INSIDE

BUILD A NICAD RECYCLER
THE COMPLETE NICAD BATTERY HEALTH-CARE CENTRE

REVIEWS
TOKYO HI-POWER
144MHz TO HF TRANSVERTER

PROELECTRON PEK-1
MORSE KEYER

PLUS
RADIATION HAZARDS

PW DISCOUNT VOUCHER

BACKSCATTER - RADIO DIARY - COMPETITION
AND A GREAT DEAL MORE!

MAY 1990
£1.60

ISSN 0141-0857

INSIDE
CB SPECIAL SUPPLEMENT
Yaesu's FT-736R.  
Because you never know who's listening.

Why just dream of talking beyond earth?  

You see, the FT-736R is the most complete, feature-packed rig ever designed for the serious VHF/UHF operator. But you'd expect this of the successor to our legendary FT-726R.

For starters, the FT-736R comes factory-equipped for SSB, CW and FM operation on 2 meters and 70 cm, with two additional slots for optional 50-MHz or 1.2-GHz modules (220-MHz North America only). Crossband full duplex capability is built into every FT-736R for satellite work. And the satellite tracking function (normal and reverse modes) keeps you on target through a transponder.

The FT-736R delivers 25 watts RF output on 2 meters, 220-MHz, and 70 cm. And 10 watts on 6 meters and 1.2-GHz. Store frequency, mode and repeater shift in each of the 100 memories.


And to custom design your FT-736R station, choose from these popular optional accessories: Iambic keyer module. FTS-8 CTCSS encode/decode unit. FVS-1 voice synthesizer. PMP-1 AQS digital message display unit. 1.2-GHz ATV module. MD-1B8 desk microphone. E-736 DC cable. And CAT (Computer Aided Transceiver) system software.

Discover the FT-736R at your Yaesu dealer today. But first make plenty of room for exotic QSL cards. Because you never know who's listening.

*CW narrow optional
NEVADA introduce the world’s FIRST
1000 CHANNEL PROGRAMMABLE SCANNER

the

Fairmate HP100E

packed full of the latest features

- 8 - 600MHz and 830 - 1300MHz frequency coverage
- An incredible 1000 channel memory capacity
- 10 independent search bands
- A fast 40 channel per second search speed
- User-selectable search steps from 5KHz to 995KHz
- Modes - AM, FM and new Wideband FM for commercial reception
- Selectable 10dB attenuator
- Keypad and rotary tune controls

Each Fairmate 100E comes complete with:
- Full set of high capacity Ni-Cads
- Two antennas (one VHF, one UHF)
- Carry case
- Shoulder strap
- Belt clip
- DC cable
- Earpiece for private listening

All this for £249

Send £2 for our latest Catalogue packed full of information on Scanners, Amateur & CB Radio

use your credit card for same day despatch

HOTLINE: 0705 662145 FAX: 0705 690626

FAIRMATE HP100E MARK 2
NEW VERSION NOW AVAILABLE WITH EXTENDED FREQUENCY RANGE

NEVADA COMMUNICATIONS 189 LONDON ROAD NORTH END PORTSMOUTH PO2 9AE
NATIONAL CONVENTION AND AMATEUR RADIO EXHIBITION

Saturday 21 April — Sunday 22 April
HALL 7, NATIONAL EXHIBITION CENTRE, BIRMINGHAM

With over 100 stands, free parking and easy access, this is the premier amateur radio event of the year. Full facilities are available for disabled visitors and an extensive lecture programme is offered.

Opening times:
Saturday 21st April, 10 till 6
Sunday 22nd April, 10 till 5

Talk-in on 2 metres, S22
Entry fee — £2

TRADE ENQUIRIES WELCOME
TEL 0277 225563
office hours
This very high quality 2m/70cm FM dual band mobile transceiver has been specially designed to provide maximum performance and operating convenience in an ultra compact package. An impressive array of features gives maximum flexibility in mobile installations. The transceiver has an output power of 45W (VHF) 35W (UHF) and incorporates a high low power switch. The unit is provided with 10 programmable memories. Channel spacing is in 5, 10, 12.5, 20 and 25kHz steps. There are four scanning modes:

1. VFO scanning of the entire band.
2. Memory scanning of selected memories.
3. Programmed band scanning of a selected segment of the band.
4. Priority scanning allows selection of a frequency, in VFO or memory, to serve as a priority frequency.

A duplexer is built-in so that when an antenna for both bands is in use, only one feeder cable for the transceiver is necessary.

The unit is supplied with a comprehensive instruction manual. It is illegal to transmit with this unit unless you hold a Radio Amateur's Class B (or A) licence.

Quote Reference DBT50 £499.95

PLUS TOP VALUE AMATEUR RADIO VHF FM Handheld Transceiver

- Ultra compact, lightweight design
- 6W VHF/5W UHF Output Power (with optional 12V battery pack)
- Simple Operation
- Easy to See LCD Display
- 10 Channel Memories
- Battery Save
- Function Lock
- Tone Burst
- Amazing Compact Size Only 3 x 6 x 17 cm approx.

A very high quality, lightweight, 2m handheld transceiver, incorporating many useful features. This transceiver is extremely simple to operate, most functions can be performed with one hand!

Quote Reference AHT50 £219.95

12V Ni-Cad Battery Pack

For use with all above handheld transceivers.
A 12V 700mAh battery pack with integral DC-DC converter which allows the transceiver to be powered from a car cigarette lighter socket.
A charger is also available for use with this pack.

Battery Pack MYP13 £59.95
Charger NBC13 £14.95

SEEE THE COMPLETE RANGE OF TRANSCEIVERS AND LOTS MORE IN OUR BUMPER 580-PAGE CATALOGUE ON SALE NOW AT ALL BRANCHES OF WHSMITH - PRICE £2.25!
**Realistic TRC-2005.** Compact 40-channel easy-to-read bright LED channel display. Ceramic filters for superior selectivity. 4-step LED signal/RF power meter. Remote speaker jack. Measures: $2 	imes 49/16 	imes 61/2". 13.8 VDC negative ground only.


**Walkie Talkie Headset**

£59.95

- 49 MHz FM
- Fully Approved To DTI Specs
- MPT-1336
- W/T Licence Exempt
**ICOM ON STAND**

**HF TRANSCEIVERS**
- **IC-781**
  - HF, SSB, CW, RTTY, AM, FM, 150W. £4,500
- **IC-765**
  - HF, SSB, CW, RTTY, AM, FM, 100W. £2,499
- **IC-726**
  - HF/50MHz, SSB, CW, AM, FM, 100W. £989
- **IC-725**
  - HF, SSB, CW (AM,FM), 100W. £759

**COMMUNICATIONS RECEIVERS**
- **IC-R9000**
  - 30KHz – 1999.99999MHz. £3,995
- **IC-R7000**
  - 25-1000MHz, 1025-2000MHz. £989
- **IC-R71E**
  - 100KHz – 30MHz. £855

**VHF-UHF TRANSCEIVERS**
- **IC-505**
  - 50MHz, SSB, CW (FM) 3W/10W. £529
- **IC-575**
  - 10W. £1,042
- **IC-575H**
  - 100W. £1,199
- **IC-275E**
  - 25W. £1,069
- **IC-275H**
  - 100W. £1,039
- **IC-475E**
  - 25W. £1,185
- **IC-475H**
  - 75W. £1,250

**LINEAR AMPLIFIER**
- **IC-4KL**
  - HF 1KW. £5,475
- **IC-475**
  - 430MHz SSB, CW, FM. £1,185

**HALL 7. RSGB CONVENTION. N.E**

ICOM (UK) Ltd.
Dept PW, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859. 24 Hour. Fax: 0227 360155.
Visa & Mastercards: Telephone orders taken by mail order, instant credit & interest-free HP.
Despatch on same day whenever possible.

Practical Wireless, May 1990
IC-2400E FM 144/430MHz £635

IC-2500E
FM 430/1200MHz £675

IC-3210E FM 144/430MHz £499

IC-901 MULTIBAND £799
FM (SSB) 144/430MHz
VARIOUS OPTIONAL FREQUENCY UX UNITS INCLUDE

IC-UX19 28MHz FM
IC-UX59 50MHz FM
IC-UX129 1200MHz FM
IC-UX592 144MHz SSB.CW
IC-UXR91 RX Unit FM.AM

PRICES AVAILABLE UPON REQUEST

IC-UXR91 RX Unit FM.AM £520

Icom (UK) Ltd.
Dept PW, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859. 24 Hour. Fax: 0227 360155.
Visa & Mastercards: Telephone orders taken by mail order, instant credit & interest-free HP.
Despatch on same day whenever possible.

Practical Wireless, May 1990
What could Yaesu engineers do to improve on the hugely popular FT-90R series? The answer was easy, they designed and built the FT-90R2 series. The FT-90R2 series of transceivers provide high performance and a 25W output, when used with ‘C’ cells or nicads, ideal for serious portable operators, or when combined with matching linears, an easy to use compact multimode mobile or base station.

What more could you ask from a transceiver?

**FT290R2**  RRP £429.00  inc
**FT690R2**  RRP £429.00  inc
**FT790R2**  RRP £499.00  inc

ALL THE ABOVE ARE SUPPLIED WITH FBA8, MH10E8, STRAP AND ANTENNA AS STANDARD.

**OPTIONS INCLUDE**
- FL2025 2m 25W LINEAR  £115.00
- FL6020 6m 10W LINEAR  £109.00
- FL7025 70cm 25W LINEAR  £139.00
- FBA8 EMPTY CELL CASE  £27.00
- MMB31 MOBILE BRACKET  £17.50
- CSC19 VINYL CASE  £8.50
- NC26C NICAD CHARGER  £11.50
- FTS7 CTCSS UNIT  £40.00

**BEST SELLING OFFERS**

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**CASES**

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<td>Soft Carrying Case (FNB12) FT23/73</td>
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<td>Soft Carrying Case (FNB12/14) FT41/81</td>
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**OTHERS**

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<td>6m 10W LINEAR</td>
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<td>FL7025</td>
<td>70cm 25W LINEAR</td>
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<td>FBA8</td>
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<td>CSC19</td>
<td>Vinyl Case</td>
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</tr>
<tr>
<td>NC26C</td>
<td>Nicad Charger</td>
<td>£11.50</td>
</tr>
</tbody>
</table>

**LIGHT IN THE HAND AND ON THE WALLET**

- NICAD PACKS
  - FBA10: 7.2V cell case only (FBA4)  £11.50
  - FNB10: 12.6V 500mAH Nicad pack  £34.50
  - FNB12: 7.2V 600mAH Nicad pack  £37.50

- CHARGERS
  - NC1EIC: Charger maws (FNB12)  £17.71
  - SMC18: Charger maws FNB12) 13A style  £17.71
  - NC26C: Charger maws FNB10) 13A style  £13.80

- SPEAKERS MICS
  - MH16A2B: Speaker/mic- Miniature type  £31.05

- CASES
  - CSC23: Soft Carrying Case (FBA10/FNB10) FT23/73  £15.50
  - CSC28: Soft Carrying Case (FNB12) FT23/73  £15.50
  - CSC36: Soft Carrying Case (FBA10/FNB10) FT41/81  £16.00
  - CSC37: Soft Carrying Case (FNB12/14) FT41/81  £16.00

SOUTH WALES AGENT: John Doyle, Transworld Comms, Neath (0639) 632374 Day (0639) 642942 Eve. Closed Thursday.

SOUTHAMPTON SHOWROOM open 9.00-5.00 Monday to Friday, 9.00-1.00 Saturday. Service Dept open Mon-Fri 9.00-5.00.
FANTASTIC PERFORMANCE, REALISTIC PRICE

The FT-747GX is a compact SSB/CW/AM and optionally FM transceiver providing 100 watts of PEP output on all hf amateur bands, and general coverage reception continuously from 100kHz to 30MHz. A front panel mounted loudspeaker and clear, unobstructed display and control layout make this set a real joy to use. Convenient features include operator selectable coarse and fine tuning steps optimized for each mode, dual (AB) vfo, along with twenty memory channels which store mode and skip-scan status for auto resume scanning of selectable memories. Eighteen of the memories can also store independent transmit and receive frequencies for easy recall of split frequency operation. Wideband (8kHz) AM and narrowband (500kHz) CW IF filters are included as standard, along with a clarifier, switchable 20dB receiver attenuator and noise blanker. User programming for more advanced control by an external computer is possible through the CAT (Computer Aided Transceiver) System. The transmitter power amplifier is enclosed in its own diecast aluminium heatsink chamber inside the transceiver, with forced-air cooling by an internal fan allowing full power FM and packet, RTTY, SSTV and AMTOR operation when used with a heavy duty power supply.

WARNING: If you buy FT747GX not designed for the U.K. market, these may not be fitted with AM/CW filters which you may not be able to obtain.

IMPROVED PERFORMANCE AT NO EXTRA COST!

Yaesu’s FT757GXII is a HF compact transceiver which offers full featured performance just about anywhere, on holiday, on the road or in the shack. Remarkably similar to the FT757GX the FT757GXII has a number of improvements which enhance the pleasure and ease of operation with no detriment to the electrical performance. The improvements include memory storage of operation mode, slow/fast tuning selection, automatic step change according to mode, IF Notch filter, 10 memories and VFO to VFO scan.

A whole host of options are available to increase the operating pleasure. So no matter where you are why not try Yaesu’s FT757GXII full featured transceiver.

OPTIONAL ACCESSORIES

FP757D Heavy Duty P.S.U. £239.00
FP7000 20A P.S.U. £219.00
FL7000 500W sold state linear amplifier £1600.00

NOW EVEN BETTER the FT757GX MK2

Yaesu have upgraded this popular HF and VHF/UHF base station transceiver. The improved version is now available with enhanced synthesiser performance and VFO tuning rate. Read Chris Loret’s review in “Ham Radio Today”.

NEW

IMPROVED

FT767GX

YAESU DISTRIBUTOR WARRANTY

Importer warranty on Yaesu make products. All staffed and equipped Service Department. Daily contact with the Yaesu, Museum-labory. Terms of thousands of spares and test equipment.

PRICES & AVAILABILITY SUBJECT TO CHANGE WITHOUT PRIOR NOTICE

SMC NORTHERN (LEEDS) CLOSED SATURDAY AFTERNOONS

FREE FINANCE ON SELECTED ITEMS

On many regular priced items. See Free Finance (on invoice balances over £120) 20% down and the balance over 6 months at 9%. Down and the balance over a year. You pay no more than the cash price!

FREE INTERLINK DELIVERY ON MAJOR EQU...
FANTASTIC SAVINGS ON SOME OF YAESU’S BEST SELLING RADIOS

**FT736R***
NOW ONLY £1199
SAVE £160

*CAN BE EASILY INTERNALLY LINKED FOR 9600 & 1200 BAUD PSK PACKET OPERATION

**FT4700RH**
NOW ONLY £499
SAVE £176

**FT470**
NOW ONLY £349
SAVE £40

TRANSCEIVER ONLY
NO FREE FINANCE ON THESE OFFERS

ALSO AVAILABLE FROM ALL SMC BRANCHES BUT ONLY
WHILST STOCKS LAST

DEPENDING ON DELIVERY STOCKS SHOULD BE AVAILABLE
AROUND 10th/11th APRIL 1990

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CHESTERFIELD (0246) 453340
AXMINSTER (0297) 34918

LEEDS (0532) 350606
BIRMINGHAM 021 327 1497

For full addresses see display advert
Tuner to tune it to your operating frequency... It's as simple as that.

- Dish 2m S2039 £23.10
- Dish 3m S2039 £35.14
- Dish 3m S2049 £34.98
- Dish 3m S2059 £35.14
- PALOMAR Antenna Products

- Antenna Noise Bridge - Up to 100MHz £59.95
- Tuner-Tuner - Tune your ATU without transmitting £299.00
- L.E.D./S.W.R. Meter - Auto SWR up to 2kW £38.35
- 9:1 Balun. For the T2FD Antenna £124.95
- Belden BY2C Chrome Base £299.00
- Vibroplex Iambic std £33.12
- Vibroplex original std £299.00
- Hi Mound MK70 £299.00

- BALUNS SPECIAL ORDER ONLY

- 1.1 50 ohm coax £99.00
- 2.0 50 ohm coax £119.00
- 3.0 50 ohm coax £139.00
- 4.0 50 ohm coax £159.00
- 5.0 50 ohm coax £179.00
- 7.0 50 ohm coax £199.00
- 10.0 50 ohm coax £219.00
- 25.0 50 ohm coax £269.00
- 50.0 50 ohm coax £299.00

- $149.95
  - Can't hear the weak ones when conditions are bad? Receiver lacks sensitivity on 20, 15 or 10? Get the world famous Palomar preamplifier. Tunes from 160 to 6 meters. Gives 20 dB gain and a low noise figure to bring out those weak signals. Reduces image and spurious responses too.

- An RF sensing circuit bypasses the preamplifier during transmit. The bypass handles 350 Watts.

- BREDHURST ELECTRONICS LTD.
  - HIGH ST, HANDCROSS, W. SUSSEX. RH17 6BW (0444) 400786

- Practical Wireless, May 1990
“A DREAM COME TRUE”

TO ALL FT 290 OWNERS, OR FOR THOSE WHO WANT TO OPERATE HF FROM THEIR 2 METRE RIG——
TOKYO HI POWER HAVE PRODUCED THIS SUPERB TRANSVERTER DRIVEN FROM 144-146MHz AT 3-10W AND PRODUCING 40 WATTS OF EITHER FM OR SSB ON EITHER 10-15-20-40-80 METRES.

SO WHY NOT ENJOY THE IMPROVING CONDITIONS ON THE HF BANDS USING YOUR 2m EQUIPMENT.

£249 — CASH/CHEQUE/CREDIT CARD
OR 12 PAYMENTS OF £23.76

Kenwood TS440S & Auto ATU
One of the finest HF transceivers ever produced by Kenwood. Whether used as a base station or mobile — its superb specification rates it high amongst its competitors.
Special Exhibition Offer TS440S with auto ATU AND FREE Revex 30amp power supply — at list price or 48 payments of £43.08.

£1,282 WITHOUT AUTO ATU £1039

NOW NO DEPOSIT AND UP TO 4 YEARS TO PAY

WHEN IT COMES TO BREAKING THE PRICE BARRIER WE ARE RARELY BEATEN. NOW A SUPERB DUAL BAND TRANSCEIVER FROM STANDARD AT AN AMAZING £379.00 CASH/CHEQUE/CREDIT CARD OR NO DEPOSIT AND 36 MONTHLY PAYMENTS OF £15.23 PER MONTH

Here are 25 good reasons why you should consider the new STANDARD C520
★ Dual band receive
★ Full duplex transmit (between 2 & 70)
★ Receive coverage 130-175MHz, 330-470MHz & 820-960MHz
★ Handheld auto repeater facility
★ Select 5-tone pager facility
★ DTMF keyboard
★ Selectable RF power output
★ CTCSS option (programmable against frequency)
★ 5, 10, 12.5, 20, 25, 50kHz programmable step sizes
★ Programmable offsets between 0 and 39.995MHz
★ 20 memories on VHF and UHF
★ Manual toneburst 1750Hz fitted
★ Reverse repeater facility
★ Power save
★ Squelch defeat
★ Dial illumination
★ Priority function
★ Multiple scanning modes
★ Dual display
★ Separate volume and squelch control for each band
★ Full range of accessories available
★ Measures only 2.5ins x 7ins x 1.8ins
★ Full 5W output when powered by 13.8 volts dc
★ One year parts and labour warranty
★ Supplied complete with empty battery case, duplex antenna, belt clip and carrying strap

STANDARD
C520
£379.00

LICENSED CREDIT BROKERS A.P.R. 29% SUBJECT TO STATUS
MORE BARGAINS FOR N.E.C.

ICR7000HF Receiver
500kHz — 2GHz

YES, 500kHz to 2GHz CONTINUOUS receive in one unit. Using the ICR7000 multimode facilities, this probably makes the “2 in 1” ICR7000HF Receiver the most versatile scanner available today. Because of the enormous frequency coverage, the ICR7000HF has 200 mode sensitive channels for increased flexibility.

Now available on A.R.E. super credit terms. 48 monthly payments of £33.23 A.P.R. 29% Cash/cheque/credit card price.

£989.

REMEMBER
WE SELL ALL WELL KNOWN BRANDS. LET US QUOTE FOR YOUR CHOICE
KENWOOD — ICOM — STANDARD

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<tr>
<th>48 PAYMENTS</th>
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<td>ICOM725</td>
<td>£23.49</td>
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</tbody>
</table>

KENWOOD TS140S
PHONE ANY OFFICIAL KENWOOD DEALER AND ASK FOR THE PRICE OF THE TS140 AND YOU WILL HEAR £862 — HE MAY OFFER YOU A DISCOUNTED PRICE OF SAY £799. BUT WE ARE OFFERING THIS SUPERB TRANSCEIVER FOR £699

WE HAVE BEEN FORTUNATE IN PURCHASING A LARGE QUANTITY OF YAESU FT 747GX TRANSCEIVERS DIRECT FROM OUR AGENT IN JAPAN AND WE ARE PLEASED TO BE ABLE TO OFFER THESE AT THE AMAZING PRICE OF

£499 INC VAT.

CW & AM FILTERS ARE AVAILABLE AT £35 EACH

AVAILABLE WITH NO DEPOSIT AND 48 MONTHS TO PAY —£16.77 PER MONTH THE FT747 HF TRANSCEIVER SSB/CW/AM (AND OPTIONAL FM) 100 WATTS PEP OUTPUT ON ALL HF BANDS AND GENERAL COVERAGE ON RECEIVE. 100kHz — 30MHz, DUAL VFO 20 MEMORIES. ALTOGETHER A SUPER ECONOMICAL HF TRANSCEIVER

PHONE FOR DETAILS

Both Brenda and Bernie will be pleased to welcome you to our stand at the N.E.C.

Brenda
G4VXL

Bernie
G4AOG

Practical Wireless, May 1990
## COMET PRICE LIST JANUARY 1990

### NEW ICOM IC-24E
- ICOM mini dual bander
- 2M & 70cms FM
- Discount Price £349 incl. nicad, charger

### NEW IC-725 STAR BARGAIN
- SM/AM Unit included
- Microphone included
- 30 Amp P.S.U.
- G5RV Antenna included
- All-in price
  - £869.00!!

### TS440S or TS680S with 6M
- Phone for Best Price

### NAVICO SUPER SPECIAL OFFER!!
- Minimum £50 Trade-In for any working 2metre or 70cms Japanese Transceiver against
- Minimum £50 Trade -In for any working 2metre or 70cms Japanese Transceiver against

### JUPITER SCANNERS!
- 25-1300 Mhz with exceptional performance (really sensitive at 900 Mhz)
- MTV5000 Handheld £275
- MTV5000 Handheld
  - Discount Deal £275
  - Includes main, case DC Lead
  - MTV5000 Base/mobile
  - Discount Deal £239
  - Inc. DC Lead & Mobile Mount

### NEW SHOWROOM IN N. WEST OPEN!!
- Greenswany Arcade, Gerrard Street, Ashton-in-Makerfield, Wigan.
- Lancs. Tel: 0942 713405
  - Jim Cook, G6TJB is at your service Mon-Sat

### R-7000
- ICOM's superb VHF/UHF/SHF receiver
- £389.00

### HP NEW HP100E from
- Fairmate, 25/1300 Mhz
- 1000 channel memory
  - £279.00

### TH75E KENWOOD DUAL BANDER
- with receive
  - 140/169 & 430/460MHz
  - Nicad & Charger
  - £389.00

### NEW ICOM IC-R1
- Micro-size handheld scanner 150KHz
  - 1300 Mhz
  - £399

### TH75E KENWOOD DUAL BANDER
- with receive
  - 140/169 & 430/460MHz
  - Nicad & Charger
  - £389.00

### TR751E — FREE CREDIT
- EXCELLENT 2 Metre performance from this great allmode rig.
  - Dep: £199 + 9 payments £44.44.

### NEW IC-R72 RECEIVER
- General coverage 100KHz/300Mhz, compact size
  - £599

### BEST DEAL IN AMATEUR
- CVR4000 £869.00!!
- All-in price included
- G5/RV Antenna included
- SM/AM Unit
  - £299.00

### IC2SET ICOM 2 metre FM Keyboard Entry Micro-Handy
- NICAD
- Wall charger
- Ext. RX coverage included
- Discount Deal £227.00
- Extended receive coverage.

### IC2SET ICOM 70cms FM Keyboard entry Micro-Handy
- Nicad wall charger
- £299.00

### NEW R7000 ICOM's superb VHF/UHF/SHF receiver
- £389.00

### 2x4SUPEF II 144/432 Mhz
- 60/8 4013 200w 2.43 metres
- £277.35

### 2x4WX 144/432 Mhz
- 6.5/9.048 200W 3.18 metres
- £277.35

### 2x4MAX 144/432 Mhz
- 8 5dB/11.9dB 200W 4.5 metres
- £277.35

### 2x4FX Garrpact 144/432 Mhz
- 4.5/7 200W 1.79 metres

### 2x4M 144/432 Mhz
- 4 5/7 200W 1.53 metres

### 2x4FX Compact 144/432 Mhz
- 4.5/7 200W 1.79 metres

### 2x4FX Compact 144/432 Mhz
- 4.5/7 200W 1.79 metres

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- 4.5/7 200W 1.79 metres

### DULEX & TRIPLEXER 14/432 Mhz
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- Unit 17, Six Harmony Row, Gowan, Glasgow.
- Scotland 511 36A. Tel: 041 445 3660.
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## YOUR ORDER CAN BE TELEPHONED WITH CREDIT CARD DETAILS & DESPATCHED IMMEDIATELY.

## FREE FINANCE ON MANY MAJOR ITEMS AT ARROW
- (Ask for details of qualifying items — see examples above.)
It must be Spring - the rally season has started! The many and excellent mobile rallies and shows up and down the country are very important to PW and our sister publication Short Wave Magazine as we can meet and talk to readers. Many of you take the opportunity to 'bend' the editor's ear, and feedback such as this can be very useful - if sometimes uncomfortable. Joking apart, most of you who have criticism and suggestions about PW's approach to the radio hobby present it in a very positive and helpful way.

As PW strides forward into the new decade we are very conscious of the fact that we must try to cater for our readers in the best way possible. And let's face it - without you there would be no magazine. To this end, throughout 1990 at all the shows and rallies that PW and SWM attend, you'll be given the opportunity to fill out a questionnaire.

The forms will enable us to gather as much information as possible from you all as to what you, the reader, require from the magazine. The data will enable us to evaluate your likes and dislikes and enable us to gather as much information as possible from you all as to what you, the reader, require from the magazine. The data will enable us to evaluate your likes and dislikes and help us to help you and you could help yourself in more ways than one.

The Show Must Go On

It's a little while since we had an amateur radio show in London. It's a very long while since we had a show where parking was unrestricted and free. The Picketts Lock Centre in North East London proved to be an ideal venue in this respect. As the spacious venue is not far from the NEC near Birmingham, would often prefer to let the 'train take the strain', I asked BR Inter-City if it would be possible to arrange special bargain tickets for those of our readers wanting to travel by train. Unfortunately, after several letters and phone conversations, BR officials politely but firmly stated that they had more than enough passenger travelling to both locations without encouraging even more by offering special rates. Perhaps we'll have more luck when a show is organised in a location served by a threatened or less well-used railway service.

Anyone for a national show on the Welsh Borders? (All Change at Craven Arms Please).

Conversion to Four Metres

Have you recently bought an ex-p.m.r. transceiver with a view to converting it to 70MHz f.m. operation? If you have, I would be pleased to hear from you and details of the particular rig you've bought. In fact, we'd like to hear about any successful conversions that have been carried out on the various transceivers that can be found.

To close this month's piece I have to thank readers who've written to me on the valve topics in previous Keylines, and pose a question to those of you who enjoy home construction. Do you, when building a design published in PW, prefer to work from the circuit alone (with tips on construction but without comprehensive guidance) or do you prefer the complete circuit, guidance, p.c.b. and over-lay service that we provide now? Either way, I would like to know your preferences. Don't forget - there's room for extra comments on our forms available at a rally near you this season.

Getting There

Many people who know me are fully aware of my interest in railways. As a founder member of the British Railways Amateur Radio Society along with Ron Hooper G3SCW (now sadly a Silent Key) I have retained much of the railwayman in my outlook to rail travel. Knowing full well that many enthusiasts wishing to travel to the big shows such as Leicester and the NEC near Birmingham, would often prefer to let the 'train take the strain', I asked BR Inter-City if it would be possible to arrange special bargain tickets for those of our readers wanting to travel by train. Unfortunately, after several letters and phone conversations, BR officials politely but firmly stated that they had more than enough passenger travelling to both locations without encouraging even more by offering special rates. Perhaps we'll have more luck when a show is organised in a location served by a threatened or less well-used railway service.

Come and see us there and help us to help you!

RM
Send your letters to the Editorial Offices in Poole, the address is on our contents page. Writer of the Star Letter each month will receive a voucher worth £10 to spend on items from our PCB or Book Services, or on PW back numbers, binders, reprints or computer program cassettes. And there’s a £5 voucher for every letter published.

