MAY 1987 £1·10

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# Practical Wireless

The Radio Magazine

## The ICOM IC-28E 2m Mobile Rig Reviewed

## Mods For The AR-2001

## Versatile Signal Tracer

## PW SPECIAL OFFER
## Black Star 600MHz Frequency Counter

# Reg Ward & Co. Ltd.


## 1 Western Parade, West Street, Axminster, Devon, EX13 5NY.

**Telephone: Axminster (0297) 34918**


## Yaesu

| | | | |
|---|---|---|---|
| FT1 | HF Transceiver | P.O.A. | (—) |
| FT980 | HF Transceiver | 1750.00 | (—) |
| SP980 | Speaker | 110.00 | (2.50) |
| FT767 | | 1550.00 | (—) |
| FEX767(2) | 2m Module (767) | 169.00 | (2.50) |
| FEX767(70) | 70cm Module (767) | 215.00 | (2.50) |
| FEX767(6) | 6m Module (767) | 169.00 | (2.50) |
| SP102 | Speaker | 75.00 | (2.00) |
| SFT290 | Mkll New Super 290 | 429.00 | (—) |
| FT290 | 2m M/Mode Port/Transceiver | 379.00 | (—) |
| FT290 | With Mutek front end fitted | 409.00 | (—) |
| MMB11 | Mobile Bracket | 37.50 | (1.50) |
| NC11 | Charger | 10.50 | (1.50) |
| CSC1 | Carrying Case | 6.50 | (1.50) |
| YHA15 | 2m Helical | 7.50 | (1.50) |
| YHA44D | 70cm ½wave | 12.50 | (1.50) |
| YM49 | Speaker Mike | 22.00 | (1.50) |
| MMB15 | Mobile Bracket | 14.55 | (1.50) |
| FT23 | 2m Mini H/H | 249.00 | (2.50) |
| FT27 | 70cm Mini H/H | £269.00 | (2.50) |
| FNB9 | Spare Battery Pack (23/73) | 23.00 | (1.50) |
| FNB10 | Spare Battery Pack (23/73) | 25.00 | (1.50) |
| FNB11 | Spare Battery Pack (23/73) | 42.00 | (1.50) |
| NC.18C | Charger (23/73) | 10.50 | (1.50) |
| NC.28 | Charger (23/73) | 11.00 | (1.50) |
| NC.29 | Base Charger (23/73) | 49.00 | (2.50) |
| PA6 | Car Adap/Charger (23/73) | 14.50 | (1.50) |
| MH12A2B | Speaker Mic | 22.00 | (1.50) |
| FT727 | 2m/70cm H/H | 425.00 | (3.00) |
| FNB3 | Spare Battery Pack | 40.00 | (1.50) |
| FNB4 | Spare Battery Pack | 45.00 | (1.50) |
| FNB5 | Empty Cell Case | 9.00 | (1.50) |
| FT209R | NEW 2m H/Held/C/W FNB3 | 299.00 | (—) |
| FT709R | 70cm H/Held | 319.00 | (—) |
| FT270R | 2m 25W F.M. | 399.00 | (—) |
| FT270RH | 2m 45W F.M. | 469.00 | (—) |
| FT2700R | 2m/70cm/25W/25W | 499.00 | (—) |
| FRG9600 | 60-950MHz Scanning RX | 550.00 | (—) |
| MMB10 | Mobile Bracket | 10.00 | (1.50) |
| NC9C | Charger | 10.35 | (1.50) |
| PA3 | Car Adaptor/Charger | 20.50 | (1.50) |
| FNB2 | Spare Battery Pack | 25.00 | (1.50) |
| YM24A | Speaker Mike | 27.00 | (1.50) |
| FT726R | 2m Base Station | 999.00 | (—) |
| 430/726 | 70cm Module for above | 349.00 | (3.00) |
| FRG8800 | HF Receiver | 639.00 | (—) |
| FRV8800 | Convertor 118-175 for above | 100.00 | (2.00) |
| FRT7700RX | A.T.U. | 59.00 | (2.00) |
| MH1B8 | Hand 600 8pin mic | 20.00 | (1.50) |
| MD1B8 | Desk 600 8pin mic | 79.00 | (1.50) |
| MF1A3B | Boom mobile mic | 25.00 | (1.50) |
| YH77 | Lightweight phones | 19.50 | (1.50) |
| YH55 | Padded phones | 19.95 | (1.50) |
| YH1 | L/weight Mobile H/set-Boom mic | 19.00 | (1.50) |
| SB1 | PTT Switch Box 208/708 | 21.00 | (1.50) |
| SB2 | PTT Switch Box 290/790 | 18.00 | (1.50) |
| SB10 | PTT Switch Box 270/2700 | 21.00 | (1.50) |
| FF501DX | Low Pass Filter | 37.50 | (1.50) |
| **NEW** | | | |
| FT767GX | HF TXCR | 1550.00 | (—) |
| FT727 | 2M/70CM H/H | 425.00 | (—) |
| FL7000 | HF Linear | 1600.00 | (—) |

