHF and the other for HF. It was only necessary for me to plug in a separate speaker to either of these sockets to hear everything. I decided to take advantage of the facility to use the oscilloscope output from the DIN plug also on the rear panel, and connected the output mark and space to the vertical and horizontal inputs of my 'scope and used the resultant display for tuning in addition to the ten segment bargraph in the PK232. The EPROM to drive the unit had to be inserted correctly in my Beb using a spare socket. This, I find, is always rather a tricky operation.

Having carried out all these operations, the next one was a trifle more awkward. I had to add an extra cable to the D plug connecting the RS232 input. This was to connect up my Epson FX 80 F/T printer for FAX. A 12 way screened cable had to be used ending in a 36 way Amphenol male plug for insertion into the printer. Following the circuit diagram of the PK232, the pin numbers of DATA 1 to 8, STROBE, BUSY and ACK were noted. An extra pin number which I had to remember was GROUND (pin 7). So having opened the D plug and carefully soldered the wires on to their respective contacts, I then turned my attention to the other end.

The Epson manual gave all the pin numbers for DATA 1 to 8 and the other three. The only awkward one was labelled LOGIC 0 and was pin 18. However, all these were soldered on and the covers of both the D plug for the RS232 on the PK232 and the Amphenol plug for the Epson were replaced. That operation concluded successfully, everything was ready to commence.

The operating manual describes in detail a sequence of operations called 'Loopback Test Circuit', and at this point, I must comment on the manual. I have seldom seen such an excellent set of instructions and information. There are 271 pages, clearly printed, with 12 appendices, giving circuit diagrams, component values, parts pictorials etc. There is even a preface on Amtor by Peter Martinez G3PLX. All in all, this manual could serve as a bible for not only Packeteers, but also those who use RTTY, Amtor or CW. The baud rate from the PK232 has to be set at 2400 bauds, and in order to achieve this ICS supply a small handbook with their EPROM. In the handbook is a short 19 line program for insertion into the Beb for this purpose. I could read and control the PK232 with the simple program just mentioned, but there would be no split screen, memory or function key action. I altered the program slightly to account for the figure of 2400 bauds, but once this was done, I had seven or three AA cells in a holder attached to the lid of the case. These were not supplied with...
the unit, and act as a battery backup for the RAM. The RAM retains all the personalised particulars, such as your callsign, selcall, etc. In fact, it retains all the parameters except the time of day clock and the monitor head list. Two functions are controlled by the microprocessor.

Next I loaded the program and ran it. I then switched on the unit, and typed 'TBAUD 2400—'. The procedure can vary then depending on whether you have a 'cold' start or there is information in the RAM. If the cells have been disconnected, then all the information is lost and one has to start from scratch, so the first switch on had no information there. Having typed 'TBAUD' with the unit on, I then switched it off and cleared the Beeb. Typing 'X'TNC' called up the EPROM giving a three-way split screen display.

The top merely showed 'PK232 DRIVER PROGRAM @ ICS 1987'. The centre section, about three-quarters of the screen, showed the received information and also accepted the 'CONNECT' or 'COMMAND' instructions which had been typed and shown on the lower portion of the screen before 'RETURN' had been pressed. Any typing done on the Beeb keyboard would first appear on the bottom section of the screen and no action would be taken by the PK232 until 'RETURN' had been pressed. All nine function keys are programmed with various commands, and a copy of the overlay supplied by ICS is shown elsewhere. There are 28 different options when in the Packet mode and 25 options when in the Amtor/RTTY/CW/ASCII mode. The various modes can be brought into operation by pressing the 'cursor' keys. Left cursor = Amtor/ FEC, right cursor = RTTY, up cursor = CW and down cursor = ASCII. To return to the previous display one had to press 'COPY'. This was not clear to me at the start and I spent some time trying to work out what to do. I would suggest that a fifth line be added to the list at the top of sheet 2 of the booklet saying merely 'Copy key = Packet', which would greatly help newcomers.

There are two modes in which the display can be shown namely Mode 0 and Mode 3. When using Mode 0, I personally found that there was not enough space between the lines, but when in Mode 3 there was a great improvement. It has to be remembered that the various function key options applied to the mode in use at any time, and when the operating mode is changed out of Packet to any of the Baudot modes, the display alters on the Status line along the top of the lower section of the screen. In the Packet mode there are five function displays, namely MONITOR, ALARM, MCON, CMSG and PRINTER, but only three, MEMORY 1, MEMORY 2 and PRINTER, when in the Amtor/RTTY/CW/ASCII mode. There is an alarm facility enabled by pressing 'shift' and 'F1', which sounds a siren when anyone calls the callsign inserted as 'MYCALL'. A speech connect operation is also available, but the Acorn speech synthesizer has to be fitted to the Beeb in order for it to work.

Switching on the unit displays the sign-on message, 'AEA PK232 Data Controller' etc. Typing 'MYCALL—' results in 'MYCALL NOCALL' being shown, so the first thing was to insert my own callsign by keying 'MYCALL G3RDG—'. This time the PK232 showed 'MYCALL now G3RDG NOCALL', showing that the command had been accepted. The next thing to do is to check the baud speed. This is done by typing 'HBAUD'. The word appears on the lower section of the screen and as soon as 'RETURN' is pressed, shows in the middle section followed by the speed setting at that moment. In this particular case the display read 'HBAUD 1200', which was what I required for VHF. It was also necessary to check that the Radio 1/Radio 2 switch was out, indicating that the unit would receive VHF frequencies. This switch has to be depressed when operating on HF.

Next, I entered the day/time sequence. Two digits have to be entered for the year, month, date, hour and minute, following the typing of 'DAY space'. If any of the parameters consist of only one digit, then a leading zero has to be added to it.

The unit always starts in the Command mode with the CMD LED lit in the status panel and the 'PKT' LED lit in the mode panel, so if I decide to try RTTY I would have had to change the mode with a cursor key. Since I had decided to try VHF first and I was already in Packet mode, I entered 'VHF—', and saw the words 'VHF ON' appear. Had VHF been OFF then the words 'VHF was OFF VHF now ON' would have been shown, indicating that the command had been accepted and the instruction altered from the previous setting. All the 143 commands can be accepted in a shortened form, for example 'HBAUD' can be entered as 'HB', followed by the figure you require, and so on.

I now had the PK232 set up for operating on 2 metres in Packet mode, on a frequency of 144.650MHz. This is the commonly used frequency for Packet radio although some operators have migrated to 144.675MHz. As described above, the function keys of the Beeb are used to perform certain operations, and F7 toggles the monitor on or off. At commencement the word 'MONITOR' on the status line merely has a series of question marks following the word, but the action of the first pressure of 'F7' brought the state of the monitor on to the display. The same effect was observed with the other four displays. There were a number of stations on the frequency that I could receive, including three Mailboxes, namely GB3KP, GB3UP and GB3HO (the RSGB headquarters mailbox), and the first station I tried to contact was GB3KP. To do this I typed 'C GB3KP'. C is short for connect. Since my callsign and the day/date/time had already been entered into the RAM it was not necessary to do anything else other
Reduced size yet high performance HF antennas are becoming increasingly popular among today's radio amateurs and ICOM is proudly responding to those needs with the Deluxe Antenna System. The AH-2 antenna package is especially designed for luxury style mobile activities such as vacationing or operating from environmentally sensitive areas such as apartments.

Mobility in top fashion hasn't been more attractive and ICOM's all-in-one design boasts numerous advantages over conventional mixed components type setups. Whether pursuing fixed station or mobile activities, the flexibility and convenience of this fully remote-controlled and automatically tuned antenna opens new horizons in limited antenna HF operations. Since the AH-2 system is packed with unique features and is a relatively new idea, we would like to discuss its innovative designs in a step-by-step manner.

There are five components in the ICOM AH-2 system. The package can be purchased complete or minus the mobile mount and whip antenna. A fully automatic antenna system consists of a small, attached control unit, a remote-actuated and microprocessor-controlled antenna tuning unit, an approximate nine-foot stainless steel whip, a universal and heavy-duty auto frame mount, and an interconnecting cable set.

An optional OPC-236 cable interface is available for the IC-751 or IC-745 HF transceivers. When using the system, a stainless whip is replaced with a random wire or a 40-foot horizontal. The overall concept provides a superb antenna tuning and the highest possible performance.

Whether assembled as a full-band mobile system or employed in fixed station use, the AH-2 system is a fully automatic and heavy-duty antenna. The system's whip and mount can be quickly installed on a TV mast, boat, or car. The mount's bracket bolts to an existing hole in an auto's rear frame and a very strong pipe bolts into the bracket and the antenna's base section. The pipe is fully adjustable to fit various cars. The antenna base section incidentally stands 17 inches tall and weighs approximately two pounds. The AH-2 system can be installed in one of eight horizontal positions, so that information is recalibrated in less than two seconds when the HF transceiver operator tunes to a preselected range. An additional microprocessor in the rig attaches remote control unit handles automatic transmission mode switching and RF power output control.

Notice also the precise use of microprocessor selected fixed capacitors rather than motor-driven variables. This overall concept provides superb antenna tuning and the highest possible performance.

The system's whip and mount truly gives new meaning to the terms unbreakable and heavy-duty. They can be quickly installed on a TV mast, boat, or car. The mount's bracket bolts to an existing hole in an auto's rear frame. The stainless pipe bolts into the bracket and the antenna's base section. The pipe is fully adjustable to fit various cars. The antenna base section incidentally stands 17 inches tall and weighs approximately two pounds. Rugged is truly an understatement.

Whether assembled as a full-band mobile system or employed in fixed station use, the AH-2 system is a fully automatic and heavy-duty antenna. The system's whip and mount can be quickly installed on a TV mast, boat, or car. The mount's bracket bolts to an existing hole in an auto's rear frame and a very strong pipe bolts into the bracket and the antenna's base section. The pipe is fully adjustable to fit various cars. The antenna base section incidentally stands 17 inches tall and weighs approximately two pounds. Rugged is truly an understatement.

Whether assembled as a full-band mobile system or employed in fixed station use, the AH-2 system is a fully automatic and heavy-duty antenna. The system's whip and mount can be quickly installed on a TV mast, boat, or car. The mount's bracket bolts to an existing hole in an auto's rear frame and a very strong pipe bolts into the bracket and the antenna's base section. The pipe is fully adjustable to fit various cars. The antenna base section incidentally stands 17 inches tall and weighs approximately two pounds. Rugged is truly an understatement.

Telephone us free-of-charge on:

HELPLINE 0800-521145.