Letters must be original, and not duplicated to any other magazines. We reserve the right to edit or shorten any letter. Brief letters may be filed via our Prestel Mailbox number 202071191. The views expressed in letters are not necessarily those of Practical Wireless.

★★★★★STAR LETTER★★★★★

Discrimination

Dear Sir

As an old-time radio enthusiast who had the regrettably useless privilege of exemption from the RAE forty years ago may I say that while I fully sympathise with your remarks on discrimination it is unfortunately the case that it has already been introduced into the novice licence concept, with the intent of promoting Morse even at the risk of defeating the purpose of that concept. Events over the last few years confirm that, by and large, DX is what attracts while Morse tends to repel.

It will always be the case that some will hold themselves better than others, but his would be easier to bear if the Morse test were a qualification for those who actually want to use Morse on the air, rather than a device for preventing access to all forms of h.f. transmission.

I am well aware of (and do not dispute) all the merits of Morse which are so repetitiously trotted out (indeed its qualities of penetration are, as I write, being demonstrated by two characters hammering away in the middle of one of the 'phone sections - I would not dare try that the other hammering away in the middle of one of the 'phone sections - I would not dare try that the other way round!). But there are people who can fully satisfy examination requirements and do have the price of, or could even build, an h.f. rig but are barred from the h.f. bands only because they have no aptitude for Morse; they cannot see why they should be made inferior compared to, say, those of us who have contrived to scrape through the test but who do not want to, could not, and have no intention of trying to carry through a Morse QSO. It is a long past time for work to begin to secure an all-bands, no Morse test licence in this and other countries. This would be perceived to be logical, which the existing situation is not, and indeed, as Morse passes out of use in other spheres while amateurs increasingly indulge in RTTY/AMTOR/packet/data transmission (and Morse itself can be encoded and decoded by machine) continuing imposition of the test as a condition of access to amateur radio indeed is illogical.

I must hasten to emphasise that I am not decrying Morse. I would be happy to accept, indeed I advocate, that the licence conditions should be so amended that the Morse sections of the h.f. bands are legally reserved for the use of Morse by those who pass the test. That, I submit, should be a sufficient privilege to underpin Morse elitism. And as to the perpetuation and propagation of enthusiasm for Morse I suggest it remains true in all spheres that a volunteer is worth two pressed men.

Alex L. Dick ('Sandy') GM0IRZ, Dundee

To All Rally-Goers

Dear Sir

The Lancastrian Rally Committee offers its sincere apologies to the many people who were under the impression that the Lancastrian Rally was to take place on Saturday 27 January 1990, as published in Practical Wireless, January and February 1990. We must point out that this was NOT the fault of the committee, but an error on the part of Practical Wireless Magazine. We have contacted Rob Mannion, the editor of PW, who has given us a firm undertaking to print a full apology and correction as soon as possible, as well as an offer to promote the rally during the coming year. We are now quite satisfied with PW's response.

We ourselves made every effort to inform as many people as possible, by putting out announcements on GB2RS Packet and even having a station on 2m on Saturday morning telling all and sundry that the rally was not taking place this year. However, we do realise that this is small consolation to the 60 or so people who made the journey to Lancaster only to be disappointed on arrival. Again, we can only offer sincere apologies and hope that this will not deter you from attending the rally on the correct date, which is Sunday 27 January 1991. Finally, to the 150 plus people who phoned our contact numbers during January, thank you for your patience and understanding. To the best of my knowledge, not one of those who phoned was ill-treated, if ill-tempered or anything other than courteous and good-humoured. We look forward to seeing you all at Lancaster in January 1991.

M. Sherlock G4ZYN
pp. J. Brown GOJSM
Chairman Lancastrian Rally Committee

Editor's comment: When you send in rally details a long way in advance of the event, please mark the year very clearly!

Dear Sir

First, thank you for an excellent magazine.

Secondly, I must say that I am not a fan of letter writing but I need info and I think you can help me.

Last evening, I had my first 2-way QSO as SSTV with UV99W. Reports exchanged, both 595, frequency was 14.233MHz, eight seconds and time 17.40GMT. His OTH was 1500W and the next. His OTH was a 1500W and the next.

Since Richard Thurlow G3VVVV went dark screen and Les Curno stopped writing there is no column devoted to SSTV and this is a shame since there are many more amateurs using the mode through computers.

Finally, I received the above station via an FT-767GX: TX the GX-2 Technical Software an ancient BEEB and RX the GX-2 Technical Software an ancient BEEB. I wonder if anybody else has noticed this too?

For about a year I have been practically unable to receive Voice Of America on 5695mc and the next frequency and the next. I know the transmission is there because occasionally I hear it cross over with GDR and Prague. Sometimes I cannot receive CSM Boston at all, in the 29 or 31m band.

Please can you tell me the date of the start of SSTV in the USSR and further, can they work any other data, as an offer to promote the SSTV? WO could not, and have no intentions of trying to carry through a Morse QSO. It is a long past time for work to begin to secure an all-bands, no Morse test licence in this and other countries. This would be perceived as logical, which the existing situation is not, and indeed, as Morse passes out of use in other spheres while amateurs increasingly indulge in RTTY/AMTOR/packet/data transmission (and Morse itself can be encoded and decoded by machine) continuing imposition of the test as a condition of access to amateur radio indeed is illogical.

I must hasten to emphasise that I am not decrying Morse. I would be happy to accept, indeed I advocate, that the licence conditions should be so amended that the Morse sections of the h.f. bands are legally reserved for the use of Morse by those who pass the test. That, I submit, should be a sufficient privilege to underpin Morse elitism. And as to the perpetuation and propagation of enthusiasm for Morse I suggest it remains true in all spheres that a volunteer is worth two pressed men.

Alex L. Dick ('Sandy') GM0IRZ, Dundee

Dear Sir

Whilst I am slowly recovering from a long illness, and recovering old valve radios, I noticed a distinct change in the pattern of the broadcast reception and wonder if anybody else has noticed this too?

For about a year I have been practically unable to receive Voice Of America on 5695mc and the next frequency and the next. I know the transmission is there because occasionally I hear it cross over with GDR and Prague. Sometimes I cannot receive CSM Boston at all, in the 29 or 31m band. This morning for the first time they came roaring in, Cuba disappeared, Ontario almost invisible at 2200 or 1400 or 1800, South American stations nil. SRI disappears. Then some days the entire band from 55 kHz to 23 MHz is smothered with whistles at every channel, some of the public commercial channels are audible on any receiver I have, Sanyo, Bush, Murphy. Some days the whistles have gone entirely from all channels.

Is there any other listener noticed this?

I understand that the E-layer is now full of junk hardware from space shots. The clutter is so close that ongoing work is not at risk of damage from collisions.

If that is true, shouldn't the metal junk reflect radio transmissions and cause unusual results?

The other question is this: looking once again at the time quote for obtaining a licence, I wonder, that every police officer, firefighter, gas repair plumber, water board repair group all have transmitters which they use continuously. Have they all passed the RAE licence examination?

My Scottish forebears would say "is that a fact?"

John D. Berridge
Whitchurch, Cardiff

Practical Wireless, May 1990
Both instruments offer such features as a variable hold-off to ensure a stable display for complex pulse trains or data streams; an X-Y mode for display of waveforms (including Lis-sajous figures); TV triggering for display of video signals and the ability to connect to a frequency counter (or similar instrument) to obtain higher accuracy measurements.

The two units have 80 x 100mm rectangular screens offering parallax-free readings and the ability to illuminate if, for example, photographs of displays are required. Both instruments are supplied with high-quality probes as standard.

**STC Instrument Services**

Dewar House Central Road
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Tel: (0279) 841641.

**Non-CFC Photoresist**

Believed to be the first aerosol photoresist product using an ozone-friendly propellant, new Electrolube Photoresist is a fast-drying positive resist for one-to-one reproduction of circuits, diagrams and images on metals from transparent positive masters.

Available in 75 and 200ml aerosols, RP50 is suitable for small production requirements. Both 1 and 2.5 litre bulk containers are also available for larger volume users. With a solids content of approximately 12%, RP50 aerosols have a shelf-life of one year unused and give coverage of approximately 2.2m² (75ml) and 5m² (200ml).

Processed RP50s clear green colour produced a high contrast image with a resolution of better than 0.1mm and a fine spraying nozzle ensures extremely thin, uniform edge-to-edge coating, with thickness entirely within the operator's control.

After applying RP50 to a clean, grease- and dust-free surface, the coated boards are left to dry overnight or alternatively oven dried for 10:15 minutes at 75-80°C. The design artwork is then placed on to the coating which is then exposed to a uv light source. Development is carried out using diluted Electrolube Photoresist Developer producing a clear green image of those areas not exposed to the uv, on a copper background. The bare copper areas are then acid etched away. The remaining photoresist on the design pattern is removed with undiluted Photoresist Developer leaving behind the printed circuit pattern ready for subsequent operations.

**Electrolube Ltd**

Blakes Road
Wargrave
Berkshire RG10 8AW
Tel: (0734) 404031

**COMEX 90**

COMEX 90, the mobile communications exhibition and conference will be held in the Telford Exhibition Centre, Telford on October 16-18. If you would like more information on this event, contact:

John Graham,
Frametrack Limited, Keswick House,
207 Anerley Road, London SE20 8ER. Tel: 01-778 5656

**Basic Measurements**

The latest hand-held digital multimeter from TMK Instruments provides the user with all the basic measurements using a single, easy-to-use, rotary switch. Model G85 has a clear 1999 count three and a half digit liquid crystal display with automatic zero, polarity, over-range and low battery indication. housed in a yellow rugged case, the G85 has recessed safety sockets and test leads. This highly reliable and value-for-money instrument has many applications and is fully guaranteed for one year.

Two d.c. voltage ranges measure to 200V, have a 10mV resolution and a basic accuracy of 0.7%, a.c. voltages goes to 500V in one range with a 1V resolution. Direct current up to 10A with a 10mA resolution and a basic accuracy of 1.5%. Ohms are measured in 2 ranges to 2MΩ with a best resolution of 1Ω, while diode test are carried out at 3 volts and 1mA. Model G85 is supplied ready for use with a battery, test leads, carrying case and instructions. The physical dimensions are 73 x 148 x 32mm. The G85 costs £39.95 excluding VAT.

**TMK Instruments**

Building 3
GEC Estate
East Lane
Wembley
Middlesex HA9 7PJ
Tel: 01-908 3355.
Dial Search

The latest edition of Dial Search by George Wilcox is now available, that’s the sixth edition.

The telephone is designed to ‘connect you’ to all sorts of interesting and useful people. So is every portable radio. Yet many radios in the home stay tuned to one station all the time! Getting more variety of listening is not a matter of chance or magic or even special training. It is largely a question of having the right details to hand - you need a directory. That’s why George Wilcox wrote the first edition of Dial Search way back in 1981.

Dial Search can save hours of frustration and make home listening worthwhile – whether your interest is in music or in news from home or abroad.

There are two maps included in the book, the first inside the front cover is a Map of European Broadcasting Stations. The second, inside the back cover, is of the Broadcasting Stations in the British Isles. Other chapters include: Abbreviations, Spot the Tune, Broadcasts in English, Frequency Bands, Longwave, Medium wave, v.h.f.(f.m.) and Shortwave.

Dial Search is available from the PW Book Service at £3.95 plus 75p post and packing.

PRO-2004 Upgrade Kit

If you own a PRO-2004 you will be well aware that it has 300 memory channels. This modification kit gives you the opportunity of increasing this by 100, like the 2005.

For just £2.50 you get the two necessary diodes and a new keypad overlay and full, detailed instructions. Also included with the package is an A4 sheet of other mods you may wish to do, such as fitting a mains socket, 30MHz stepping, etc.

The instructions for the modification should be straightforward enough for most users to be able to do. Although, as you are warned, if your set is still new, your set is still under guarantee this modification will invalidate that guarantee.

P. Beckett
3 Pasture Close
Whitmore, Newcastle
Staffs ST5 5DQ

Straight Key Day

The European CW Association’s Straight Key Day, organised on behalf of EUCW by the Scandinavian CW Activity Group (SCAG), will be held on Saturday 23 June 1990, and is open to all amateur c.w. operators who enjoy working on the hand key, whether regularly or just occasionally.

This is not a contest. The idea is to put aside the electronic keyer for the day and use a hand-key for relaxed QSOs! Those taking part should call CQ SKD on frequencies between 3.540 and 3.570MHz, 7.020 and 7.040MHz, 14.050 and 14.070MHz, or anywhere on the 10MHz band.

Participants having at least five contacts with other straight key stations may vote for the best hand-style or ‘fist’ worked, one vote for each of the three considered best. A ‘Straight Key Award’ will be sent free of charge to every operator who receives at least two votes.

Although it is expected there will be good support from British based EUCW member clubs, all UK c.w. operators are invited to join in to help make this event a resounding success. Logs and votes should be sent before 17 July 1990 to:

The SKD Manager
Daniel Klintman SM7RXD, Adjunktsgatan 3D
S-214 56 Malmoe, Sweden

Eddystone Users Group

Mr W.E. Moore has decided to form an Eddystone Users Group. During a recent visit to the Eddystone factory, he obtained agreement to use facts and data from their manuals in a group newsletter. This would be sent to members and would be operated on a non-profit basis, only a nominal charge for post and printing.

Anyone interested should send an s.a.e. to:
Mr W.E. Moore, 112 Edgeside Lane, Waterfoot
Rossendale BB4 9TR.

Inner & Outer Hebrides DXpedition

Alan G1EUU and Colin G1JME will be using the callsign GM1WAB/M whilst on their inner and outer Hebrides DXpedition. Their timetable is as follows:

May 26 - Grantham to Ardrossan
May 27 - Arran, Gigha, arrive late on Islay
May 28 - Islay, Jura, Luing
May 29 - Mull, (Iona*), South Uist
May 30 - South Uist, Benbeculla, North Uist, Baleshare, Girmay, Berneray
May 31 - Skye, Harris
June 1 - Harris, Lewis, Great Bornae
June 2 & 3 - Activate NB, NC, ND, NH, NO, NT, NS, NX and NY squares.

The frequencies in use will be 144.440 & 50.200MHz, 430MHz by arrangement on 144MHz.

*The Isle of Iona may not be mobile operation.

G1EUU
68 Aire Road
Grantham
NG31 7OP
DIY from Morokulien

The East Leeds ARC G0MFF was formed only a few months ago. They are, in the main, contest orientated and have already entered many contests under the club call sign.

The club has now finalised arrangements to go even further afield to no lesser place than Morokulien on the border of Norway and Sweden (UO65OW). The borders of both Sweden and Norway actually run through the 'shack' in Morokulien, hence call signs for both countries have been issued.

For those who have never heard of Morokulien, it is only a handful of kilometres from Charlottenburg, Sweden or about 115km north-east of Oslo.

Five members of the club, G7ELS, G4VRW, G7CTC, G7DHM and G7EXI will be in Morokulien from 8 May 1990 until 11 May 1990 inclusive, using the call signs L5SLG, SJ9WL and of course G0MFF with the appropriate prefix on h.f. and v.h.f. and probably packet. Hopefully they will be using the satellites as well.

A video of the expedition will be made and will be available for hire on the return of the expedition for a small charge to boost club funds. The shack is available to all amateurs so a video will give you a good idea of what to expect, should you decide to pay a visit.

Anyone wanting to hire the video should contact the club secretary at: ELARC 2 Temple Walk Leeds LS15 7SQ

International Marconi Day 1990

Following the tremendous success of the worldwide events held in recent years, the Cornwall Radio Amateur Club are once again co-ordinating International Marconi Day on April 21.

The event will run from 0000Z through to 2359Z and the stations participating are:

K1VV/IMD - Operation of this station is under the Direction of 'Whitey' and our other good friends in the Cape Cod area, where the first Europe to USA contact was made.

VE1MND - Operation of this station is by our colleagues in Nova Scotia - at the G0MFF Museum which has been opened recently.

VO1MND - This station will be operated from St Johns, Newfoundland, as this is the area where the very first transatlantic contact was made.

D21MJD - No Marconi Day would be complete without our good friends working the official Marconi Club Station in Italy. This station is located in Villa Grifone, near the village of Pontecchio, and it was at this site that the very first transmission in the history of amateur radio was made.

QTI-TNA

QTI is produced by the QTI Talking Newspaper Association, a voluntary organisation which is dedicated to helping visually handicapped radio amateurs and short wave listeners to enjoy radio and electronics magazines.

Each issue of QTI tape magazine is a compilation of technical articles selected from current radio magazines and recorded on tape by a team of readers from all parts of the United Kingdom. The magazine comprises two C90 cassettes and is sent out to more than a hundred members about every three weeks. Most of them are in the UK, there are some in Europe - Norway, West Germany, Southern Ireland as well as India, Canada and California. Also, a copy of each issue is sent to Australia where it is copied and distributed to listeners in Australasia.

The service is available to all handicapped radio amateurs and short wave listeners for a voluntary subscription of just £3.50. Under the Post Office arrangements for the blind, postage is free. In other cases postage has to be paid.

An enterprise of this kind is always in need of funds to cover maintenance, replacements and the purchase of up-to-date recorders and fast-copiers in order to provide a first class service. Material and financial support has been given by the electronics industry, amateur radio dealers and the radio press. However, donation large or small, are gratefully accepted. A covenanted donation is worth one quarter as much again, because QTI-TNA, as a registered charity, can reclaim the income tax which has already been paid on the amount of the donation. There is also a "Sponsor a Member" scheme which is designed to help those members who are on small incomes by paying their subscriptions. Volunteer helpers are also needed.

Harry Longley QTI TNA, 7 Anderson Close, Lancaster LA1 3JE. Tel: (0524) 332707.

Water Music?

Pioneer has launched a new wave of musical performance, with products specially designed to extend the range of Pioneer hi-fi sound enjoyment out onto the high seas.

The marine loudspeakers, available in two models 100 and 120W max. Both models have been especially designed to withstand the tough marine environment and feature gold-plated lead wire and connection terminals, stainless steel mountings and an injection moulded water resistant polypropylene woofer, built to take even a direct jet of fresh or salt water.

Pioneer have also designed a Marine Cover made to fit any Pioneer car stereo cassette/tuner combination. The new cover protects your sound source by keeping it dry and safe from the rigours of the sea.

Petrol Tokens

When you fill your car up with petrol, do you collect the vouchers that come each time or do you never seem to get enough for the 'gift' of your choice? Well the Belfast RAIBC are collecting BP petrol tokens to provide their members with equipment. So far they have had two TS440 h.f. transceivers and accessories presented by BP last November. They are still collecting these BP petrol tokens. Send them off to:

RAIBC (NI), PO Box 87, Belfast BT12 5PU

QAGIS

The repeater run by the Young Amateur’s Group in Scotland has been postponed and will now take place over the weekend of April 14/15. The objective is to work all 25 Scottish voice repeaters. The group GMOMVZ would, as before, appreciate any help such as contacts on some of the quieter repeaters.
radio was made by the Young Marconi in 1895.

**GB0IMD** - Under the direction of Vernon, a keen Marconi Historian, this station will operate from the area on the Isle of Wight where many early experimental transmissions were made by Marconi and his associates.

**GB4IMD** - This is the Cornish RAC station operating from the original Marconi site on the top of the Magnificent cliffs by Poldhu Cove on the Lizard Peninsula in Cornwall and very close to England's most southerly point. This was the European station site when the first transatlantic transmissions were made.

**GB2MDI** - The Marconi station for Northern Ireland will be under the direction of Ivor GI4WRI. The site is near Rathlin Island, the well-known Marconi experimental site in that area.

**IY0TCI** - Last year, Pat worked as a 'guest' only, but this year will operate as an official Marconi Day station in Civitavecchia. It was near this site that Marconi carried out his first experiments on 500MHz.

**IY1TTM** - Last year, this station worked as a guest only, but will participate fully in 1990 working from the Tigullio Tower, Marconi. The location of the tower is near Sestri Levante on the Italian Riviera near Genoa. It was from this tower that the early experiments on v.h.f. and u.h.f. for marine direction finding purposes and propagation studies were carried out.

**ZS6RSA** - This station is representing the South African influence of Marconi. It was from the site in Poldhu, Cornwall that the first transmissions to South Africa were made. During the event last year, special broadcasts were made on the radio station the Voice of South Africa and the SARL held a very successful open day to celebrate International Marconi Day.

**DA0IMD** - Greg DL1BFE actually came to visit Cornwall last year and this year will be in charge of this station on the North German coast. It is interesting to note that the first ever 'Marconigram' was sent from Borkum Island on 28 February 1900 and the German PTT officially opened the first wireless service of the world at this site on 15 May 1900.

**GB2DI** - John and his colleagues in the Salisbury Radio Club will be operating from the area near Salisbury where in September 1896 and March 1897 Marconi conducted his early field experiments for the benefit of the British Army. This site is where the old roman road meets the A30, just south of Figsbury Rings.

**GB4MDI** - David and his friends hope to operate their station from Flatholm Island in the Bristol Channel, a famous Marconi experimental site. They will, in fact, be on the island for about five days using the call GB2FI and will change the call to GB4MDI for the 24 hour period of the International Marconi Day. If the weather prevents access to the island then the station will work from the Marconi site on the Welsh mainland, near Barry.

**F17IMD** - Associates in IRCs. The official award is for the 24 hour period of the International Marconi Day. Operations this year will be voice only and the following table gives the various band segments on which to listen:

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.7 - 3.8MHz</td>
<td></td>
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<tr>
<td>7.05 - 7.1MHz</td>
<td></td>
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<tr>
<td>14.15 - 14.35MHz</td>
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<tr>
<td>18.1 - 18.16MHz</td>
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<td>21.15 - 21.45MHz</td>
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<tr>
<td>24.93 - 24.99MHz</td>
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<tr>
<td>28.3 - 28.69MHz</td>
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<tr>
<td>28.3 - 28.69MHz (f.m. at top end of band)</td>
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</tr>
<tr>
<td>50.1 - 50.5MHz</td>
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</table>

This year, to qualify for the Marconi Award, it will be necessary to work any 10 of the 15 special stations. QSL cards can be exchanged via the bureau, or if preferred directly (with stamps or a donation towards the costs please).

All official award claims must be accompanied by either $5(US), £2(UK) or 10 IRCs. The official award is for full two-way working only, but in addition there is a separate award for short wave listeners where claimants will have to record at least 10 of the Marconi Day stations together with the times heard (UTC). The s.w.l. award will cost $3(US), £1.50(UK) or 6 IRCs.

**CRAC (or IMD)**
**PO Box 100**
**Truro**
**Cornwall TR1 1RX**

Cut out this coupon and bring it with you to any of the rallies that Practical Wireless is attending and you can save 5% on goods bought from our stand. If you collect the coupon from two separate months of Practical Wireless you can save 10% on goods purchased from Practical Wireless at the rally.

If you don't want to cut up your magazine, bring the whole issue along and we will validate the coupon without removing it from your magazine.

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Why do NiCads fail?

Chief causes for premature failure are:
1. Frequent shallow discharge before recharging resulting in 'memory phenomena' - apparent loss of Ampere-hour capacity.
2. Charging to less than 1.4V per cell (not replacing 30% more energy than discharged) also effects memory.
3. Shorted cells. The shorted condition is caused by chemical 'whiskers' growing inside discharged NiCads. Cells with this fault condition will, when tested, measure zero voltage and zero resistance across the terminals and will not accept a charge.
4. Reversed cell polarity. This occurs when a cell in a series string becomes fully discharged and is then reverse-charged by the current flow from the other, healthier cells.

Fortunately, as has been proved, these defects are usually curable with proper techniques and most NiCads can be restored to full health. However, it should be realised that 'dryout' caused by internal seals rupturing from overheating, with the resultant loss of fluid, is incurable. This fatal condition can be recognised by the presence of small crystals deposited around the cell terminals.

The NiCad Recycler was designed to overcome many everyday problems for the NiCad user and includes in one unit, all the facilities needed for curing, maintaining and prolonging the active lives of NiCad cells. It has also been designed with options for individual constructors. These features are:
1. One-shot Charge Mode. This is a programmable charge rate and has shut-off voltages suitable for one to ten cells (1.4 to 14V).
2. Continuous Cycle Mode. When full voltage (1.4V per cell) is reached, the battery is switched to a discharge load. When deep discharge is reached (1.0V per cell), the battery is switched back to charge. The battery will be cycled between charge and discharge over its full capacity range. Recycling can be done once, or periodically, to keep batteries healthy or as many times as needed to eliminate any memory condition.
3. Short 'Zapper'. This important and versatile facility on the unit applies high current pulses to shorted cells to burn out internal chemical 'whiskers' and/or repolarise reverse-charged cells.

How It Works

Now it's time to look at the circuit, Fig. 1, and see how it works. In my particular design, constant current charging is used, so as to avoid the initial high current and heating that can occur when the recharging of deeply-discharged cells is attempted. Overheating on recharging can be a common result of the constant voltage method and this problem is avoided in this design. The circuit design, shown in Fig. 1, has evolved from a well-proven method
Comparator IC3a

Pin 8 of the reference voltage to generate an alternative method. Fig. 2a & b: Two sections of an LM339 quad comparator (IC3a and IC3b) sense and control the maximum charge and deep discharge voltage limits as follows:

Continuous or One-shot mode is selected by S3 (shown in One-shot mode) and R1 sets a reference voltage on the inverting input to IC3a, equal to 1.4V x number of cells. The non-inverting input of IC3a monitors the charge output voltage across the battery under charge. When the charge voltage rises above the reference voltage the output of IC3a goes high, biasing off TR1 charge current and causes TR2 to illuminate the ‘end of charge’ i.e.d. as well as applying power to the top of relay RL1 (S3 in Continuous charge position).

Hysteresis is applied to IC3a by the 680kΩ resistor between the output and non-inverting input pins, so that when the uncharged battery terminal voltage drops approx 0.2V, IC3a output will again go low. TR1 turns on the charge current and the i.e.d. goes out. This on-off cycle repeats as the terminal voltage rises or falls relative to the reference voltage with the charge current being pulsed (rather than tapering down) and pulsation decreasing as the battery ‘tops off’. The pulsating end charge is very effective in bringing the battery to the full charge of 1.4V per cell without forcing the cells into overcharge or heating. After several hours on pulsating charge, no discernible heating has been noted. With the Mode switch (S3) set on Continuous cycle, the i.e.d. D7 illuminates to signal that the charge cycle is complete.

Recycle Mode

The first time that the battery terminal voltage rises above the charge reference voltage, IC3b output goes high, TR3 conducts and energises relay RL1 which switches the battery across a discharge load resistor shown as a switched (S4) value of resistance. Discharge continues until battery voltage drops below the deep discharge reference level, the level of which is set by R3 to the inverting input of IC3b (the reference level is equal to 1.0V x number of cells), IC3b output is then high, keeping TR3 in conduction. When the cell or battery voltage drops below the R3 reference, IC3b output goes low and de-energises the relay which switches the battery back over to the charging circuit. Interruption of the relay current causes the battery to be put back onto recharge.

The potentiometer R3, with external resistors, sets the discharge voltage limit to approximately 70% of the full-charge limit (1.0V x number of cells). Since the lower reference network is supplied from the wiper of R1, it will always track R1. Resistor R3 needs only to be adjusted once.

Setting the charge voltage is very dependent on the accuracy of R1, which has to be calibrated for.
each combination of cells (i.e. 1, 2, 3 and up to 10 cells). A ten-turn potentiometer with a dial is recommended for ease of resetting. Suitable units may be obtained from one of the mail order suppliers. If this source of supply fails there are options for providing accurate reference voltages, and two methods are shown in Figs. 2a and 2b.

**Shorted Cell Zapper**

 Burning out internal NiCad shorts by discharging a large (10000µF) capacitor through the offending cell is not a new idea. While effective, it was found that many discharges were required to fully clear the shorts and the process was cumbersome using a clip-lead hook-up. Another method, connecting up one or more good cells across the shorted cell works well, but could result in excess heating and damage if the heavy current is sustained for too long.

The automatic zapper circuit in Fig. 1, shown within the area enclosed by the broken lines on the main circuit diagram, is simplicity itself. The zapper applies repeated short duration high current pulses to a shorted cell, which positively clears whisker shorts without potential damage to the cell under treatment. The zapper is included as part of the complete circuit, but may be built as a stand-alone unit permitting charge conditioning and short zapping of different cells at the same time. Only one cell at a time should be zapped however, as the effectiveness of the energy pulse is very much reduced when more than one cell is treated in this fashion.

**How The Zapper Works**

When the zapper section (Pulse) of the unit is selected, the regulated 20V d.c. charges the 10 000µF capacitor through TR4, which is in conduction. When the voltage across the capacitor reaches 15V, the Zener diode (D10) conducts, triggering the s.c.r., D9, which discharges the capacitor through the battery in a short burst of high energy.

Negative feedback to the base of TR4 through the 220kΩ resistor, causes the transistor to shut down the charging current until the capacitor is fully discharged and the s.c.r. becomes non-conducting. When TR4 conducts, the capacitor is again charged and the entire cycle is repeated continuously, applying short bursts of high current through the shorted cell.