## Linear Amps

| | | | |
|---|---|---|---|
| **TOKYO HI POWER** | | | |
| HL 160V | 2m, 10W in, 160W out | 244.52 | (2.50) |
| HL 82V | 2m, 10W in, 85W out | 144.50 | (2.50) |
| HL 110V | 2m, 10W in, 110W out | 249.00 | (2.50) |
| HL 35V | 2m, 3W in, 30W out | 76.00 | (2.50) |
| HL 30 | 2m, 3W in, 30W out | 54.00 | (2.50) |
| HL 30V | 70cms, 3W in, 30W out | 122.50 | (2.50) |
| **MICROWAVE MODULES** | | | |
| MML144/30-LS | inc preamp (1/3 w i/p) | 98.90 | (2.50) |
| MML144/50-S | inc preamp, switchable | 106.95 | (2.50) |
| ML144/100-S | inc preamp (10w i/p) | 149.95 | (3.00) |
| MML144/100-HS | inc preamp (25w i/p) | 159.95 | (3.00) |
| MML144/100-LS | inc preamp (1/3w i/p) | 169.95 | (3.00) |
| MML144/200S | inc preamp (3/10/25 i/p) | 369.84 | (3.00) |
| MML432/30L | inc preamp (1/3w i/p) | 169.05 | (2.50) |
| MML432/50 | inc preamp (10w i/p) | 149.50 | (2.50) |
| MML432/100 | linear (10w i/p) | 334.65 | (3.00) |
| **B.N.O.S.** | | | |
| LPM 144-1-100 | 2m, 1W in, 100W out, preamp | 235.00 | (3.00) |
| LPM 144-3-100 | 2m, 3W in, 100W out, preamp | 235.00 | (3.00) |
| LPM 144-10-100 | 2m, 10W in, 100W out, preamp | 205.00 | (3.00) |
| LPM 144-25-180 | 2m, 25W in, 180W out, preamp | 305.00 | (3.00) |
| LPM 144-3-180 | 2m, 3W in, 180W out, preamp | 355.00 | (3.00) |
| LPM 144-10-180 | 2m, 10W in, 180W out, preamp | 355.00 | (3.00) |
| LP 144-3-50 | 2MN 50W out, preamp | 145.00 | (3.00) |
| LP 144-10-50 | 2M 10W in, preamp | 145.00 | (3.00) |
| LPM 432-1-50 | 70cm, 1W in, 50W out, preamp | 255.00 | (3.00) |
| LPM 432-3-50 | 70cm, 3W in, 50W out, preamp | 255.00 | (3.00) |
| LPM 432-10-50 | 70cm, 10W in, 50W out, preamp | 215.00 | (3.00) |
| LPM 432-10-100 | 70cm, 10W in, 100W out, preamp | 395.00 | (3.00) |
| LPM 432-3-100 | 70cm, 3W in, 100W out, preamp | 395.00 | (3.00) |

## SWR/PWR Meters

| | | | |
|---|---|---|---|
| **HANSEN** | | | |
| FS50VP | 50-150MHz 20/200 Interval PEP/SWR | 106.70 | (2.50) |
| FS300V | 50-150MHz 20/200 PWR/SWR | 53.50 | (2.50) |
| FS300H | 1.8-60MHz 20/200/10W | 53.50 | (2.50) |
| FS210 | 1.8-150MHz 20/200 Auto SWR | 63.50 | (2.50) |
| W720 | 140-430MHz 20/200W | 41.50 | (2.50) |
| **WELZ** | | | |
| SP10X | 1.8-150MHz PWR/SWR | 39.95 | (2.50) |
| SP122 | 1.8-60MHz PWR/SWR/PEP | 79.95 | (2.50) |
| SP220 | 1.8-200MHz PWR/SWR/PEP | 67.95 | (2.50) |
| SP225 | 1.8-200MHz PWR/SWR/PEP | 119.95 | (2.50) |
| SP420 | 140-525MHz PWR/SWR/PEP | 74.95 | (2.50) |
| SP425 | 140-525MHz PWR/SWR/PEP | 119.95 | (2.50) |
| SP825 | 1.8-200-430-800-1240MHz | 179.00 | (2.50) |
| **TOYO** | | | |
| T430 | 144/432 120 W | 52.50 | (2.50) |
| T435 | 144/432 200 W | 58.00 | (2.50) |

## Scanning Receivers

| | | | |
|---|---|---|---|
| SX200 | VHF/UHF Scanner | 325.00 | (3.00) |
| SX400 | VHF/UHF Continuous Coverage | 645.00 | (3.00) |
| AOR2002 | VHF/UHF Continuous Coverage | 487.30 | (3.00) |
| HX2000 | H/H Scanner | 269.00 | (3.00) |