This is a helpline for obtaining information about ordering ICOM equipment. We request that amateurs cannot be used to deliver or receive equipment and parts orders. Thank you.
pressing these two keys followed by 'SHIFT F6' caused it to commence transmitting and, calling up the message on disc, start sending the CQ sequence. At the end it sent the CW identity and returned to receive. If I didn't want the CW ID to be sent, I could merely toggle the CTRL TAB keys and return to receive in the normal manner.

This was all very satisfactory, so the next thing was to actually contact a station. I had a good QSO with an Italian station, and found that I was becoming accustomed to the use the different keys required in the QSO. The commands 'RXREV' and 'TXREV' really explain themselves, but if one wanted to toggle the transmit sideband to the other, one would key in 'RXREV T ON' or 'RXREV T OFF' to achieve the desired result. Of course the same thing could be done by changing sidebands, but the command was there if needed. The command 'ABAUD' was also helpful on some occasions when conditions were not too good, but it had to be used with discretion.

I was unable to find any ASCII signals at the times when I was listening, so I cannot comment on this mode except to say that it was called into operation by the pressure of the 'DOWN' cursor and the illumination of the ASCII LED in the mode panel of the unit. The baud speed was altered with the command 'ABAUD'; as opposed to the baudot (RTTY) adjustment with the command 'RBAUD'. The shift could also be altered between 200Hz, suitable for narrow shift, and 1000Hz which could be used for reception of weather stations etc. This could be accomplished with the command 'WIDESHFT' (abbreviated to 'WI') either 'ON' or 'OFF'. Normally it remained 'OFF' for the 170Hz shift of most stations.

The next mode to be set up was Morse. This is called up by keying in the command 'MORSE' (or 'MO')—or in the manner made available by the program, pressure on the 'UP' cursor. In either case, the Morse LED lit on the mode panel. The PK232 had an automatic speed tracking facility in this mode which meant that it was only necessary to tune in a CW signal. The unit was in tune when the centre of the 10 segment bargraph tuning indicator lit and the lit bars shifted from the centre to the lefthand side of the display in rhythm with the Morse keying of the received station. A very simple job.

The same sequence of operations as was used in the RTTY QSOs was necessary, and one could use either LSB or direct keying using the output of the unit which would key directly the FSK output of the transmitter. I used LSB, and it is worthwhile noting that a 1200Hz tone is being switched as the output in this case, but one receiving 800Hz tone, I had to use the RIT in the rig because of the offset between the transmit and receive tones.

Which brings me to the last two facets of this remarkable unit. With the insertion of the optional FAX EPROM it was possible to receive and also send FAX. This was not so much a feature of the equipment for the purpose of this review.
Despite conflicting opinions over the last 12 months, the general consensus opinion by world-wide observatories is now that Sunspot Cycle 22 probably last 12 months, the general consensus of that after the sunspot maximum of 1957, in the New Scientist on 25th June, 1987 research geologist in Adelaide, writing so that by the mid 21st century sunspot activity should be lower than at any time in the preceding 300-350 years.

**intercontinental openings**

During the last two months we have been favoured with one of the most interesting Sporadic E seasons on record, with many inter-continental openings and long distance QSOs which would do credit to the HF bands. This could not have come at a better time as it should give the class B operators and other newcomers to the band a forecast of what to expect in the future.

These outstanding conditions have been highlighted by a very successful DXpedition of historic importance. Ted Collins G4UPS, who is better known for his operations as ZD8TC with a total of 80 countries worked on six metres, 569/519; 2103Z WA1OUB, 579/529. He heard 1712Z, EA1MO heard at 1727Z on SSB but he faded out, CT0 out at 1800Z.

The next activity was on 2nd July: 1647Z six metres, LA2AB, 599/559; 1652Z band, Q4JCC, 559/579; 1745Z six metres, LA2AB, 59/59; 1810Z stations but couldn’t raise them, CT0 beacon very strong at 1712Z, EA1MO heard at 1727Z on SSB but he faded out, CT0 out at 1800Z.

The next activity was on 2nd July: 1647Z six metres, LA2AB, 599/559; 1652Z band, Q4JCC, 559/579; 1745Z six metres, LA2AB, 59/59; 1810Z stations but couldn’t raise them, CT0 beacon in from 1649-2223Z; 2036Z six metres, LA2AB, 59/59; 2036Z, LA9DL, 57/45; 2048Z, 9H1CG, 59/57; 2056Z, 9H1BT, 59/57; 2152Z, GB3RMK beacon, 599/59, 2152Z, 9H1 stations work LA2AB, still all 59; 2220Z some activity crossband, worked 9H1, GB3RMK fades out.

3rd July – ten metres opens up at 0030Z; 0902Z, 9H1CG, 59/57; 1005Z six metres, G1M, 59/59; 1014Z, 9H1CG, 59/59; 1103Z, 9H1CG, 59/59; 1134Z ditto; 1201Z, 9H1CG, 579/579; 1244 GM beacon, still 599, fades out 1343Z but no GM activity, typical E opening; 1433Z E19Q heard calling CQ on six, 589; 1438Z QSO on six, 599/599 (at last), 57/57, DL stations XB; 1500Z six, 579/579; 1510Z six, 579/579; 1605Z six, 579/579; 1705Z six, 579/579.

Ted understood that during this opening UK stations were QSOing YV0. He would like to know the overall picture during this time-frame. Was there much activity to receive a report from Jim Trebig FY7THF beacon during the opening to UK stations were QS0ing YVO. Did the YVO have a path before or after 1705Z? Did anyone hear the FY7THF beacon heard? Did anyone hear the FY7THF beacon heard? Did anyone hear the FY7THF beacon heard? Did anyone hear the FY7THF beacon heard?

4th July – constant TV from about 0630Z, CT0 beacon very strong 1530-1745Z. 5th July – 1033Z F4JCC on ten metres working crossband; 1045Z CT0 beacon in for 45 minutes; 1403Z CT0 beacon in for just over one hour; 1935Z band, 599/559; 1937Z six metres, 9H1AS, 59/57; 2004Z, GW4HKO, 59/59.

6th July – Nil on six metres. 7th July – 1160Z six metres, LAGO, 59/59; 1134Z ditto; 1301Z, 9H1CG, 59/59; 1325Z, GM4UPL, 59/59; GM beacon in from 1317-1400Z, TV fades out during this time, TV returns by 1450Z; 1635Z until 1717Z TV very auroral, returns to normal 1717Z.

**Conclusions LX/G4UPS**

Ted felt that he was very unfortunate in not having any really good openings whilst in LX, and would be interested to hear one of these stations, but can’t remember which one, working W6TZD and could hear T3D 339.

When Ted moved to Luxembourg to operate as LX/G4UPS, his location was JN29SX, 4km south of Luxembourg City. He had to use a 28ft high mast, from which a straggly G5RV, six metre dipole and ten metre dipole were slung. Not a very tidy array, but it worked! LX was far more interesting than C30. C30 was what one would expect, a mixture of southern French, CT, EA path, LX had constant, all day long TV from Eastern Europe, with lots of Russian/Polish FM on the band. For a shorter path into DL or G one would need to stop for a longer period, maybe at the beginning or end of the season, plus a wee bit of luck.

He arrived on 28th June and got the aerials and ailing work on up to the HF bands by 1826Z. The first six metre activity, apart from constant TV, was on 30th June: F4JCC and G4JCC study over 1712Z, EA1MO heard at 1727Z on SSB but he faded out, CT0 out at 1800Z.
know what propagation was like during this period. According to the locals the band there remained dead over the whole period. Ten metres appeared to be open very early every day to UBS/UA, YO etc, and he suspects that the TV was coming from SP land, as he was hearing a lot of Polish/Russian FM throughout the day, and the TV was on from around 0630Z-2300Z every day, but did fade out at times of other paths being open.

He intends to go to LX for a longer period next year, a little better equipped, and with a beam for ten metres and a DX TV set-up. He would like your comments on the LA/9H1 path with him in the middle, hearing/working both! (See Charlie Newton's comments).

E openings July 19th to 21st

Charlie Newton has plotted out the periods of blanketing E as recorded by stations, with the northernmost at the top. What strikes him most is that the E cloud can be very patchy and only be seen by one station at any one time, such as at South Uist at 10.00 hours on the 20th. But what is more obvious is that all or most of the stations see something. This means that we are not dealing with small isolated areas or patches of isolated E clouds, but rather massive ionic clouds covering vast areas of Europe. We must remember that the Ionozone stations only look up vertically at the ionosphere, so although they may not see the cloud at their recording time, it could be only just off their recording edge. The 20th was, he felt, a case like this: from 07.00 to 08.00 the Slough station recorded '0', meaning other phenomena, but could not be positively identified as blanketing 'E'. The cloud was a bit thin.

The other point of considerable importance is that the northern station South Uist has seen a lot of E, very much more than we would expect. Also it is very interesting that SF spread F appears prior to the E and at the end of the E. Spread F means that the ionosphere is spread and holes are appearing, can be horizontal or vertical or both. So we see the pattern, the intensification of the E layer from a patchy F2 and the disintegration of the E layer back to a patchy F2.

For the southern stations spread F is a rare event, so we would not expect it, but we would expect more sporadic E. It is therefore interesting to note that on the 20th, the southern station Poitiers had the least E. It would appear that the mid Europe band (latitude 54 to 57 degrees) was where the E or O (other) phenomena worked. If we use just plain logic then contacts would have been possible to well north of South Uist latitudes, and to well south of 54 degrees. If we drop the frequency to 29MHz, such as for cross-band working, then this is what happens. If we now increase the frequency then it is only the denser parts of the cloud that can do the trick, so we are back to patches. If we go to the limit, say two metres, then we may only have one patch to work with. So contacts can be very widespread or very selective, it mainly depends on frequency. Also, of course, the clouds tend to spread more east west than north south, this is due to the earth's magnetic field causing an alignment that way.

From the mailbag

As could be expected after such an eventful period we have had a very long and interesting mailbag, and desirable as it may be, we unfortunately do not have enough space available to include all reports in full. My apologies.

Another long letter was received from Lefty, K1TOL, dated July 1st: 'As I write these lines I hear European video on 49,750 and 760, but I hear no European stations coming through. My CW keyer has been on memory-repeat mode, but no answers!

On 29th May I heard OX3HF for 4 hours, then at 2020Z heard GB3SIX from S2-S9, but then only for 4-5 minutes. On 5th June I had a QSO with CT4KQ at 2303Z. On 7th June the GB3SIX beacon was heard from 1244-1515Z, but no UK stations. For the last four days since 6th July I have heard Russian video at 1300-1400Z. I made many calls on CW, but heard no stations except from the USA. How frustrating!