The l.e.d., D11, across the output, which indicates the condition of the cell, is normally off since the battery is a direct short, but it flashes each time a pulse is applied. When the shorted battery is cleared, the l.e.d. lights continuously indicating that battery condition is good. To make sure it stays so, it is recommended that the battery be left on the zapper for 10 to 30 minutes after the l.e.d. comes on. (Depending on how long it initially takes to clear the short in the cell). This ensures that whisker shorts are thoroughly cleared before putting the cell back into service. Right after removal from the zapper, the cell may display a voltage of 1.25V BUT SHOULD IMMEDIATELY BE PUT ON A LOW CHARGE UNTIL A FULL 1.4V IS MEASURED UNDER CHARGE. This ensures that whisker shorts will not grow back within a few days, but will be cleared by the cell's full charge.

In addition to clearing shorts, the zapper will repolarise cells that have become reverse polarised. However, not all sick NiCads can be rejuvenated. Some are just worn out from use. Cells which have been subjected to severe overheating may have ruptured safety seals (a built-in protection to avoid explosion) and have leaked electrolytic fluid. This can be detected by looking at the insulator ring between the + terminal and the case. If this area contains small crystals, the cell should be discarded.

**An Economic Variation**

As already mentioned, there is an alternative to the somewhat expensive ten-turn potentiometer, R1 in the circuit diagram, Fig. 1. Two alternative methods of generating the reference voltage to pin 8 of the comparator IC3a are shown in Fig. 2a and Fig. 2b. The first alternative, shown in Fig. 2a, is a resistor chain consisting of ten 680Ω resistors and a 3kΩ resistor to make up the total resistance to
### Table 1

<table>
<thead>
<tr>
<th>Current</th>
<th>Other resistor</th>
</tr>
</thead>
<tbody>
<tr>
<td>10mA</td>
<td>none</td>
</tr>
<tr>
<td>25mA</td>
<td>330Ω</td>
</tr>
<tr>
<td>50mA</td>
<td>120Ω</td>
</tr>
<tr>
<td>100mA</td>
<td>56Ω</td>
</tr>
<tr>
<td>150mA</td>
<td>36Ω</td>
</tr>
<tr>
<td>200mA</td>
<td>27Ω</td>
</tr>
<tr>
<td>250mA</td>
<td>22Ω</td>
</tr>
<tr>
<td>450mA</td>
<td>12Ω</td>
</tr>
</tbody>
</table>

The total current flowing in this chain is a nominal 2.05mA, this gives 1.395V across each of the 680Ω resistors. This figure is close enough to the required charge end point voltage for NiCad cells. The switch method allows the number of cells under charge to be chosen very quickly, but lacks the versatility of the multi-turn potentiometer. The switch, Sa, is a single-pole, 12-way switch with only ten positions utilised to select the appropriate setting for the number of cells to be charged.

Should there be no requirement to charge many differing battery types, then the variation shown in Fig. 2b, could also replace R1 in the main circuit diagram (Fig. 1). Again, it is a resistor chain of around 10kΩ total resistance with a take-off voltage as required for the number of cells under charge. The configuration as shown, with a chain consisting of Rc, Rd and Re is that calculated to allow the end point charge limit for a 10 cell battery pack to be set. The actual value of voltage should be able to be set over the range of 13V to 15V. This voltage would be suitable for battery packs for the FT-290/690 series or the TR-2300 which is adequate to cover the charging of 1 or 2 cells in series with the adjustment covering 1-3V.

### Suiting Your Needs

If the constant current values are unsuitable for the cells under charge, that problem is easily overcome and may be changed by alteration of the resistor combination between the 'out' and the 'common' terminal of constant current generator IC2. This i.c. tries to maintain a constant 5V between these pins.

So, if for example, a 10mA setting were required for charging 9V (PP3 type) rechargeable batteries, then you should change R5 to 510Ω, and alter the values of R6 and 7 to add the additional values. Although only three positions are shown, the switch recommended is a two-pole 6-way item, and so six current ranges could be included in the finished project and a table, Table 1, is provided, showing possible values of resistors, assuming a lowest charging current range of 10mA.

### Shopping List

- **Resistors**
  - 5% 0.5W Carbon film
  - 100Ω 2 R5,24
  - 180Ω 1 R28
  - 220Ω 1 R16
  - 1kΩ 3 R13,14,27
  - 3kΩ 3 R8,12,18
  - 3.9kΩ 1 R30
  - 5.6kΩ 2 R10,19
  - 6.8kΩ 1 R2
  - 10kΩ 2 R26,29
  - 20kΩ 2 R11,17
  - 33kΩ 1 R4
  - 150kΩ 1 R23
  - 220kΩ 1 R25
  - 680kΩ 2 R9,15
  - 1.5W Wirewound
  - 20Ω 1 R6
  - 50 1 R7
  - 5% 15W Wirewound
  - 10Ω 2 R20,21
  - 10-turn variable
  - 10kΩ 1 R1
  - 22-turn Cermet (vertical mount)
  - 10kΩ 1 R3

  *Note: Values of R22 will vary according to the discharge load and voltage.*

- **Capacitors**
  - Monolithic ceramic
    - 10µF 4 C4-7
  - Electrolytic axial lead
    - 1000µF 1 C1
  - Electrolytic radial lead
    - 47µF 1 C2

- **Semiconductors**
  - Diodes
    - BZX61C5V1 1 D5 (1.3W Zener)
    - BZX61C15 1 D10 (1.3W Zener)
    - TIC116M 1 D9
    - 1N4001 1 D8
    - 1N4003 5 D1-4, 6
    - i.e.d. 1 D7 (Electromail 587-080)
    - i.e.d. 1 D11

  - Integrated Circuits
    - LM339 1 IC3
    - LM7805 1 IC2
    - LM7815 1 IC1

  - Transistors
    - TIP42 2 TR1,4
    - TIP122 1 TR6
    - 2N2222 3 TR2,3,5

- **Miscellaneous**
  - Relay 12V double-pole change-over (Electromail part no. 351-572), Transformer 24V 1A, fuse holder and fuse (1.5A), box to hold project was a Maplin type 2108, two off 2-pole 6-way switch, two pole change over switch, single pole change over switches, on/off switch plus knobs to suit, sockets for the battery connections, p.c.b. and interconnecting wire.
  - Electromail.
  - PO Box 33, Corby, Northants NN17 9EL.
Do you want to increase the versatility of your 144MHz multi-mode transceiver? Is a separate h.f. transceiver out of the range of your budget? Or do you require a small, lightweight and efficient mobile rig for h.f.? If so, Rob Mannion G3XFD has the answer for you in the shape of the HX-240 transverter from Tokyo High Power Labs.

I was a little concerned when the chance to review the Tokyo HX-240 transverter came my way. What use would it be to me? Why would I want one in the first place? Well, I can assure you that I did find a use for it and feel very certain that any A licencsee owning a multi-mode 144MHz transceiver wanting to be active on the h.f. bands for a minimum outlay, would find it to be the cost effective answer.

At first sight when I opened the packaging the transverter looked extremely simple, so simple in fact that it appeared that it might not be up to the exacting task demanded of it. How wrong those first impressions were, can now be seen by the many good contacts recorded in my log book on the bands from 3.5MHz to 28MHz.

The unit is so small and neat looking that at first glimpse it looks as if it is made up entirely of heatsinking with a panel meter mounted on the front. Looking at the front panel, the layout as I've already said is deceptively simple - but it works very well and Tokyo can be congratulated for their simplistic approach as the transverter equipment is very operator friendly.

**Meter Calibration**

The large power indicating meter which dominates the front panel is clearly calibrated. The operator can see immediately whether or not the automatic power-down safety control for antenna mismatching is operating. A warning lamp illuminates to tell the operator that a mismatch is occurring, but I found in practice that this part of the warning system errrs on the over-protective side. No doubt this is a good thing because p.a. transistors don't come cheap and can be awkward to replace. However, having said that, I consider that the almost constantly illuminated warning lamp could convince the operator that there was a problem with the antenna matching when in reality there isn't.

The other controls and indications on the control panel are simple and self-explanatory. Once you have connected the transverter to the 144MHz transceiver with the supplied coaxial lead and linked it to a power supply, you'll be ready to start. It really is as simple as that. I can honestly say that I think that the biggest possible cause for confusion when you're using the transverter will be from the originating 144MHz transceiver.

**Connecting up and Testing**

The obvious thing to do when I first connected the equipment up, was to try it out for reception, and it proved to be first class in this respect. The transverter is equipped with a pre-amplifier operated by the appropriate button on the control panel, but it's very unlikely that you'll ever have to use it as the transverter seems to be very sensitive. In fact, I found that the r.f. gain control on the 144MHz multi-mode had to be backed off considerably to reduce overloading of the receive side. If the pre-amplifier does have to be used, it is automatically removed from circuit on transmit, so there's not much chance of it being damaged. As I said, the receive side of the transverter is very sensitive and there seemed to be no major problems other than some broadcast-band breakthrough effects on receive which I am fairly confident were being caused by overloading of the front end of the 144MHz rig.

**Receiving Adjustments**

The breakthrough - mostly apparent on 3.5MHz and 7MHz - seemed to be from short and medium wave broadcasting stations but they soon disappeared when the transceiver r.f. gain was turned down. For this same reason I also found that the pre-amplifier was not needed. When it was turned on, the 144MHz transceiver was very unhappy. But once the operator has adjusted the receiving controls on the 144MHz rig, there should be no problem. The only difficulty I ran across was with the tuning rate on the multi-mode as it was either very fast or incredibly slow and this could be very tedious on the h.f. bands although this problem cannot be blamed on the transverter.

**On Air Testing**

Transmitting with the transverter must be compared with the proverbial 'doddle'. It really is easy and there seems to be virtually nothing you can do to cause problems. The operator does have to ensure that the transverter is not over-driven, but by careful reading of the comprehensively prepared instruction book this problem should be avoided. The instruction book itself deserves more than a passing reference as it is clearly laid out and despite the sometimes quaintly chosen English, is very...
readable and sometimes amusing. The wording, although perfectly understandable is sometimes a little odd. This is not meant to be a criticism aimed at the Japanese author, but is only meant to warn the reader. In fact I found that the booklet grew on me-the more I read it. Normally instruction books are read once or twice before being mislaid. This one is like an old friend who chats away to you with a very slight foreign accent - but with a lot of interesting information to impart.

There was only low transmit output power of the transverter would seem at first glance to be a disadvantage but I can assure you that it's definitely not. Having owned an h.f. mobile transceiver for many years (Yaesu FT - 75) I know how effective lower power rigs can be when matched into a good antenna. The first tests with the transverter were carried out from my car as a static mobile. My G - Whip mobile antenna, suitably matched into the transverter allowed the unit to provide the maximum 40W p.e.p. With this combination I worked stations all over the UK and the only complaints from other operators were about the engine noise that was being heard over the air as the car 'ticked over' in our driveway.

**Excellent DX**

On 7MHz and 28MHz the unit provided excellent DX from the static mobile set-up using the base loaded antenna and from the trapped dipole above the house. The best DX was on 14MHz using the trapped dipole from the shack. On one particular evening I joined in a DX net and worked stations in Pennsylvania, California, Canada and Brazil. The transverter's output was obviously man enough to provide reliable communication and many stations expressed surprise when they heard about the relatively low power of the equipment.

**Using 28MHz**

This transverter is the first commercial 144MHz to h.f. bands type I've tried and it certainly doesn't have the design problems that I encountered when I built one for myself a few years back. Although I did come across one potential hazard that may or may not be common with this model of transverter. While using the equipment on 28MHz I found that breakthrough interference occurred around the Band II BBC Radio 4 channels. I listened for the effect on several different v.h.f. portable radio receivers plus the one fitted in my car. The effect was noticeable on all the receivers, although it was only likely to cause problems within 30 metres or so. My own KW2000A was fired up on 28MHz but the s.s.b. didn't seem to cause any problem whatsoever.

A friendly neighbour who just happens to be a radio listener and consequently values good reception as he doesn't own a TV, offered to help and listened out for me while I transmitted on 28MHz f.m. and s.s.b. As I'm a keen 28MHz operator I was pleased when he reported that everything was clear and there was no sign of b.c.i. After consulting the circuit manuals of the various v.h.f. radio receivers that had suffered from the breakthrough, I came to the conclusion that the problem was caused by the broadband front ends of the Band II tuner on the radios. This was confirmed to my satisfaction when I looked at my neighbour's radio and found that it boasted a properly designed and well tuned front end. His portable receiver even had an amplifier at Band II and it still didn't suffer from b.c.i. But be warned, if you do operate on 28MHz nowadays be aware of the possibility of this form of b.c.i.

**Conclusions**

By now you will realise I liked the concept of using a transverter such as the Tokyo HX-240. Personally I feel that it will be of greatest use for any operator who is already active on 144MHz and wants to join the fray on the h.f. bands. The transverter will do this admirably and for a very reasonable cost. However, I do feel that the mobile operation capability is by far the most attractive aspect of the HX-240. Just think, if you've got already got a 144MHz multi-mode transceiver in the car, by purchasing this transverter you will have obtained a versatile and very compact transceiver for less than half the price of a separate mobile rig.

**Specifications:**

- **Frequency range:** 3.5, 7, 14, 21 and 28MHz.
- **Output power:** 30-40W p.e.p. (s.s.b./c.w.)
  - f.m. 30W maximum (28MHz only)
- **R.F. Input Power:** 2.5/10W selectable.
- **Spurious level:** -40dB or less
- **Receiver Pre-amplifier gain:** 8-10dB
- **In-Out Connector:** M type (SO-239)
- **Supply Voltage:** 13.8V d.c. 7A maximum.
- **Dimensions:** 146mm wide, 50mm high, 192mm depth.

**Features:**

- COX (Carrier Operated transmit/receive switching circuit).
- Terminal for remote transmit/receive control.
- Power level meter.
- Receiver pre-amplifier.
- Antenna mismatch protection circuit.
- Reverse d.c. power polarity protection circuit.
- Output high/low selection.

**Summary:**

The HX-240 is easy to use and would provide an ideal way for many operators - with a 144MHz multi-mode transceiver - to get them on to the h.f. bands for minimum cash outlay. The transverter also offers an ideal chance for the mobile operator and this point alone would certainly attract my attention and purse. I must thank South Midlands Communications of Chandlers Ford, Eastleigh, Hants. Tel: (0703) 255111, for the loan of the review model.
**JUPITER II**

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- 20 Amp PSU: £129.99
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- Fist mic: £21.00
- Total regular price: £964.94
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The Yaesu FRG-9600 has always been a desirable scanner since its first introduction, offering the user continuous coverage between 60-905 MHz with all modes (SSB up to 460 MHz) at a good price and with all the options you would expect to get with a well designed scanner (TV and computer interlaces, mobile bracket, etc.) Raycom offers exclusive upgrades to new or existing units.

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We extend the frequency coverage to at least 950 MHz (this depends on individual units) and fit a low loss 'N' connector. By modifications to the front-end RF switching we retain the single connector and improve the sensitivity throughout the range, typically by 3 to 4 'S' points! Beware of imitations - nobody does it as well as we do!

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Grand opening offer, to Celebrate the Launch of our new Showroom.

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25 to 550 Mhz and 800 to 1300 Mhz, ONLY £349.00 inc accessory pack.

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IC - R1
500 KHz TO 1300 MHz
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RAYCOM EXCLUSIVE ANTENNAS

ROYAL 1300 DISCONE
STAINLESS STEEL CONSTRUCTION
A quality unit manufactured in Britain, the Royal 1300 is ideal for wideband scanners & scanning receivers.

Specifications:
Receive 25-1300 MHz
Transmit 50, 144, 430, 900, 1200 MHz
Power 200 watts
Connector type 'N'
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RA519
Type Discone 8+8
Length 1.7 metres
Weight 1 Kg
HR1300 discone ....................... £59.50

BB-145S
BROADBAND MAGMOUNT
Another exclusive Raycom import, the BB-145S is a broadband ¼ wave mag mount antenna for mobile scanners and 2 metre transceivers. Supplied complete with 4 metres of quality co-ax and PL259 plug, this easily installed antenna is compact in size due to the integral loading coil and is specified for 138-172 MHz, but often loads at 70 cms!
BB-145S magmount ................. £14.95

FRG-9600 standard 60-905MHz ........ £479.00
FRG-9600 Mark II 60-950 MHz .......... £499.00
FRG-9600 Mark V 0.15-950 MHz ....... £625.00
FRG-9600 Mark II pack ................ £545.00
FRG-9600 Mark V pack ................ £699.00
Standard to Mark II upgrade .......... £40.00
Standard to Mark V upgrade .......... £149.00
Raycom Mark II to Mark V upgrade .... £129.00
All packs include a mains power unit and ROYAL 1300 discone (as below), worth £85! Great value!
Many readers will remember the ‘all dry’ portable with its 90V and 1.5V h.t. and l.t. batteries. Many of these receivers are still in use today and provide both good service and a source of spares for the valved-radio enthusiast. Ron Ham looks back at the early receivers and takes us right through to the 1950s, and the introduction of printed-circuits and ferrite-rod antennas.

When a man’s wages varied between 30 (£1.50) and 45 (£2.25) shillings per week or 60 (£3) shillings if he was well paid, his family had to be very selective as to the programmes they listened to on the household wireless receiver. Once the set was purchased and between 8 and 10 guineas (£8.40 - £10.50) had depleted the breadwinner’s savings there was the running cost to consider and budget for. Yes lads and lasses, budget for because a great number of factory made sets from the 1930s to the early 1950s used a high tension battery, usually 120 volts, a grid bias battery tapped in progressive steps from 1.5 to 9 volts and a 2 volt wet accumulator, Fig. 1. A guide to the cost of these, which gradually increased as the years went by is 10s (50p) for the ‘Winner’ h.t., 1s/4d (8p) for the ‘grid’ and around 14s. (70p) to purchase one accumulator plus 6d (2.5p) to have it recharged at the local cycle-shop, garage or wireless dealer.

Accumulators

Despite being economical with set use, two accumulators were required so that one was being recharged while the other was in use. In most cases this meant two trips a week for someone in the family, in all weathers, to take one for recharging and collect the other for use. Apart from the cost of 1s (5p) per week this would mean a careful walk carrying the beast by its handle or cradle, because these wet cells were not permitted aboard a bus or train in case the sulphuric acid was split. I emphasised the word careful because if this acid touched clothing, holes would rapidly develop and the material would rot away. This also applied to the fabric on vehicle seats and of course, on arrival home, you never put it down on the carpet or the table-cloth and if the set was in the corner by the window, as many were, one had to mind the curtains while the set was revolved to allow the accumulator to be stood inside and connected. These wet cells had two large terminals, coloured black (negative) and red (positive) and a stopper on the top. The terminals each accepted a spade from a lead in the set and the stopper was removed during the approximate three-day recharging process to let the gasses escape. Unfortunately, the gassing deposited a fine liquid on the terminals and over the top of the accumulator which had to be wiped off and the terminals greased to prevent corrosion. A thoroughly messy job and all for a ‘tanner’ (6d or 2.5p). The normal accumulator, supplied by Ediswan, Ever Ready, Exide or Oldham appears on the right of Figs. 1 and 2 and ‘portable’ sets, like the very early Roberts, Fig. 3, used the small Exide LB13 ‘gel-cel’ standing in front of the group in Fig. 2 and in service between the dial and the Drydex 108 volt h.t. in Fig. 3. The Pye LT2, price 12/9d (67p), on the left of Fig. 2 was designed to fit inside the ‘portables’ made by Pye and listed on the label. Larger capacity accumulators such as the Exide CZG3 and the hefty Ediswan which dominate the middle of Fig. 2, were purchased in order to get a longer low tension life and, depending on use, possibly confine recharging to once a week. Space was provided inside a set, usually to one side of the chassis, to accommodate the normal sized accumulator so one of the big ‘wets’ would have to stand outside of the cabinet and the l.t. leads extended to the required length.
good example is the battery version of the medium-wave only Wartime Civilian Receiver, Fig. 4, where the h.t. sat on a shelf above the chassis with an accumulator by the side.

The Battery Set

A multitude of houses throughout the United Kingdom did not have mains electricity until the late 1940s and early 1950s, which meant that battery powered equipment was the only means of hearing the news and enjoying the entertainment provided by a wireless receiver. Please remember, I am talking about the days prior to the transistor revolution. The main current consumers inside a set were the valves, which also had a fragile glass envelope and a glowing filament and were expensive to replace if they were broken through mechanical shock or when the filament went open circuit through use. The group of valves in Fig. 5, were progressively used in battery sets throughout the period. The centre piece is one of the popular 4-pin 2 volt triodes, PM1LF, used by the home constructor and some manufacturers in the 1920s and 30s and to its left is the 7-pin, FC2, frequency changer used in the manufactured superheterodynes of the late 1930s. Both valves were made by Mullard and the envelope of the FC2 had a metallic coating which acted as a screen to prevent unwanted signals being picked up by the electrode assembly inside the valve.

So much for the accumulator era of which many of us share a love-hate relationship. However, in the late 1930s thoughts were already turning towards an `all-dry' receiver. This meant that a new range of valves, with 1.5 volt filaments and good capacity dry batteries had to be designed, developed and manufactured at affordable prices because a wet cell can produce 2 volts and a dry cell only 1.5.

The All-dry Breakthrough

Among the early `dry' valves were the Mullard DF1 with its side-contact base used in Philips portables, top right Fig. 5 and the Raytheon 1C5 with an international octal base, bottom left Fig. 5, used in the single-wave band sets made in the States by Detrola, Fig. 6 and brought to the UK by American troops during WWII. The power for the 4-valve Detrola was derived from a special h.t. battery, the ALLDRY No 6, which cost 13/3d (66p) and a heavy duty l.t., an ALLDRY 4 at 3/8d (18p), Fig. 7. Incidentally, for those of us who moan about modern value-added tax, a purchase tax of 25% was added to the marked price on all batteries until it was abolished in 1948/9. Batteries then remained tax free until the early 1970s when VAT was added to electrical goods.

The AD6 was a double 45 volt battery giving the 90 volts required for the h.t. on these valves and the supply for the filaments was derived from the AD4. In the immediate post-war years Bush produced their BP90, Fig. 8, using Mullard octal based valves, bottom right Fig. 5 and in position, Fig. 9, driven by a large 90 volt h.t. and an AD4 l.t., both fitting in the middle of the frame aerial, Fig. 9, at the back of the cabinet. Although the high tension drain was in the order of a few milliamps, the low tension consumption was another matter. For instance, the Bush BP90, Fig. 9, using a DK32 frequency changer, DF33 i.f. amplifier, DAC32 diode-triode and DL35 audio-output and the Detrola 282, Fig. 7, with a similar valve line up of 1A7, 1N5, 1H5 and 1C5 respectively each required a steady 0.25 amps from the AD4.

Miniaturisation

During WWII, the Canadian WS58 transceiver and the Clandestine MCR1 miniature communications receiver were among the battery operated military equipment that used some of the new series of small, all glass, base-less valves. These new B7G base types included the 1T4, which proved popular with set manufacturers in the early post-war years. The Mullard version, DF91, is on the lower centre right of Fig. 5 and the Ever Ready range of these valves was used in their personal set, Model 'B', Fig. 10, with a special combined h.t./l.t. battery type B114 and their larger Models 'C' and 'K' each requiring the large capacity B103 which was similar to the later B136 in the centre of Fig. 11. In the 1950s the demand increased for really portable receivers and, to meet the need for a more economical l.t. drain, Mullard introduced their 96 series valves, DK96, DF96, DAF96, lower centre left Fig. 5 and DL96 which meant that sets like the Ever Ready 'Sky Queen', Fig. 12, powered by the B136 sitting inside its frame aerial, Fig. 13 and the casual Vidor 'Lady Margaret', seen among other portables in Fig. 14, used about 0.125 amps. This was very important for the the relatively small 'Lady Margaret' which was designed around the the B126, ('Baby 90') and AD35 (1.5 volt) batteries seen
individually in Fig. 11 and fitted to the 'Margaret' in Fig. 15. In those days those of us working 'in the trade' reckoned to sell roughly three AD35s at 1/6d (12.5p) to each B126 at 9 shillings (45p) per set in regular use. At the top of Fig. 11 is another special combined battery, the B141, made to fit snugly in side the cases of the Ever Ready 'Brief Case' and 'Sky Casket', Fig. 16, long and medium wave-band receivers. From memory, the 'Sky Casket' was among the first of these portables to use a ferrite rod antenna, Fig. 17, instead of the wire frame aerial, sometimes wound in a flat pattern in the lids of earlier models.

**Mains-Battery Operation**

Among the stately battery sets for the living room was the Ever Ready 'Sky Lord', Fig. 18, with its 96 series valves, wire frame aerial, large loud speaker and a shelf for the B136, Fig. 19. In order to reduce battery costs still further, some set makers, like Decca, Murphy, Pye, Ultra, Vidor, Fig. 20 and no doubt others, introduced mains/battery portables which used a 7.5 volt low tension because, for convenient mains operation, the valve filaments were wired in series.

At this point I must warn collectors about the high voltages inside the mains operated sets. Do not touch the chassis or components unless you really know what you are doing because some of the mains-battery types that often turn up in 'jumble sales' and other bargain basements - are not 'isolated' from the mains. To ensure safety with any equipment operating from the 250V supply an isolating transformer is thoroughly recommended.

By the end of the 1960s portable radio sets were using the ultra low consumption transistors instead of those current hungry valves and, you've guessed it, yet another range of batteries, but that is recent history. The photographs in this article were taken by the author inside the vintage wireless building at the Chalk Pits Museum, Amberley, Sussex.  

**Wanna Swap!**

Have 18m lattice tower, six triangular fully galvanised 3m sections, complete with base plate, rotator cage, guys and 8 turnbuckles. Delivery can be arranged. Would exchange for 144MHz mobile transceiver in g.w.o. or w.h.y? F. Jensen G1HQQ Tel: (0702) 617708.

Have 13.8V 40A p.s.u. worth £85, would exchange for w.h.y?, with cash adjustment. Mr G. L. White GOGLW. Tel: (0344) 52601.

Have a bench top d.v.m. unused multi-range includes frequency and transistor tests, data hold and memory, Plus TEAMS TRX-404 UK c.e.p.t. transceiver with SWR-176 test meter +filter and p.s.u. Would exchange for PK232 intelligent terminal unit with cash adjustment. Mr S. Deacon G6HVS. Tel: (051-334) 6859.

Have 18m lattice tower, six triangular fully galvanised 3m sections, complete with base plate, rotator cage, guys and 8 turnbuckles. Delivery can be arranged. Would exchange for 144MHz mobile transceiver in g.w.o. or w.h.y? F. Jensen G1HQQ Tel: (0702) 617708.

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Have Codar CR70A communications receiver covering 100kHz-30MHz, complete with pre-selector, external speaker and instruction book. Would exchange for w.h.y? Bryan. Tel: (0902) 640614.

Have complete Cine outfit, comprising: Bell & Howell Sportster IV, triple lens and zoom lens and Yashica 8 twin lens, both have fitted leather cases and handbooks. Plus Meopa editor complete in fitted oak case and 6 unused films. Would exchange for HRO with bandspread coils. R. G. Nicklin Tel: (0792) 89482.

Have DI30N Super Discone antenna covering 25-1300MHz. Would exchange for an Microwave Modules MML144/30 linear with either 1 or 3 watts input to compliment an FT-290R. Mr G. B. Hayes. Tel: Northwich 44670
A very confusing aspect of our hobby, trying to make sense of the specifications that came with the new rig. Every manufacturer seems to specify these using a different system or reference level. Further to that, many people have difficulty understanding the specification, even when it is presented in a standardised way. To illustrate this, let us take as an example all those figures connected with receiver sensitivity.

**How Sensitive?**

The term sensitivity, in its basic form, indicates the lowest signal level that will produce an audio output. This figure assumes that the normal signal to noise ratio for the passband, at the same time as the test signal.

In practice: the sensitivity is quoted as the amount of signal input that is required to give a certain signal to noise ratio at the loudspeaker. This is much more realistic, because it indicates a usable signal strength rather than one which is right on the noise level.

**Signal Strength**

The input signal which is required to produce the quoted signal to noise ratio, can itself be specified in more than one way. It is usually given in microvolts (µV), or alternatively in decibels with reference to 1mW (dBm). Remember that 0dBm is 1mW into 50Ω and is equivalent to 0.2236V r.m.s., so 1µV is equal to -107dBm, and -127dBm is equivalent to 0.1µV. The voltage input is normally specified as p.d., or potential difference, and is the voltage required at the input of the receiver.

Sometimes these figures are quoted as e.m.f., which is the open circuit output voltage of the signal generator. When the input impedance of the receiver is equal to the output impedance of the signal generator, then p.d. is exactly half e.m.f., but if they are other than equal then this relationship no longer holds true. As e.m.f. is always greater than p.d. it is normally avoided, as this makes the advertised sensitivity appear worse than an equally sensitive set, but whose sensitivity figures are quoted using the p.d. reference method.

As was mentioned earlier, signal to noise ratios are usually chosen to represent signals that would be fairly easily readable. The normal signal to noise specification for a.m. and s.s.b. is 10dB, whilst for f.m. 12dB is the figure most usually chosen. Why 12dB? The signal to noise ratio, S/N, should be actually described as signal + noise to noise (S+N/N). This value of 12dB represents a doubling of the audio power, and means that the signal and noise power are equal. Looked at another way, this represents the level of signal required to equal the noise generated in the receiver. This figure is sometimes described by the further term, noise floor.