## Icom Products

| | | | |
|---|---|---|---|
| IC761 | New Super HF Transceiver | P.O.A. | (—) |
| IC751A | HF Transceiver | 1465.00 | (—) |
| IC735 | New HF Transceiver | 949.00 | (—) |
| AT100 | 100W ATU (751/745) | 365.00 | (3.50) |
| AT150 | 150W ATA (735) | 315.00 | (3.50) |
| PS55 | Ext PSU (735) | 185.00 | (3.00) |
| IC505 | 50MHz multi-mode portable | 459.00 | (—) |
| IC290D | 2m 25w M/Mode | 542.00 | (—) |
| IC28E | 25W FM | 325.00 | (—) |
| IC28H | 2m 45W FM | 399.00 | (3.00) |
| IC Micro | 2E New Mini H/H | 239.00 | (3.00) |
| IC2E | 2m The Original H/H | 225.00 | (3.00) |
| IC02E | 2m H/H | 299.00 | (3.00) |
| IC275E | New 2m 25 Base Stn | 1029.00 | (—) |
| IC4E | 70cm H/H | 285.00 | (3.00) |
| IC04E | 70cm H/H | 299.00 | (3.00) |
| IC48E | 70cm 25W FM Mobile | 449.00 | (3.00) |
| IC490 | 70cm 10W M/Mode | 617.00 | (—) |
| IC3200 | 2m/70 Dual Band FM Mobile | 556.00 | (—) |
| IC12E | 23cm H/H | 428.00 | (3.00) |
| ICR71 | Gen Cov RX | 825.00 | (—) |
| IC7000 | VHF/UHF Scanner | 957.00 | (—) |
| AH7000 | 25-1300MHz Discone | 82.00 | (2.50) |
| SP3 | Ext Speaker | 61.00 | (2.00) |
| CK70 | DC Cable (R70/R71) | 7.00 | (1.50) |
| EX257 | FM Board (R70/R71) | 41.00 | (1.50) |
| GC5 | World Clock | 43.00 | (2.00) |
| **HAND HELD ACCESSORIES** | | | |
| AO2 | Waterproof Bag all Icom H/H | 14.38 | (1.50) |
| BC35 | Desk Charger | 70.15 | (2.00) |
| BP3 | Battery Pack 8.4V (2/4E/02/04E) | 29.90 | (1.50) |
| BP4 | Empty Battery Case (2/4E/02/04E) | 9.20 | (1.50) |
| BP5 | Battery Pack 10.8V | 60.95 | (2.00) |
| BP7 | Battery Pack 13.2V (02/04E only) | 74.75 | (2.00) |
| BP8 | Battery Pack 8.4V | 71.30 | (2.00) |
| CP1 | 12v Charge Lead BP3/7/8 | 6.90 | (1.50) |
| DC1 | DC/DC converter operate from 12v | 17.25 | (1.50) |
| FA2 | 2m Helical BNC | 9.20 | (1.50) |
| FA3 | 70cm Flexible ¼Ω Antenna (BNC) | 9.20 | (1.50) |
| HM9 | Speaker/Mic | 21.85 | (2.00) |
| HS10 | Head set Boom Mike | 20.70 | (1.50) |
| HS10SA | Vox Unit HS10 (02/04E only) | 25.30 | (1.50) |
| HS10SB | PTT SW Box HS10 | 20.70 | (1.50) |
| LC1 | Leatherette Case 2E/4E + BP5 | 6.90 | (1.50) |
| LC3 | Leatherette Case 2E/4E + BP3 | 6.90 | (1.50) |
| LC11 | Leatherette Case 02E/04E + BP3 | 9.20 | (1.50) |
| LC14 | Leatherette Case 02E/04E + BP5/7/8 | 9.20 | (1.50) |
| SS1 | Shoulder Strap | 10.35 | (1.50) |
| **OTHER ACCESSORIES** | | | |
| SM6 | 600ohm 8P Base Mic | 46.00 | (2.00) |
| SM8 | 1.3K/600Ω 8P Base Mic | 82.00 | (2.00) |
| SM10 | Comp/Graphic Mike | 116.00 | (2.50) |

## Oscar Antennas

| | | | |
|---|---|---|---|
| 2QW | 2m ¼ wave element | 3.15 | (1.50) |
| 2NE | 2m ⅝ wave element | 8.94 | (2.00) |
| 2VF | 2m ½ wave element | 16.13 | (2.00) |
| 78F | 2m ⅞ wave element | 21.15 | (2.00) |
| 88F | 2m ⅝ wave element | 24.10 | (2.00) |
| 258 | 70cm 2 × ⅝ wave element | 29.37 | (2.00) |
| 358 | 70cm 3 × ⅝ wave element | 33.73 | (2.00) |
| 70N2M | 2m & 70cm Dual band element | 24.95 | (2.00) |
| 70N2DX | 2m & 70cm Dual band element | 37.35 | (2.00) |
| HS770 | 2m & 70cm Duplexer | 24.95 | (2.00) |
| GCCA | Gutter clamp 4m cable | 14.25 | (1.50) |
| SOCA | 4m Cable | 6.00 | (1.50) |
| TMCAS | TRVHK Mount + 6m cable | 12.75 | (1.50) |
| SOMM | Mag. Mount | 12.75 | (1.50) |
| SOWM | Adjustable Wing Mount | 6.00 | (1.50) |
| VHFL | Discone 65-520MHz | 22.50 | (2.50) |
| GP144W | 2m 2 × ⅝ Colinear | 42.00 | (3.00) |
| GP432 | 70cm 3 × ⅝ Colinear | 47.50 | (3.00) |
| 70H2V | 2m & 70cm Dual Band Colinear | 47.00 | (3.00) |

## Datong Products

| | | | |
|---|---|---|---|
| PC1 | Gen. Cov. Con. | 137.40 | (2.00) |
| VLF | Very low frequency conv. | 34.90 | (2.00) |
| FL2 | Multi-mode audio filter | 89.70 | (2.00) |
| FL3 | Audio filter for receivers | 129.00 | (2.00) |
| ASP/B | r.f. speech clipper for Trio | 82.80 | (2.00) |
| ASP/A | r.f. speech clipper for Yaesu | 82.80 | (2.00) |
| ASP | As above with 8 pin conn | 89.70 | (2.00) |
| D75 | Manual RF speech clipper | 56.35 | (2.00) |
| D70 | Morse Tutor | 56.35 | (2.00) |
| MK | Keyboard morse sender | 137.40 | (2.00) |
| RFA | RF switched pre-amp | 36.00 | (2.00) |
| AD270-MPU | Active dipole with mains p.s.u. | 51.75 | (2.00) |
| AD370-MPU | Active dipole with mains p.s.u. | 69.00 | (2.00) |
| MPU | Mains power unit | 6.90 | (2.00) |
| DC144/28 | 2m converter | 39.67 | (2.00) |
| PTS1 | Tone squelch unit | 46.00 | (2.00) |
| ANF | Automatic notch filter | 67.85 | (2.00) |
| SRB2 | Auto Woodpecker blanker | 86.25 | (2.00) |