'I wonder how far UK stations have worked into USA? Also, which stations in Europe have the most number of US stations worked? We have not heard any Europeans since June 20th, prior to that I had worked 150 Europeans, mostly Gs. I have also worked PA0XMA, DK1PZ, DJ3CY, CTO1LN, CT4KQ, LA9UX, C30DAR and 9H1BT. I also heard 9H1CG, but failed to work him.

'I have now worked 75 countries on six metres since 1977, and I have just heard that ARRL has now authorised 50MHz DXCC; who'll be the first?'

Ray Cracknell G2AHU wrote a letter dated 28th July regarding the Reporting Club records, we are looking for the first intercontinental and then special modes, eg the first transatlantic Es; the first TEP etc. Hearsay reports of W6s being heard as well as 0 and 7s have been coming in, but when I try to get first hand information they become dubious. Indeed, the path to the West coast goes over the magnetic North pole, and I shall need a lot of convincing that it is possible by Es'. Can any of our readers help us in this matter?

Oving Aylesbury G6NB writes: 'Recent openings for me have been on 17th June when I worked my old friend Larry Nava at 2246Z, followed by K1TOL, WA10UB and W5HQU. This was followed on the 19th June at 20.00Z with W9IP2, K1TOL and VE1XY. Lady Luck was with me on the 24th June when I worked W6JKV/YV0 at S9+ (also my son Richard G2BSJ worked him at S9+).

In the Contest News (page 614) of the August issue of Radio Communication, we note that a fixed station 50MHz contest is listed: 0900-1300GMT, 18th October, 1987, and further events with other formats will take place next year. The 'Countries worked' ladder has been held over pending clarification/confirmation of status of some European countries, but please send your claims to me, Ken Ellis G5KW, 29 Stanbrook Road, Northfleet, Kent DA11 0JW. Many thanks.

<table>
<thead>
<tr>
<th>Date</th>
<th>Time Chart</th>
<th>MD</th>
<th>MN</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>20</td>
<td>21</td>
<td>22</td>
<td>23</td>
</tr>
<tr>
<td>24</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 SU</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 AP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 P</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 SU</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 AP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 PO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 P</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21 SU</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21 AP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21 PO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SU</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>POIATERS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E blanks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SF spread</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Compiled by G2FKZ

SEPTEMBER 1987
QSL MAIL BOX is the alternative professional QSL CARD mailing service dedicated to the rapid distribution of QSL CARDS efficiently worldwide

NO WAITING  ------------ NO POSTAGE  ------------ NO LIMITS

Membership to QSL MAIL BOX is open to all AMATEURS and SWLs who wish to confirm those all important QSOs.

All member's QSL CARDS received by QSL MAIL BOX will be despatched each month on the same day each and every month by FIRST CLASS MAIL or AIRMAIL. FREE of post and packing charges regardless of Quantity. So all QSL CARDS in your box on your despatch date will be mailed to you.

NO WAITING  ------------ NO POSTAGE  ------------ NO LIMITS

Membership to QSL MAIL BOX is by annual subscription. Just complete the form below (Photocopies accepted) include your subscription, return them to us and our worldwide QSL MAIL BOX is at your service.

DON'T DELAY QSL 100% VIA MAIL BOX TODAY

73s and 88s Good DX DE GOHGU

NAME

ADDRESS

COUNTRY

POST CODE

DATE

CALLSIGN

DAY  MONTH  YEAR

ANNUAL SUBSCRIPTION:-
CHEQUE/POSTAL ORDER/MONEY ORDER. £7.50 inc VAT

Subscription receipts will be forwarded on your first despatch date

RETURN TO
QSL MAIL BOX. HEREFORD. HR4 7TA. UNITED KINGDOM
Moe Lynn VE6BLY has sent me details of the arrangements for the VE Morse test, effective from 15th October, 1986. Tests are administered by three appropriately qualified amateur examiners on behalf of the Department of Communications, although candidates still have an option to be tested by the department. There are two levels of examination. The Amateur Class requires a sending and receiving speed of 10wpm for three minutes, including plain language, figures, punctuation marks, Q codes and emergency signals. Candidates may send on a hand key, a semi-automatic key, or an electronic hand key. When receiving, the text must be copied legibly by hand or by typewriter. The Advanced Amateur test has similar requirements, but at 15wpm.

Licence conditions

Morse is the only form of communication permitted in the lower part of most bands up to 144MHz. For example, on 3.5 to 3.725, 7.0 to 7.050 and the first 100kHz on 14, 21, 28 and 144MHz. Holders of certain professional operators’ certificates can operate on the amateur bands, and permitted powers are higher than in the UK. The maximum dc input is 1000 watts, or 750 watts carrier power measured across an impedance matched load.

There are a number of other noticeable differences between Canada and the UK. Third party traffic is permitted, and authorisation can be obtained in certain circumstances for amateur operation on ships and aircraft.

Several bands are considerably wider than ours, eg 3.5 to 4.0, 7.0 to 7.3 and 144.0 to 148.0MHz, and there are extra bands at 220 and 902MHz.

Overall, Canadian amateurs appear to have a better deal than we do. CW operating seems to have retained its status, including the right to use particular sections of the bands, not by ‘gentleman’s agreement’, but by legislation. One can’t help wondering where we went wrong along the way!

CW on 2 metres

In an earlier column I suggested that there could be more CW activity on 2 metres. Ian Corrnes G4OUT near Stafford responded by telling me he had worked 217 CW stations on 2m during 1986, mainly ragchewing, representing 9 countries and 44 counties. On my reference to ‘Monday night is CW night’ he commented, ‘This may have been the case a few years ago, but it is certainly not now.’ He then gave me a detailed breakdown of his own activities over the year in which (excluding contests) the most active day was Saturday, followed in descending order by Wednesday, Sunday, Thursday, Friday, Monday and Tuesday.

Ian has clearly enjoyed 2m CW from the beginning. When he obtained the G-QRP Club’s Novice Award, with an output of 2.5 watts, it was endorsed ‘First 144MHz Class A’. Now he operates with 3 to 10 watts into a 12 element ZL Special at 40ft agl with a good take-off in all directions. He says, ‘There are plenty of people to work on 2m CW if one cares to look’. Another 2m enthusiast is Dave Ackrill G0DJA in Kings Norton who says, ‘I spend most of the time I allow myself for amateur radio using Morse code on the 2m band.’ He runs 2.5W into a 20 metre long wire via an ATU. With this antenna he regularly puts a signal into Liverpool, Manchester and Yorkshire under flat conditions, and has often heard the Scottish beacon, GB3ANG. When he wrote to me he was hoping to erect a rhombic and work even farther afield.

Key speeds

Gerald Stacey G3MCK offers some interesting comments on keying. ‘I think it is accepted that novices can send faster than they can receive. I wonder when, or if, the reverse is true? That is, at what speed does the brain become a limiting factor when forming and sending messages? ‘I have different top sending speeds for ragchewing and rubber-stamping, due to the difficulties in composing my thoughts. One thing I think is different between now and 25 years ago is the degree of “non-standard” abbreviations that were used then, and aren’t now (eg, RUI omitting all a few letters at 20wpm, having brain power to spare to use in abbreviating words. The same operators today use texts, etc, and need this brain power to drive their keys at plus 25wpm; hence they don’t abbreviate extensively. In fact, one well-known QRP operator advised me not to abbreviate at high speeds to assist in minimising errors.’

Morsum Magnificat

Last November I announced the first issue of an English edition of Morsum Magnificat, or ‘MM’ as it has become known among its devotees. Some people expressed doubt when it began that it would be possible to fill a 48 page magazine four times a year. However, the reverse has been the case and an amazing range of Morse material has been coming in from a variety of sources. The latest issue (Summer 1987) illustrates what I mean. There are twenty-six items ranging from a few lines about the best high-speed operator in Europe, by G3OC, to the memories of Samuel FB Morse III W6FZZ, who says, ‘I frequently boast of being much more proficient (as a telegrapher) than was my great grandaddy!’

An article on the heliograph by WA1SP shows why Morse telegraphy brought an end to the Apache wars in 1886. There’s the story of a WW2 German spy-set, now in the Leith Police Museum, complete with circuits for those who want to try their hand at vintage reconstruction; a discussion on the importance of ‘readability’ in RST; a suggested approach to direct conversion reception without the disadvantage of hearing the signals on both sides of the beat frequency. Add to that the tale of a Morse key which went down when the German High Seas Fleet was scuttled at Scapa Flow in 1919; information about the Scandanavian CW Activity Group; G8PG’s question, ‘Marconi – DXer or Con-man?’; G0EEM’s memories of training as an interceptor in WW2; vintage keys for collectors; and more... and you can see what I mean! Even though I say it myself, there is nothing quite like it anywhere in the World! Produced by and for Morse enthusiasts, veteran or beginner, it costs just £6 a year for four issues. Just send me a cheque, QTHR, payable to Morsum Magnificat to join the fascinating world of Morse.

Tony Smith is English Language Editor of Morsum Magnificat.
The big interest at the moment is the recent release of the 50MHz band and the possibility of getting some intercontinental DX on the band as conditions improve. There have been excellent openings to the States in the last few weeks, which show what can happen even under flat, bottom of the sunspot cycle conditions.

During the next few issues we shall be describing a range of equipment to help get you on the band, and we start this month with a look at a suitable aerial system.

**Yagi basics**

The first thing that the VHF man is going to notice about any aerial for 50MHz is its size, which, in round figures, is about three times that of the equivalent two metre array. There is nothing we can do to alter the laws of physics, but we can make sure we get the best possible results from a small aerial.

The smallest array would consist of only two elements and could be built in either a dipole and director or dipole and reflector configuration. Which is the better choice? At first sight the director array would appear to be the best as it presents a balanced load to the unbalanced co-ax cable. A better system is that over a spacing of from 0.1 to 0.25 of a wavelength the gain varies very little and is set at about 5.5dB over a dipole. The importance of this point is that it then allows us to set the spacing to ease feed impedance problems and to get a reasonable front to back (F/B) ratio.

The F/B ratio in the following design is arranged to be around 15dB, which still allows us to hear strong signals off the back of the beam; too high an F/B ratio can mean that you actually lose contacts by not hearing people calling CQ.

**Advantages**

The advantage of the reflector based array is that over a spacing of from 0.1 to 0.25 of a wavelength the gain varies very little and is set at about 5.5dB over a dipole. The importance of this point is that it then allows us to set the spacing to ease feed impedance problems and to get a reasonable front to back (F/B) ratio.