**Comparisons**

Trying to compare the specifications at different signal to noise ratios is not too difficult, as long as certain points are borne in mind. For f.m., the simple answer is to compare the various figures quoted to produce the SINAD ratings specified for each receiver. For a.m. or s.s.b. however, much depends on which specification the manufacturer has used.

The most commonly found specification is at 10dB S/N, although m.d.s. or 3dB S/N are occasionally used. Provided that the rigs are specified using the same method, then direct comparisons may be made. If comparing the m.d.s. method with the 10dB S/N, then multiplying the m.d.s. signal voltage by three, again allows direct comparisons to be made.

**Factors Affecting Sensitivity**

There are three main factors governing a receiver’s sensitivity. The first is noise generated in the first r.f. stage and, to a lesser extent, in the following stages through which the signal passes. The second factor affecting the receiver noise figures is the bandwidth of the receiver itself. Generally, the narrower the bandwidth, the less the noise level. From this idea it must be obvious that, for best S/N figures, the bandwidth used should only be wide enough for the mode of reception.

Have you had trouble getting your copy of Practical Wireless each month? If so write or telephone Elaine Richards at the editorial office with all the details.
We kick off the year in January (in the pub, of course) by trying to decide on the year’s programme. The conversation goes like this.

“OK, so we do the 144/432 in March.”

“Hmm, it gets a bit cold in March, what do you think Rob?”

“Ah yes, well er, I might be going away that weekend, what about you Dave?”

“Well, I’m not sure, it can be cold in March.”

“OK, we don’t do March.”

“The RSGB have incorporated the 432 and 1296 Trophies in the May DC to Light contest, what shall we do there?”

“How about doing the 432MHz Trophy section?”

“Yes, that sounds good to me, everyone agree?”

“Yeah, at least it won’t be so **** cold as March.”

“Fine, next is the May two metre bash.”

“Sorry, we have a problem here, we’re going to Scotland to check out some sites for a DXpedition.”

“That’s OK, the wife would go barmy if we did two contests in May anyway.”

“In June, we’ve got the six metre Trophy and the PW effort.”

“Nope, no problems here, everybody else OK?”

“That’s settled then.”

“I’m doing NFD with my club but that’s no problem as we don’t do it as a group anyway, do we?”

That sort of snobbish goes on all evening until a programme is decided on. At last it’s the week before the first contest. The pre-contest meeting convenes.

“Er, got a small problem.”

“What’s that Dave?”

“Well, I tried the linear over the weekend and I was just giving it the final tweek and there was this loud crack and big blue flash!”

“What do you mean, died.”

“I mean died as in not working, knackered, flashed over, U/S, OK.”

“You got eight hundred quid?”

“Yes, that sounds good to me, everyone agree?”

“Yeah, at least it won’t be so **** cold as March.”

“I’m doing NFD with my club but that’s no problem as we don’t do it as a group anyway, do we?”

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“Er, got a small problem.”

“What’s that Dave?”

“Well, I tried the linear over the weekend and I was just giving it the final tweek and there was this loud crack and big blue flash!”

“Dave, you’re trying to tell us something aren’t you?”

“Yes, I’m afraid the valve died.”

“What do you mean, died.”

“I mean died as in not working, knackered, flashed over, U/S, OK.”

“Can’t we get another bottle?”

“You got eight hundred quid?”

“This is serious, we will have to use the K2RIW.”

“All together - ‘Oh no!”

“Just one other thing.”

“You mean there’s more?”

“Oh it’s no real problem, I just had to pop the rig back for repair. Duff transmitted audio, should get it back on Friday night!”

“Well, we did get the rig back and we did use the K2RIW and we apologise to everyone else taking part for our grotty audio.

As quick as a flash it’s June and Six Metre Trophy time. No problems beforehand and the gear is ready to go in good time. “CQ contest, CQ contest” - four hours into the contest.

“Hmm, contacts a bit slow.”

“Well, the s.w.r. meter’s showing enough grunt going out.”

“Oh dear, its looking at reflected power.”

“You did test the antenna at home John?”

“Well, the s.w.r. meter’s showing enough grunt going out.”

“All together - ‘Oh no!”

“It’ll only take a minute to adjust the Gamma Match.”

Half and hour later.

“I don’t understand this, it just won’t match.”

“Anyone got a length of aluminium tube handy?”

As luck would have it, we found a length of tube and fixed it to the original tube with tape! As it was of smaller diameter than the original, the clamp had to be packed out with beer can ring-pulls which were in plentiful supply. After an hour it’s back to “CQ contest, CQ contest”.

Ah, the PW QRP. A bit of fun without the hassle of generators, tents, etc.

“Where are we going to do it from?”

“How about that place where I go to do a bit of portable from time to time.”

“Sounds good to me, isn’t there a pub near there?”

We enjoyed the contest, we had no equipment malfunctions and it was a nice hot day. So hot that Mark, Kris and Dave thought that some refreshment was required. I personally thought that one of the others should have told Mark that the prawns out on the bar as snacks looked a bit dodgy and mixing them with Guinness may give rise to problems in the very near future. To cut a long story short, Dave told me that the greenish tinge on Mark’s face was all the encouragement he needed to beat his best time from the site to Mark’s house!

I will gloss over VHF NFD as I am a committee member of my club and should be trying to keep morale high. Suffice to say that I advise members to check our position in the results from the bottom up, rather than the top down. It will save a lot of time!

Next on the agenda was the 144MHz Low Power. Very boring! Everyone turned up, nothing broke, nobody got ill and we seemed to do quite well. Could this be the spur to great success in the Two Metre Trophy? Certainly wasn’t! With brilliant foresight, I managed to contract ‘flu the day before the contest. This was probably a good move on my part as, as I quote, “nearly killed ourselves with the **** generator, the antenna didn’t work, so few operators that I had to take home twenty cans of Fosters and I only took twenty-four......”
The end is in sight. Only the Four Metre Trophy left. This is the stuff, the gentlemen’s band. Not in our tent pal! End of ‘season’ depression setting in.

“What are we doing this stupid contest for?”

“Look, you didn’t have to come.”

“Thank God it’s the last one.”

“I’m sick to death of all this moaning.”

“Are you going to operate or not?”

“No.”

“Well clear off then, I can’t hear.”

“Neither can your rig.”

We survived without coming to blows, which is probably the year’s highest achievement.

There you have it, a year in the life of a v.h.f. contest group. Pretty bad, eh? What makes it worse is that we actually remain friends and we will do it all again this year.

PW

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PW QRP Contest

The 8th Annual Practical Wireless 144MHz QRP Contest will take place on Sunday 17 June 1990 from 0900-1700UTC.

Transmitter output power will be limited to three watts as usual. Full contest rules will be published in the June issue of PW, which will be on sale from May 10.

Contest adjudicator is Neill Taylor G4HLX.

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Services

Queries
We will always try to help readers having difficulties with a Practical Wireless project, but please note the following simple rules:

1: We cannot give advice on modifications to our designs, nor on commercial radio, TV or electronic equipment.

2: We cannot deal with technical queries over the telephone.

3: All letters asking for advice must be accompanied by a stamped, self-addressed envelope or envelope plus IRCs for overseas readers.

4: Make sure you describe the query adequately.

5: Only one query per letter please.

Back Numbers & Binders
Limited stocks of many issues of PW for the past years are available at £1.80 each including post and packing.

Binders, each holding one volume of PW, are available price £3.50 each (£1 P&P for one, £2 for two or more).

Send all orders to the Post Sales Department.

Subscriptions
Subscriptions are available both for the UK and overseas. Please see current issues for the latest prices.

Constructional Projects
Each constructional project is given a rating to guide readers as to its complexity.

Beginner: A project that can be tackled by a beginner who is able to identify components and handle a soldering iron fairly competently.

Intermediate: A fair degree of experience in building electronic or radio projects is assumed, but only basic test equipment is needed to complete any tests and adjustments.

Advanced: A project likely to appeal to an experience constructor and often requiring access to workshop facilities and test equipment for construction, testing and alignment. Definitely not recommended for a beginner to tackle on their own.

Components for our projects are usually available from advertisers. For more difficult items a source will be suggested in the article. Kits for many of our recent projects are available from CPL Electronics and FJP kits, both of who advertise in the magazine.

The printed circuit boards are available, mail order, from the Post Sales Department.

Mail Order
All PW services are available Mail Order, either by post or using the 24hr Mail Order Hotline (0202) 665524. Payment should be by cheque (overseas orders must be drawn on a London Clearing Bank), Access, Mastercard or Visa please.

Wireless Line
This is an information service for the radio enthusiast, updated each Friday. Calls cost 38p per minutes peak time and 25p per minute off-peak. The number to ring is: (0898) 694632.
It all began with a few circuit symbols, a d.c. circuit of a battery, switch and a resistor connected in series. This lead to Ohm’s Law, then the a.c. series circuit with a brief description of phase, resonance and reactance. All this was in the March 1988 issue, in which a note to the effect that, Fig. 1.6 was a physical representation of Fig. 1.5, was omitted.

Next, d.c. and a.c. parallel circuits, resistors in parallel and the a.c. parallel tuned circuit were dealt with in April 1988, together with details of a simple crystal set. The references to the illustrations Fig. 2.4 and 2.5 were accidentally reversed.

Transistors were introduced in the May 1988 issue and their uses in common emitter, common base and common collector amplifiers was discussed. A sample printed circuit board layout was included.

Hartley, Colpitts and crystal oscillators were described, then an equivalent circuit of the piezo-electric crystal leading to a bit about Q appearing in June 1988.

In July 1988, half wave, full wave and bridge rectifiers together with the voltage doubler circuit were described in the part about power supplies. Unfortunately an over-simplification occurred here as the curve in Fig. 5.1 representing the current through the rectifier diode in the half wave reservoir capacitor (C in Fig. 5.2). The illustration Fig. 5.4 should have shown the diode current as high amplitude pulses of very much shorter duration than half a supply cycle and not as a half sine wave. Sorry if that misleads the reader!

Receivers

The section on receivers started in August 1988 with a description of an r.f. amplifier stage, non-regenerative and regenerative detectors for r.f. (tuned radio frequency) receivers, as well as some more about the ‘goodness factor’ Q with a description of selectivity.

A suitable a.f. amplifier for use with headphones in a t.r.f. receiver was in the September 1988 issue. There was also a note explaining how the performance of an amplifier was affected by bypass capacitors and therefore why their inclusion was so important. This was followed by a definition of the term ‘superhet’, ‘beat frequencies’ and ‘intermodulation distortion’, ending with a description of a mixer stage.

The h.f. oscillator, with the use of negative-temperature co-efficient capacitors to improve frequency stability was discussed in the October 1988 issue. The receiver i.f. amplifier, automatic gain control and the reason for screening some stages or components also appeared the same month.

The December 1988 copy included a description of a beat frequency oscillator (b.f.o.) with its use as a speech clarifier when resolving signal sideband (s.s.b.) telephone signals, as well as how it makes a Morse (c.w.) signal into an audible note. Demodulation of amplitude modulated signals by using an envelope detector and resolving s.s.b. signals with a product detector were also described of the operation of a push-pull amplifier concluded that article.

The various stages used in transmitters with a description of a fixed frequency r.f. generator, together with a chat about harmonic distortion and periodic waveforms appeared in the January 1989 issue. Frequency multipliers and Morse keying stages, with an explanation of ‘key clicks’ and how they can be avoided were also in the same issue.

In February 1989 the use of valves was discussed and the importance of the physical layout of valve amplifiers to prevent unwanted feedback was considered. Operation of valves in Class A mode was described showing the relationship between anode current and grid voltage. Low distortion with comparatively low efficiency was shown to be typical of Class A operation.

Modes and Stages

Other modes of operation for valves, viz Classes B, AB and C were described in the March 1989 issue. Meanings of ‘fly-wheel’ action in tuned amplifiers and ‘intermodulation products’ were also discussed.

How an r.f. power amplifier can be amplitude modulated was discussed in the April 1989 issue. A suitable Class B audio amplifier for use as a modulator was described and a method of preventing dangerous ‘spikes’ from ending the life of the modulation transformer whilst sending Morse instead of speech was included. Working out the ratio required for the modulation transformer ended the part about amplitude modulation (a.m.) Single sideband (s.s.b.) and its gain over a similar a.m. system lead to an explanation of ‘decibels’ or, as it’s usually written, dB. A mention of ‘peak envelope power’ (p.e.p.) concluded the month’s article.

The stages necessary in an s.s.b. transmitter were listed in the June 1989 issue and descriptions of the microphone amplifier, balanced modulator, crystal filter and h.f. converter attempted. How the reactance of a piezo-electric crystal changes with frequency was also shown in this issue.

In the July 1989 copy of PW suitable h.f. oscillators, both fixed frequency and variable frequency (v.f.o.) were discussed. The Zener diode was introduced and its use as a voltage stabiliser described. The merit of using a high intermediate frequency over a low i.f. were discussed as were the meaning of the phrases ‘image frequency’ and ‘second channel’.

Frequency modulation, in the August 1989 issue, was discussed and an attempt made to analyse a frequency modulated signal showing its propensity to provide a very large number of sidebands. ‘Frequency deviation’ and ‘modulation index’ were explained.

How power is distributed between carrier and sidebands was discussed using a practical example. This showed that when the power levels of the various...
individual sidebands and the carrier were added together, the total power did not change during changes of modulation, even when the modulation was zero. Phase modulation (p.m.), its similarity to, and differences of p.m.s. 6dB/octave rise in audio frequency response mentioned.

The September 1989 issue contained circuits of a frequency modulator and phase modulator. An error crept in here on page 26 in the first column on line 30, where 'RI' was mentioned it should have been 'R2', otherwise the associated text was nonsense! Amplitude and phase changes with frequency for a parallel tuned circuit were shown here to assist in the description of the phase modulator. The reason for using limiter stages in f.m. receivers was mentioned and demodulators suitable for f.m. and p.m. signals were described. The phrase 'induces a voltage' was explained when referring to transformer action. On page 28 the last paragraph referred to 'vector addition' - it should have indicated that it is a method of adding (or for that matter, subtracting) quantities such as voltages or currents that are not in phase with each other.

Methods of identifying the different types of filters, low pass, high pass, band pass and band stop were printed in the October 1989 issue. Both 'π' and 'T' versions of each type were described using 0Hz (zero frequency or d.c.) to represent low frequencies and ∞Hz (infinite frequency) to represent high frequencies. Components then became either dead shorts or open circuits at these extreme frequencies enabling the response of the filter being examined to be roughly assessed.

Frequency responses of filters, together with measuring methods, appeared in the November 1989 issue. Matching of measuring equipment to the alleged input impedance of the filter to be measured was discussed in detail.

The issues of December 1989, January 1990 and February 1990 were concerned with the solving of impedance matching problems when both source and load were any combination of complex impedances, series or parallel connected. Formulæ had been manipulated so that the final procedures appearing in print provided practical means of working out the required matching reactances. From these reactances, component values could be found for the frequency at which the network was intended to operate. There was a little bit left out of the Type 7 heading, it should have read = 'This is with one complex impedance comprising resistance and reactance in series and the other complex impedance comprising resistance and reactance in parallel."

Finally, there was a description of the directional wattmeter and its use in indicating resonance and matching of an antenna system with an antenna tuning unit (a.t.u.). By varying the a.t.u. controls to obtain zero reflected power at the same time as maximum forward power the whole system is resonated and matched, providing maximum power to the antenna. This appeared in the March 1990 issue.

Sign-off

If this series of articles has answered just one question for a single reader, the author will be satisfied that his work has not been in vain. If it has inspired other to persist in their search for knowledge about radio - even better!

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The PEK-1 is supplied as a ready assembled but uncased unit with an 11 pin in-line connector for the various external connections. The double sided glass fibre p.c.b. measured 74 x 61mm and was silk screen printed with the component overlay. Power economy was obviously clearly in mind when the PEK-1 was designed as the power requirements were extremely modest requiring 5V to 15V at a mere 0.1µA at standby and either 0.5mA for solid state keying or 12mA for relay keying. With such low power consumption the obvious choice was to use a PP3 size 9V battery.

The keyer had been well thought out in terms of the facilities provided, as in addition to both solid state and relay keying, it contained its own sidetone oscillator. The sidetone output was designed to directly drive one of the readily available piezo sounders which could subsequently be attached to any convenient flat surface once the keyer is boxed. The keying outputs should cope with pretty well every requirement with the solid state keying suitin 90% of applications. The device used for the solid state keying was a VN10 power v.f.e.t., which provided a low resistance between the keying line and ground when activated. This device is capable of keying lines with a maximum key-up voltage of 60V and conversely and maximum key-down current of 300mA (but not both together!).

For occasional situations requiring the keying of a higher voltage, the v.f.e.t. could be set to drive an onboard relay which was capable of switching up to 200V, but in this case the maximum current was 150mA. With regard to the keying technique used, the PEK-1 featured full iambic operation which seems to be the accepted standard for use with paddle keyers. This enables high speeds to be attained with minimum effort on the part of the operator. In addition, the PEK-1 includes dot and dash memories which allow the operator to key slightly in advance of the keyer output and so further aids higher speed operation. If you've never used dot and dash memories before you will find it a little getting used to, but once mastered is very useful. The connections to the operators paddle were very straightforward and comprised three connections - common, dash and dot wires.

Obviously with an electronic keyer a speed control is required so that the automatic dot and dash repeat times match your sending speed. The PEK-1 could be continuously adjusted between 5w.p.m. and 34w.p.m. which should prove adequate for most operators. The speed adjustment was achieved with a conventional rotary potentiometer which was mounted on the main p.c.b.

For the on-air tests I connected the PEK-1 to the mechanism of my Spacemark keyer and the keying line to my trusty Icom IC-720A. The keying requirements of the Icom are not very demanding, so I opted to use the solid state keying option from the PEK-1. By using my favourite Spacemark mechanism I was able to get a good feel for the action of the PEK-1 without it being masked by an unfamiliar paddle. I was very pleased with the performance of the PEK-1 and the quality of the resultant output was very good. The dot to dash ratio was fine for the speed range provided, though some high speed operators would probably like to see the top speed increased slightly and a variable dot/dash ratio provided. However, the settings provided were fine for general operation.

**Summary**

The PEK-1 proved to be a very well built and effective keyer which should fit the bill well for most operators. The versatile keying options combined with its simple operation should ensure that the resultant c.w. is of a high quality.

The PEK-1 costs £22.00 and is available from ProElectron, 35 Cromwell Road, Cheltenham, Glos GL52 5DN.

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**Specification**

- **Speed**: 34 words per minute
- **Dot/Dash Ratio**: 1:3
- **Keying Output**: 60V, 300mA (solid state) 200V, 150mA (relay)
- **Power Supply**: 5-15V d.c.
- **Supply Current**: 0.1µA (standby), 0.5mA (solid state keying), 12mA (relay keying)
- **Dimensions**: L=74mm, W=61mm, H=21mm
Radiation Hazards

With the debate on nuclear radiation hazards raging in the press these days, Brian Dance takes an important look at the hazards from both r.f. and microwave radiation.

Electromagnetic radiation of a very wide range of frequencies is always present in our environment. It is enormously increased in intensity near most r.f. or microwave equipment. The energy of such radiation can certainly produce heat in biological tissue by processes which seem to be relatively well understood. This heating effect has been put to good practical use by physiotherapists over many years and is now used to raise tissue temperature accurately for cancer therapy.

Can fairly low levels of non-ionising electromagnetic radiation produce significant effects in living organisms other than tissue heating, e.g. effect the cell nucleus or the cell membrane? Can it cause illness or result in a feeling of being unwell? Can it assist tissue healing? Questions of this type are proving very difficult to answer and are a subject of much controversy amongst world experts.

Cataracts

During World War II, there was considerable concern about the incidence of cataracts and internal burns amongst radar technicians. In the 1960s exposures to power densities of 10mW/cm² from 10MHz to 100GHz were regarded as permissible for microwave workers, partly because lens opacities in eyes of rabbits were not produced until the density reached at least ten times this value. Cataracts are a common effect, since the lack of a blood supply in the lens of the eye means that this cooling mechanism is absent. However, there is considerable conflict between various specialists on the biological effects of microwaves, some believing that a power density of under 1mW/cm² can produce reversible disturbances of the central nervous system which may result in headaches, EEG pattern changes, etc.

For many years, little work was done on the personal hazards resulting from exposure to various levels of electromagnetic radiation, exposure to 'reasonable' levels being regarded as constituting only a minor hazard. There has recently been a far greater interest in research on the possible hazards associated with exposure to electromagnetic radiation and the levels which may be regarded as safe. Daily newspapers have often asked questions about whether radiation from television receivers, from video display units or from microwave ovens can, for example, cause cancer. Microwave ovens when new must not leak a level of more than 1mW/cm² at 50mm from the door, nor more than 5mW/cm² during their working life.

The problems of potential hazards from microwave radiation have greatly increased during recent years due to the more widespread use of microwave dathermy in industry and in medicine, the increased power output from radar systems and the use of microwave ovens both in the home and elsewhere. The bombarding of the US embassy in Moscow by microwaves aroused much comment.

Power Lines

Does living under a high voltage power line increase one’s chances of developing any illness? According to work carried out by Dr Cyril Smith, Senior Lecturer in the Department of Electronic and Electrical Engineering of the University of Salford, it seems that proximity to power lines can affect certain people in a similar way to that in which food and other allergens may affect them. He feels that the fields may produce irritability, headaches or sudden blackouts. As the fields get stronger, the effects do not seem to increase, but just get more complicated.

The British Central Electricity Generating Board (CEGB) has repeatedly denied that its cables have any effect on people’s health. However, the electricity industry announced in 1988 that it would undertake major research to measure exposure of people to magnetic fields from the distribution and use of electricity - the first such research in the UK. New remote monitoring techniques and innovative personal exposure meters were employed to help build an accurate picture of the magnetic fields to which people are subject in their everyday lives. Few studies have been carried out anywhere in the world which involve measurements of personal exposure to magnetic fields. The electricity industry is also financing two separate research projects at universities which will look for possible links between living near power lines and adult and childhood cancers. An independent programme of basic research into the key biological interactions is being funded to assess their significance, if any, for human health and welfare.

Cancer

There is some evidence from US research that the electromagnetic fields from power lines may be linked with cancer growth. It was found that low energy electromagnetic radiation increased the activity of the enzyme ornithine decarboxylase in human, rat and mouse cancer cells grown in culture. This enzyme produces a substance which stimulates cell growth and proliferation. The fields used were similar to those from power lines. The Veterans Administration Medical Centre found r.f. and microwave fields only influence cells if the fields are modulated at frequencies of less than 100Hz - which includes the mains system.
The Cancer Therapy Research Foundation, San Antonio, Texas, examined the electric and magnetic fields separately and found that the magnetic field seemed to be far more biologically active than the electric field. Human cancer cells exposed cells which were shielded from the fields. Unlike ionising nuclear radiation, the fields do not seem to make healthy cells cancerous, but may possibly help cancerous cells to grow more rapidly. In the past there has been much concern about possible interference with the operation of heart pacemakers, but it seems that modern pacemakers are unaffected by overhead power lines.

Work at the University of California, Riverside, also suggests that exposure to common sources of low energy electromagnetic radiation, including radiation from electric blankets and power lines, may promote the growth of cancerous tumours by increasing the activity of an enzyme essential to cell growth. However, it was stressed that the research is not yet definitive enough to establish a cause and effect relationship between exposure to a field and an increased cancer risk.

Other epidemiological studies have connected low frequency electromagnetic fields with leukaemia and brain tumours amongst children. A New York panel reported that children who live near overhead power lines are twice as likely to develop leukaemia as those raised away from magnetic fields associated with power lines.

Establishing the cause-and-effect relationship between electromagnetic radiation and cancer is extremely difficult because so many environmental factors may play a role in the cancer producing and growth processes. Between 1971 and 1980 a considerable number of soldiers in the Polish army were subjected to heavy doses of microwave or radio waves. It was concluded that this group was three times more likely to contract cancer than unaffected soldiers. The rate of lung cancer seemed unaffected by the exposure, but lymphatic cancers increased by 6.7 times, thyroid cancers by 4.3 times and stomach and skin cancers by 3 times in exposed people.

It seems impossible at the present time to give definite answers to many fundamental queries about the effect of electromagnetic, magnetic or electric fields on people, but a study of the recommendations of the large national laboratories can provide some understanding of current views on possible hazard levels. Ideally international agreement on the permissible levels is required.

**Permissible Levels**

The British National Radiological Protection Board made recommendations on acceptable levels of electromagnetic fields or non-ionising radiations at frequencies below 300GHz. They were applicable to those using radio and television broadcast equipment, the use of nuclear magnetic resonance diagnostic equipment in hospital, r.f. smelting and heat sealing equipment, short wave transmitters, power lines, microwave ovens and radar systems.

The human body tends to absorb more radiation at certain frequencies than at others, so the recommended limits vary with frequency. In the past a limit of 10mW/cm² (100W/m²) was set, but resonance absorption of the human body between 30MHz and 100MHz led to a reduction in the recommended limit for workers to 1mW/cm² over this range. The limit for frequencies between 100MHz to 500MHz was fixed at f/100W/cm² where f is the frequency in MHz. A level of 5mW/cm² was set for the 500MHz to 300GHz range. The maximum exposure times was two hours per day.

Lower levels were recommended for the general public than for those exposed to the radiation in their work. From 30 to 300MHz the limit for the general public was fixed at 0.4mW/cm², from 300MHz to 1.5GHz at f/750mW/cm² where f is frequency in MHz and at 2mW/cm² in the 1.5 to 30GHz range. The maximum exposure time for the general public was fixed at five hours per day.

**US FCC Limits**

In the USA the Federal Communications Commission (FCC) Report came into force in January 1986. This is the first federal regulation of its kind which requires all new or modified broadcast facilities to meet specified standards for human exposure to r.f. radiation. This ANSI (American National Standards Institute) C95.1-1982 standard, shown in Fig. 1., followed six years of study into the acceptable limits of r.f. exposure. The maximum values shown are those averaged over a six minute exposure time. They are based on the whole body average specific absorption rate (SAR) limited to 0.40W/kg of tissue, with a peak SAR value of 8W/kg. This is averaged over any 1g of tissue so as to prevent local hot spots. This standard is based on the absorption factor of human tissue and the level of r.f. at which thermal damage can occur. It is essentially the inverse of the absorption curve for the human body, but a ten fold factor of safety is included.

A relatively high power level is required to exceed the limits of Fig. 1 at a distance of more than a few metres. Broadcasting stations and radar installations form the majority of high power radio frequency sources to which members of the general public can provide some understanding of current views on possible hazard levels. Ideally international agreement on the permissible levels is required.

Fig. 2: Applications of frequencies in the 300kHz to 100GHz region which may lead to R.F. hazards.
Radiation Hazards Continued

public are likely to be exposed. Some services such as aviation, amateur radio and satellite uplinks may provide sufficient power densities to exceed the limits, but their location and/or intermittent operation normally prevent them from being a serious public hazard.

A study by the FCC and the Environmental Protection Agency (EPA) measured radiation levels around a multi-station broadcasting system in Washington. The station included ten f.m. transmitters and numerous two-way communications and microwave relay stations. The f.m. stations (each with an effective radiated power in the range 126kW to 200kW) provided by far the largest contributions to the maximum power densities in the area. In many localised regions the radiation limits were exceeded, so a person remaining in such a place for an adequate time would receive radiation in excess of the six-minute-average ANSI standard. However, if the measurements were averaged spatially rather than at a single point, no place accessible to the public exceeded the recommended limit.

The FCC report showed that vegetation, especially coniferous, apparently provide good radio frequency shielding. On the other hand, metal objects and even household electrical wiring could produce local concentrated field regions. The radio masts of non-operating transmitters produced a considerable local increase in the field from other transmitters, necessitating care in working on the masts.

The EPA said that high levels of radio frequency radiation could be harmful to people, not only because it increases the body temperature, but also because it causes mild electric shocks and burns. In addition, the radiation has been linked with chemical because it causes mild electric shocks and burns. In

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**Conclusion**

One can only reach the very unsatisfactory conclusion that the effect of electric and magnetic fields on the human body remain very much in dispute. The rise in temperature due to exposure can be measured, but virtually all other effects are the subject of conflicting opinions. It really does seem that the human body is too complex for anyone to produce simple and definite answers or perhaps even to achieve similar results to those reported by others. Opinions of the world's experts on the safe exposure limits to electromagnetic radiation vary widely.

Nevertheless, in 1981 the first official recognition was made that a fatality resulted from exposure to electromagnetic radiation. The widow of Samuel Yannon, a radio technician who for 15 years worked on radar servicing, in the top of the Empire State Building, received a monetary award in respect of his death. In Britain the Department of Health and Social Security does not accept that there is a link between cancer generation and electromagnetic exposure. However, a DHSS tribunal accepted that an exposure to microwave radiation provided grounds for granting a special pension to a widow whose husband died of thyroid cancer after he worked on radar servicing.