## CW/RTTY Equipment

| | | | |
|---|---|---|---|
| Tono 550 | Reader | 329.00 | (3.00) |
| **ICS/AEA** | | | |
| PK64 | Complete Packet/Amtor terminal | 239.00 | (3.00) |
| PX232 | Packet/RTTY Terminal | 269.00 | (3.00) |
| **BENCHER** | | | |
| BY1 | Squeeze Key, Black base | 67.42 | (2.50) |
| BY2 | Squeeze Key, Chrome base | 76.97 | (2.50) |
| **HI-MOUND MORSE KEYS** | | | |
| HK703 | Up down keyer | 38.35 | (2.00) |
| HK704 | Up down keyer | 26.35 | (2.00) |
| HK706 | Up down keyer | 21.80 | (2.00) |
| HK707 | Up down keyer | 20.15 | (2.00) |
| HK710 | Up down keyer | 39.95 | (2.50) |
| HK802 | Up down solid brass | 109.00 | (2.50) |
| HK803 | Up down solid brass | 104.50 | (2.50) |
| HK808 | Up down keyer | 66.95 | (2.00) |
| MK703 | Twin paddle keyer metal base | 34.50 | (2.00) |
| MK705 | Twin paddle keyer marble base | 32.78 | (2.00) |
| MK706 | | 30.48 | (2.00) |
| STAR | Master Key Mkll | 54.70 | (3.00) |
| STAR | Master Key cmos memory keyer | 95.00 | (3.00) |
| **KENPRO** | | | |
| KP100 | Squeeze CMOS 230/13.8v | 109.25 | (3.00) |
| KP200 | Memory 4096 Multi Channel | 234.55 | (3.00) |

## Trio

| | | | |
|---|---|---|---|
| TS940S | 9 Band TX General Cov RX | 1995.00 | (—) |
| AT940 | Auto/ATU | 258.23 | (2.50) |
| SP940 | Ext Speaker | 92.32 | (2.50) |
| TS930S | 9 Band TX General Cov RX | 1750.00 | (—) |
| AT930 | Auto/ATU | 192.75 | (2.50) |
| SP930 | Ext Speaker | 90.94 | (2.50) |
| TS440 | **NEW** 9 Band TX General Cov RX | 1195.00 | (—) |
| AT440 | Auto/ATU | 152.73 | (2.50) |
| PS50 | H/Duty PSU | 234.63 | (2.50) |
| TS830S | 160-10m Transceiver 9 Bands | 1095.00 | (—) |
| AT230 | All Band ATU/Power Meter | 185.90 | (2.50) |
| SP230 | External Speaker Unit | 70.12 | (—) |
| TS530SP | 160m-10m Transceiver | 895.00 | (—) |
| TS430S | 160m-10m Transceiver | 995.00 | (—) |
| PS430 | Matching Power Supply | 183.26 | (3.50) |
| SP430 | Matching Speaker | 43.00 | (2.50) |
| MB430 | Mobile Mounting Bracket | 16.66 | (2.50) |
| FM430 | FM Board for TS430 | 50.68 | (2.50) |
| SM220 | Station Monitor | 362.37 | (3.50) |
| BS5 | Band Scope Unit (520/530) | 72.05 | (2.00) |
| BS8 | Band Scope Unit (830/940) | 81.22 | (2.00) |
| TL922 | 10/160 2K Linear | 1495.00 | (7.00) |
| TM201A | 2M 25W Mobile FM | 358.00 | (3.00) |
| TM401A | 70cm 12W Mobile FM | 392.82 | (3.00) |
| TH21 | 2M Mini H/H | 228.00 | (2.50) |
| TH41 | 70cm Mini H/H | 268.00 | (2.50) |
| TH205 | 2M H/H | 218.01 | (3.00) |
| TH215 | 2M H/H Keyboard | 258.00 | (3.00) |
| TR751 | 2M 25W M/M Mobile | 649.00 | (—) |
| TS711 | 2M 25W Base Stn | 991.29 | (—) |
| TS811 | 70cm 25W Base Stn | 1085.00 | (—) |
| R2000 | Gen Coverage HF/RX | 637.26 | (—) |
| VC10 | 118-174MHz Converter (R2000) | 170.76 | (2.00) |
| R5000 | **NEW** General Coverage HF/RX | 895.00 | (—) |
| VC20 | 118-174MHz Converter (R5000) | 176.32 | (2.00) |
| **HAND HELD ACCESSORIES** | | | |
| BT2 | Empty Battery Case TH21/41 | 12.50 | (1.50) |
| DC21 | DC Power Supply TH21/41 | 26.38 | (1.50) |
| EB2 | Ext. Battery Case TH21/41 | 17.85 | (1.50) |
| HMC1 | Headset with Vox TH21/41 | 34.71 | (1.50) |
| PB21 | Nicad Pack TH21/41 | 25.68 | (1.50) |
| BC6 | Desk Charger TH21/41 | 106.21 | (2.00) |
| SC8 | Soft Case TH21/41 | 12.50 | (1.50) |
| SMC30 | Speaker/Mic TH21/4/2600 | 29.85 | (1.50) |
| **ACCESSORIES** | | | |
| MC50 | 4P Desk Mic | 48.59 | (2.50) |
| MC60A | 8P Desk Mic | 93.02 | (2.50) |
| MC80 | Electric Desk Mic | 56.93 | (2.50) |
| MC85 | Desk Mic Audio Level Comp | 107.55 | (2.50) |
| MC42 | 8P Fist Mic | 22.22 | (1.50) |
| MC35 | 4P Fist Mic | 22.91 | (1.50) |
| MC55 | Mobile Mic (6br 8p) | 55.53 | (2.50) |
| LF30 | HF Low Pass Filter | 34.02 | (2.00) |
| KX3 | Receiver ATU (Mizuho) | 67.28 | (2.50) |
| HS6 | Lightweight H/phones | 25.68 | (2.00) |
| HS5 | Deluxe H/phones | 39.57 | (2.00) |
| SW100A | SWR/Power Meter 1.8-150MHz | 52.76 | (2.00) |
| SW100B | SWR/Power Meter 140-450MHz | 52.76 | (2.00) |
| SW200A | SWR/Power Meter 1.8-150MHz | 113.85 | (2.50) |
| SW200B | SWR/Power Meter 140-450MHz | 113.85 | (2.50) |
| SW2000 | SWR/Power Meter 1.8-54MHz 2K | 123.57 | (2.50) |
| SWT1 | 2m ATU | 40.26 | (2.00) |