The F/B ratio in the following design is arranged to be around 15dB, which still allows us to hear strong signals off the back of the beam; too high an F/B ratio can mean that you actually lose contacts by not hearing people calling CQ.

**Matching**

The feed impedance of the array will be too low for direct connection to co-ax, and some form of matching section must be used. A common method is to use a folded dipole, but this is not easy to make, cannot be readily adjusted and presents a balanced load to the unbalanced co-ax cable. A better system is the gamma match, in which the outer of the cable is grounded to the centre of the aerial, and the inner is taken through a variable capacitor and matching line to a tapping on the element, in a similar manner to the well-known HB9CV aerial. This has the advantage of being inherently unbalanced, and it allows us to tune out both the capacitive and inductive reactances of the aerial, so allowing, in theory at least, a fully matched resistive load.

**Construction**

The beam is built by the method known as Plumbers' Delight, and everything you need is available from your local hardware store or supermarket. The boom and elements are all made from standard half inch (or 12mm) diameter copper water pipe and the element supports are normal 'T' joints. These must be of the soldered (not compression) types, so as to maintain good electrical continuity.

The boom is cut to a length of 33in and the 'T' pieces are then fitted at each end, making sure that they are square and in line with each other. The elements are first cut to a slightly longer length than is required, and are then soldered to the 'T' sections. They are then cut to give the overall length shown in the diagram.

**Electrical**

A small plastic box should now be mounted under the boom at the radiator end. This may be done by using either a couple of self tapping screws into the boom, or a couple of pipe clips mounted on it with bolts taken through the box. A hole should be provided to allow the Gamma rod to emerge, and another hole should be made at the inner end of the box for the coaxial cable. When the rod and cable are fitted, these holes should be filled with a sealing compound to stop water getting into the box.

A solder tag should be fitted inside the box, making connection to the centre of the 'T' by means of a self tapping screw, and the co-ax braid should then be soldered to the tag. The Gamma rod may be made from a 15in length of water pipe and the matching capacitor is soldered from the end of this pipe to the inner of the co-ax cable. A shorting clip is then made up from a small piece of metal and fitted in place.

**Tune up**

The aerial should be mounted on a clothes post or similar support and should be as much in the clear as possible; an upward tilt will help to avoid ground reflection problems while adjustments are made. The SWR meter is connected in line and some RF power applied at about 50MHz.

Adjustments are now made by varying the tuning of the capacitor and adjusting the length of the matching rod until the lowest possible SWR is obtained. With patience it should be possible to get very close to the magic 1:1. The ends of the elements should be filled with corks or stops of some kind to prevent the very annoying 'organ pipe' effect in high winds. To finish the job the whole aerial should be well painted before it is finally fitted to the mast.
RADIO AMATEURS EXAM?
PASS FIRST TIME!

Before you enrol check the benefits of
RRC'S unique Home Tuition Service

- A qualified personal tutor
- Study material prepared by specialists
- Completely self-contained courses
- Handy pocket-sized booklets
- Personal study programme
- Regular marked tests
- Courses regularly updated
- 48 hour despatch
- Free advice before you enrol
- Telephone Helpline
- Free 'How to Study' Guide
- Installment Plan
- Free Postage on course material
- Worldwide Airmail Service
- Extra tuition free if you don't pass first time

SEND NOW FOR OUR LATEST
100 PAGE INTERNATIONAL CATALOGUE

1,000s MAJOR & MINOR
ELECTRONIC COMPONENTS

Audio, Hi-Fi, Stylish Car Radios, Amps, Kits, Meters, Scopes, Test Gear, Transistors, Disco, Hardware Tools, Computer Bits. Send £1.00.

SMITH ELECTRONICS
157 CHAPEL STREET, LEIGH
LANCS WN7 2AL. TEL: (0942) 606674

SEPTEMBER 1987 please mention AMATEUR RADIO when replying to any advertisement
Another report to hand from our intrepid mole brings news of some forthcoming licence changes. Some of these are concerned with Packet radio and will allow unattended operation under certain circumstances. The idea is to facilitate the automatic handing on of packets when the board operator is not present.

As far as is known, this will be the first time in our history that such operation has been permitted. It could also mean the opening up of a limited type of third party traffic to enable messages from originators other than the station licence holder to be forwarded automatically. There is also a proposal to allow local clubs and suchlike to run boards under a licensing system similar to the existing GB7 series.

More Packet news

The note in last month's issue on the proposed 350kHz section of 50MHz being set aside for Packet operation has resulted in a flurry of correspondence and a lot of publicity on various bulletin boards trying to explain it all. So what is really happening? The Packet Working Group (PWG) have quoted the RSGB position as being that there is no intention of forcing Packet operators off two metres. In other words, they still intend to use those frequencies as well as the six metre band, so proving the point I made last month.

It is expected that there will be around 300 mailboxes running within the next few years and that the two metre allocation for data comms between 144.625 and 144.675 is insufficient for this amount of usage. One could always argue that the use of SSB operation should be investigated with a view to getting more efficient operation and more stations in a given band.

IARU agreement

The PWG also point out that there is already a 100kHz allocation on six metres for Packet purposes (what happened to the 350kHz they were talking about?)? They try to make this sound like an international agreement, but in fact it was introduced by the group itself. The next point made is that licences for operation of boards on 70cm could take up to two years to obtain due to the involvement of the MoD in the discussions. In contrast to this, similar licences for both two and six metres can be issued in a matter of weeks.

One of the major problems to be overcome is that of interlinking various systems, because the IARU has an agreement that this shall not be implemented on two metres. It is also virtually impossible due to QRM problems to interlink on the same frequency as the mailbox traffic.

The solution

It is intended to run a system of units on six metres which will handle both mailbox and real time applications, and these will be interlinked at levels 3 and 4 on either 70MHz or 23cm. There will also be a network of gateway stations on two metres, allowing you to get into any mailbox irrespective of the frequency the mailbox is on. If you find a lot of QRM on the two metre input then you will have the option of trying the six metre input where conditions may well be less hectic.

All these points are only concerned with a formal mailbox system and normal person-to-person digipeating will continue in the same way that it does now.

More communication

It could be said that perhaps the PWG should communicate more, and they intend to do so once the bulletin system is running. This will keep operators informed, but what about Joe Ham? When there are proposals for using up a chunk of airspace which, in a sense, is public property, then surely everyone should know what is going on? If the PWG and, indeed, the RSGB would supply the various magazine writers with brief information about what is going on, even if these notes were not for publication—a sort of RSGB 'D' notice—it would at least stop what they refer to as 'ill-informed comment'.

Good things

Details have been received of the official Maltese licences which are available to all classes of licence holder. They have a power restriction of ten watts, but there seems to be no limitation on the gain of the aerial used. With any moderate size beam this will mean an ERP of around 50 watts, which equates fairly well with our restrictions.

There has also been a general allocation in Norway to replace the previous limited permit system. The allocation is from 50 to 52MHz with a power limit of 25 watts to an aerial of not more than 6dBd gain.

Illegal operation

Two strictly illegal operators are EA1MO in Spain and YU50MHZ in Yugoslavia. The first of these apparently operates under a friendly agreement with the local TV station that he can continue as long as he does not cause any interference, at least that is the rumour. There has also been some illegal operation from France when a visiting amateur could not resist the opportunity to provide some TVI.

Beacon news

Another good bit of news is that the Portuguese beacon, CT0WW, came on the air on 10th June. The frequency is 50.03MHz and it is running 40 watts to a dipole aerial. Several reception reports have come in from the southern part of England. To balance the numbers VE1SIX, a Canadian beacon, was struck by lightning on June 11th and is off the air. GB3NHQ, operating from RSGB HQ at Potters Bar, is still putting a good signal around in spite of running QRP, which must be a problem for HQ staff when they operate on six.

There is news of a proposal to put a 50MHz beacon on Grand Cayman Island, probably using the callsign ZF2KZ with ZF1RC as beacon keeper. No more details are available at this time, however.

First contacts

Some notable 'firsts' have been recorded. On 28th May G3GCH made the first G/Malta contact with 9H1CG. This was followed on 6th June by the first GM/Malta contact, made by GM3WOJ and 9H1CG, the distance being around 2800km. Also on the 6th, 9H1BT was worked by G18YDZ and EI6AS to give the first contacts between Malta and Northwestern Ireland and Eire. The following day, G18YDZ made the first contact into Cyprus, where he contacted ZC4VHF. On 14th June, G3GKX contacted W6JKV/P/V2A for the first G to Antigua contact.

On 24th June W6JKV had moved to Aves Island, signing W6JKV/P/YVO, and the first G contact was made by G4QLT. This opening lasting about one and a half hours, during which W6JKV worked many British stations.
Operating news

June 14th saw a big opening into the States on 50MHz with activity from at least six of the American call areas being reported, as well as CT and EA stations. Another opening on the 15th resulted in more American stations being worked and also a report that CT1WW worked into VP2; this contact may also be a first over the path.

The same day saw a lot of crossband activity with 4U1ITU in Geneva working hordes of G stations. On 18th June there was another opening into the USA in the morning and around midday a nice Es opening on two metres, with many YU, I, OE, YO, OK and 9H stations being contacted.

The biggest transatlantic opening so far occurred on the 19th, when the band opened to the whole of the Eastern coast area. Dozens of Americans were worked and even QRP stations were putting tremendous signals over here. Do not forget that the crossband frequency is 28.885MHz and regular monitoring can give early warning of good openings on six.

Up in space

Oscar 12 (Fuji) is now into the second year of operation, the mailbox facility coming into use in May. It provides AX.25 access when the transponder is in operation. It can store up to 50 messages before the earlier ones get overwritten, but there is no message security; anyone can read your MBX. The callsign to use is 8J1JAS and the frequencies are 144.85, .87, .89 and .91 for the input and 435.91 for the output.

Oscar Phase 3

The latest ideas on Oscar phase 3, which may be launched in 1990, is that the transponder should have a downlink power of 250 watts PEP. That should need a few solar panels to keep it running! The launch of the phase 3C bird now looks likely for January 1988, always provided that the next couple of Ariane rockets go up the right way rather than the submarine mobile operation that one of them decided on a year or two back.

Do not forget if you are a mailbox enthusiast that if all else fails you can make use of the facilities provided on UoSAT Oscar 12, but to do so you first have to access the university's digipeter, GB3UP.

Microwaves

There has been a noticeable increase in activity on 10GHz this season and even 24GHz has seen about an extra 20 stations, mainly in the Midlands and the North, compared to last year. August activity from the Telford group's visit to The Old Man of Coniston and G8KQW's trip up Snowdon will have made some near 200km paths available on both bands.