Practical questions, such as to how far one should keep away from one's transmitting antenna whilst operating at a certain power level for a certain time, are obviously not easy to answer. A survey instrument (which must be suitable for the frequency or frequencies involved) can be used to measure the level in mW/cm² and this can be compared with the ANSI recommended levels. It seems sensible for everyone to keep as far away from strong fields as is conveniently possible until more is known about their possible effects on people. However, millions of humans have been working in such fields for many years, so the chances of serious hazards existing may be quite small. For those who seek extra protection, a microwave reflecting suit is offered by Lion Uniform Inc. (Dayton, Ohio, USA). It provides at least 20dB attenuation at 2450MHz by reflecting radiation.
CB is here to stay! It's some time since we had a look at what's happening on 27MHz and so we offer you our view of the way the service has evolved, the way equipment has changed and one or two personal experiences. Some incidents are interesting, a few are amusing and in one case ...rather frightening!

Many CB radio enthusiasts have used the 'instant access' that the service provides so that they can get on the air with the minimum of fuss and formality. Some of them then discover that CB provides all that they require from the hobby of radio communications. However, others find that they may want to go off in other directions and that could lead them into amateur radio.

For those who want to enter the world of the licensed radio amateur, there is what seems to be the long and tortuous path leading to the Radio Amateur Examination. This often, very long and difficult path can appear to be strewed with obstacles such as radio and electronics theory, mathematics, money hurdles, pride and prejudice before the coveted licence is obtained.

There is little we can do to avoid the theory hurdle apart from providing plenty of good technical reading and introductory articles. But we can lower the jumps a little for the money obstacle by producing good 'home-brew' circuits, so that even first time constructors can build their own equipment. However, where prejudice is involved we can 'knock that on the head' immediately and firmly state that as far as PW is involved - it doesn't exist.

To back this up we present our view of the CB scene and introduce at the same time our new, regular feature writer, Rick Maybury. Month by month Rick will report on the CB front and if 27MHz is where you enjoy radio communications - this is the page for you. Don't forget, we're not assuming that everyone on CB is a budding radio amateur. If you are, fine, we're here to help you in any way we can. However, if you're happy to enjoy CB for its own sake - you're sure to enjoy Rick's page every month.

Radio amateurs and CB enthusiasts are very near neighbours in every sense of the word, we've got to meet some time and that time has arrived. Welcome to PW and the wider world of radio construction and communications!
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Rick Maybury begins his regular review of the UK CB scene, but this month, by way of an introduction he looks back at his own early experiences with two-way radio, before it became (almost) respectable.

Citizens’ Band - Eleven Years On

Some people can tell you exactly what they were doing the day John F. Kennedy was assassinated. Neil Armstrong setting foot on the moon and the murder of John Lennon evoke equally strong memories. Whilst I can vaguely remember all of those events, I can tell you precisely where and when - almost to the minute - I first encountered Citizens’ Band radio.

It was eleven years ago, on 15 March 1979, around 10 o’clock in the morning and I was on a semi-regular trip to Colchester in a colleagues car. We were on the way to the printers, to sort out the usual last-minute problems on Hobby Electronics Magazine; long gone and much honoured.

Somewhere near Gant’s Hill my colleague sheepishly opened the glove compartment to reveal a shiny new Midland CB rig - something I had only ever seen before in photographs. He had brought it a week earlier, along with a ‘disguised’ antenna, on a business trip to the USA. I hasten to add that his choice of antenna was not influenced by any need to maintain secrecy - he wasn’t even aware that CB was illegal then - but simply because it was almost the last minute and when we arrived there was history.

The rest, as is customary to say at an examination, was finally broken.

After a few minutes we plucked up enough courage to have a go - we soon picked up the jargon - and by the time we turned to go North we had two new friends and I was hooked.

Smuggled In

At that time CB rigs were virtually unobtainable - there were probably only a few hundred American a.m. units in the country, mostly brought in by truckers from the Continent where they were readily available. Fortunately I was due to go to Holland a couple of weeks later, to visit one of our sister magazines. With a little help from the staff I managed to track down an American rig - it was a fairly basic design, called Otron, and it cost around £30. By then I was aware that it would be easier to smuggle it back into the country and unscrew the fake antenna - and by the time we turned to go North we had two new friends and I was hooked.

After five minutes knob twiddling we finally came across a truck driver, somewhere on the Southend Arterial road, chatting to a fellow CBer. It sounded like a foreign language - a mixture of American slang, spoken with a phoney accent, interspersed with more familiar references to last night’s TV, his sexual prowess, and capacity to consume alcohol.

Fortunately I was due to go to Holland for a day-trip to Holland and fill it to the roof with rigs. I know quite a few that did just that and some of them are millionaires now! (I should also say one or two of them ended up as unwilling guests of Her Majesty...). There was a time, back in those early days, when the importation and sale of CB rigs was strictly illegal - Customs and Excise apparently treated them in the same way as ordinary transistor radios and provided the duty was paid, they were allowed in. For a few short months there were fortunes to be made.

Not me. I spent the next two years doing my bit to get the archaic Wireless Telegraphy Act changed - I was there on the regular Hyde Park marches, Parliamentary lobbies; I even served on GLC Committees. Free speech, the right to communicate, two-way radio for the masses.

There are more than enough stories from those pre-legislation days to fill Practical Wireless ten times over but suffice it to say that after much dithering and posturing the British Government finally realised that it would be easier to legalise CB, and make money out of it, than spend a small fortune chasing illicit CBers around the country. Their solution was for the Home Office to come up with the faust name ‘Open Channel’, draft a Green Paper discussion document, and finally publish the historic MPT1320 and MPT1321 specifications which set out proposals for a unique UK FM CB service on the 27MHz and 934MHz bands. On 2 November 1981 the Post Office monopoly on all forms of long-distance communications, - which other than shouting required passing an examination, was finally broken.

The rest, as is customary to say at this point, is history.
After the unfavourable reaction of most of my fellow amateurs regarding the last CB review, I was a little apprehensive on the subject of doing another. But as I pointed out to them at the time, CB is still the only easy way for most people to get access to the field of radio communications. Indeed, I also pointed out that some of our radio clubs most enthusiastic award chasing members, cut their DXing teeth via CB. Still, why should I have to make excuses? I know the value of CB and its role in propping up the somewhat ailing hobby of amateur radio.

I must say that since I last reviewed one of the new CEPT rigs back in May 1989, the band noise has increased alarmingly due to transatlantic propagation caused by the current sunspot cycle peak. It has, of course, increased the chances of working some interesting DX if you’re patient and can stand the din. As far more European stations seem to be using the band; you will no doubt remember the new CEPT frequencies have been accepted throughout the EEC. Having said that, there still seems to be very few UK CBers in evidence, which is good I suppose for those more serious band users.

Having reviewed one of the first CEPT rigs to grace Nevada’s emporium I found myself quite unconsciously comparing the two rigs. The Satcom SCAN40-F seems to have gone the same way of most amateur equipment; it has quite a few bells and whistles than its more simplistic predecessor the Team TRX 404.

Unpacking

On unpacking the Satcom I was surprised to see such a busy looking rig and a little disappointed at the lack of technical information enclosed. No interesting schematics, not even a functional block diagram. Still most people don’t want to know how it works. Anyway, the rig comes with a users manual and a bag of assorted installation hardware. To complement this, there are some quite useful hints and tips in the manual on the installation of the rig and its antenna (not supplied).

The power lead supplied with transceiver was at least a metre long including an in-line 2 amp fuse, long enough for most installations! The microphone supplied with the rig is a fairly ordinary 50052 dynamic type with a 500mm curly lead, terminated in a Japanese standard 4-pin screw collet plug. This particular item gave me a little trouble when I first aired the rig, as it had an intermittent short circuit on the mic. The fault had been caused by the misassembly of the microphone shell and was easily put right, but was a little annoying. It’s a shame that this seemingly minor assembly fault crept past Satcom’s QA person, as I was amazed at the high standards of construction used within the rig itself. The back panel of the rig is quite ordinary. Here sockets are provided for the optional selective calling unit, d.c. power, extension speaker (3.5mm jack) and antenna (SO239 type).

High Standards

All the rigs sub-assemblies are connected to the main p.c.b. by multiway plugs and sockets; even the speaker had its own spade type connectors. In fact, I would go as far as saying that the transceiver’s internal construction far outshone some of the more expensive amateur gear I’ve poked around in.

Unfortunately, I can’t tell you a lot technically about the internal working of the rig, only that it has a phase locked loop synthesiser to produce the 40 channels and has a

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The front panel of the transceiver is well laid out and has all the good looks of a thoroughbred, as does the whole transceiver which is finished in a rather nice gunmetal grey metallic paint. As mentioned earlier, the rig is endowed with a surprising number of knobs and switches; just the thing for those compulsive twiddlers like myself. On the far right of the front panel is the microphone socket above and to the right of this are the VOLUME and SQUELCH controls, of the dual-concentric type. Below this rotary control is a push-on/push-off type switch which controls the rig’s d.c. power. In fact the next five switches to the right of this, have exactly the same type of switch action.

The d.c. POWER switch seems to have a strange effect on the transceiver, as it doesn’t seem to fully disconnect the rig from the vehicle supply. When in the off position, the rig displays faintly in the channel window the letters PA. As the rig doesn’t seem to have a public address function, this display remains a mystery and leaves a quiescent current drain of 17mA. Although this is not mentioned in the manual, I can only assume that this function may be part of the rig’s selcall option. However, I can only guess as the rig’s selective calling working as this is only vaguely mentioned in the back of the operating manual. The operation of selective calling is explained in the Team 404 review, in the May 1989 issue of PW. One thing is for sure, when you install the transceiver in your vehicle, I should make sure that it is connected through the car’s ignition switch. So when the vehicle is left unattended the rig does not flatten the battery.

**Scanning**

The other switches on the front panel, going right from the power switch, are marked, PRI, AUT.S, M-COMP, SQ FIX and NB. The switch marked PRI when pushed automatically switches the rig to Channel 9, which for those who don’t know, is recognised as a distress channel.

The next switch along to the right, works in league with the transceiver’s rather over complex means of changing channel. Instead of the more usual rotary channel switch, two buttons are provided, one marked with an ‘up’ arrow and the other with a ‘down’ arrow. Both switches have a press-to-make action and will either change the rig’s operating frequency up or down as required. If either of the buttons, which are located on the right hand side of the channel display, are kept depressed the rig will continuously cycle through all 40 channels.

The AUT.S button when locked in sends the rig in search of a busy channel, stopping only when the rig’s squelch is lifted. This scanning mode, for which the rig is obviously named after, I feel is a little wasted. As paging systems operated by some UK manufacturing plants work in this band and issue long and often noisy strings of tones, they constantly lock up the receiver’s scanning function. If a delayed hold had been provided, so that every time the rig encountered a constant carrier it locked on the channel for 6 seconds and then continued scanning, then this function might have been relegated from being just a novelty.

The obvious use for such a channel change system, would be to put the UP and DOWN buttons on the microphone, as is the case with some amateur mobile equipment. However, this was probably left off in the interest of keeping the equipment’s price in the competitive range. The next switch marked M-COMP, gives the rig a very useful and unusual feature. Gone are the days of power mics, as this switch increases the microphone sensitivity by a quoted 20dB. When I used the facility on marginal contacts it gave me at least one extra point on the readability scale. A very worthwhile improvement to include, as I’m sure you will agree.

**Fixed Squelch**

Next on the list is the button marked SQ.FIX. This I must admit had me rattled as the manual just said the button fixed the squelch on? At a wild guess I think it must be some kind of pre-set squelch. So I left it on, thinking that it would probably work like that very same function on the Team 404. I’m sad to say that yes, it is a pre-set squelch, but it takes quite a beefy signal to lift it. Unlike the Team rig which looked for a well modulated f.m. carrier as well as a pre-set level of r.f. signal, the Satcom’s I feel, must be operated by r.f. signal strength alone. This function is only useful if you’re expecting a call from a very local station.

The last button, marked NB, enables a noise blanker to be activated on the receiver. This is quite handy for cutting back some of the vicious ignition interference experienced in the mobile environment. I must admit though, it only reduced some of the noise which is all that can be expected in equipment of this type. However, it is a nice touch as well as being marginally useful and a rarely found feature on CB equipment.

**Twiddley Bits**

The rig is also endowed with a tone control, a simple but useful means of rounding off some of the sharp edges on the harsh audio some people transmit. Poor audio is caused mainly by people holding their microphones far too close to their mouths when speaking, especially in a mobile environment.

The next rotary control enables the r.f. gain of receiver to be adjusted and is the one feature I used the most. At times, I wound this control down to nearly half its maximum setting just to give the rig a fighting chance of selecting some of the stronger signals from what seemed like a solid wall of hash. Knowing how much power some continental stations use, I think all CB rigs should be provided with an r.f. gain control.

The last knob in this trio provides a means of adjusting microphone gain. This particular control I left at maximum for most of the time, as even with the microphone compressor running it seemed that without it, you just weren’t heard. This is bad operating practice I know, but when you’re trying to get a contact in all that noise you need to pull out all the stops. This reminds me of one poor Italian station I heard, he must have shouted himself hoarse trying to
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work a Spanish station. He shouted louder and louder, till I was worried that he might either explode or have a fit of the vapours. Still he managed it in the end, but I should think he had to go and lie down in a darkened room for a while to recover!

### Display

The Satcom has a very striking display with two eight-segment green I.e.d.s to show the number of the channel in use, and five separate I.e.d.s to provide a bargraph type Signal/power meter. Another three I.e.d.s mounted vertically to the right of the channel display, show the state of the transceiver, red for TX and green for RX. The third I.e.d. comes on when the rig is set on the priority channel. The whole display window is covered in a smart, smoked effect panel, which I might add, helps to lessen the glare from the display when the rig is used in the car at night.

### In Use

I quite enjoyed using the rig, as it gave me a chance to make some new friends outside amateur radio and look up some old ones from the last time I was on the band. However, if I was going to become a permanent resident on 27MHz, I don’t think I would rush out and buy this particular transceiver. The rig, for all its gadgets and goodies didn’t come up to my expectation, particularly on receive. In particular I found the preset squelch very insensitive and the volume control a little abrupt in its action.

Although most of my comments about the receiver’s performance were based on gut reaction rather than measurement, I got the distinct impression that the rig needed an r.f. gain control as it seemed overwhelmed at times by high band noise and strong signals. On-air reports of the quality of modulation were good, even with the microphone compressor running. The received audio from European stations using what sounded like CEPT spec. equipment, weren’t too bad either, although crushing s.s.b. splatter and a.m. heterodyning at times completely obliterated the narrow band f.m. used by the CEPT breakers. The means of setting a channel I also found frustrating rather than useful, but then I’ve always liked rotary tuning dials. Perhaps it’s a hang-up from using old valved comms. receivers!

### Summary

I couldn’t help myself comparing the Satcom rig with the Team and although the Team looks rather utilitarian up against the Satcom, it does work remarkably well. Having said such harsh things about the Satcom, I feel that this rig will appeal to lots of breakers mainly because of its good looks and on reflection I think it will also take a lot more physical punishment than the Team. The Satcom SCAN40-F has a quality feel and look about it and wouldn’t be out of place in any new vehicle, particularly those with the more futuristic looking dashboard.

In the end, ‘you pay your money and take your choice!’ My thanks go to Nevada for the loan of the reviewed unit. For further details, current price and availability, phone (0705) 662145.
CB radio was not new to my family and I when we went to live alongside the beautiful and remote Little Loch Broom in Ross-Shire. Situated as we were, some 120km north-west of Inverness, we had many hours of empty roads to traverse for the regular shopping trips that are required for young families.

While we were living in the Hampshire countryside we had used CB to link our house and car and it had proved very useful - when we had been able to find a clear channel that is. In our Hampshire village, dominated by a very large farming company, the biggest users of CB were undoubtedly the tractor drivers. Every farm vehicle seemed to be equipped with a 40-channel transceiver so that the driver could keep in touch with home. Even the potato picking machine had a rig fitted.

Once we had settled into our new way of life in the Highlands I quickly found out that, for my own use, CB radio was not just going to be a way of keeping in touch with the family but also a very essential safety aid. Fitting a 40-channel rig into the car for anyone who was on the road a great deal was a forgone conclusion, but many people who had to leave their vehicles also carried walkie-talkies. Ever since the CB service was introduced legally into the UK, pressure has been placed on hill-walkers and climbers to carry CB walkie-talkies. Many people do carry the equipment and from experience I can report that they have more than proved their worth.

For people like myself who were likely to be literally anywhere in the Highlands and Islands, mobile amateur radio equipment and CB gear were useful although at times propagation would play some odd tricks during an otherwise run-of-the-mill conversation. I can remember one occasion when a friend and I were busy trying to locate a fault on a very long cable TV system when someone from Cornwall joined in the conversation. I can remember one occasion when a friend and I were busy trying to locate a fault on a very long cable TV system when someone from Cornwall joined in the conversation.

A very effective way of working with walkie-talkies is to operate them in conjunction with a vehicle mounted transceiver. The more efficiently matched vehicle antenna and (usually) higher output transmitter fitted in the car can greatly extend the range of the hand-held portable.

## Hill-Billy Eyeball

It was while using CB equipment in this fashion to help in the location of a fault on a 27MHz u.h.f. and v.h.f. TV and radio cable system, that my friend and I were joined by the other handheld user who was located in the mining town of Redruth. The relatively short skip conditions on 27MHz were so good that our friend in Cornwall was able to pass on his own advice to where the fault could be!

If, by chance, the Redruth CB operator reads this piece and remembers the incident, he may be interested to know that the problem was located in a stretch of cable that passed above a path frequented by the local wild goat population. These magnificent animals have impressive long shaggy coats and their regal appearance is topped off by an impressive set of horns. A legacy of the Highland crofting clearances, they have returned to the wild and apart from rubbing their horns on low-slung coaxial cable and the occasional nibble at low voltage supply lines, do no harm to anybody.

However, it must be said that there was one gigantic goat that had to be avoided at one location for he allowed no trespassers on his territory. I'm not particularly fit and have never been an athlete, but when my Labrador and I were attacked by this unfriendly beast one afternoon - we both managed a very creditable gallop up the very steep hillside. The sight of a very large bearded engineer with an even larger rucksack filled with test equipment, being chased by the bearded monster would have been funny I've no doubt if anyone had been able to see the incident.

As it happened, the only witness was my friend who was about 400 metres below me waiting for instructions via the CB in my car. Although Murdo only heard what was happening just before and after the chase - he was able to picture the scenario accurately because in my panic I ran to safety holding the transmit button in at the same time. I dropped the walkie-talkie at one point and the animal stopped to sniff and nibble at the shoulder strap. This gave me time to abandon my rucksack and climb up on a steep sided rock. There was just room enough for my dog Mandy and I to stay clear while the goat sniffed and nibbled...
around my rucksack before he lost interest and wandered away.

Unfortunately for me, my troubles had not departed with Billy. For he had left his calling card behind and it was certainly unforgettable. In fact, both the hand-held and the rucksack were radiating very strong goat signals and it was only the anxious voice of Murdo emanating from the smelly radio that gave me courage to pick it up and use it. It took a long time for the smell to vanish from the radio and even longer for story to lose its appeal in local bars but I shall never forget my encounter with Badralloch Billy.

Popular Festival

Hand-helds were often a useful aid when small boats were being used and remote communities such as Sconlarig, on the other side of Little Loch Broom found many uses for CB radio. Sconlarig has featured in various TV programmes and has attracted some unusual and talented people. There’s no mains electricity and there are only two practical ways of getting over there from the ‘mainland’. Although this remote stretch of land is not physically an island, to all intents and travel purposes it is.

Visitors have the choice of a two kilometre boat trip across the seaward end of the Loch or face an eight kilometre walk from the end of the road at Badralloch. In either case walkie-talkies provide a very helpful link for possible emergency use and for pop festivals! It may seem a little odd to pick it up and use it. It took a very helpful link for possible travel purposes.

Transporting the many hundreds of visitors down to the ferry pier at Badlaruch via the narrow road and steep hill, took much effort and close cooperation. The main car park (just off the main A832) was also the point where the ‘Westerbus’ dropped people off as they arrived from Inverness. With the aid of several sets of hand-held transceivers and a fleet of minibuses, the hordes of visitors were driven to the pier to complete their journey by boat. Once over the other side they still had two kilometres or so to walk but they all seemed to think it was worth it. It was no small tribute to the equipment in use that by the end of the event (spread over several days) none of the transceivers had failed.

A trip to the main hospital in Inverness, or a shopping visit to the ‘Highland Capital’ could easily take up a day. Travelling back late at night or even in the late afternoon had its own hazards as we often found out. One dark evening when my family and I were half way home from Dingwall - the county town of Ross-Shire which was 80km and a good hoot’s journey away, we struck a ‘cat’s eye’ that had been dislodged by one of the huge fish lorries that ply between Ullapool and virtually all over Europe. A quick call on the CB soon had someone along to help us change the wheel. The most useful help they could offer was the light from their headlamps and we were soon on our way home again.

K9 Control

Sheep abound in the Highlands and you learn to live with the hazard of sheep ‘exhaust’ and road manners. Sheep have diabolical road-sense and the phrase to remember is ‘woolly minds wander’ in every sense of the word. Where sheep are involved, in an odd way, life has come full circle because the very crofters who were evicted in the last century so that sheep could be grazed where their cattle and goats browsed now keep sheep in a big way.

Many sheep farmers use the specially designed rough-terrain three-wheeled motor bikes to round up their flocks and some enterprising individuals have latched on to a modern approach to rounding up the huge flocks of sheep by equipping their dogs with walkie-talkies! Normally the Collies can work to many hundreds of yards away from the shepherd, but high wind noise can drown the loudest whistle. To get an order and allow the dogs to work at greater ranges a small hand-held rig is strapped to the animal’s back. The shepherd can then work the dogs from a vantage point and control them with simple commands. As can be imagined, this approach can be a great help in mountainous countryside.

Working with two dogs is not a problem either, as two-channel transceivers will enable both animals to receive their instructions. At this point I must state categorically that despite my widespread travels in the Highlands and Islands and extensive enquiries - I cannot confirm the rumour that one clever crofter has managed to train his dog to reply and query instructions via the CB, although many are trying!

Comradely CB

There were many foreign CB users in the Highlands, and although I’ve no doubt that they were breaking British law, they certainly did no harm. For example, it was not uncommon to see two or three French or German motor-caravans in convoy, keeping in touch via their own CB gear while they enjoyed their Highland holidays. But the prize winners for the most enterprising use of CB radio must surely go to the enterprising use of Eastern European visitors to the picturesque fishing and ferry port of Ullapool.

Ullapool, which is situated half way down Loch Broom, plays host to very many ‘Klondyking’ fish processing ships every year. The biggest customers for the locally caught fish are the Russians, East Germans and Bulgarian ships. For a large part of the year the waters of the loch are jammed with closely anchored ships and the air immediately around the factory ships is permeated with the smell of cooking fish and tomato sauce. The small town is often completely overwhelmed with visitors from the ships who are often ferried in fleets of lifeboats from the anchored fleet. Relations with local people are on the whole very good and the visitors are always especially kind to any children they see...perhaps reminding them of their own families who are so far away.

Fleets of coaches take the ‘Klondyking’ to the can keep it to buy up virtually any consumer electronic item they can afford. Particularly popular are radio-cassette recorders and colour TV sets. The latter seem to be in most demand by the crew members from the Russian ships - despite the fact that they are fully aware that the equipment they are buying is for the PAL standard rather than the SECAM system adopted by Russia.

Back in Ullapool the CB talkies-talkies are put to good use and during their Highland holidays. But the enterprising use of CB radio must play an important role in the organisation.
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No doubt there are a few 934MHz clubs throughout the UK, but the 934MHz Club UK have come to our notice over the past few years as they send regular reports in to the Propagation column in Backscatter each month.

They are a very active group publishing a quarterly newsletter, organising awards and contests and running a QSL bureau between members. Another service they supply to members is that of 'club items'. These are log books, QSL cards and two different types of badges.

The Club aims to "encourage and further the use of 934MHz throughout the country and to represent the users of the frequency in connection with representations to the various government bodies concerned with radio communication". From their newsletter, it is obvious they meet with the Department of Trade and Industry to discuss matters affecting 934MHz users.

Awards & Contests

The 934MHz Club UK run four awards, all of which require QSL confirmation of contacts.

Five Counties: For this award members need two confirmed contacts from two different stations in each of five counties.

Ten Counties: Two confirmed contacts from two different stations in each of ten counties.

Twenty-five Counties: One confirmed contact from twenty-five different counties.

Worked All Counties: One confirmed contact with one station in all counties.

The 934MHz Club UK organises two contests each year for club members. The National Field Day is held on the third Sunday in May from 1200 to 2000. The Annual Contest is held on the second Sunday in October from 1000 to 1800. Logs must reach the contest manager not later than 30 days after the contest has taken place.

National Field Day: All Contestants must operate as mobile or portable stations. There are two classes in the contest, restricted and unrestricted. Unrestricted means that the station is unrestricted as to the antenna system and antenna height used. Restricted means the station may only use a single omni-directional antenna. If used from a vehicle, vessel or caravan the antenna should be mounted directly onto the vehicle, vessel or caravan without additional masting. If operating from a tent or using a hand-held, the mast should not exceed a height of 2m above the ground.

Prizes for the longest distance contact, the most points and the most contacts are awarded in each of the two categories, so there is plenty of opportunity for prize gathering. If stations are not entering the contest but wish to participate, then those stations may use their home base.

The scoring and logging systems is very simple and easy to use. One point per contact, plus one point for each 20 miles range of the contact. For example a 60 mile contact equates to 4 points.

The log must show the name, callsigns and UK number of the contestant, plus their precise location during the contest. The log sheet must also state whether the operator was operating in the restricted or unrestricted class. Contacts in the log should be numbered consecutively and show the other stations callsign, location, range and, if applicable, the UK number and contact number.

Annual Contest: The UK and its surrounds have been divided up into regions and counties. Regions are denoted by a letter and counties by a number. The region and county codes quoted together are called a location code. The contest manager can supply a complete list of these codes to participants. In additions, each contact exceeding 49 miles needs a distance code: A = 50 - 99 miles, B = 100 - 149 miles and C = 150 or more miles.

Obviously if you are interested in joining the 934MHz Club UK, then you can ask for details of such things as the awards scheme and the contest rules to get the full details.

Contacts

For those that think 934MHz means only very short distance contacts, you could not be more wrong. There are plenty of short distance contacts, ideal for local chats, but from a couple of borrowed logbooks another story emerges. Contacts of 100 miles (New Forest to Guernsey) are possible, or 60 miles between the Isle of Wight to Beachy Head, or 70 miles from the North Yorkshire Moors to Huddersfield. Even good mobile contacts are not unknown, travelling along the M62 one station worked stations in Stoke some 40 miles away. Of course, in the contests even better distances are worked when people go out to local hill tops, the longest contact in the last National Field Day was 164 miles. There's more to 934MHz than meets the eye!

More Details

If you would like more details on the 934MHz Club UK, then you should send an s.a.e. to: The Hon. Sec. 934 MHz Club UK, PO Box 424, Althorpe, Nr. Chelmsford, Essex.
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Practical Wireless, May 1990
Stefan Niewiadomski needed a high voltage p.s.u. to power a valve receiver he was renovating. Unable to find a suitable transformer, he wound his own. Here he tells you how he did it.

The Circuit

Shown in Fig. 1 is the circuit diagram of the power supply. Transformer T1 has two secondary windings, one for the l.t. and one supplying the h.t. The voltage values were arrived at by the following method. Neglecting rectifier losses, a rectifier and smoothing capacitor would give an output voltage of 1.414 times the r.m.s. value of the input voltage, so the input voltage is the desired output voltage divided by 1.414.

From this the required voltage is 90 + 1.414V, which is 63.64V to which we may add the odd one volt to account for rectifier losses, then round it up to 65V for good measure. It was decided to use a bridge rectifier configuration for two reasons: the regulation and smoothing are better, and no centre tap is required on the winding.

Heater Supply

Calculating the voltage for the heater supply is a little more complicated. To operate correctly the integrated circuit IC1 needs an input voltage at least 3V higher than the regulated output voltage. For an output of say 1.4V say we set its of load input voltage to about 5V so that as the load increases the input voltage is maintained across the regulator input. Because the l.t. voltage supply is fairly low, rectifier losses will be significant, so a couple of volts are added to compensate. The l.t. winding thus has to be (5 + 1.414)+2V, or some 5.5V r.m.s.

The high voltage secondary feeds diodes D3-4 connected in bridge formation, these four 1200V p.i.v. diodes are cheaper than one suitable high voltage bridge rectifier. The rectified output is smoothed by capacitor C1 before being passed to the filter circuit R1 C1, supplying further smoothing by way of a.c. potential divider action. This method does result in some voltage drop as current is drawn from the rail. At 10mA load the nominal 90V is reduced to around 85V across C2. This drop in voltage is perfectly acceptable to the radio being powered, it being more important to reduce the hum and ripple on the h.t. rail.

The low voltage output from T1 is rectified in the bridge rectifier D5 before filtering in capacitor C3. This filtered supply is fed to regulator IC1, which is an LM317T adjustable positive voltage regulator. The output voltage of IC1 is governed by the values of R3 and R4, which have been chosen to give an output of 1.4V. The LM317 range of regulators are eminently suitable for this application, being capable of producing...
a regulated output as low as 1.2V at a current up to 1.2A. Capacitors C4 and 5 decouple the regulator to ensure r.f. stability.