## Power Supplies

| DRAE | | | BNOS | | |
|---|---|---|---|---|---|
| 4 amp | 43.40 | (2.50) | 6 amp | 75.00 | (3.00) |
| 6 amp | 65.00 | (3.00) | 12 amp | 125.00 | (3.50) |
| 12 amp | 86.50 | (3.50) | 25 amp | 185.00 | (4.50) |
| 24 amp | 125.00 | (4.50) | 40 amp | 385.00 | (4.50) |

## Aerial Rotators

| | | | |
|---|---|---|---|
| KR250 | Light Duty | 78.00 | (3.00) |
| AR200XL | Light Weight | 59.95 | (3.00) |
| AR40 | 5 core Medium Duty | 125.00 | (2.50) |
| KR400 | Med/H Duty | 139.00 | (3.00) |
| KR500 | 6 core Elevation | 149.00 | (3.00) |
| KR400RC | 6 core Medium Duty | 169.00 | (3.00) |
| KR600RC | 8 core Heavy Duty | 219.00 | (3.00) |
| T2X | 8 core Very Heavy Duty | 499.00 | (—) |
| KR5400 | Elevation/Azimuth | 279.00 | (3.00) |
| KR5600 | Elevation/Azimuth | 369.00 | (3.50) |
| KR800SDX | Heavy Duty | 325.00 | (3.50) |
| KR1000SDX | Heavy Duty | 368.00 | (4.00) |

## Switches

| | | | |
|---|---|---|---|
| SMCS 2U | 2N 50239 | 18.95 | (2.00) |
| SMCS 2N | 2 way 'n' Skts | 23.50 | (2.00) |
| Welz | 2 way SO239 | 29.95 | (2.00) |
| Welz | 2 way 'n' Skts | 49.00 | (2.00) |
| Drae | 3 way SO239 | 15.40 | (2.00) |
| Drae | 3 way 'n' Skts | 19.90 | (2.00) |
| Kenpro KP21N | 2 way Switch | 27.00 | (2.00) |

## Miscellaneous

| | | | |
|---|---|---|---|
| DRAE | Wavemeter | 27.50 | (2.00) |
| T30 | 30W Dummy load | 8.50 | (2.00) |
| T100 | 100W Dummy load | 38.00 | (2.00) |
| T200 | 200W Dummy load | 56.00 | (2.00) |
| CT20A | 20W Dummy Load PL259 | 15.95 | (2.00) |
| CT20N | 20W Dummy Load N. Plugs | 22.95 | (2.00) |
| CT530 | 100W Dummy Load (500WHmin) | 79.00 | (2.50) |
| DRAE | 2m Pre-set A.T.U. | 14.50 | (2.00) |
| **TOKYO HI-POWER** | | | |
| HC200 | 10-80 HF Tuner | 115.00 | (2.50) |
| HC400 | 10-160 HF Tuner | 199.00 | (3.50) |
| **CAP CO.** | | | |
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The Radio Magazine

MAY 1987 (ON SALE 9 APRIL) VOL. 63 NO. 5 ISSUE 962

THIS MONTH



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## NEXT MONTH

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The Yaesu FT-767GX Reviewed

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# It may be important

to other amateur radio manufacturers to offer equipment that, first and foremost, is built around an all-singing, all-dancing microprocessor. It may be that the real need of the radio amateur, to communicate with the least fuss possible, was forgotten long ago. The approach from KENWOOD has always been different. Equipment reviewers have spoken for many years of "excellent ergonomics", the ability to pick up a piece of KENWOOD equipment and operate it first time with no reference to the user's handbook. **The three new models featured on this page** continue this design policy; equipment built to a high specification that are a pleasure to own and use.


## **NEW** from KENWOOD the TH215E handheld,

**Having used a TR2600E** since its introduction, I must admit I could not see how it could be greatly improved. However, by making one simple change from previous models, the TH215E 2 metre handheld has become much easier to use. On the earlier TR2500 and TR2600E two buttons had to be pressed each time a frequency in memory was required. On the TH215E a memory is selected by pressing one button. A small alteration but one that has changed the character of the handheld and brought it even more into line with the amateurs requirements.

**A rugged diecast metal case** adds to the strength of the handheld. For greater flexibility the TH215E operates on DC voltages from 7.2 to 16 volts. An external power supply connection is included on the rig's top panel (use optional power cable PG2V or PG3C). Output power is dependent on voltage. Switched to its high power setting, the TH215E produces 2.5 watts at 8.4 volts. This increases to 5 watts when supply is 13.8 volts. On its low power setting the output is approximately 500 milliwatts.

**Making the microcomputer work for you** as opposed to you working for the microcomputer has resulted in a truly flexible piece of equipment. The stepping rate when using up/down frequency shift buttons can be user programmed in either 5, 10, 15, 20 or 25 kHz steps. The repeater offset can also be programmed to shift from 100 kHz to 9.900 MHz.

**Length of operation** has always been a problem with the handheld transceiver. The TH215E with its battery saver successfully gets over this by switching off the receiver. The actual length of time the receiver is off can be determined by the user. In addition a comprehensive range of optional nicad packs are available which will extend operation. These are the PB1 (12V, 800mAh), PB3 (7.2V, 800mAh) and the PB4 (7.2V, 1600mAh).