Talk-back for microwave contacts is centred around 144.175MHz for SSB and, although there is no official FM frequency, many stations who do not have sideband capability are using 144.525MHz. Activity is no longer confined to the contests and there are operators out most weekends.

It is particularly pleasing to see some activity from South Wales, with groups in the Chepstow and Swansea areas making good progress. Tim G3KEU mentions the lack of 10GHz SSB operation, except in the south, although several Midland stations are known to have such capability. Perhaps they would make an effort for the September contest? GM4ISM is now operational on most bands, including 5.7GHz SSB and 10GHz FM and SSB, with a four foot dish from his new QTH at Larkhall. He has an excellent take-off to the south and is looking for skeds. Contact him on (0698) 886504.

Sign-off

Time to go. Please let me have all your news, especially on 50MHz which is creating a lot of interest. What a band that is going to be when the sunspot activity moves up the curve a little! OTH is 81 Ringwood Highway, Coventry or you could join in the fun on Prestel and use 203616941.
There is nothing more calculated to depress your average repairman than to pick up an item with "intermittent" written on it as the fault. Sod's law dictates that the thing will work like a good 'un, until returned to the customer, whereupon it will promptly turn up its toes. Sometimes it's the customer's fault—a legal CB set that came in described as 'dies after a few minutes' that had nothing wrong with it. It springs to mind. This particular set drove me to distraction, until I found out that the owner was secretly using a very naughty linear amplifier on the end of it, and powering the whole lot off a mains. I soon discovered 2 metre rig that died after a minute or so.

Another customer induced fault was a 2 metre rig that died after a minute or so. This turned out to be a very poor aerial that collapsed under the strain after a few seconds every subsequent go. You can just about get away with a dipole somewhere over the band. The reason is quite simple. A half wave dipole working into the wrong lead out wires will hit 20MHz of the ten metre band. Real intermittents

Here I am talking about the 'tap it and it crackles' sort of thing. Very irritating. Modern electronic gear is very reliable, so it's a good idea to check all the connectors to the gear first, power leads and aerial plugs etc. I then prefer to take the coil out of the rig, put it on and then, with great care, gently tap my way all round the boards with an empty plastic biro. The reason I use an empty boro is that I once got a belt from a TV line output transformer up the ink bit!

The idea behind the gentle tapping across the board is to locate the area in trouble. When you are near the fault the crackling will be more pronounced (or less pressure will be required). This method will often lead you straight to the fault, look for nests of resistors, for example, where there might be lead out wires touching, ditto transistor legs etc. Either that or a dry joint lurks in the area.

One fault that I have come across very frequently in marine equipment concerns the lead out wires of axial capacitors. Very often the capacitor itself is made of aluminium, but the lead out wires are BTC (bare tinned copper). The lead out is simply crimped into the aluminium, see Figure 1. A gentle tap on a capacitor with a dodgy crimp will soon show up this fault. You can either replace it, or do the strong arm stuff with a pair of pliers. I think the fault is particularly prevalent in marine gear due to the dissimilar metals and the corrosive atmosphere, though I have come across this fault in some amateur rigs.

Intermittency in high power circuits, such as television line output stages, power supplies etc, can sometimes be found by running up the equipment in the dark and jarring it. Small flashes can sometimes be observed where the contact is taking place, but I must emphasise the extreme care necessary when using this method. Exposed high voltages and a darkened workplace are not conducive to a long life, so take great care.

Portable Russian SW radios

These sets are sold under various names, such as Vega, Selena and Astrid, at very attractive prices, often around £30 new, £5 or less secondhand. A lot of amateurs first came into the hobby by buying one of these and becoming 'hooked' on short wave listening. Although there is no BFO for amateur SSB use, it's quite surprising how much interesting broadcast stuff that these sets will pull in.

The main bugbear on these sets is the turret used in the tuner. This is a six inch long, three inch diameter thing, containing all the coils for the different wavebands. The band change switch is on the side of the set rotates the turret and changes contact between the coils. This is achieved by a row of fingers, which are fixed, and small 'studs' on the rotating bit.

These studs are silver plated and tend to blacken up over the years as the silver oxidises, leading to great intermittency. Rule one, never, ever try bending the fixed fingers. I've not come across one set yet that has had trouble here, it's always the studs. Rule two, don't use sandpaper or emery cloth on the studs to clean them up, it's too vicious. The ideal thing to use is the non-metallic stuff used in the kitchen to scrub pots and pans, often referred to as 'Scotchbright'. It's sometimes sold adhering to the back of sponges used for washing up. Used dry, a couple of gentle rubs will soon clear away the black oxide, thus restoring the set to its former glory.

In the 'egg on my face' department I must confess to having repaired dozens of these sets which had push on knobs (volume, tuning etc). Sometimes these were a little difficult to get off, and required a screwdriver to persuade them free. Who bought a duff one for 25p at a rally and bust a pot levering off a screwed on knob?

50 please mention AMATEUR RADIO when replying to any advertisement SEPTEMBER 1987
On the subject of pots on these sets, the variant with the tone control underneath the wavechange switch (on the side) requires great care in its removal. Even the gentlest tug on the knob to get it off will pull the middle out of the pot, breaking it for good. I always hold the shaft inside the set with a pair of pliers, whilst pulling the knob off outside.

**Microswitches**

A friend came round in a panic. He was off to some sailing race or another and his marine hand-held transceiver, an Icom IC-H6, had died on him. Apparently, he had put it on charge the day before it was required, and had grabbed it on his way to the river, and it didn't work. He did provide one important clue – he said the transmit receive switch, the normal bar on the side, didn't feel right.

He was correct, the microswitch was not well, a flat spring had lost its springiness. The problem was he had a car and boat outside, and required the rig working, there and then, and I had no spare switch. Suddenly, inspiration struck, use elastomer sleeving. I lightly glued in a thin sliver as per Figure 2 and all was well. I warned him it was only a bridge, but he told me this was the last race of the season and boat, trailer and transceiver were being sold as a lot. Thus a proper repair was SEP (someone else's problem)!

Although I've never had trouble with them in other rigs, the mini-microswitch referred to above is used in a number of modern amateur hand-portables, so the above might be a good 'get you home' bridge while waiting for the new spare to arrive. I wouldn't recommend the bridge on high current mains microswitches, such as in washing machines. Such a decent contact is required that I wouldn't consider anything but a proper new replacement in these cases.

**Daiwa SR1000**

This is a VHF 1000 channel synthesized receiver. Not that widely sold in this country as an amateur receiver, they seem to have sold well in their marine environment. I met him again he said I deserved only seven out of ten for my efforts, because although the receiver now worked well on two, the switch markings for the MHz frequency selector were wrong.

Think about it. The marine variant covered 154 to 164MHz. The continuously rotatable MHz switch (ie no end stop), if set to 4 gives 154MHz, there being no 100's or 10's of MHz switch. '0' thus equated 160MHz and '3' thus gave 163MHz.

After fitting my conversion crystal, which I'd worked out to give coverage of 140 to 150MHz, his receiver gave 140MHz as an indicated 144MHz, ie he had to dial up an indicated 8MHz to get 144. What he didn't know was that the MHz indicator dial on the switch shaft is on a clutch. In front of his startled eyes I removed all the knobs, pulled off the front panel and moved the indicator disc back four positions, being now awarded 10 out of 10 for effort!

Price wise a secondhand SR1000 on two goes for £45, the marine variant about a tenner less. By the way, 10kHz is about a tenner less. By the way, 10kHz is 5kHz off.

**Heathkit HR10B**

I must confess to never having noticed these receivers before. I came across an amateur with what I thought was a RA1; Heathkit receiver under his arm at a rally. The guy was looking for the bringing and buying, but after the obligatory haggle I was carrying it to my car and he was tucking fivers into his wallet. It was only as I went to put it into the boot that I noticed it didn’t cover Top Band, as does your RA1, and the layout looked a bit odd. The reason for all this was that I’d just bought a HR10B.

Once again Heathkit are belittling their own product – the handbook describes it as a basic receiver. Somehow, an amateur bands only receiver with a crystal filter and RF stage doesn't strike me as too basic.

Performance wise, they are very stable indeed. I am only talking of experience here with two examples (I bought another soon afterwards). The RA1 exhibits an itsy bitsy tendency to pull a kHz or so when you twiddle things whilst on 10 metres, the HR10B doesn’t. It has very good SSB reception, even on 10. OK, it doesn’t cover 160 metres or the new bands, but that still leaves plenty of action to listen to. I am quite favourably impressed.

Price wise they seem to go for about the same as an RA1, forty to fifty quid. Note, apart from my two I’ve since seen two others change hands. Also note that neither of these Heathkit receivers (the RA1 or the HR10B) came with fitted speakers. I’ve seen quite a few amateurs take back RA1s to sellers saying that their recent purchases don’t work, only to look surprised when the seller demonstrates it working into an external speaker! Another thing to watch is the calibrator. Both sets come with a ‘Cal’ button on the front. Don’t be lulled into thinking that this means a calibrator is fitted. The odds are that it isn’t. A calibrator was an optional extra on both receivers. It plugs into an octal socket inside. Only the button and socket are standard!

**Varying Standards**

It’s also worth remembering that most Heathkit stuff is kit built (I know I’m stating the obvious!). Construction standards will thus vary enormously, from the frankly awful to the ‘you sure this wasn’t factory made? Strangely enough the layout of the HR10B is a little bit better thought out and the examples of these that I have recently seen seem very well made, though a good layout is no guarantee against dry joints and other poor workmanship.
RADIO AMATEUR LICENCE
Start training now - No previous knowledge required.
Study for 3-6 months. Post Coupon now for free brochure - without obligation.
Radio & Telecommunications Correspondence School, 12 Moor View Drive, Teignmouth, Devon.
Tel: 06267 – 79396.

NAME ______________________________________
ADDRESS ___________________________________
__________________________________________ POST CODE ____________

MUTEK AMATEUR RADIO LIMITED
We are pleased to announce that we have been appointed by MuTek Ltd as the official repair agency for their range of amateur radio products.
All repairs should be sent direct to ourselves and not to MuTek Ltd. Please do not hesitate to phone with any queries regarding this service.