The light emitting diode D6 gives a visual indication of power on, but may be omitted if not required. If this is the case then its associated current limiting resistor R2 may also be left out. This i.e.d. may be mounted on the front panel if the unit is being used as a cased stand-alone unit, or left on the board if being fitted inside the radio to be powered.

In common with many other battery sets the Westminster requires a floating l.t. supply as it generates a grid bias via an internal resistor between the h.t.- and the l.t.- supplies. The h.t.- output has therefore been connected to mains earth, and the other three terminals have been allowed to float with respect to this connection.

**Transformer Design and Construction**

When designing a transformer the first thing to do is to determine the total power or VA rating required so that the correct core/primary winding assembly made be selected. To do this total up all the products of the supply voltages multiplied by that supply's current. For our project this equates to 65V x 10mA, or 0.65VA, plus 5.5V x 0.275mA. This equates to about 2.2VA which is well within the capability of the smallest available transformer kit, which has a 20VA rating. In fact the secondaries will supply considerably more current than needed for this project.

Then to work out the number of turns required for each secondary winding, the number of turns per volt output must be known. The stipulated transformer kit (Maplin YJ61R 20VA) has a quoted figure of 6.04 turns per volt. This translates to 392.6 turns for the 5.5V winding. Theoretically the wire sizes chosen should be as heavy as possible to fully fill the available secondary windings space. This results in the smallest losses for the completed transformer. The problem with this approach is the difficulty in predicting how much room will be taken up by the secondary

---

**Fig. 2:** Shown here is the track pattern and component overlay of the p.c.b. (Note: do not be tempted to use low voltage items for capacitors C1 and C2)

**Fig. 3:** Skeleton drawing of the regulator. Refer to the formulae within the text if you intend changing the l.t. output voltage to other than the designed value.
Fig. 4: This is the recommended box layout for the project if not to be fitted inside a valved radio.

windings. This is especially true when wound by hand, as each person will wind the turns with a different tension and tidiness. For this project therefore the wire gauges were chosen to be a reasonable compromise for low resistance, easy handling and safety margin in the size of winding. Enamelled wire of 0.22mm (34/35s.w.g.) was chosen for the h.t. winding and 0.56mm(24s.w.g) for the l.t. winding. One 250g reel of each gauge should prove adequate for the project. Don't forget that you must use enameled wire, not bare tinned wire for this application.

As supplied the transformer kit consists of 'E' and 'I' core laminations, two frame ends and all screws nuts and fibre washers to hold the completed transformer together. The former, on which the primary winding is already wound, is supplied with plastic clip-on covers.

The Windings

Ignoring all but the former at present, the h.t. winding is to be wound first. Solder the free end of the 0.22mm wire to one of the terminal pins away from the row of pins to which the primary winding is already connected. With most enamelled wire there is no need to scrape the insulation away before soldering, the action of heating with a soldering iron causes the enamel to peel back out of the way. The winding can now commence. Try to do this away from inquisitive people, as answering the 'what are you doing?' question frequently leads to losing count, (usually very near the last few turns too). The secondary windings are wound in a channel in parallel to the already wound primary. Do not attempt to modify the primary winding or alter it in any way.

Several layers will be required for the h.t. winding, so neatness is essential. Be careful to avoid kinking the wire as it comes of the reel. Try to be as accurate as possible in counting the turns, but in practice within 10 turns of the 393 calculated will be perfectly adequate. On completion of the last turn cut the wire to length and solder it to the terminal adjacent to the start connection.

Before starting the l.t. winding. The h.t. winding must be insulated by covering the whole of the winding with several layers of good quality insulating tape. Using the 0.56mm, and as before, solder the start of the l.t. winding onto a new terminal. Wind the 33 turns as evenly as possibly over the top of the h.t. winding and finish up by soldering the end of the winding to a fourth terminal on the secondary side. There is no need to wind the l.t. windings in the same direction as the h.t. ones, so don’t worry if you think you might have got it wrong.

The windings can be impregnated with a varnish if protection against moisture and chemicals is required. Varnishing the completely assembled cores also can reduce the amount of mechanical hum in use. The prototype was not varnished as future modifications would prove difficult to make, and also the shack was not felt to be a hostile environment.

Transformer Assembly

Clip the plastics covers around the former, these give abrasion protection to the windings in use. This is the time to start stacking the 'E' and 'I' form core laminations, two frame ends and all screws nuts and fibre washers to hold the completed transformer together. The former, on which the primary winding is already wound, is supplied with plastic clip-on covers.

Testing the Transformer

I found it was best to test the transformer at this stage. The transformer kit is supplied with two 120V windings which must be connected in series for the UK mains voltage of 240V. Identify the primary side and connect the inner two terminals together. Solder the mains connections to the outer terminals and make the earth wire from the plug to the body of the transformer. Apply the 240V mains to the transformer and switch on. Should the transformer make a great deal of noise the switch off and disconnect from the
mains before attempting to find out the reason for it. Assuming all is well measure the output voltages to verify they are within tolerance: 63-67V for the h.t. winding and 5-6V for the l.t. winding.

**General Construction**

All the components with the exception of the transformer are mounted on p.c.b. as shown in Fig. 2, the track and overlay diagram. The majority of components are polarised, not only the capacitors, but also the various diodes. Take care to place them onto the board with the correct orientation before soldering them in.

The LM317T is the correct variant of this device which is suitable for p.c.b. mounting. The LM317KT version has a TO3 case and requires a differing mounting method. The Low power version LM317M in a similar case could also be used, but note that in all cases the body or mounting flat is internally connected to the output pin, and should be insulated from other potentials. Whilst on the prototype C1 and C2 were in one metal can the p.c.b. has been laid out for two separate items. Connections to and from the board are made via 1mm diameter solder terminals. On completion of the soldering, make sure all soldered joints are clean and well made, and that all components are in their respective places.

On the author’s prototype the transformer and p.c.b. were both mounted on an ‘L’ shaped aluminium plate, with the socket SK1 on the vertical panel. This allowed the original plug from the radio to be plugged into the new power supply. The more recommended layout is shown in Fig. 3 in which the whole unit is mounted in a preferably metal box.

**Power Supply Testing**

It is advisable to test the p.s.u. before connecting it to the radio, if only to ensure that the voltages are correct. After carefully checking that the p.c.b. and associated wiring are correct check using a suitable voltmeter the two outputs. The l.t. output should be very close to the nominal 1.4V (between 1.35 and 1.5V) off load. A resistor of 4.7Ω 1W resistor will simulate the design loading of the l.t. supply. There should be no discernible drop in voltage on full load of 300mA. Turning to the high voltage output, measure it off load, it should also be close to the nominal level of 90V (90–95V). If this turns out to be correct then using an 8.2kΩ 1W resistor connected as a load to measure across C1 should have fallen to around 85V. The voltage across C1 should however remain fairly constant up to around 40mA drain, as the drop in output is almost entirely due to the resistor R1.

Leave the l.t. load on for a few minutes and check, every so often by touch, that IC1 does not become more warm to touch. The i.c. dissipates around 40mA drain at the designed load, and so will become warm but not unbearably hot.

**Differing Output Voltages**

Using the principles outlined in the article, other output voltages and currents may be obtained. Some valved radios operate from 120V h.t. and with 2V l.t. (originally supplied from a 2V accumulator or lead-acid cell). For the h.t. windings there should be no problems, as it is merely a case of recalculating the number of turns to use. For the l.t. supply this becomes a two part answer. If the resistor R3 is reduced to zero then the output is 1.2V so the output voltage is approximately:

$$V_{out} = 1.2(1 + \frac{R3}{R4}) \text{ volts}$$

The quiescent current of the i.c. itself will add to this voltage, but only slightly about a few percent of the output. Rearranging the formula above gives the following approximate calculation for R3:

$$R3 = \frac{220(1 - \frac{V_{out}}{1.2})}{1.2} \Omega$$

Then the number of turns may need to be recalculated in line with the method suggested earlier. The design principles described here can still be applied when no h.t. supply is required. For example, several relatively low voltages, which cannot be obtained from a standard transformer, may be required and these could be obtained from a number of secondary windings.

**Conclusions**

The design and construction of a mains power supply suitable for use with battery portable radio has been described. Because of the voltages required for this radio, no off-the-shelf mains transformer could be found. Design and construction methods of a suitable transformer were given using a suitable transformer kit. The principles used in the design can be applied to other designs where the output required cannot easily be obtained from standard transformers.

**Bibliography**

Two useful books dealing with older radios are:

*Radio! Radio!* by Jonathan Hill. Published by Sunrise Books, 2-4 Brook Street, Bampton, Devon EX16 9LY. This book contains over 1000 photographs and individual descriptions of vintage radios.

*Practical Handbook of Radio Repair* by Chas Miller. Published by Newnes Technical Books. Contains useful information on the repair of valved radios of all types.

**Shopping List**

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<thead>
<tr>
<th>Semiconductors</th>
<th>Resistors</th>
<th>Capacitors</th>
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<tr>
<td>LM317T 1</td>
<td>IC1</td>
<td>Electrolytic 150V working (min) axial leads 47μF 2 C1,2</td>
</tr>
<tr>
<td>W005 1</td>
<td>D6</td>
<td>Electrolytic 16V working axial leads 220μF 1 C3</td>
</tr>
<tr>
<td>1N4007 4</td>
<td>D1-4</td>
<td>Tanatulum resin dipped bead 16V working 1μF 1 C5</td>
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<tr>
<td>1.2</td>
<td>1</td>
<td>0.1μF 1 C4</td>
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**Miscellaneous**

- 20W transformer kit (Maplin kit YJ61R), p.c.b. (see services), 250g of 0.56mm2(24s.w.g.) enamelled wire, 250g 0.24mm2(24s.w.g.) enamelled wire, suitable plug and socket for the output, box or aluminium plate to mount the finished project.

**Capacitors**

- Electrolytic 150V working (min) axial leads 47μF 2 C1,2
- Electrolytic 16V working axial leads 220μF 1 C3
- Tanatulum resin dipped bead 16V working 1μF 1 C5
- Disc ceramic 0.1μF 1 C4

**Power Supply Testing**

It is advisable to test the p.s.u. before connecting it to the radio, if only to ensure that the voltages are correct. After carefully checking that the p.c.b. and associated wiring are correct check using a suitable voltmeter the two outputs. The l.t. output should be very close to the nominal 1.4V (between 1.35 and 1.5V) off load. A resistor of 4.7Ω 1W resistor will simulate the design loading of the l.t. supply. There should be no discernible drop in voltage on full load of 300mA. Turning to the high voltage output, measure it off load, it should also be close to the nominal level of 90V (90–95V). If this turns out to be correct then using an 8.2kΩ 1W resistor connected as a load to measure across C1 should have fallen to around 85V. The voltage across C1 should however remain fairly constant up to around 40mA drain, as the drop in output is almost entirely due to the resistor R1.

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- **Transistor HFE test**: dc volts: 200mV-750V
  - ac current: 200uA-10A
  - ac current: 200uA-10A
  - Resistance: 200Ω-20MΩ
  - Continuity, diode & HFE test

Price: £33.67

Prices inc VAT. Please add 90p for P&P.
What Is Propagation

Let us pretend that we have one of the very latest super sensitive 'IcoKenYae' communications receivers and with it, we are whisked back in time to 1790 and able to connect it to a random length wire antenna and a suitable mains supply. Unfortunately, I can only guess what would be heard, but, as we intend to discuss the practical side of propagation during the monthly progress of this column then we must begin by thinking about the time before any terrestrial radio waves were being generated.

Interference

Before connecting the antenna let's switch on the set and hear the gentle 'twitter' of the receiver's background noise coming through the loudspeaker. This is caused by the movement of electrons within the horde of components which make up the set. There would be no mains born interference adding to the set noise because, with no other electrical appliances in existence, our supply would be 'clean'.

Just imagine the luxury of a world without computer hash, d.c. motors, ignition, thermo-stats, time-base whistles and any of the other switching nuisances that you can think of.

Atmospheric Noise

Next we connect the antenna and find that noise from natural sources, such as celestial bodies or from within the earth's atmosphere, would be blending with our background noise and if strong enough, would be clearly identifiable through the speaker. A typical example of this is the multitude of continual 'cracks' from electrical discharges which manifest as 'sheet', 'streak', Fig. 1, or 'fork' lightning while thunder storms are in progress. The intensity of the 'cracks' depends on whether the prevailing storm is at a distance or nearby or, like Fig. 1 to me at 0130 last July 7, right over my head.

The Earth's Atmosphere

Perhaps when the earth was formed it gathered the complex atmosphere which we talk so much about today. This gaseous cloud, engulfing the earth like smoke around a tiny ball, is made up of several well defined layers, Fig. 2, the condition of which can vary between night and day and with the attitude and position of our planet on its annual orbit around the sun. Briefly, immediately above us is the troposphere which is the home of the earth's weather and not too far above that are several layers known collectively as the ionosphere, but more about these and how they were discovered next time. For the benefit of the many computer buffs among our readers, I produced the illustration of our atmosphere, Fig. 2, with the Trojan Cadmaster light pen connected to my Amstrad PCW 8512.
Packet Update 10

Roger Cooke
G3LDI moves on to look at British Software available for the packet radio enthusiast

It is very nearly five years since the first packet activity in Norwich, time flies when you're having fun! However, in that short time we have seen packet develop from a few devotees trying out their first parameter set on their home constructed TNC-1. Solving the problems of hooking the gear together, to the vast international network of interconnected BBS, Nodes and Gateways handling hundreds of messages per week flying about between over 150 different countries. And, talking about flying, the recent successful launch of the latest series of PACSATS from Kourou proves how sophisticated this mode has become. Extensive monitoring will take place for a few weeks before satellite use can take place. However, listening to Dove, the future looks bright, end-stop signals being reported with perfect copy. Full details of how to decode and use all six satellites can be found in the satellite column by Pat Gowan G3IOR, but basically DOVE is the easiest to copy, being f.m. p.s.k. 1200 baud. A list of all six is given in Fig 1.

British Software

During the last five years of packet there has been some evidence that there are talented people in this country too! Among the most recent programs which have been rapidly gaining in popularity are two which work very well together. In fact, the second piece of software discussed here will not run without this first one.

The GSBQP AX25 Networking Package.

John Wiseman has spent many a happy (?) hour writing, debugging and up-grading the GSBQP node software to arrive at the present 3.51 version. The BPQCODE is a multi-port, NetRom Compatible node software in which runs on an IBM or compatible PC. In addition to working as a NetRom Compatible Node, the program also performs the functions of MBBIOS or COMBIOS when used with the WORLI or WA7MBL BBS software. In other words, BPQCODE is loaded instead of the present COM-port driver. You have multi-connect with just one TNC and radio. If you have multiple ports/TNC's, you can access any port you wish.

As an example, suppose you have a PK-232 on h.f. (port 1) and a TNC-2 on v.h.f. (port 2). To call W3TMZ on h.f. just enter C 1 W3TMZ and then call C 2 G4YFB on v.h.f... The same holds true if you have a dozen TNCs. For example C 12 PACSAT.

Any station connecting to your Node can do several things. A question-mark (?) will provide a help menu and a "P" provides a list of all 12 ports. Connection can then be made to another station in the same way as NetRom, or to the BBS, or to the Sysop. If Sysop is selected, then the BBS can be kept running independently of chatting via a terminal program. In fact, 8 separate applications are supported in this way.

There is a terminal program with BPQCODE called PAC2 which is adequate for this application. Several different contacts can be carried on simultaneously in this manner with separation of the incoming and outgoing texts! All this on one radio and one TNC!

In order to accomplish all this what is needed? The TNC must have KISS-mode capability. In KISS-mode, all operations are carried out by the computing of a custom made assembler/disassembler. Luckily, most TNCs support KISS-mode, the PK232 HOST-mode is also supported. It is compatible with most of the major BBS software programs, WORLI, WA7MBL, AA4RE, G4YFB, GSUFQ and the latest one from G1NNA.

The system is written in 8086 assembler and is currently only available for the MSDOS/PCDOS environment, although once loaded it makes no use of operating system facilities. John does say however, that he intends writing a version for use with CP/M machines. It has been tested on IBM XT and AT PC machines. The software needs about 40 - 80K RAM, varying with the number of buffers, comms links and COMBIOS ports configured. It is NOT public domain but may be used by licensed Radio Amateurs in Amateur Packet Radio Systems.

Documentation is more than adequate and help is given with examples of how to set it up. Once running it is invisible to the Sysop, is memory resident and has very few bugs. John is open to suggestions, in fact he welcomes them, and would like feedback and views of users. At present there are about 70 users in the UK alone, and, judging by the amount of traffic passing through my h.f. gateway for John, there are more than that world-wide. It has become very popular and very well-received in the USA. John is writing a new version and by the time this gets into print, it will probably be available. He envisages an on-going situation and has several enhancements in mind, the latest being a remote sysop facility. John's photograph is shown in Fig 2. If you contemplate a copy of the software, or write via snail-mail to John, please don't forget to include a stamped return mailer, postage, s.a.s.e., or whatever.

The G1NNA Multi-user, Multi-port BBS, 1.05

A couple of years ago, Brian Lloyd gained his B.Sc.(Hon) degree at the University of East Anglia. It is almost superfluous to say that his degree is in Computer Science, because writing this software helped him attain it. During his stay in East Anglia, Brian visited locally and asked for suggestions or a "wish-list" for the most needed facilities on any BBS system. The result is the G1NNA BBS, now up to version 1.05.

This software is not public domain. It is intended for the use of licensed amateurs only, who run licensed BBS systems. This software will only be distributed by the author and his agents and only to licensed BBS. Any other form of distribution will be
unauthorised and will not receive the support of the author. The software must not be tampered with in any way.

You are strongly advised to register as a user so you can receive notice of updates and additions. Registration can be sent to G1NNA @ GB7ESX.

One of the main features of this BBS is the use of mail compression, which I think will have to be adopted as a standard facility in any re-write of major BBS systems. The only pre-condition to this, is, of course that the BBS accepting the compressed mail must be compatible. It also supports Hierarchical forwarding, quite a bone of contention at present, but again, standardisation is needed and it seems that this system is gaining in the popularity polls world-wide.

**Overview of the BBS software.**

This software was written to run with the G8BPQ node software V3.22 or later. It will not run with earlier versions. The software allows for a total of sixteen connects via as many RS232 ports as you like (up to 16). You will require at least a fast 286 to run 16 ports but a normal 8MHz PC should be quite capable of handling 8 or maybe 10 connects without too noticeable a drop in speed.

When this software was written there were several paramount priorities:
1: Must be easy to set up.
2: Need the minimum of maintenance.
3: Cut down the time to forward mail.
4: Must be fast.
5: Cut the use of the hard disk to a minimum.
6: Easy for users to use.
7: Easy for the BBS sysop to use.

Comments on these pre-requisites
1: The BBS could not be simpler to set up provided the manual is followed. There are no complicated files to set up. Several of the files used by present BBS software can be used, e.g. the SWAP.BBS and ATBBS.BBS files.
2: The software requires very little maintenance as all forwarding and auto-killing of messages are taken care of.
3: This software uses mail compression before forwarding to another BBS using the same software, saving up to 50% of the time taken to forward mail. Forwarding to BBS using other software is done in the normal way. You do not need to know what software the other BBS is running.
4: This software is very fast. For instance, it can tell in an instant if there is any mail to be forwarded to a BBS. LM, L< and L> will take a few seconds.
5: All message headers are kept in memory as well as on hard disk so L, LL, L<, L>, LM etc., do not use the hard disk at all.
6: The menu and the commands used by MBL etc., have been retained and a few added. An example is the 'F' command which will search a self-building data file for a users home BBS.
7: Once set up there is very little for the sysop to do except read the mail.

This BBS will also run under Desqview.

supports Hierarchical Forwarding and features import and export facilities. It also has a remote sysop facility which can be used via a password. All types of Personal Mail Box forwarding are allowed.

At the back of the user manual there is a registration form which you are encouraged to fill in and return. By so doing, enclosing a disk mailer plus return postage, you will automatically receive the latest up-date. Telephone support (advice) is also offered (reasonable hours!).

Brian certainly has paved the way toward mail compression techniques in this country, it has proved quite a success in the Pacific Net with the VK/JA BBS stations forwarding on h.f. using 1200 baud PSK with mail compression for quite some time now.

Any further enquiries: G8BPQ @ GB7DAD.
G1NNA @ GB7ESX.

That's just about it for this month. Next article DXCluster, Lan-Link and some discussion and views about HF packet band-planning. Some people seem to think its declining!! Your views appreciated. G3LDI @ GB7LDI, or Tel: (0508) 70278 24hr answering.

73 and happy packeting.
“Thanks for the nice signal report, OM.
The station here is home-brew.”

It’s a great feeling to be able to say you built the equipment yourself, not to mention the enjoyment you gain from doing the construction. You can feel sorry for the guy, who spent over three grand on his new set, and isn’t enjoying his radio as much as you are. Sure his set seems to have knobs for everything, but somewhere along the block box production line, they took the fun out. How many extra QSOs do you get with 1000 memories, and fifty less than essential functions?

May we suggest a rig that offers the challenge and pleasures of low power communication, combined with the fun of building it yourself?

SINGLE BAND CW TRANSMITTERS

These little rigs are simple to build, but offer a nice sounding CW note that you can be proud of. Key shaping and output filtering are provided, as is one crystal to get you on the air. RF output power is adjustable with an onboard control. Provision is made for connecting a VFO (HOWES CVF range) for full band coverage, and you can also add a DcRx Direct Conversion receiver for transceive operation if you wish.

- **CTX80 (80M 5W)** Kit: £12.80 Assembled PCB: £16.90
- **CTX40 (40M 3W)** Kit: £12.80 Assembled PCB: £16.90
- **MTX20** Kit: £22.90 Assembled PCB: £29.90
- **CVF VFO** (80, 40 or 20M) Kit: £10.40 Assembled PCB: £16.90
- **50pF Tuning capacitor to suit VFOs:** £1.50

**DcRx DIRECT CONVERSION COMMUNICATIONS RECEIVERS**

These receivers make a great introduction to amateur radio for the novice, besides being widely used by experienced QRP (low power) operators as part of a transceiver. Modes are SSB and CW, with up to 1W of audio output for ‘speaker or ‘phones. These are straightforward, single band receivers, and give amazingly good results. A “hardware” package to suit (case, dial, tuning caps, knobs, sockets etc) is available. There are versions for 20/30M, 40M and 80M amateur bands.

- **DcRx** Kit: £15.60 Assembled PCB: £21.50
- **DcRx Hardware:** £15.50

**DXR10 10, 12 & 15M COMMUNICATIONS RECEIVER**

This three band receiver gives SSB and CW reception on the three highest frequency shortwave amateur bands. These are commonly known as “DX” bands, and you can hear stations from all over the World. You don’t need a big antenna for these frequencies, and you can hear stations from all over the World. This three band receiver gives SSB and CW reception on the three highest frequency shortwave amateur bands. These are commonly known as “DX” bands, and you can hear stations from all over the World. You don’t need a big antenna for these frequencies, and you can hear stations from all over the World.

**ACCESSORY KITS**

We have lots of add-on goodies to tempt you with. Could you fancy extra filters, or perhaps a digital frequency display? Need a good quality ATU?

- **CTU30** ALL HF Bands ATU 30W Kit: £27.90 Assembled PCB: £33.90
- **CM2** Quality Mic with VOGAD Kit: £11.80 Assembled PCB: £15.80
- **CSL4** SSB & CW Dual B/W Filter Kit: £9.80 Assembled PCB: £15.80
- **DCS2** “S meter” for receiver Kit: £7.80 Assembled PCB: £11.80
- **DFDS** Digital Counter/Display Kit: £39.90 Assembled PCB: £59.00
- **SWB30** SWR/Power Indicator Kit: £12.50 Assembled PCB: £17.30

All HOWES kits come with a good quality Printed Circuit Board, full clear instructions, and all board mounted components. If you would like more information, please send an SAE for a free catalogue or information sheets on any specific products. Technical help and Sales are available by ‘phone during office hours.

PLEASE ADD £1.00 P&P to your order total.

73 from Dave G4KOH, Technical Manager.
Radio Diary

*Practical Wireless & Short Wave Magazine in attendance.

April 15: The Centre of England Amateur Radio Rally will be held at the Motorcycle Museum, Bicknell, near the NEC Birmingham. It’s being held in three large exhibition halls and free ample parking. Frank Martin G4UMF. Tel: (0952) 598173.

April 21-22: The RSGB are holding their Convention and Exhibition at the NEC, Birmingham.

April 22: The Marske rally will be held in the Marske Leisure Centre, Marske-by-the-sea. Doors open 10am. Mr Phoenix GT6BR, 1 Conway Road, Redcar, Cleveland. Tel: (0642) 48005.

April 29: The Bury Radio Society will be holding its annual Hamfest at the Castle Leisure Centre, Bolton Street, Bury. Doors open at 11am (disabled at 10.30am). Talk-in on S22 and SUB. Catering facilities and a licensed bar are available as well as the giant Bring & Buy. C. Marcroft G4JAG, Mosses Community Centre, Cecil Street, Bury.

May 6: The 7th Anglo-Scottish Rally will be held in the Tait Hall, Kelso. Doors open 11am. All the usual facilities will be available, hot and cold food, bar, Farmer John’s ice cream, etc. Bruce GM4UIB, QTHR.

*May 12: The VHF Convention will take place at Sandown Park Racecourse, Esher, Surrey.

*May 13: The Yeovil Amateur Radio Club will be holding its 6th QRP Convention at the Preston Centre, Monsks Dale, Yeovil. D.J. Bailey G1OMM, 7 Thatcham Close, Yeovil, Somerset BA21 3BS.

May 19: The Swindon Radio Rally will be held in the Oasis Centre, Swindon. J Broadfoot. Tel: (0793) 611859.

*May 20: The 33rd Northern Mobile Rally will be held at the Great Yorkshire Show Ground, Harrogate. Mike G0MKK. Tel: (0423) 56453/507653.

May 20: The 7th National Amateur Radio Car Boot Sale will be held at the new venue of Stockwood Park, Luton. This is easier to get to (not far from junction 10 on the M1). Private sellers £7 in advance or £9 on the day, traders £20. Clive G4ENB. Tel: Luton 27907.

May 20: The Parkanaur Amateur Radio Rally will be held at the Silverwood Hotel, Lurgan, Co. Armagh. Doors open at 12 noon and the entrance fee is £1. There will be the usual trade stands, Bring & Buy, bookstand, OSL bureau, etc., Talk-in on S22. The proceeds of this rally go to the Stanley Eakins Memorial Fund at Parkanaur near Dungannon. Jim Leppin GH1YGS. Tel: (0762) 851179.

May 20: The Cambridge & District ARC are holding their 5th Annual Rally & Radio Car Boot Sale at Coleridge Community Centre, Radegund Road, Cambridge. Doors open at 10.30pm. Brian G4TRO. Tel: (0223) 353664.

May 27: The 14th annual East Suffolk Wireless Revival will be held at the Civil Service Sportsground, Straight Road, Bubblesham, Ipswich. There will be a Bring & Buy, Car Boot Sale, a transceiver clinic, 50MHz demo station, all the usual traders and lots more including a children’s play area. Paul Whiting G4YOC. Tel: (0473) 642959.

May 28: The 1990 Birtcotes Radio Rally will be held near Bawtry, Doncaster. Doors open at 11am (10.30am for the disabled). Talk-in on S22. Details and or booking forms from: Pat Smith, 23 Florence Avenue, Balby, Doncaster. Tel: (0202) 857526.

June 2: The first Belfast Amateur Radio Convention, organised by the RAIBC (Northern Ireland Area), is being held in the Ormeau Park Recreation Centre, Ormeau, Embankment, Belfast. All the usual convention attractions will be there plus demonstrations and talks on the hobby by local well-known amateurs. They are also trying to cater for the XYLs by having demonstrations on microwave cookery, crafts and first aid. The special event station operating on the day will be GB2BRC. David Caldwell G1DOWH. Tel: (0232) 471370.

June 3: The Southend & District Radio Rally and Boot Sale will be held at the Rocheway Centre, Rocheway, Rochford, Essex. There will be the usual trade stands plus a Bring & Buy, licensed bar and coffee bar. Doors open 10am with talk-in on S22. John Stone G0DFE. Tel: (0702) 202216.

June 10: The Royal Naval Amateur Radio Society Annual Mobile Rally will be held in the Sports Field, HMS Mercury, near Petersfield, Hants from 1000-1700.

June 24: The Annual Longleat Mobile Rally will be, as usual, held at Longleat near Warminster, Wilt. Shaun O’Sullivan G8VPG. Tel: (0225) 873989.

July 1: The Worcestershire District Droitwich Strawberry Rally will be held at the High School, Droitwich. There will be the usual trade stands, Bring & Buy, family entertainment and strawberry fields (weather permitting). Gates open at 11am with free car parking and entrance. Tony G4OPD. Tel: Worcestershire 620507 or Derek G4RBD. Tel: Worcester 641733.