**The TH215E has ten memories** which store frequency, frequency step and whether the rig is to operate in simplex or repeater mode. Memory 1 is also used as a priority channel and memories 8 and 9 serve to define the limits of programmable scan. There are three modes of frequency scan, band, memory and programmable. The receiver also has three stop/resume scanning modes. These are seek where the scan instruction is cancelled once a signal is found, time where the set holds on an occupied channel for approximately 5 seconds and carrier where the scan is held until the carrier drops.

**The transceiver also has reverse repeater,** an illuminated display for night operation, priority channel operation so that an expected call is not missed, a lock which disables either transmit or keypad functions and an indicator which tells that the battery voltage has fallen below the level for good communications.

**The KENWOOD TH215E** comes complete with PB2 nicad (8.4V, 500mAh), nicad charger and helical aerial.

**TH215E** . . . **£258.00** inc VAT, carriage £7.00.

## a **NO NONSENSE**, high power 2 metre mobile, the TM221E

## **AND** a new dual band FM mobile, the TW4100E


**The NEW TW4100E dual band (2 metres and 70 centimetres) FM mobile transceiver** follows on from the well-known TW4000A. Producing 45 watts on 2 metres and 35 watts on 70 centimetres the transceiver is 150 mm wide, 200 mm deep and 50 mm high. Unlike its predecessor, the TW4100E has full duplex facilities (you can transmit on 2 metres whilst, at the same time, receiving on 70 centimetres or vice versa).

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send £1 for complete mail order catalogue.

# AR2002 receiver


**Frequency range of the AR2002** is from 25 to 550 and from 800 to 1300 MHz. Modes of operation are wide band FM, narrow band FM and AM. The receiver has 20 memories, memory scan and a search mode which checks frequencies between user designated limits.

The receiver has a push button keypad for easy frequency entry and operation.

A front panel knob allows the listener to quickly step up or down in either 5, 12.5 or 25 kHz steps from the frequency initially chosen.

The AR2002 has a front panel LED bar "S" meter.

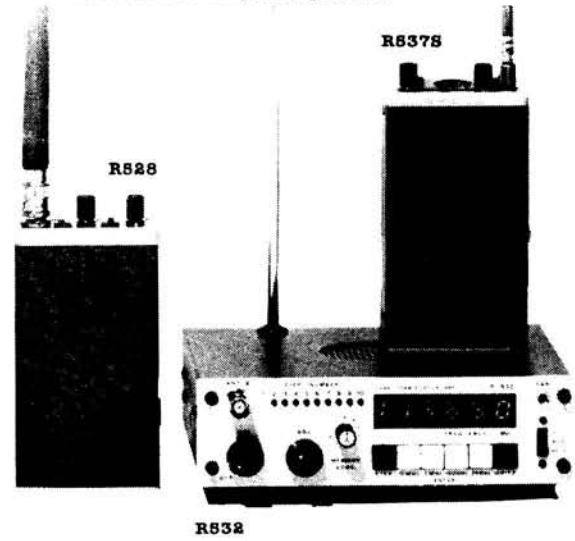
There is a front panel 3.5 mm jack socket for headphone use.

A socket for the optional RS232 interface (RC PACK) is provided on the rear panel. The RC PACK consists of an 8 bit CPU with its own ROM and RAM and with your own computer acting as a dumb terminal many additional operating facilities become available. Of course, if you want to write your own programs using the RC PACK as an interface then "the sky's the limit".

**AR2002 Receiver . . . £487.30 inc VAT,** carriage £7.00

# airband receivers

**R537S** . . . a tunable airband receiver covering 118 to 136 MHz plus the facility for two crystal controlled channels (crystals not included).
**R537S . . . £69.51 inc VAT, carriage £2.00. Crystals £4.60 each.**
**R528** . . . an airband receiver scanning four out of six crystal controlled channels (crystals not included). The R528 also has a manual channel selection switch.
**R528 . . . £125.36 inc VAT, carriage £2.00. Crystals £4.60 each.**
**R532** . . . not needing crystals, the R532 is a synthesized receiver covering the airbands from 110 to 136 MHz and having 100 programmable memory channels (ten banks of ten). Operating on 12 volts DC, the R532 can be used either mobile or at home with the optional mains power supply. Add a nicad battery pack and carrying case and the R532 is also ideal for portable use.
**R532 . . . £224.05 inc VAT, carriage £7.00.**




# DAIWA meters

**CN410M** . . . Frequency range 3.5 to 150 MHz, forward power switchable 15/150 Watts, reflected 5/50 Watts, SO239 connectors.

**CN460M** . . . Frequency range 140 to 450 MHz, forward power switchable 15/150 Watts, reflected 5/50 Watts, SO239 connectors.

**NS448 with remote head** . . . Frequency range 900 to 1300 MHz, forward power switchable 5/20 Watts, reflected 1.6/6.6 Watts, N type connectors.

**NS660P** . . . switchable meter reading (average, normal PEP and hold PEP) and provision for optional remote head (U66V), frequency range 1.8 to 150 MHz, forward power switchable 15/150/1500 Watts, SO239 connectors.

**U66V** . . . remote head, frequency range 140/525 MHz, max 300 Watts, N type connectors.

**SC20** . . . extension cable for U66V, approx 20 metres long.

**CN410M . . . £61.72 inc VAT,** carriage £1.50.

**NS660P . . . £115.00 inc VAT,** carriage £2.50.

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**In Cardiff,**
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telephone 0222 464154.