Beronheath Ltd
Bradworthy, Holsworthy, Devon EX22 7RT
Tel: (0409 24) 548

6 METRE Linear TRANSVERTER
ALLOWS ANY POPULAR 2 METRE TRANSCEIVER (UP TO 3W) TO BE USED ON 6 METRES ANY MODE
• Two versions available
• 2W pep o/p * or * 25W pep o/p
• Low noise BF981 front end
• DC or RF switching
• Low harmonic output
PROFESSIONALY DESIGNED TO THE HIGHEST STANDARDS FOR THE DISCERNING AMATEUR

▲ 25W o/p complete boxed transverter...... £159 + £4.00 p&p
▲ 2W o/p complete boxed transverter...... £119 + £4.00 p&p
▲ 2W o/p assembled & tested PCB .......... £97 + £2.00 p&p
▲ 25W add on PCB.................... £39 + £2.00 p&p

R N Electronics
37 Long Ridings Ave • Hutton • Brentwood • Essex • CM13 1EE • TEL: 0277 214406

THE PERFECT COMPLEMENT TO AMATEUR RADIO
Packed with construction projects and the latest technology plus pages of readers’ classified ads

On sale NOW at your newsagent and at equipment dealers

RADIO & ELECTRONICS WORLD SUBSCRIPTION ORDER FORM
To: Subscription Department • Radio & Electronics World • 1 Clarendon Road • Croydon • Surrey • CR0 3SJ.
Tel: 01-760 0409
NAME ________________________________
ADDRESS ______________________________
________________________________________ Postcode___

PLEASE SUPPLY: (tick box) for 12 issues, all rates include P & P
Inland World-Surface Europe-Air World-Air £16.20 £18.10 £21.85 £28.80

PAYMENT ENCLOSED: £ —
CREDIT CARD PAYMENT □ □ □ □ □
EXPRIRY DATE

Cheques should be made payable to Radio & Electronics World. Overseas payment by International Money Order, or credit card

Postcode
Signature

please mention AMATEUR RADIO when replying to any advertisement
FOR SALE

- Sony ICF2001D, £200. Sony ICF7600D, £150. Sony AIR-7, £150. All radio receivers as new and boxed. £75 at £90 on only £60. Peter, 49 Campbell Close, London SW16. Tel: 01-769 1499, evenings.

- Icom 720A 0-30 kHz/9500Hz, £350. £250. MML100-S 100W linear, £150. SEM Tranzmatch ATU 2, £65. SEM Auto HF pre-amp, £10. MALL 28MHz Rx pre-amp, £2. All, o/w, offered considers. G4JK QTHR. (0273) 735565.

- £1801. 3 sets of 4 screws around £60, in mint cond. £30: (0254) 823295.

- Panasonic RF6000, 24 band (0-230MHz), FM/AM/SBB/CW, turret tuner, Rx value £15 when new, £45 RTM or £200 £500 for Son £CRF330K, or sell! (Must be collected). (061) 8374570.

- £500. 2002 scanner, covers 25MHz to 550MHz, and 800MHz to 1300MHz, £299. Also Diamond D130 scanning antenna, covers 25MHz to 1300MHz, built with £290, unused, £50 for £45. (0237) 202086.

- £45. Heathkit RA1 amateur bands, only £45. Apply AR88D, very good condition, outside like new, £150. £450. GUIS 2NT. Tel: (0276) 232847. £45 with joymatch aerial tuning unit, brand new, £450. Floor stand, £25 ono. G4VFT QTHR. Tel: (0705) 527587.

- £100. Unused PA valves. All purchased from Lowes, £500. And good condition, collect and it’s yours, £350. MOW 609696.

- £250. MML100-S 100W linear, £100. SEM Tranzmatch ATU 2, £65. SEM Auto HF pre-amp, £10. MALL 28MHz Rx pre-amp, £2. All, o/w, offered considers. G4JK QTHR. Tel: 01-82070 daytime only, ask for lan.

- £345. AOR 2002 scanner, covers 25MHz to 550MHz, and 800MHz to 1300MHz, £299. Also Diamond D130 scanning antenna, covers 25MHz to 1300MHz, built with £290, unused, £50 for £45. (0237) 202086.

- £500. 2002 scanner, covers 25MHz to 550MHz, and 800MHz to 1300MHz, £299. Also Diamond D130 scanning antenna, covers 25MHz to 1300MHz, built with £290, unused, £50 for £45. (0237) 202086.

- £100. Unused PA valves. All purchased from Lowes, £500. And good condition, collect and it’s yours, £350. MOW 609696.

- £250. MML100-S 100W linear, £100. SEM Tranzmatch ATU 2, £65. SEM Auto HF pre-amp, £10. MALL 28MHz Rx pre-amp, £2. All, o/w, offered considers. G4JK QTHR. Tel: 01-82070 daytime only, ask for lan.

- £345. AOR 2002 scanner, covers 25MHz to 550MHz, and 800MHz to 1300MHz, £299. Also Diamond D130 scanning antenna, covers 25MHz to 1300MHz, built with £290, unused, £50 for £45. (0237) 202086.

- £500. 2002 scanner, covers 25MHz to 550MHz, and 800MHz to 1300MHz, £299. Also Diamond D130 scanning antenna, covers 25MHz to 1300MHz, built with £290, unused, £50 for £45. (0237) 202086.

- £100. Unused PA valves. All purchased from Lowes, £500. And good condition, collect and it’s yours, £350. MOW 609696.

- £250. MML100-S 100W linear, £100. SEM Tranzmatch ATU 2, £65. SEM Auto HF pre-amp, £10. MALL 28MHz Rx pre-amp, £2. All, o/w, offered considers. G4JK QTHR. Tel: 01-82070 daytime only, ask for lan.

- £345. AOR 2002 scanner, covers 25MHz to 550MHz, and 800MHz to 1300MHz, £299. Also Diamond D130 scanning antenna, covers 25MHz to 1300MHz, built with £290, unused, £50 for £45. (0237) 202086.

- £500. 2002 scanner, covers 25MHz to 550MHz, and 800MHz to 1300MHz, £299. Also Diamond D130 scanning antenna, covers 25MHz to 1300MHz, built with £290, unused, £50 for £45. (0237) 202086.

- £100. Unused PA valves. All purchased from Lowes, £500. And good condition, collect and it’s yours, £350. MOW 609696.

- £250. MML100-S 100W linear, £100. SEM Tranzmatch ATU 2, £65. SEM Auto HF pre-amp, £10. MALL 28MHz Rx pre-amp, £2. All, o/w, offered considers. G4JK QTHR. Tel: 01-82070 daytime only, ask for lan.
FREE CLASSIFIED ADS

**ADVERTISERS PLEASE NOTE**

Please ensure that your telephone number (if applicable) and address are included in the appropriate section of your ad. If you do not wish to have your address published, please include it but state 'not for publication'. Any ads submitted without an address and/or telephone number will not be printed. This condition has become necessary because a small number of ads have been submitted by bogus readers, causing considerable inconvenience to the holders and the telephone numbers quoted.

- **Satellite dish DIY steel slabbed, parabolic profile, rotary scraper. Makes 'plug' in sand/ cement/plaster, etc, on which to lay up' 1.8m GAP (condition unknown), £225 ono. Slim Jim, 30 amp PSU, 30 watt linear, forces sale. Tel: Dennis G1UKS. Tel: 01-657 0430, evenings
- **Homebrew gear:** 160m/80m Ax, £10. 160m AM Tx, £5. HF CW Tx, £5. All believed working or good for conversion to 10MHz, £125 ono. Concord Marr 2 4N. Tel: (0727) 737185
- **Datong Morse tutor D70, £33. Welz SP220 SWR, £30 ono. Tel: Rugby 811295 QTHR
- **Vanguard scanner, 516MHz-5169C)4 after 2pm daily**
- **Compact short wave receiver, 153kHz-30MHz FM, 76 108 AM, FM SSB CW, 10 memories with all manuals and accessories. Boxed, as new, £30. Contact: Lambert, Castlefiel, West Yorks. Tel: 516904 after 2pm daily
- **Realistic DX302 comms Rx, Digital readout, vgc. Complete with photocopy manual and circuit diagram (no mods), only £115 or WHY? Gary, 22694 Grovers Cottages, Ring O'Belles Lane, Lathom, Ormskirk, Lancs L40 5TF. Tel: (0704) 947000
- **Atlas 215X 100W HF mobile rig, 16m to 15m, including safety mobile microphone, speaker, handbook, with seven mobile whip and gutter mount. This rig is outstanding mobile, £350. 10m multimode Ham International, full coverage of 10 band CW, SSB, FM, AM, ideal also for 3.5MHz, £250, spares and TRT, with STC type modem, plus most of software, £120, no offers. Andy GA2YZ. Tel: Gostops (0705) 589560 anytime

**WANTED**

- **Compact semi auto pre-amp, £15. Ic208 KRM plus three cartridges, £30 ono. 48K Spectrum, plus box and manual. Offers or carry or sell with no problems. Tel: (0687) 257185
- **Sony CF330K, also Pan-International Crusader X', 12 bands, FM/AM/CB CW Rx, or Panasonic RF9000. Must be excellent condition, with manual, if possible, and moderately priced. Cash buyer. Tel: (061) 743 1570
- **Homebrew gear:** 160m/80m Ax, £10. 160m AM Tx, £5. HF CW Tx, £5. All believed working or good for conversion to 10MHz, £125 ono. Concord Marr 2 4N. Tel: (0727) 737185
- **Sony CRF330K, also Pan-International Crusader X', 12 bands, FM/AM/CB CW Rx, or Panasonic RF9000. Must be excellent condition, with manual, if possible, and moderately priced. Cash buyer. Tel: (061) 743 1570
- **Homebrew gear:** 160m/80m Ax, £10. 160m AM Tx, £5. HF CW Tx, £5. All believed working or good for conversion to 10MHz, £125 ono. Concord Marr 2 4N. Tel: (0727) 737185
- **Panasonic RF3100 receiver. LW MW FM SW, 1.6-516033 Sussex**
- **Realistic PRO30, complete with 9 volt power unit, scanner and power unit, only two months old, freq coverage 66-68, 138-174, 360-512MHz, cost £250, selling for £100. Dev. Tel: (0245) 257186
- **Sony Yaesu FT7070, all band scanner, with freq readout, £50 ono. Tandy Realistic PRO32 portable scanner, AM, SSB, 22,000 frequencies, new, cost £220, sell £165. Fidelity citizen band 3000 FM home base, as new, cost £130, sell £75, or exchange either for video recorder or WHY? B Stapleton, 30 Hallingbury Road, Bishops Stortford, Herts CM22 5LA. Tel: (0279) 57735
- **Sony Yaesu FT575RX, with FT77AT, antenna tuner and FT970HD. Heavy duty PSU. All boxed and in mint condition, only 6 months old, £495, buy or sell as four, or buy or sell as a set. Tel: (0289) 360286
- **Realistic PRO30, complete with 9 volt power unit, scanner and power unit, only two months old, freq coverage 66-68, 138-174, 360-512MHz, cost £250, selling for £100. Dev. Tel: (0245) 257186
- **Sony Yaesu FT7070, all band scanner, with freq readout, £50 ono. Tandy Realistic PRO32 portable scanner, AM, SSB, 22,000 frequencies, new, cost £220, sell £165. Fidelity citizen band 3000 FM home base, as new, cost £130, sell £75, or exchange either for video recorder or WHY? B Stapleton, 30 Hallingbury Road, Bishops Stortford, Herts CM22 5LA. Tel: (0279) 57735
- **Sony Yaesu FT575RX, with FT77AT, antenna tuner and FT970HD. Heavy duty PSU. All boxed and in mint condition, only 6 months old, £495, buy or sell as four, or buy or sell as a set. Tel: (0289) 360286
Classified Ad Form removed
RF DEVICES AT ROCK BOTTOM PRICES!
Nobody beats us!