July 1: The York Radio Rally will be in the Tattersall Building, York Race Course. The Knavesmire is well signposted as you go to the Stanley Eakins Memorial Fund at Parkanaur near Dungannon. Frank Webb G3ZKS. Tel: (0904) 625798.

July 1: Newport ARS are holding their 3rd Grand Superlative Equipment and Junk Sale at the Brynglas Community Education Centre, Brynglas Road, Newport. The sale is open from 10.30am to 4pm (10am for the disabled). Kevin G7WSB. Tel: (0633) 262488.

July 6, 7 & 8: The Popular Flying Association Rally is again being held at Cranfield Aerodrome, Bedfordshire. All activities related to flying, including airband radio will have a place there.

July 14: The Cornish Radio Amateur Club Rally will be held in the Richard Lander Scholl, Truro. There will be the usual trade stands, Bring & Buy, a computer display/demo and a weather satellite demo. There will be refreshments, good free parking and the doors open at 10am (9.30am for the disabled). Rolf Little G7FKR. Tel: (0872) 72554.

July 15: The Sussex Amateur Radio and Computer Fair will be held at Brighton Racecourse. All the usual traders and other attractions will be there. Doors open from 10.30am to 4.30pm, with entrance at £1. Ron Bray G8VEH (QTHR). Tel: (0273) 415654 office hours or (0903) 673978 other times.

July 22: The Burnham Beeches and the Maidenhead & District Amateur Radio Clubs are staging the 7th McMichael Rally at the Haymills Centre, Burnham, near Slough. Doors open to the public at 10.30am (10.15am for the disabled). Admission is £1, the car boot sale boot pitches cost £5. There will be the usual trade stands, packet radio demo, refreshments, tea and coffee on the RAIBC stand this year - honestly!, bar as well as the GB4MR special event station.

*July 29: The Scarborough ARS Rally will be held at the Spa, Scarborough. Doors open at 11am. Many large trade stands, large Bring & Buy, Morse fee of 50p (children admitted free). There is ample free parking. On show will be amateur radio, electronics and computing, arts and crafts, there’s a grand Bring & Buy, Morse tests, lectures on various aspects of amateur radio, a raffle and talk-in on S22. A licensed bar and cafe will be available for refreshments. The Knavesmire is well signposted as you go to the Stanley Eakins Memorial Fund at Parkanaur near Dungannon. Frank Webb G3ZKS. Tel: (0904) 625798.

*August 12: The Festival Refuelling Sports Grounds, Wimborne, Dorset. The event will feature Radio and Electronics Trade Stands, Craft and Gift Fair, Bring & Buy, a vintage wireless exhibition and full family entertainment. Talk-in on S22. The event begins at 10am. Free parking and overnight camping on the Saturday night by prior arrangement. John G6API. Tel: (0202) 691649 or Rob G5DUN. Tel: (0202) 479038.

August 12: The 1990 Derby Mobile Rally will take place once again at Lower Bemrose School, St Albin’s Road, Derby, just off the A511 Derby Ring Road. Gates open at 10.30am with all the usual attractions including the Giant Junk Sale. Kevin Jones G4APY, 20 Pinecroft Court, Oakwood, Derby DE2 2LJ. Tel: (0332) 669157.
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5. Variable Speed, 2-99 wpm, variable sidetone 500-1250hz, variable inter character spacing, a relay switched output and built in sidetone speaker. Works from 9-14 volts DC at 300ma.

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Instant finance available subject to status. Written details on request.
Spurious signals can be generated in a receiver mixer by excessive signal levels and some means of reducing the signal can be very advantageous. This attenuator was originally built to work with a regenerative detector, a type of receiver which is particularly prone to overload.

My laboratory style attenuator circuit comprises of a row of pads, each one selected by its own double-pole switch. For receiving, I wanted something that could be worked with one knob only. As the attenuator pads follow a binary sequence it seemed sensible to use a binary encoder, Fig. 1a, as an eight to three line device will give 0 to 42dB attenuation with 6dB steps or 0 to 21dB in 3dB steps. Eight to three means eight single input lines are translated into a combination of three output lines as a binary representation of the active line number.

The outputs of IC1 in Fig. 1a, assume a condition determined by the switch and will change from 000 to 111 in a binary sequence as the switch is rotated. These outputs operate the relays via the driver IC2. The fourth relay in Fig. 1a is not part of the attenuator but is used to select one of two converters by the changeover line. It can be omitted if it is not required or perhaps a fourth attenuator might be included instead.

The circuit is built on double sided circuit board, Fig. 2, with the top side being used as a ground plane only. Having produced the etched circuit on the underside, turn the board over and remove the copper from around each hole with a small drill or spot-face cutter. Leave the six through ground-plane connections to facilitate soldering. These holes are marked appropriately on the component placement illustration, Fig. 2.

The unit is built into a small diecast aluminium box with the supply and changeover lines filtered to keep stray signals at bay. The s.i.l.(single in line) resistor package (R1 to R8) pulls the encoder inputs down in the absence of the selecting voltage. Values shown for the attenuators are for 50Ω working, but equations and pre-worked examples, shown in Table 1 and Fig. 3, are provided for calculating any

**Table 1.**

<table>
<thead>
<tr>
<th>Attenuation in dB</th>
<th>50Ω</th>
<th>75Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>292.4</td>
<td>17.6</td>
</tr>
<tr>
<td>6</td>
<td>150.4</td>
<td>37.3</td>
</tr>
<tr>
<td>12</td>
<td>83.5</td>
<td>93.2</td>
</tr>
<tr>
<td>24</td>
<td>56.7</td>
<td>394.6</td>
</tr>
</tbody>
</table>

**Fig. 1a.** The eight to three decoding circuit, plus the converter change over control.

**Fig. 1b.** The relay controlled attenuators of the 50Ω impedance circuit.
attenuation steps or for working with different impedances. Some of the resistor values might have to be made up from parallel pairs, especially if you require greater accuracy. For those of you who also own a Spectrum computer I have included a listing of a program in Fig. 4.

In use, this attenuator will prove to be a useful aid to reception along with providing the builder with some practice in binary coding techniques. However, bear in mind that if you use this unit with a transceiver, make sure that the transmitter output does not go through it as it will not handle more than 0.5W!

Fig. 2. Overlay and track pattern.

Fig. 4.
Radio Information
Cassette - 1

Save 95p off the normal price of £5.95 inc P & P.

Amateur radio is a fascinating and absorbing hobby but can be very bewildering to the newcomer - and sometimes to the more expert as well.

To enable you to hear what some of the more exotic modes sound like, we have produced this cassette.

On Side A you will hear a selection of off-air recordings of QSOs via a variety of satellites, QSOs on the 50MHz amateur band and QSOs using meteor bursts, aurora, Sporadic-E and moonbounces on the 144MHz band.

Side B is given over to the various data modes. Morse, RTTY, AMTOR, FAX and packet are all featured with off-air examples of QSOs to give you an idea of what they sound like and to enable you to set up your gear if necessary.

Due to popular demand the special offer price to Practical Wireless readers is again £5.00 including post and packing and VAT.

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(1)

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During the period of "putting-together" of the column, I had to make a fast visit to London, while there I received word of a postal strike, and this, I believe accounts for the absence this time of so many regular column contributors.

For many readers, and certainly for this column, February was a month of waiting and gnashing of teeth, of tearing of hair and - definitively - of fraying at the mouth, as the number of QSOs on the bands fell. After the beam here broke a load-bearing pad in the second gale, I chose that lovely warm and still final Friday in February to put it back up, GW0JAI and my wife Irene, GW3JU, and we began our up-to-speed QSOs on hand, the next gale, on the Sunday night, while it didn't damage anything of the antenna, did manage to pull the coaxial feeder tight down over the rotor box, up to 120° "down" for 20MHz, an antenna pany, I am confining to beamings 315 degrees. Woe is me indeed! However, being a decent sort, the column won't let on who it was who didn't use enough turns of tape on that feeding line.....

**Events**

All this of course, has tended to inhibit the Mark One ear, so I am doubly indebted to you contributors out there, to DX News Sheet, to The DX Bulletin, The DX Magazine, The Canadian Amateur, and of course K1AR's Contest Calendar gallops. First, K1AR The Contest Calendar preambles this time is most interesting, comparing as it does the logs of 5A1TW, in the 1963 CW QO CW contest, with the P40GD log for the same contest in 1989.

Interestingly the peak rate in 1963 was 62 QSOs/hour, with twelve hours showing better than one would experience at the time. There is a high mark of stations on the band, and for the DXpedition is currently at April 14, signing K9700. LSBXO/XM, commenting on the G8DQ, gales, notes that it is a comforting feeling to know that one's antennas are safely locked away in the car. In fact a home-brew quarter-wave fed, from an FT-707 to about 80W, everything is worked from the car, either on the move or occasionally while static. There is a high peak of stations on the band, and this might be noted on the home QRP cycle. By the time you get to read this, things should be better.

All that having been said, it does feel as though the last few days before we sat down to write the column, the bands did a little to have picked up, even though we didn't dare crank the beam round to check.

**WARC Bands**

Somewhere different to make our start this month. Red G88EOM (Woodley) IK4WPI, commenting on the G8DQ, gales, notes that it is a comforting feeling to know that one's antennas are safely locked away in the car. In fact a home-brew quarter-wave fed, from an FT-707 to about 80W, everything is worked from the car, either on the move or occasionally while static. There is a high peak of stations on the band, and this might be noted on the home QRP cycle. By the time you get to read this, things should be better.

**HF Bands**

**The Bands**

Clearly, in the absence of useful antennas for either 10 or 12 MHz, I cannot expect to do much of anything useful, although some people seem to agree that things haven't been as good as one would have hoped - though of course, far and away better than one would experience at the time. However, we must move on with the cycle. By the time you get to read this, things should be better.

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**QSL Addresses**

Reports to
Paul Essery GW3KFE
287 Heol-y-Coleg, Vaynor, Newtown, Powys SY16 1RA

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Solar Data for February 1990

Following numerous small flares, which caused some auroral events in the last few days of January and the beginning of February, solar activity was very quiet. Solar flux levels declined from 229 units on January 29, down to 160 units on February 4. There was a flare on February 3 of 560 flux units but it lasted only for 7 minutes. The period between February 5 to 18 saw a major decline in solar activity. The sunspot count was down to 62 on February 17 and no flare reports were issued during this time. The period through the end of February saw very little change in solar activity. The mean sunspot number for February was 128.4, reaching a maximum of 249 on February 24, and a minimum of 57 on February 17. Since December 1988 the flux levels have dropped about 100 units, which was totally unexpected and may indicate that we have gone past solar maximum. Although this sunspot may appear to be decreasing to 50MHz operation it should be borne in mind that the decline from sunspot maximum will take a number of years and that conditions will warm slowly according to the conditions for the year and the prevailing solar activity.

Radio conditions during February were pretty similar to those of January, which it had previously described as gloomy. There were some exceptions though, with a glimmer of increased trans-equatorial propagation (t.e.p.) openings on 50MHz and a number of successful contacts on 14MHz.

Reporting of propagation events on the v.h.f. and u.h.f. bands hasn’t been helped by the demise of my 50MHz and 14MHz antenna systems and heavy duty rotator during the January and February period and the loss of the tower supporting the 70MHz and 432MHz antennas last October. I have always felt that it is very difficult to report about band conditions if the writer is not active on the band or not in the area at the moment. However all is not doom and gloom. The replacement tower and associated hardware has recently been delivered and I reckon that I shall be active for the next few months are May 28, June 11 and 25, July 9, 22 and 26, August 19, 26 and 29, September 15, 19, 26 and 29, October 14, 21, 28, November 11, 18, 25 and December 2, 9, 16, 23 and 30. The 50MHz Band

Band conditions during February were not as good as had been generally expected. The were a number of sporadic E openings, noticeably more than have occurred in recent years. The beginning of the t.e.p. season was experienced by station situated mainly on the north coast of England. It was noticeable however that the band was starting to wakke itself up for the forthcoming season.

Although Stephen Daniels GODKM (AVN) has been restricted to weekend operation he still managed to work a number of stations at the highest powers and was able to contact stations in t.e.p. Asia and Africa. The best contact was with KT6J (Yasme) and 4K2OT (Franz Josef) and the station at 250W.

The VHF Band

VHF Up

Reports to
David Butler G4ASR
Yew Tree Cottage
Lower Maescoed, Herefordshire HR2 0HP

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**STEPSHES JAMES LTD.**

47 WARRINGTON ROAD,
LEIGH, LANCs. WN7 3EA.
heard 5 minutes later, peaking at S5. From 1515UTC contacts were then made with 7S9WB, ZS8A and Z33E. At 1818UTC Geoff worked G0EAD, for a first GJ-CE contact, presumably via Sporadic-E. The Southern African i.e.p. opening continued with the ZS91W beacon being copied to a fading signal, disappearing at 1900UTC. Sporadic propagation is so much dependent on some unidentified minor stream was prevalent on February 4.

During the morning, contacts were made with SM7FEJ, G0EAD (twice), PA9VXT and PA3BSM. In a late afternoon i.e.p. opening, at 1635UTC, 9L1SL was worked for another GJ first. This was JS2US operating the Sierra Leone club station. More on him later. Auroral propagation was detected in the early evening, from 1600UTC, during contacts with G3MOWJ and GM9GEK. Perhaps by now you are beginning to believe what I said about the Channel Islands being a unique location! Sporadic meteor work, on February 5, allowed Q232W to be worked at 1350UTC. Staying with this mode, Geoff worked his 80th country on the band when HB9CRQ(JN47) contacted was at 2302UTC on February 6. TEP openings continued to be prevalent during many afternoons but pressure of work did not allow full usage of the 9L1US (ex-J52US) was heard for over an hour, from 1600UTC, on February 17, at S9+. This opening to the south was followed by an auroral opening to the north with a number of stations being heard.

All was quiet during the next day, apart from a brief scatter opening in the afternoon, in which G4ZAV was worked. Geoff comments that he seems to have a very good direct path to GZ9C and suggests that QRP stations are consistently heard at very good strengths, with Dan H9GCRQ being copied nearly every evening from around 2300UTC.

In a typical opening, at 1300UTC, on February 23, 9L1US was heard to copy G4ZAV from 30 miles away running on 50.10MHz. He also has a beacon running on 50.09MHz, but not good news, as 9L1US is also operating a beacon on the same frequency. Locator square N3 444 was worked on February 22, when 9L1US replied to a CDLQDX call. More i.e.p. openings continued to be heard. The 9L1US beacon was heard at 1120UTC, on February 26, followed by a very strong signal by the 9L1US beacon. Propagation was very interesting on February 25. The band was open, at 0345UTC to 9L1US who was putting in a tremendously strong signal. While being strong, in a southerly direction, French stations were worked via backscatter.

At 1022UTC, SV1OЕ was worked via backscatter. The FY7DX beacon in French Guiana was heard at 1032UTC, again on the same great-circle path, via backscatter, as was the Portuguese beacon CT0WW. Contact was made on s.s.b. with TR20A at 1102UTC and immediately afterwards the TR20A and 9L1US beacon were heard on channel 9L1US. From midday the ZS9VHF beacon became audible and the FY7DF beacon started to be worked on the beam-heading. Contacts then were made with Z33D, at 1240UTC, and with 9L1US, at 1310UTC. He had been heard calling c.q. for some time but no replies. The 9L1US beacon was still being copied at 1400UTC. Geoff hears this beacon every day, between 0900 to 1400UTC. In the main morning it was very weak, with no flutter but around 1200UTC the propagation mode appears to change, and the note of the beacon sounds quite echoy, very much like multi-path signal. This change takes place within 20 minutes but the signal is never lost. Geoff wonders whether this other mode is pure t.e.p. or is it another form of propagation?

Various openings were recorded throughout the month, mainly restricted to the Southern African continent but on February 28 the real DX return. At 0930UTC the band opened up to Australia with VK6YU being heard weakly. As the opening progressed signals became stronger allowing contacts to be made with VK6BH, VK6SDK, VK6XV and VK74Y. The signals from VK74Y were very strong. A very weak VK8 station was heard but not worked. Adrian CA2MM was worked via backscatter at 1020UTC after the Australian stations had faded out. The FY7DF, 9L1US and G3DIX beacon then began to fade, all via backscatter. Certainly a very interesting month from Geoff's point of view but very frustrating for the rest of the UK operators on the mainland. Our turn will come soon.

As mentioned in the report from CBCC, Dave Heil K8MM (ex-J52US) is now on the air from Sierra Leone. Whilst waiting for his permanent call, 9L1US, he operated from the club station 9L1SL for a few weeks. Dave will be busy laying plans to activate the African countries such as Guinea (3K), Mali (T2) and Burkina Faso (XT) whilst on his tour of duty. Dave asks that stations working him on 50MHz do so in "context style" so that more stations will have a chance to work him. He also requests that stations work him only once he is getting no takers while calling CQ. He runs about 80 watts output on 50MHz, but is always happy to take and hang around for a quick contact. When operating as J52US stations continually called when marginal and this practice resulted in the loss of many contacts. We have generally prefers to operate c.w. around 50.09MHz. QSL cards go via his manager, Kenneth Schepker WA6OUC, 3675 Cedarline Drive, Cincinnati, Ohio 45247, USA.

The 70MHz Band

From OSB The Newsletter for Four Metres, edited by Roger Barnard GW4GNN, comes the news of what may prove to be the first two-way s.s.b. contact on the band. Geoff Gray GW3NAG worked GW1LX for over two hours, exchanging pictures with his portable camera. Geoff was using all home constructed equipment, apart from the camera and TS202S, whilst Ralph GW1LX used all commercial gear including a Robot 1200 scan converter.

Emerson Helwing E9G located in Warrington, County Cork is now active on the band. He is running a Microwave Modules transverter and Vaby antenna.

Victor Mitchell G4ONL passes on the information that he regularly leaves a beacon running from his shack between 20.150 to 20.155MHz, so it may be worth bearing in his direction from time to time.

Ian Kyle G1BAY is also active on the band. Although he has a poor take-off into the UK, virtually ruling out tropo contacts, Ian can usually be found whenever there is a sniff of an aurora.

Another station that is normally heard via aurora is Tony Ritchie GM3WYL (I07S). He has been operating with an indoor 1098CV antenna but will shortly be putting a 4-element Yagi on the mast.

The 144MHz Band

Although tropo conditions were virtually non-existent during February there were a number of minor auroral openings to live up the band.

John Lincoln G4MUJ reports a good event on January 30, collecting a new square, IO9S, when G1RO was worked. Contacts were also made with DL LA, GM and G. John describes the recent winds in the north as being normal for the time of the year, with only one director being bent from the antennas.
Standing in the wind-swept north, comes a rebuke from Peter Bates GM4BYF. He mentions the aurora on December 1 which had described previously as 'not very spectacular'. Peter didn't think so either, having worked a string of PA stations, but at 2230UTC on February 4, he wondered if anyone else heard RSBCO or could confirm his location. My listing of USSR v.h.f. operators, based on information from John Lemay G4ZTR (ESX) mentions RB5CCO as being in KN59. He is also quite responsible for the aurora on February 4, when contacts were made with GSM4JJJ and 1000th InoEuz-E contact! His listing was not well reported or there was some illegal activity. Peter was surprised when the Ukrainian operator, RB5CCO called on this frequency during the weekends. It was marginally better on February 4, when contacts were made with OM4BYF, OM4CBQ, OM4FPH and OM4FJN (MB3). Unfortunately the first two schedules had to be abandoned because of poor visibility. At the beginning of the third schedule nothing was heard from WA7CJO. This was a bit worrying as they were working a 300W amplifier and should have been quite readable. It was then decided to check steering accuracy by looking for moon noise with a wideband receiver. It was quickly discovered that the moon noise was at 65 degrees off track. The signal had been properly aligned on the moon signal from WA7CJO was copied immediately. Using 5 minute transmit/receive periods, the signal was completed in less than 30 minutes. The signal from WA7CJO had a strong auroral quality, 44A, with a little hint of pure tone and was not very difficult to copy. Future plans at K2UYH, include improving the receive system by using a h.e.m. preamplifier and getting a new 5m dish installed.

Where has reached me of a 10GHz e.m.e. contact, after several unsuccessful attempts, with Allen Katz K2UHY and Jim WA7CJO. Another station active on 430MHz in e.m.e. is Peter Blair G3LTF. During the month of June, he will be celebrating the 20th anniversary of his first e.m.e. contact! His programme is Sandown Racecourse, Esher. The convention, organised by members of the RSGB VHF Committee, opens at 10.00 a.m. A comprehensive trade exhibition will last until the close of play, at 6 p.m. A detailed lecture programme will commence from 2.15 p.m. Subjects include Transverter optimisation, DX and the Solar Cycle, Amateur Satellites, Laser Communications, and Microwave Construction. There will also be forums by the VHF Contests Committee, Microwave Committee and the Morse Test Group. Annual General Meetings of the UK Six Metre Group and the Remote Imaging Group will also be held in the Conference Centre. Most of the RSGB Specialist Committees and the Spectrum Managers will be in attendance. The convention will be held at the St. George's Hotel, Farnham. The RSGB VHF National Convention will take place on Saturday May 12th and not on the 13th as unfortunately was incorrectly announced in the previous issue of Practical Wireless. The venue for the RSGB VHF National Convention will be in attendance. You can find them in the main trade exhibition. A reminder of the date again, Saturday May 12th. It is on the same day as the FA Cup Final. Come on the Reds!

John Lemmy GAZTR (ESX) mentions the storm damage affecting nearly property but reports that his modest antennas consisting of two stacked 5 element Yagis supported by fiberglass poles and guyed 24m tower. On January 30, produced a new county for John when GM4CLN/V was worked. During February included operating mobile, with Ron G10IB, using a SSB Electronics 10GHz transverter driving a Hughes travelling wave tube having 37W output. A dish mounted, GaAsf.e.t. low noise amplifier was connected through a bandpass filter into a 2-stage WBSJJA type preamplifier, using AFT10155s, into the 10GHz transverter. The dish was mounted on a simple tripod and used visual sighting of the moon with the aid of a bore sight tube. This was a bit worrying as the bore sighting tube had slightly moved and the dish was a few degrees off track. Once the dish had been properly aligned on the moon signal the WA7CJO was copied immediately. Using 5 minute transmit/receive periods, the signal was completed in less than 30 minutes. The signal from WA7CJO had a strong auroral quality, 44A, with a little hint of pure tone and was not very difficult to copy. Future plans at K2UYH, include improving the receive system by using a h.e.m. preamplifier and getting a new 5m dish installed.

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Practical Wireless, May 1990

Beacon and Repeater News

Terry Cooper G4XDP, Secretary of the Mid Cornwall Beacon and Repeater Group, reported that the all-PC unit has been completely blown off causing much damage. The group are awaiting repairs to the building and suspect that all feeder cables may require checking. If you want further information you can telephone G4XDP on (0726) 830 48.

Meteor Showers

During the next few weeks there are a number of useful meteor showers which can be utilised to increase your county or squares totals. The following data will help you determine in which direction to beam at specific times and when the shower will not be visible.

The Lyrids, shower, which is due to peak on April 18-25, has maximum activity on April 21. Between 0100-0300 and 0400-0600 beam west or east, 0600-0700 beam north or south. This shower is below the horizon from 1300-0100 UTC and therefore is not visible at any time.

The Eta Aquarids shower runs between April 21 to May 12 with maximum activity on April 22. The shower is below the horizon between 1600-0300 UTC.

Expeditions

Andy Adams G4WKG/MM has sent me further news regarding his North Sea Wet Squares activity. Although the Royal Research Ship Challenger was scheduled to leave Barry, South Wales on February 26, the ship was delayed for two days due to the bad weather. Andy should have started the first leg of the North Sea cruise, leaving Dundee, on April 3. The ship was then scheduled to sail eastwards towards Denmark and then sail in a northerly direction following the Norwegian coast up as far as Stavanger. The track then continues in a south-westerly direction to Aberdeen, north to the Orkney Islands, around the Faroe Islands, crossing to Bergen, Norway and then sail in a southerly direction to arrive in Den Helder, Holland on April 14. The second leg of the journey will commence on April 18 and includes the area covered by locators J500, D1, 02, 03, 04, 11, 12, 13, 14, 21, 22, 23, 24, 33, 34, to arrive in Great Yarmouth on May 3. A 50MHz permit has been issued for two frequencies, 50.100 and 50.110 MHz for use by the communications team accompanying the Anglo/Soviet North Pole Expedition. The UK communication officials will be Lawrence GM4MNA and Morag Howells GM4MUV. Other operators will be Leonid Libitin UA3CR and Dimitri Shparo UA3AJH. In addition to the commercial side of the operation the team will be active on most amateur bands, including 50MHz. This is the first permit to be issued for use in the USSR and it is expected that permission will also be granted to use the callsign G8M6/UA0 from the main base camp (K05SKC) and G8C/UA0 from the forward base camp, located at 80 degrees north. Base camp will be operational from 18.00 to 20.00 UTC and via Oscar 10/13 and RS11/10(UK). For 50MHz operation an FT-650, 100W amplifier and a 4-element Yagi will be used. This arrangement will be via Ian Crockford GM1AUV. The card will contain information about the expedition and the fund raising for the Multiple Sclerosis Society.

A group of amateurs, including G1SW/UA0 are now operating from the island of Harris, Outer Hebrides (I0XM7), for 2 weeks until April 21. Operation is on 50MHz, 144MHz and the team is running 100W e.p.r. on 50MHz from a 5-element Yagi, whilst on 144MHz the equipment consists of a 100W amplifier into a 9-element Yagi. Operators of the 50MHz band wanting to work the island of Homs should listen out for G2H/UA0 operational between May 1-5. The team consists of members of the Northants Expedition Group, who will include G8LF, G7TX, G6A, G5EQ, G6S, G6BA. Please note that QSL cards should be sent to the GB2HI bureau.

A joint American/Russian expedition will operate from the Kaukassian mountains of the Ukraine on 40, 144 and 1296MHz. Further details nearer the date.

Help Required

David Law G0LBBK has heard about a 144MHz nine-element Yagi on a 4M boom, designed by G0SFX, but does not know the source of any published information. If you have any knowledge of this antenna then please pass it on.

Deadlines

With the possibility of improving conditions on the v.h.f. bands I am expecting a bumper mailbag. Please send your letters to me to arrive by April 30. The other two deadlines are May 28 and June 26.
Looking on the demodulation technique, there are a number of design options available and the one chosen for this unit was the two tone filter type. This type of unit employs a limiter and two band-pass filters at the front end - one tuned to the mark frequency and the other to the space frequency. The number of filters cascaded varies from design to design but the most common is 2 to 6 amps per filter. The output of each filter is then combined using an op-amp chopper which, with a 5V supply rail produces a t.t.i. compatible output.

The -5V rail for the op-amps is internally generated using a 7660 integrated circuit, so the only external supply needed is 5V. From past experience this type of terminal unit is particularly effective for h.f. operation where condition can be very difficult. The system employed was quite basic and the interface connector at each end. The radio interfacing with the BBC B was simplicity itself, requiring the construction of just one ribbon cable with standard 20 way i.d.c. connectors at each end. The radio side of the terminal unit was also very simple to interface and I chose to use a f.s.k. employing the tones generated using true f.s.k. and this is also easily supported, providing of course your transceiver has the facility.

Although I used the terminal to make contacts on both RTTY and AMTOR, it's really the receive side that is under test. I must say I was very pleased with the results, all strong signals were handled with, as expected, no difficulties at all. Signals that were close to the noise floor also copied well, even in the presence of some selective fading. Performance in amongst the QRM was also good and the result, all strong signals were handled with, as expected, no difficulties at all. Signals that were close to the noise floor also copied well, even in the presence of some selective fading. Performance in amongst the QRM was also good and the standard of overall audio filter, both prices again fully inclusive.

Summary

The Data Compact from G3LIV performed very well throughout the review period, living up to the high quality of previous terminal units from this source. If you own a BBC B and are looking for a terminal unit this must be one of the front runners both in terms of performance and neat appearance. The cable basic unit for RTTY is available at a fully inclusive price of £59.00. If you need the optional boards they are priced at £12.50 for the AMTOR/ timbing board and £10.00 for the pre-limiter audio filter, both again fully included. The contact address is Mr J. Melvin G3LIV, 2 Salters Court, Gosforth, Newcastle, Tyne and Wear NE3 5BH. My thanks to Johnn for the loan of the review model.

Spectrum Software

Some good news for Spectrum computer owners - J & P Electronics are launching an e.p.r.o.m. loader for this computer at Spring RSGB Rally at the N.E.C. Birmingham. One of the common means from Spectrum users is the time it takes to load software from tape, well J & P now have an answer to this in the form of their new e.p.r.o.m. loader. This unit can be set up with up to four programs from the J & P range, any of which can be loaded in a matter of seconds as opposed to lengthy wait associated with tape loading. As an additional bonus the unit can be supplied with the hardware associated with the program built in. For example the top of the range unit will include the FAX hardware and audio filters with a.g.c. So not only do you get faster load times but a nearer station as well.

The Spectrum models supported at present are as follows: Spectrum, Spectrum Plus, Spectrum 128 and Spectrum 128 + 2. Users of other Spectrum models have not been forgotten and work is still in progress on these units. The prices have yet to be finalised, but a basic receive only unit with one program installed is likely to be £75.50, while the top of the range with FAX, RTTY, SSTV and Morse software complete with all hardware will be less than £200.00. So if you're interested why not visit the next G3LIV get to J & P Electronics, Unit 45, Meadowmill Est, Dixon St, Kidderminster DY10 1HH.