**In London,**
the address, 223/225 Field End Road, Eastcote, Middlesex,
telephone 01 429 3256.

**In Bournemouth,**
the shop manager is Colin, G3XAS,
the address, 27 Gillam Road, Northbourne, Bournemouth,
telephone 0202 577760.

**Although not a shop,** there is on the South Coast a source of good advice and equipment, John, G3JYG. His address is Abbotsley, 14 Grovelands Road, Hailsham, East Sussex. An evening or weekend call will you put in touch with him. His telephone number 0323 848077.

**Lowe Electronic Shops** are open from 9.00 am to 5.30 pm, Tuesday to Friday and from 9.00 am to 5.00 pm on Saturday. Shop lunch hours vary and are timed to suit local needs. For exact details please telephone the shop manager.

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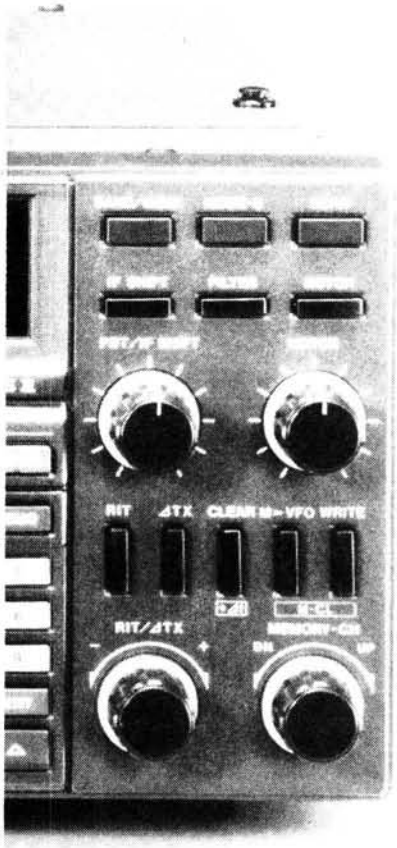

## IC-761, HF TRANSCEIVER with General coverage receiver.

The new ICOM IC-761 H.F. Transceiver has many features making it probably the best top of the line Amateur transceiver available today. This all mode transceiver features an internal aerial tuning unit and A.C. power supply. The A.T.U. boasts a 3 second band selection and tune up with a VSWR matching of less than 1.3:1.
For the serious operator the 100kHz-30MHz general coverage receiver and 105dB dynamic range make it ideal for DX chasing. Frequency selection is by the main VFO or via the front panel direct access keypad.
And for when reception is difficult, pass band tuning, I.F. shift, notch filter, noise blanker, pre-amp and attenuator should enable you to copy even those weak DX stations whether amateur or broadcast.
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The IC-CR64 high stability crystal is standard as is the CI-V communications interface for computer control. Twin VFO's and split mode for cross band contacts the IC 761 features program scanning, memory scan and mode select scan and the 32 memories can store frequency and mode.
The transceivers operating system is held permanently in ROM and is not dependant upon the lithium battery. The cell is used for memory back up only. A new style meter gives P.O., A.L.C., IC, VC, COMP and SWR readings.
This new equipment is fully compatible with existing ICOM accessories such as the IC-2KL 500 watt linear amplifier. Here at THANET we believe the IC-761 will set a new trend that others will surely follow. For more information please contact your nearest ICOM dealer or THANET ELECTRONICS LTD.

## IC-735.

IC-735

- Small Compact Size.
- 100kHz-30MHz General Coverage Receiver.
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- FM Standard.
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- 12 Memories.
- CI-V Communications Interface.
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99 programmable memories can store frequency, mode, offset frequency and direction. A total of four scanning functions for easy access to a wide range of frequencies, memory scan, programmed scan, selected mode memory scan, lock-out scan.

A new LCD uses a soft orange backlight for ease of operating even in bright daylight. The CI-V communications interface for computer control via a serial port is mounted on the rear panel. Pass Band Tuning and Notch Filter Systems have been incorporated to provide clear operating reception.

This transceiver has a built in A.C power supply, but can also be used on 13.8v D.C for mobile or portable operation. Optional accessories available are AG25 Masthead pre-amplifier, VT36 Voice Synthesizer, FL83 CW Narrow Filter and CR64 High Stability XTAL.

To fully appreciate all the facilities of this sophisticated transceiver contact your local ICOM dealer or Thanet Electronics for further information.

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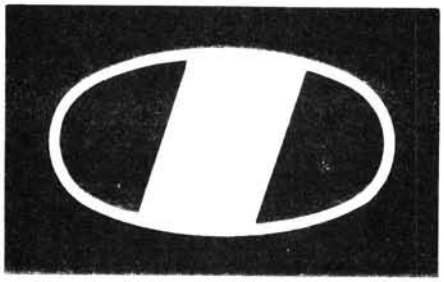

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| KR2000RC H/D Bell | £445.00 |
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| KR5600 H/D AZ + Elev | £369.00 |
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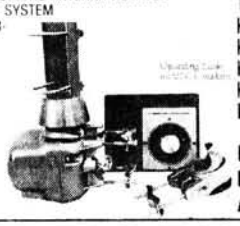

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| PL259F | UR67 Push Fit | £1.00 |
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| PL259B | Del Luxe UR43 76 5MM | £2.77 |
| PL259E | 1 5MM | £1.13 |
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| PL259PM | PAN MT 4 Hole | £1.77 |

**UHF COAX SOCKETS**

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| SO239F | 4 Hole PAN MT | £0.71 |
| SO239NF | Nut Inner | £0.81 |
| M358 | T 2F + 1M | £2.06 |
| M458 | 4W 3F + 1M | £3.38 |

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| UG536 | 5MM | £2.48 |
| UG21 | 11MM | £2.44 |