Over 30,000 RF devices at low prices

REPLACEMENT RF TRANSISTORS
MRF454 HF/SSB 80W £20.00
MRF450 HF/SSB 50W £11.60
MRF238 VHF/FM 25W £12.80
MRF475 HF/SSB 20W £2.99
2SC1969 HF/SSB 18W £2.50
2SC2043/1307 HF 16W £2.00
2SC1947 VHF 3.5W £7.60
2SC1946A VHF 32W £14.30
BLW 6OR HF/VHF 50W (Special) £20.00

JAPANESE IC's (PART OF OUR RANGE)
APX30 E192 £145
APX740 E20 £185
APX1460 £95
APX470 £95
SAA32 £75
SA32 £75
SA137 £75
SH150 £75
L4460 £85
L4470 £85
CC167 £85
CC167 £85
CC167 £85
CC167 £85
CC167 £85
CC167 £85
CC167 £85
CC167 £85

Send £1.00 p&p or SAE for full list
All prices inc. VAT
Many IC's and other types in stock

RACOM LTD
DEPT AR 584 HAGLEY RD WEST QUINTON BIRMINGHAM B66 OJS
021 421 8201-3
(24hr answer phone)

Selectronic
The UK's leading suppliers of 934MHz personal radio equipment
203 High Street
Canvey Island, Essex,
Tel: 0268 691481
(Open Mon-Sat 9-5.30)

Amateur radio equipment also in stock
### ADVERTISING RATES & INFORMATION

#### DISPLAY AD RATES

<table>
<thead>
<tr>
<th>depth mm x width mm</th>
<th>ad space</th>
<th>1 issue</th>
<th>3 issues</th>
<th>6 issues</th>
<th>12 issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>105 x 90</td>
<td>½ page</td>
<td>£65.00</td>
<td>£62.00</td>
<td>£59.00</td>
<td>£33.00</td>
</tr>
<tr>
<td>128 x 90</td>
<td>½ page</td>
<td>£115.00</td>
<td>£110.00</td>
<td>£105.00</td>
<td>£70.00</td>
</tr>
<tr>
<td>147 x 130</td>
<td>½ page</td>
<td>£225.00</td>
<td>£210.00</td>
<td>£200.00</td>
<td>£100.00</td>
</tr>
<tr>
<td>186 x 130</td>
<td>½ page</td>
<td>£430.00</td>
<td>£355.00</td>
<td>£335.00</td>
<td>£165.00</td>
</tr>
<tr>
<td>263 x 186</td>
<td>1 page</td>
<td>£830.00</td>
<td>£780.00</td>
<td>£740.00</td>
<td>£380.00</td>
</tr>
<tr>
<td>263 x 394</td>
<td>double</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### COLOUR AD RATES

<table>
<thead>
<tr>
<th>depth mm x width mm</th>
<th>ad space</th>
<th>1 issue</th>
<th>3 issues</th>
<th>6 issues</th>
<th>12 issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>128 x 186 or 263 x 90</td>
<td>½ page</td>
<td>£390.00</td>
<td>£290.00</td>
<td>£275.00</td>
<td>£245.00</td>
</tr>
<tr>
<td></td>
<td>1 page</td>
<td>£930.00</td>
<td>£690.00</td>
<td>£655.00</td>
<td>£325.00</td>
</tr>
<tr>
<td></td>
<td>double</td>
<td>£1,320.00</td>
<td>£1,070.00</td>
<td>£1,015.00</td>
<td>£800.00</td>
</tr>
</tbody>
</table>

#### SPECIAL POSITIONS

- Covers: 10% extra (Bleed area 307 x 220)
- Facing Matter: Outside back cover 10% extra, inside covers 10% extra

#### DEADLINES

<table>
<thead>
<tr>
<th></th>
<th>colour &amp; mono proof ad</th>
<th>mono no proof &amp; small ad</th>
<th>mono artwork</th>
<th>on sale Thurs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep 87</td>
<td>30 Jul 87</td>
<td>5 Aug 87</td>
<td>7 Aug 87</td>
<td>27 Aug 87</td>
</tr>
<tr>
<td>Oct 87</td>
<td>27 Aug 87</td>
<td>2 Sep 87</td>
<td>7 Oct 87</td>
<td>24 Sep 87</td>
</tr>
<tr>
<td>Nov 87</td>
<td>1 Oct 87</td>
<td>4 Oct 87</td>
<td>9 Oct 87</td>
<td>31 Oct 87</td>
</tr>
<tr>
<td>Dec 87</td>
<td>29 Oct 87</td>
<td>4 Nov 87</td>
<td>16 Nov 87</td>
<td>28 Nov 87</td>
</tr>
</tbody>
</table>

#### CONDITIONS & INFORMATION

**SERIES RATES**

Series rates also apply when larger or additional space to that initially booked is taken. An ad of at least the minimum space must appear in consecutive issues to qualify for series rates. Previous copies will automatically be reprinted if no further copy is received.

- A hold ad is acceptable for maintaining your series rate contract. This will automatically be inserted if no further copy is received. Display Ad and Small Ad series rate contracts are not transferable.

**COPY**

- Except for County Guides copy may be changed monthly.
- No additional charges for typesetting or illustrations (except for colour separations).
- For illustrations just send photograph or artwork.

**PAYMENT**

- Above rates exclude VAT. Accounts are strictly net and must be settled by the advertisers only.
- A ‘hold ad’ is acceptable for maintaining your series rate contract. This will automatically be inserted if no further copy is received.

**FOR FURTHER INFORMATION CONTACT**

Amateur Radio Sovereign House, Brentwood, Essex CM14 4SE

**ADVERTISERS INDEX**

- Beronheath Ltd
- J Bull
- Centre Electronics
- Cirkit
- P M Components
- R N Electronics
- L F Hanney
- Hedleys
- ICOM
- QSL Mailbox
- Matmos/Comp Appreciation
- Newtech Ltd
- Radio & Telecommunications
- Rapid Results
- Selectronic
- MGR Services
- Smith Electronics
- K W Tentec
- Telecomms
- Waters & Stanton
- R Withers

**NEW! from Cirkit**

**SUMMER 1987 ELECTRONIC CONSTRUCTORS CATALOGUE**

- **6 MULTIMETERS TO BE WON**
- **PRICE ONLY £1.20**
- **Many new lines**
- **Extended range of test equipment**
- **£11 worth of discount vouchers**
- **6 Multimeters to be won in easy to enter competition.**
- **Available at your local newsagent or direct from address below.**

**ADVERTISERS INDEX**

- Beronheath Ltd
- J Bull
- Centre Electronics
- Cirkit
- P M Components
- R N Electronics
- L F Hanney
- Hedleys
- ICOM
- QSL Mailbox
- Matmos/Comp Appreciation
- Newtech Ltd
- Radio & Telecommunications
- Rapid Results
- Selectronic
- MGR Services
- Smith Electronics
- K W Tentec
- Telecomms
- Waters & Stanton
- R Withers

**SUMMER 1987 ELECTRONIC CONSTRUCTORS CATALOGUE**

**NEW! from Cirkit**

**SUMMER 1987 ELECTRONIC CONSTRUCTORS CATALOGUE**

- **6 MULTIMETERS TO BE WON**
- **PRICE ONLY £1.20**
- **Many new lines**
- **Extended range of test equipment**
- **£11 worth of discount vouchers**
- **6 Multimeters to be won in easy to enter competition.**
- **Available at your local newsagent or direct from address below.**
**CLOPPY FLOPPY DISC DRIVE For Only £27.50**

As used in the Amstrad 664/6280, the Einstein and other popular computers coming in the next few weeks. It is a new and totally independent disc, only but with a capacity of 5000 per disc, this is equivalent to the size of 5 x 60 disc. Other features:

1. It has the robust compatible interface (34 way edge connector).
2. It is plug compatible with the 5, 5" disc, the recording method, data transfer rate and rotation speed are the same as 5, 5".
3. It is fitted with long life brushless motor and uses steel ball bearings and reliability and fastiness at 3m/s.
4. Its touch key locking system makes it easy handling and disc slot protects against dust.
5. The back of the disc can be seen, and up to 4 discs may be kept in a plastic chain.

We include the operator’s manual and other information showing how to use this with popular computers 800, Spectrum, Amstrad etc. Brand new and only at £27.50 including post and VAT.

**SOUND TO LIGHT UNIT**

Complete kit of parts of three channel sound to light converter. Control sound level of several hours, and 10 watt B.T. switch. More than 125 watts possible. This is a home in which you wish but it is not supplemented enough for discotheque. This unit is housed in an attractive two tone metal case and has controls for each channel, and a master on/off. The audio output and input are by 1.5" speakers and can be switched over by home builders provided with instructions for the installation of connecting lamps.

Complete with £4.15 incl. tax kit £3.00.

**NEW ITEMS**

Some of the many described in our current list which you may require, with your parcel.