Commodore Radio User Group

I have just received the latest news letter from this active group. It would seem that Simon Lewis GM3PLM and his wife Lyn are doing a sterling job against all the odds. What this really comes down to is that they need some help, in the form of Commodore users who are prepared to make a contribution to the running of a lively user group. At present the club improves quickly and I'm sure all readers users with their activities specialising in radio items. They have a very good range of C-64 software on disk (seventeen disks at the last count) and ever provide very valuable support to the older machines. They even have e.p.r.o.m. based RTTY and AMTOR software for the Commodore PET 3000 and 4000 series machines. For more information on the group and how you can help please send a s.e. to Simon Lewis, Commodore Radio Users Group, 66 Camperdown Court, Helensburgh, Strathclyde G84 9HJ.

BARTG Changes

Regular readers will remember that I recently announced that Pat and John decided we were stepping down from the job of membership secretary for BARTG and that G6T7F would be taking over. Sadly ill-health has hit G6T7F's family and she has had to pull out. So I hope that situation will improve and we may hear from her soon. The new arrangements are that Pat and John take the membership secretary job back until the BARTG A.G.M. in November. So to summarise, all membership and general enquiries about BARTG should be directed to Pat & John Beedie, Flynmont, Salem, Llandudno, Dyfed SA19 7NP, Phone (0558) 82228. Incidentally the subs rates for 1990 are £10.00 UK, £14.00 Europe & Eire, £14.00 Overseas surface, £22.00 Overseas air mail.

Atari Software

I have had many letters in the past from readers asking for information on sources of radio software for Atari 800 series computers. I have managed to locate a few sources, but nothing very spectacular. However a recent letter from Nick Ashby of Wemby identifies what looks like a very good source of software in the States. The company is called Electrosell and the address is 1656 South California Street, Loveland, CO 80537 USA. The software they advertise is designed to work on the following Atari models: 400, 800, 60XL, 800XL, 1200XL,65XE and 130XE. All programs are available on disk, tape or in cartridge form which should suit virtually all users. There are a total of four programs available to cover c.w., RTTY, ASCII and Packet - all have a transceive capability. Of course the usual warnings apply, i.e. buyer beware, particularly as I have no direct experience of this company. My thanks to Nick Ashby for taking the trouble to write.

Rally Programme

For those of you who would like to meet me and have a chat about the hobby, I will be attending a number of rallies during the year, helping out on the PW & SWM stand. The schedule is as follows: RSGB WHF Convention Sandown Park, May 12; Harrogate, May 20; Elvaston Castle, Derby, June 10; Cornish Rally, Truro, July 14; BARTG Rally, September 16; Llandudno, October 20/21. I look forward to seeing you there.
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<thead>
<tr>
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<th>Assembled</th>
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<tr>
<td><strong>Straight hand key</strong></td>
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<tr>
<td><strong>Twin paddle key</strong></td>
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</tr>
<tr>
<td><strong>Single paddle key</strong></td>
<td>33.50</td>
</tr>
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</table>

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Practical Wireless, May 1990
Welcome JO-20
The new Japanese satellite is now up, on, and fully active. It is operating to the best intentions of JARL and JAMSAT, and to everyones' complete delight and satisfaction.

Shokuroku JAI-AN, President of the Japan Amateur Radio League wrote on 7 February to announce the successful launch and send an early set of Keplerian elements. He said that the I-1 No.6 launch vehicle lifted off from the Tanegashima Space Centre at 0133 UTC on 7 February, carrying not only the main MOS-1-B and JAS-1-B, but another very similar satellite in shape and weight to JS-1-B called 'DEP', standing for DEployable Boom and Umbrella Test. Separation of JAS-1-B from the launch vehicle was at 0233, and the first signals from the 100mW 435-750MHz telemetry beacon were heard in Tokyo at 0308. “The condition of the bird seems good, and the beacon signal with a pre-amplifier can be heard well” says Shokuro.

"JS-1-B was named 'FUJI no 2' in Japanese, and may also be called 'FUJICOM-A'.

A good equator crossing reference for NC-19 is 1200 degrees north, giving extensive visibility for UK users, particularly those in the coastal areas such as W5, W7, WA0, JA2, etc. After having been on the go for some 7-8 days, it has made its way to the westerly end of the downlink band, s.s.b., in this column, the analogue 'JA' will be used in all passes, s.s.b.

The orbit that it has been placed into by using the spare fuel from the launch vehicle for extra boost has placed the satellite in a 135 degrees inclination, and a 0.001 eccentricity elliptical orbit, with a perigee of 938Km and an apogee of 1715Km. This is highly advantageous, and not only provides for far longer periods out of earth's shadow to use the lower half of the downlink, s.s.b. in this column, the analogue 'JA' will be used in all passes, s.s.b.

A set of UK passes for the week end of 15th/16th February will be announced soon.

As a reminder to those already published in this column, the analogue 'JA' transponder inverts signals from an uplink passband of 142-340 kHz to a downlink passband of 435-500 kHz.

Hellesdon, Norwich, Norfolk NR6 6DX

1504

Fig. 2

Amateur Satellites

Reports to Pat Gowen G3IOR
17 Heath Crescent
Hellesdon, Norwich, Norfolk NR6 6DX

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Back-Scaler

A.F.S.K. signals, nothing more was heard after 0500UTC on 23 January, despite continuous attempts by the University of Surrey command to activate the redundant on-board systems. Some listeners have reported weak signals on 145.8 MHz but, with so many mystery satellites now being observed on the 700mW band, these cannot definitely be related as coming from U-15. There are rumours, backed up by others, that a different than expected Keplerian elements discovered for this satellite, of a possible collision, the terminal results of which were delayed. Such slow death might have occurred if the solar panel had not been impacted, resulting in the drainage of battery power, or the failure of the panels to permit battery recharge.

The services of the giant radio telescope at Stanford, California, are being pressed to rekindle the 140MHz band.

Despite the legal use of the exclusive space only French speaking terrestrial F.M. users allocated 145.8-146.0 MHz band could illegally use the exclusive space only.

Japanese hand-held rubber duck antenna produced a dual vertical for 437MHz. Even a 1.5W output worked a few old European friends last 20dB over the beacon, and out of band. I wrote that he is rather disappointed with the synchronous detector he is using. The beam is ex-G5LI in Quebec. He has been listening to "JA" transponder for c.w. and A.M. transponder s.s.b. operation. Dave Rowan writes that he is rather disappointed with the synchronous detector he is using. The beam is ex-G5LI in Quebec. He has been listening to "JA" transponder for c.w. and A.M. transponder s.s.b. operation.

"145.9 MHz" writes George. "Some signals are impossible to understand, as the beacon is different than expected. Keplerian elements discovered for this satellite, of a possible collision, the terminal results of which were delayed. Slow death might have occurred if the solar panel had not been impacted, resulting in the drainage of battery power, or the failure of the panels to permit battery recharge. As a further reminder, the single 435.10MHz downlink is fed by uplinks on 145.850, 145.870, 145.890 and 145.910MHz.

The Microsats

It is just as well that the SPOT-III launch carrying the six amateur radio microsatellites was not postponed to the following Ariane mission, as two minutes into mission after an offset main stage thruster succeeded in burning the launch gantry through the sensor block, and a 0.8 dB NF pre-amplifier. All the telemetry readings look good, showing this satellite to be in excellent health.

DOVE, OSCAR-17, will be the last to be loaded, as a vast amount of information needs to be beamed up to its memory and transmitted in operation and 145MHz bandpackets for close fits to attempt to match the assigned object numbers. It could not be stated categorically that the OSCAR satellite number to the found object number was absolute, as these were early indications.

The set of Keplerian elements and the assignments given were as follows: Satellite

<table>
<thead>
<tr>
<th>U-o-14</th>
<th>OSCAR-15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catalogue Number</td>
<td>29438</td>
</tr>
<tr>
<td>Epoch Set Number</td>
<td>7</td>
</tr>
<tr>
<td>Epoch</td>
<td>90</td>
</tr>
<tr>
<td>Frequency</td>
<td>10432425</td>
</tr>
<tr>
<td>pre-amplifier</td>
<td>82382169</td>
</tr>
<tr>
<td>Gain</td>
<td>97.716</td>
</tr>
<tr>
<td>RAAN</td>
<td>100.773</td>
</tr>
<tr>
<td>Eccentricity</td>
<td>0.001029</td>
</tr>
<tr>
<td>Argument of Perigee</td>
<td>208.902</td>
</tr>
<tr>
<td>Mean Anomaly</td>
<td>150.826</td>
</tr>
<tr>
<td>Mean Motion</td>
<td>14.294545</td>
</tr>
<tr>
<td>Asc. Dec. Draw/Dir</td>
<td>1.546546</td>
</tr>
<tr>
<td>S.O.S.</td>
<td>37.097194</td>
</tr>
<tr>
<td>Beacon Frequency</td>
<td>25</td>
</tr>
<tr>
<td>435.850, 435.870, 435.910MHz</td>
<td></td>
</tr>
</tbody>
</table>

The AMSAT cluster were very tightly packed in the first week following launch. The Doppler TCA curves could be used to discriminate between the eight different satellites.

Microsat Keplerian Elements

Whilst early NORAD location gave good discrimination between the eight different objects placed in orbit by the ARIANE launch, only successive AOS, LOS, and Doppler TCA could be used to determine which object was which. It was too difficult to eliminate the SPOT-II satellite and the ARIANE third stage, but the AMSAT cluster were very tightly packed for the first week following launch. The enigma of unravelling the bunch to discrete satellites was performed after the first few days of flight by Ray Starke W2RS, Bob McGwier N4HY, Phil Karn KA9QI and many others, who plugged in the supplied NASA/NORAD set of personal Keplerian elements, and then watched the individual satellites for close fits to attempt to match the assigned object numbers. It could not be stated categorically that the OSCAR satellite number to the found object number was absolute, as these were early indications.

The set of Keplerian elements and the assignments given were as follows:

Satellite

<table>
<thead>
<tr>
<th>AD-18</th>
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<tr>
<td>Epoch Set Number</td>
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</tr>
<tr>
<td>Epoch</td>
<td>90</td>
</tr>
<tr>
<td>Frequency</td>
<td>10432425</td>
</tr>
<tr>
<td>AOS-19</td>
<td>208.902</td>
</tr>
<tr>
<td>Frequency</td>
<td>145.828</td>
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<tr>
<td>Gain</td>
<td>97.716</td>
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The SPOT-II satellite was well defined, as object 90-05-A, whilst the third stage of the launcher was 90-05-H, both of which are visible to the eye and are high profile RADAR reflectors. These are well separated from the microsat pack now, and can be eliminated from the group identification matchings.

In the third week of February, NORAD and NASA shed further light by assigning the object numbers and different catalogue numbers, which were then further identified with the still closely packed amateur satellite stream. The latest results is that object number 90-05-B is catalogue number 20437, OSCAR-14, UoSAT-D, Object 90-05-C, catalogue number 20438 is OSCAR-15, UoSAT-E; Object 90-05-D is catalogue number 20439, PACSAT OSCAR-16; Object 90-05-F is catalogue number 20440 is DOVE: OSCAR-17; Object 90-05-G is catalogue number 20441, WEBSAT, OSCAR-18, and that object number 90-05-Ga catalogue number 20442, LLU-SAT, OSCAR-19.

By the time you apply these elements, the tightly packed bunch will have spread out, so permitting defined AOS, TCA and LOS times. You will then know if your findings agree or otherwise with the calculated passes for your location, and will be able to adjust if this is necessary.

Next month we will publish the full and latest set, by when all will be definite.

For those using plotters or calculators for tracking, here follows the information on the period and westerly increment per orbit, plus a reference equator crossing gave date, orbit number, UTC time of crossing and the degrees west of that crossing. Note how the missing UO-15 is way out ahead of the others. See Table above.

John Brangan GM4HUS has sent in Table 3, his computer graphics derived plot of ground tracks for the average microsatellites, showing those passing in range of the UK, based on London. He gives the approximate UTC pass times, plus or minus 50 minutes as pass 1, 0040; 2, 0220; 3, 0400; 4, 0540; 5, 0720; 6, 0900; 7, 1040; 8, 1220; 9, 1400; 10, 1540; 11, 1720; 12, 1900; 13, 2040, and pass 14 2200. The arrow on the track indicates the direction of the pass. It can be seen that the UK is well served by the437.15MHz frequency, but is too weak on 437.025MHz. "LUSAT on 437.15MHz is stronger, giving 5% copy even on the low angle polar passes, whilst LUSAT on 437.125MHz is a good copy." writes John. Both PACSAT and LUSAT signals flutter at some 5kHz when the satellites are near the poles in the afternoons, but LUSAT is strong enough to override and still print - PACSAT is not.

OSCAR-10

A 0-10 was out of sunlight for several weeks in February, when no transponder usage was permitted. If it has again, as expected, overcome the rigours of the dead period, it should be up, and running and capable of good mode 'B' transponding by the time you read this column. The attitude for the future is as follows: April, ALON 29; July, 17/-; 16/-; October, 5/2; January 1991, 350/2. Remember that with the IIGH gone bust, no magnetorquer re-orientation of the satellite attitude is possible.

OSCAR-13

AO-13 users will be well aware that the best communications are provided when the main lobes of the satellite are pointing directly at the user station on earth, so providing the best possible uplink transponding and the strongest and least spin modulated downlink. This ideal condition cannot always be maintained, as the power charge storage of the battery has to be considered by ensuring that the solar cells see the most direct sunlight. The antenna pointing attitude of OSCAR-13, as at March 19 is ALAT 207, ALON 1.7 degrees. On April 5 it goes to 207.6 and 11.1, on April 16 207.8 and 0.6, and on April 30 208 and 0.1. Until then the next ground commanded change to provide optimum solar cell charge relative to the best antenna pointing the schedule, the OSCAR-13 operational transponder schedule until 9 May 1990 is:

Mode 'B' transponder on from MA 0 to MA 165.
Mode 'L' transponder from on from MA 165 to MA 190.
Mode 'LS' transponder on from MA 190 to MA 195.
Mode 'S' beacon plus 'L' transponder on.
Mode 'S' transponder on from MA 195 to MA 200.
Mode 'BS' on from Mean Anomaly 200 to MA 205.
Mode 'B' transponder on again from MA 205 to MA 295.

The semi-directional antennas are employed around perigee between MA 240 and MA 600, and only the 'S' mode transponder on the brighter 'B' beacon will be on from MA 195 to MA 200.

Tony Hopwood (Upton on Severn) and Doug Smillie heard the auroral influence on some radio signals on the 25th and 26th. Ern Warwick heard 'pulses' from noted strong echoes on signals about 500km away and weaker on signals around 2000km away at 1300 on January 28, whilst echoes on the beacon WA4DJS (28MHz) on the 26th and K5OS/8 (14MHz) on the 29th and February 1. He also reports that signals from the German beacon DK3WYC (10MHz) was influenced by 'weak aurora' at 1940 on February 23 and 1925 on the 24th. Many of you, unfamiliar with this effect may remember hearing the normal sharp note of a cw signal become horribly raspy and/or a single side band transmission change to a 'ghostly' whisper and not realised that this was being caused by an auroral manifestation. Conditions like this are simply described as tone-a.

Magnetic

The 'jam jar' magnetometer, operated by Ron Livesey, detected 'storm thresholds' on January 5, 14, 20, 22, 23 and 29. Ron received additional reports of 'pulses' from Doug Smillie (Wichawa), using a Hall effect...
unit, on days 8, 13, 21, 22, 24, 29 and 30. ‘Large pulses’ from Garry Hawkins (Bristol) on days 22, 24 and 30 and ‘very unsettled’ from Karl Lewis (Saltash) on days 16, 20, 23, 24, 25, 29 and 30. Both Garry and Karl use fluxgate instruments. "The Ap index for January was quiet to unsettled," wrote Neil Clarke whose computer print out showing the daily index variations can be seen in Fig. 6b.

**Spordic-E and 'F2'**

John Woodcock (Basingstoke) received unlockable pictures in Band I on January 11 and heard very strong Middle East type music and similar pictures at noon on the 23rd. Simon Hamer (New Radnor) logged smoky 'F2' pictures at 1330 on the 17th, 18th and 30th on Ch. E2 (48.25MHz) and David Glenday (Arbroath) logged weak 'F2' activity on Chs. E2 and R1 (49.75MHz) at 1215 on the 21st. Between them, David and Simon received television signals from Finland, Iceland, Italy, Scandinavia and the USSR in Band I during outbursts of Spordic-E on January 5, 11, 12, 15, 16, 19 and 23. Em Warwick found 28MHz almost dead on February 16 and reports a fade-out followed by a dead band during the afternoon of the 21st.

**Propagation Beacons**

First, my thanks to Mark Appleby G4XII (Scarborough), Chris van den Berg (The Hague), Henry Hattfield, John Levesley GOHJL (Brislington), Greg Lovelock G3III (Shipston-on-Stour), Ted Owen (Maiden), Fred Pallant G3RNM (Shoreham), Ted Winning and Em Warwick for all the extra information they pack into their 28MHz beacon logs.

Although I cannot use all of it I can compile the main chart of when the beacons were heard, Fig. 5 and include some of the additional gen under the appropriate headings elsewhere in this column. Among the new beacons heard this time, Mark Appleby logged H65GEW on 28.222MHz, "on the same spot as H62HHA was before" and Em Warwick copied SB42L on 28.216MHz sending "QTH XM64 UK 2000m ASL 10 WATTS FSE QSL VIA ZC4EP." Both Mark and Em heard K40DK/B (28.220MHz) around 1620 on February 11, keying, "QSL PO BOX 3581 WILMINGTON/NC 28403," most watchers logged K66Y (28.202MHz) and a "new one from Naini," came up, "said Ted Owen after he found S2/AFR on 28.245MHz on February 25. Em Warwick has also seen C40MIN on 24.915MHz and Frank on 24.931MHz, G4XIII, ZS3DN/B and 4X6TU/B on 14.100MHz and DQXWCY on 10.144MHz.

**Tropospheric**

The slightly rounded atmospheric pressure readings, Fig. 4, for the period January 26 to February 25 were taken at noon and midnight from the Short and Mason barograph which I have used continually since 1982. The graph in Fig. 8 shows extremes ranging from 28.1
Fig. 8: A couple of massive filaments dominating the area of the sun photographed by Cmdr Henry Hatfield on 28 August 1989 at 0956 UTC. Please note you should NEVER try to photograph the sun DIRECT, Henry Hatfield uses special scientific equipment to achieve these results. Looking directly at the sun could damage your sight permanently.

I reported in last month’s column that a clandestine station had been heard in the Soviet Union, transmitting in the Azeri language, on frequencies used by the Soviet domestic second, or ‘Mayak’, programme. The Soviet government responded to this ‘Freedom’ station by broadcasting a new unidentified station, also in Azeri, giving the domestic second, or ‘Maya k’, programme. The station also wishes to increase its transmissions in Estonian and Latvian, and some other languages, including Spanish and French, may have to suffer cutbacks. The Directors of the two German and English broadcasts, whilst making it sound a little like Western classical music from the West. No reports from the international media and tracker identified programmes for the Canary Islands, south-west France and Spain in Band II while Rob heard a Spanish amateur station, on 144MHz, using hand-held equipment! John Woodcock received pictures at varying strengths from CANAL+ only, between 1000 and 1500 on February 6, 16, 19 and 24.

934MHz

“Whenever tropospheric conditions are good, very long ranges can be achieved with the legal 12 element beam antenna,” wrote John Levesley UK -627, the contest manager for the RS4MHz Club UK and added, “Even with a simple vertical aerial you can work well over 150 miles under lift conditions.” John’s best vertical to vertical contact was from his home in south-west Hampshire to a merchant vessel off Ushant, about 25km with 4 watts fm. During February, John received signals from Guernsey on the 4th, 5th and 7th.

The Voice of the GDR [Stimme der DDR] has been renamed Deutschlandsender, and has transmitted under this title since February 12. The external services of West and East Germany [Deutsche Welle and R Berlin International] have agreed to coproduce in some fields, whilst maintaining full independence. The Directors of the two organisations are particularly keen to work more closely together in technological matters, such as frequency co-ordination and study of listener and reception analyses. Last month in this column I asked what will happen to DW and RFI on completion of German unification later this year, and this agreement between the Directors may well be a precursor to a merger.

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The Microreader is a small compact unit that allows anyone equipped with a suitable SW receiver, to read Morse & RTTY signals simply and without fuss. In both cases the characters are shown on the display.

In the tutor mode, the Microreader will send random groups of characters with variable speed & spacing, or plug in your own morse key to check your work out of RTTY. Despite the fact the Microreader contains two fast processors (12 MHz), it is extremely quiet generating virtually no RFI. The Microreader can also if you wish, transfer the decoded messages to any printer, computer or terminal unit equipped with an RS232 port.

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to start Polish language broadcasts. Meanwhile a Danish politician has suggested at the Nordic Council session held recently in Iceland that the Nordic countries should establish a joint radio station to broadcast all over the world. The propoal suggests that the programmes could be produced by journalists in the different Scandinavinan countries, and then put together in a joint main broadcasting office.

A Swedish commercial station has commenced test transmissions from facilities in Poland twice daily. Based in Malmo, Radio Scandinavia was last heard of when it broadcast from Radio Andorra's f.m. transmitter in the late 1970s. A new station beaming to Cuba in Spanish has started using the facilities of WHRR in the United States and Radio Clarin in the Dominican Republic. The Voice of the Foundation is put together by the Cuban American National Foundation in Miami, claiming that it is an integral and important part of the Cuban society in the United States.

A new 500kW transmitter has been inaugurated at Africa No 1 in Libreville, Gabon.

Radio Canada International's German language broadcasts were heard for the last time on February 23. Attempts to secure financing for the service were unsuccessful. The Voice of America is to cease services in six languages during the summer, including Greek, Indonesian, Portuguese and Laotian from April 1, and Uzbek and Swahili on June 1. The decision to close the Uzbek language section may also be reversed in view of the current situation in parts of the Soviet Union where unrest continues and nationalist fervour continues to make the news. More than 200 jobs have been cut from the Voice since December 1987, and this reduction has gone hand in hand with reductions in advertising, promotion and foreign travel for staff.

European Stations

All time GMT/UTC

Radio Tirana has announced its current English language broadcast schedule:

0630 on 9.50 & 7.205MHz
1830 on 9.48, 7.12 & 1.395MHz
2230 on 9.48, 7.215 & 1.395MHz

To North America
0200 on 11.825 & 9.756MHz
0330 on 11.825 & 8.9MHz
2330 on 11.825, 9.76 & 6.12MHz
To Asia and Australasia
0700 on 11.825 & 8.505MHz
1300 on 11.825 & 6.505MHz
To Africa
0430 on 11.825 & 6.505MHz
1530 on 11.825 & 6.505MHz

The test transmissions of Radio Scandinavia by transmitters belonging to Radio Norway International. European transmissions are:

0630-0655 on 15.16 & 6.985MHz
0700-0730 on 17.745, 17.72 & 15.85MHz
1300-1355 on 11.94MHz

Radio Budapest's new transmissions to Eastern Europe may be heard at 0611MHz as per:

0400-0415 in Russian
0415-0430 in Romanian
0600-0615 in Swedish
0515-0530 in Serbo-Croat

Evening transmissions in these four new languages start at 1700, but are audible in the United Kingdom since 6.11MHz carries Budapest in Turkish at that time. It is assumed that the same frequency is used from two different transmitter sites at that hour.

Radio Meditteranean from Malta has not been heard for some weeks. The station, which used the facilities of the Deutsche Welle relay station on the island, transmitted in English, French and Arabic on 6.11 and 1.557MHz during the evening at 1800 and again at 2130.

Radio Bucharest in Romania has English broadcasts:

0200-0300 on 11.94, 11.83, 9.57, 9.51, 6.155 & 5.995MHz
0400-0430 on 11.94, 11.83, 9.57, 9.51, 6.155 & 5.995MHz
0530-0600 on 17.745, 17.72 & 15.38MHz
0645-0715 on 21.55, 17.005, 17.72, 15.355 & 11.945MHz
1200-1230 on 17.72 & 15.345MHz
1300-1345 on 21.55, 17.85, 15.365 & 11.945MHz
1500-1535 on 17.745, 17.72, 15.335 & 11.945MHz
1930-2030 on 9.96, 9.195, 7.105 & 10.605MHz
2100-2130 on 9.897, 7.195, 7.105 & 6.105MHz
5.956MHz

Radio Exterior de Espana is asking listeners’ help in assembling a profile of the station’s audience and what they want from the station. Questionnaires, in Spanish, have been sent out to listeners on their mailing list, and further copies are available by writing to REE, Apartado de Correos 156402, Madrid, Spain. There is a reward for one lucky listener: a week’s holiday in the area of Spain of their choice — all expenses paid, naturally.

The test transmissions of Radio Scandinavia by Radio Polonia are heard between 1000 and 1100 on 9.875MHz, with a repeat at 2000 on 1.503MHz. The address of the station is P.O.Box 14008, 0204 Malmo, Sweden.

Middle Eastern and African Stations

Domestic programmes from the Sierra Leone Broadcasting Service open at 0600 in the morning on 3.911MHz, continuing until 0910 when the frequency changes to 5.99 (which is generally inaudible in Europe), returning to 3.911MHz at 1730 or thereabouts. Closedown is at 2215. English news is broadcast throughout the day.

Radio Mogadishu from Somalia appears to have closed down: Previously heard on 8.056 or 9.585 with 50kW the external service has been unheard of for more than a year.

Capital Radio from Transkei broadcasts in English on 3.927MHz from 0230 daily until frequency changes at 0440 or thereafter to 7.165. At 1530, the frequency reverts to 3.927MHz. Closedown is at 2300.

Asian and Pacific Stations

Radio Afghanistan in Kabul which is run by the Soviet backed government has English transmissions beamed to Europe daily at 1830 until 1930 on 6.02, 7.215 and 9.835MHz. English to Asia is transmitted between 0930 until 1030 on 17.72, 15.35, 9.335 and 4.945MHz. The 4.945MHz is a relay within the Soviet Union.

Radio Japan’s English language broadcasts in its General Service are beamed to Europe at:

0700-0800 on 21.56, 21.10, 17.89, 17.81 & 17.765MHz
1500-1600 on 21.70, 11.865 & 11.815MHz
2100-2130 on 17.98, 17.81, 15.27 & 11.915MHz
2300-2400 on 21.81, 17.81, 17.765, 15.195 & 11.835MHz

North, Central and South American Stations

The World Service of the Christian Science Monitor continues to put in good signal to the United Kingdom, with specific transmissions to the European continent:

0000-0400 on 9.98 & 13.765MHz (not Monday)
0400-0600 on 9.84 & 13.765MHz (not Monday)
0600-1000 on 9.94 & 13.765MHz
1400-1600 on 21.78MHz
1600-2000 on 21.64MHz
2000-2200 on 13.77 & 15.16MHz

Listeners to Christian Science Monitor may get the latest frequency information by calling 617-450 2002 in the United States. Ring the 'Shortwave Hotline' on 617-450 2002 for other questions.

The Voice of the Foundation mentioned at the beginning of this article is beam to Latin America in Spanish between 1500 and 1600 on 21.84MHz, and from 0100 until 0200 on 4.95MHz, and to Europe at the same time on 7.315MHz.

Slow Scan TV & FAX on the Amiga

I know from the feedback I get that there are a lot of people with Amigas who would like to put them to use in amateur television: there are probably even more who are sitting on the brink and might be swayed if they knew there was some decent software around. In these pages we have already reviewed VideoStudio and mentioned some other so-called desktop video programs, but only made passing mention of slow-scan applications.
Errors & Updates

A Simple Transistor & FET Tester, February 1990

Two small errors crept into the project on pages 27 to 33 of the February issue of Practical Wireless.

The diode, D11, has been reversed in the drawing Fig. 1. The cathode should have been connected to the point IC on the printed circuit board (the anode being connected to capacitor C4 in Fig. 1).

Along with this reversal of diode polarity, the legends for p-type f.e.t.s and n-type f.e.t.s must now be reversed. This may be achieved by swapping the connections to 26D with the one on 26E and changing 26H with the line to 26G on the circuit board.

A further problem appeared in that, to read the correct polarity of transistor on the meter, the connection to the meter must also be reversed so that p.n.p. transistors cause a deflection to the right.

We apologise to any of our readers for whom these mistakes may have caused difficulties. Thanks to those readers who pointed out the changes that needed to be made when they spoke to staff on the Practical Wireless stand at the London Amateur Radio Show.
The prepaid rate for classified advertisements is 42 pence per word (minimum 12 words), box number 60 p extra. Semi-display setting £13.90 per single column centimetre (minimum 2.5cm). Please add 15% VAT to the total. All cheques, postal orders etc., to be made payable to Practical Wireless. Please ensure that remittance should be sent to the Classified Advertisement Dept., Practical Wireless, Ercino House, The Quay, Poole, Dorset BH15 1PP. Telephone (0202) 676033.

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