- 5P98 5 POUNDERS* 2P8 - Mains motor with gear box and variable speed selector Series wound so makes a very eye catching display for working and definitely a bit of history

- 5P97 F.M.I tape motor two speed and reversible

- 5P96 1250v- 0-250v 60 mA F. 86 3v 5A mains transformer + 50p post

- 5P95 Photo magic- original 'vintage' photo cell

- 5P94 10 metres twin screened compute, coax

- 5P93 6" alarm bell 24 volt d c on 50V a c

- 5P92 10 metres twin screened compute, coax

- 5P91 1 light box size 14" o 12" IOF circuit tracing gas Add f 3 for postage

- 5P90 90 min time switch with edgewise engraved controller

- 5P88 1 24V 5A mains transformer in waterproof case, ideal for garden

- 5P87 20w 10 turn variable resistor for cell phone charging

- 5P86 50 volt 60 amp relay (250v d c/250v a c)

- 5P85 50 Ohm miniature relay very sensitive

- 5P84 - Modem board with press keys for telephone redialler

- 5P83 40 amp 30 amp mains fuse 15A

- 5P82 - 10 turns 3 watt pot i spindle 100 ohm

- 5P81 24hr time switch mains operated ( s.h.)

- 5P80 - 10 time delay switch mains operated

- 5P79 - 5 amp mains operated

- 5P78 - Pilot bulb lamp metal clip on type

- 5P77 - 50 Ohm miniature relay

- 5P76 - 70 25 watt pots 1000 ohm

- 5P75 - 1W amplifier Mullard 1172

- 5P74 - 10 - 4 BA

- 5P73 - 66V 2 CO miniature relay very sensitive

- 5P72 - 24 hour time switch mains operated ( s.h.)

- 5P71 - 200w 20A dimmer

- 5P70 - & mad battery chargers

- 5P69 - 1 metre lengths colour coded connecting wire

- 5P68 - 15v - 0-15v 2 amp mains transformer

- 5P67 - 1 21(w tangential heater 115v easily convenient for 230V

- 5P66 - 1 21(w tangential heater 115v easily convenient for 230V

- 5P65 - 5/16" diameter aerials

- 5P64 - 5P89 1 light box size 14" o 12" IOF circuit tracing gas Add f 3 for postage

- 5P63 - 5P90 90 min time switch with edgewise engraved controller

- 5P62 - 1 24V 5A mains transformer in waterproof case, ideal for garden

- 5P61 - 20w 10 turn variable resistor for cell phone charging

- 5P60 - 50 volt 60 amp relay (250v d c/250v a c)

- 5P59 - 50 Ohm miniature relay very sensitive

- 5P58 - 24hr time switch mains operated ( s.h.)

- 5P57 - 200w 20A dimmer

- 5P56 - & mad battery chargers

- 5P55 - 1 metre lengths colour coded connecting wire

- 5P54 - 15v - 0-15v 2 amp mains transformer

- 5P53 - 1 21(w tangential heater 115v easily convenient for 230V

- 5P52 - mains transformer 26V 10A upright mounting. add f 2 post

- 5P51 - Uniselector 4 pole, 25 way 50 volt coil

- 5P50 - mains motor with gear box and variable speed selector Series wound so makes a very eye catching display for working and definitely a bit of history

- 5P49 - 24 volt  pou with separate channels for stereo made for Mullard UNILEX

- 5P48 - 1 24V 5A mains transformer in waterproof case, ideal for garden

- 5P47 - 20w 10 turn variable resistor for cell phone charging

- 5P46 - 1 24V 5A mains transformer in waterproof case, ideal for garden

- 5P45 - 20w 10 turn variable resistor for cell phone charging

- 5P44 - 1 24V 5A mains transformer in waterproof case, ideal for garden

- 5P43 - 20w 10 turn variable resistor for cell phone charging

- 5P42 - 1 24V 5A mains transformer in waterproof case, ideal for garden

- 5P41 - 20w 10 turn variable resistor for cell phone charging

- 5P40 - 1 24V 5A mains transformer in waterproof case, ideal for garden

- 5P39 - 20w 10 turn variable resistor for cell phone charging

- 5P38 - 1 24V 5A mains transformer in waterproof case, ideal for garden

- 5P37 - 20w 10 turn variable resistor for cell phone charging

- 5P36 - 1 24V 5A mains transformer in waterproof case, ideal for garden

- 5P35 - 20w 10 turn variable resistor for cell phone charging

- 5P34 - 1 24V 5A mains transformer in waterproof case, ideal for garden

- 5P33 - 20w 10 turn variable resistor for cell phone charging

- 5P32 - 1 24V 5A mains transformer in waterproof case, ideal for garden

- 5P31 - 20w 10 turn variable resistor for cell phone charging

- 5P30 - 1 24V 5A mains transformer in waterproof case, ideal for garden

- 5P29 - 20w 10 turn variable resistor for cell phone charging

- 5P28 - 1 24V 5A mains transformer in waterproof case, ideal for garden

- 5P27 - 20w 10 turn variable resistor for cell phone charging

- 5P26 - 1 24V 5A mains transformer in waterproof case, ideal for garden

- 5P25 - 20w 10 turn variable resistor for cell phone charging

- 5P24 - hp motor, ex computer, 230V, mains ° matron I 45Orpm If not collect

- 5P23 - 24hr time switch mains operated ( s.h.)

- 5P22 - 1 pan mouldings, 4 hole

- 5P21 - 25w 1000w12volt

- 5P20 - 20 metres extension lead, 2 core - ideal most Black and Decker garden tools etc

- 5P19 - 100 rmrs 4 core telephone cable £ 13.50

- 5P18 - Liquid/gas Shut off valve mains solenoid operated

- 5P17 - Disco switch- motor drives 6 or more 10 amp change over micro switches

- 5P16 - Motorised stud switch ( oh.)

- 5P15 - Uniselector 4 pole, 25 way 50 volt coil

- 5P14 - 1 1250v- 0-250v 60 mA F. 86 3v 5A mains transformer + 50p post

- 5P13 - 1 lamp motor two speed and reversible

- 5P12 - 1 24V 5A mains transformer in waterproof case, ideal for garden

- 5P11 - 15v - 0-15v 2 amp mains transformer

- 5P10 - 1 24V 5A mains transformer in waterproof case, ideal for garden

- 5P9 - Mains motor with gear box and variable speed selector Series wound so makes a very eye catching display for working and definitely a bit of history

- 5P8 - 24hr time switch mains operated ( s.h.)

- 5P7 - 200w 20A dimmer

- 5P6 - & mad battery chargers

- 5P5 - 1W amplifier Mullard 1172

- 5P4 - 24 volt  pou with separate channels for stereo made for Mullard UNILEX

- 5P3 - 24 volt  pou with separate channels for stereo made for Mullard UNILEX

- 5P2 - Wall mounting thermostat, high precision with mercury switch and

- 5P1 - Continental style

- 5P - lounge suite

- 5P - tropical

- 5P - tropical

- 5P - tropical

- 5P - tropical

- 5P - tropical

- 5P - tropical

- 5P - tropical

- 5P - tropical

- 5P - tropical

- 5P - tropical

- 5P - tropical

- 5P - tropical

- 5P - tropical

- 5P - tropical

- 5P - tropical

- 5P - tropical

- 5P - tropical

- 5P - tropical

- 5P - tropical

- 5P - tropical

- 5P - tropical

- 5P - tropical
DELTA 934 Mhz TRANSCEIVER

Have you tried this evening post office? Range is from 10 - 250 miles according to your location and VHF conditions.

THE DELTA 934 IS A STATE OF THE ART TRANSCEIVER AND NOW IN USE BY OVER 70% OF 934 Mhz ENTHUSIASTS' RANGE IN STOCK.

PHONE FOR DETAILS

WE ARE NOW APPROVED

- RLDWIDE DISTRIBUTORS OF AMATEUR & PERSONAL RADIO EQPT.
- KENWOOD STOCKISTS

TRANSMIT 70 500MHz

MAX POWER 500W

WIDEBAND ANTENNA

GAIN 3.5dB

V/IDEBAND DISCONE

RECEIVING ANTENNA

13 Element) 70 500MHz

HANDHELD SCANRIN

BEARCAT 100XL

A super sensitive low cost hand held which covers:

66 88kHz, 118 174MHz

405 512MHz

Includes Public Service, Aircraft, Marine, etc.

- 16 Channel memory scan
- Priority keyboard lock
- Lighted display

BASE SCANNING RX

BEARCAT 175XL

For the enthusiast a sensitive base receiver which covers:

66 88kHz, 118 174MHz,405 512MHz

Same spec as the popular 100XL hand held model.

ZETAGI DL150

RF INTERMEDIATE LOAD AND POWER METER

A very accurate unit for the service's 1st line equipment

FREQ: 10 kHz - 100 kHz

POWER: 1 - 100 W

ZETAGI 500

SWAP AND POWER METER

For the enthusiast who wants the very best. A top meter unit with push button options to select 1% SWAP or 50 OHM output

FREQ: 3 - 200 MHz

POWER: up to 1000W

FD 1350

150MHz FREQUENCY COUNTER

FREQ: 100kHz - 300MHz

SENSITIVITY: 30Hz at 10kHz

Display: 8 digit

Supply: 9-15V CC

TELECOMMS BUMPER NEW 1987 CATALOGUE

AVAILABLE NOW

Packed full of CB, 934 MHz & Amateur Equipment—plus useful info. Only £2.00

Includes a £2 voucher

NEW LOW PRICE

2 MTK HAND HELD

CT1600

Through bulk buying we can now offer this superbly sensitive handheld at an all time low price. Unit covers 2 Mtr Ham Band Plus 142-145 MHz (for Export)

- Repeater Shin
- 8 channel memory scan
- Incl. Genuine Battery Pack

Each set supplied CW re-cordable pack and in more charge unit

VHF MOBILE AMPLIFIERS

MODE: R10

144 MHz - 150 MHz FM Plus Low Noise Pre-amp Switchable

MODE: R11

144 MHz - 150 MHz FM Mobile Amp

SEE OUR NEW CATALOGUE FOR FULL RANGE

RF AMPLIFIERS

All amplifiers except broadband (2-30 MHz) models are tuned for 29.6 MHz centre freq. Should you require a lower freq. 29.5 MHz please scale when ordering. Export models available for 26-30 MHz

C.T.E. MOD 767

76-Watt FM, 150W P.E.P.

INPUT: 0-15 W

SWITCHABLE - Class B/Class E

REMOTE CONTROL, FACILITY

MOBILE AMPLIFIERS

C.T.E. MOD 76700W FM P.E.P.

(29.6 MHz)

INPUT: 0-30 W

ABOVE MODELS HAVE REMOTE CONTROL FACILITY

MODELS WITH THE ADDITIONAL MODELS

CTE MOD 747 80W FM 1150W PEP £49.96

CTE MOD 767 150W FM 300W PEP £116.87

CTE MOD 767R 250W FM 750W PEP £233.99

CTE MOD 767RJ 500W FM 750W PEP £499.95

CTE MOD 767RJ 1000W FM 1500W PEP £999.95"