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| CX140D | N + 2 Cable | £25.15 |
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| CX540D | 3 BNC | £48.30 |
| CX600N | 3 N | £48.30 |
| CX600NJ | 4 N | £71.40 |
| CX600NS | 2 N + 2 Cable | £71.40 |

## COAX SWITCHES

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| SMCS2U | 2 Way SO239 | £18.95 |
| SMCS2N | 2 Way N | £23.50 |
| KP2IN | 2 Way N | £27.00 |
| AN2 | 2 Way Side | £4.60 |
| AN3 | 3 Way Side | £5.00 |

Post and Packing £1.65

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|---|---|---|
| LDF | 2 50A 3/8 Heliax | £3.68 |
| LDF | 4 50A 1/2 Heliax | £4.43 |
| UR43 | 50R 5MM Solid | £0.31 |
| UR76 | 50R 5MM Stranded | £0.32 |
| UR67 | 50R 10MM | £0.78 |
| UR70 | 75R L Duty | £0.32 |
| UR39 | 75R M Duty | £0.56 |
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| CK2-3 conv. kit TB2-3ss | £106.95 |
| UGP/2m ground plane | £15.41 |
| C5/2m Mk2 4.8dBd omni | £89.70 |
| LR1/2m vert 4.3dBd | £35.70 |
| LR2/2m vert. omni | £28.18 |
| LW5/2m 5 ele 7.8dBd | £17.30 |
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| LW16/2m 16 ele 13.4dBd | £42.43 |
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| PMM14/2 parabm 13.7dBd | £68.08 |
| Q4/2m qd 4 ele 9.4dBd | £35.30 |
| Q6/2m qd 6 ele 10.9dBd | £46.28 |
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| TS930 | S H Trc HF Base | £1195.00 |
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| FT77 | S S HF Transceiver 100W | £379.00 |
| Oscar11 | S S 40 CH 10 Mtr Mobile | £55.00 |
| Oscar11 TL-120 | S S (CB) 40 CH CB S H (Kenwood) HF-Lin 10W-100W | £45.00 £110.00 |
| FT757GX | S H 100W Gen Coverage Rx | £745.00 |
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| FT290R | S S 2 Mtr 2 watt Multi | £310.00 |
| FT290R | S H 2 Mtr Multi | £249.00 |
| KDK FM-240 | S S 2 Mtr 25W Mobile | £289.00 |
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| FT780R | S H 70cm 10W Multi | £349.00 |
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| FT270R | S S 45W 2 Mtr Mobile | £359.00 |
| TW-4000A | S H D band 2 Mtr 70cm 25W | £325.00 |
| TV144 | S H 2 Mtr module | £135.00 |
| FT209R(3) | S S 2 Mtr H Port 3W | £249.00 |
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| FT709R(3) | S S 70cm K board Port 3W | £269.00 |
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| FT270QR | S H D band 25 watt 2 Mtr 70cm | £329.00 |
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| MS8400A | S S VHF UHF Scanner | £219.00 |
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| AT-500 | S H Comm full auto ATU | £299.00 |
| YC-1000L | N O Data Logger (600MHz) | £399.00 |
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| FTV901R | S H 2 Mtrs fitted | £225.00 |
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| FP757GX | S S SW mode PSU 12V 12A | £99.50 |
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| FTV901R | S H 2 Mtrs, 4 Mtrs and 70cm | £449.00 |
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| FS200L | S S Meter 3 5-150MHz | £34.95 |
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| Caiscope | S S Super 6 Single Beam | £125.00 |
| SC-1 | S H Station Consul PSU (4 amp) | £49.00 |
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| HAL ST 5000 | A S RTTY TU (ST-5 type) | £95.00 |
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| Grab Bag | New Yaesu Shoulder bag | £7.95 |
| Yaesu Shirt | New T shirt Yaesu | £2.50 |
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| SP4 | N O HF Speech Processor | £39.00 |
| UDM 211 | N O Base Mic Tect | £24.95 |
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| MX 275E | N O 27 Mhz FM VOX Portable | £49.00 |
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| Yaesu | FRV8800 V.H.F. Converter | 100.00 | (2.00) |

| HF TRANSCEIVERS | | | |
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| Trio | TS940S | 1995.00 | (—) |
| Trio | TS930S | 1750.00 | (—) |
| Trio | TS440S | 1195.00 | (—) |
| Trio | TS430S | 995.00 | (—) |
| Trio | TS830S | 1095.00 | (—) |
| Trio | TS530SP | 895.00 | (—) |
| Yaesu | FT980 | 1750.00 | (—) |
| Yaesu | FT757GX | 969.00 | (—) |
| Yaesu | FT767GX | 1550.00 | (—) |
| Icom | IC735 | 949.00 | (—) |

| V.H.F. SCANNING RECEIVERS | | | |
|---|---|---|---|
| Icom | ICR7000 | 957.00 | (—) |
| Yaesu | FRG9600 | 525.00 | (—) |
| A.O.R. | AR2002 | 487.30 | (—) |
| Signal | R532 "Airband" | 224.00 | (—) |

| V.H.F. SCANNER ACCESSORIES | | | |
|---|---|---|---|
| A.K.D. | HFC1 HF Converter | 49.00 | (1.00) |
| Revcone | Discone Antenna 30-500MHz | 31.50 | (2.00) |
| Icom | AH7000 Antenna 25-1300MHz | 82.00 | (3.00) |

| ANTENNA TUNER UNITS | | | |
|---|---|---|---|
| Yaesu | FRT7700 Short wave listening | 59.00 | (2.00) |
| Yaesu | FC757AT | 349.00 | (—) |
| Trio | AT230 | 220.00 | (2.50) |
| Trio | AT250 auto | 385.00 | (—) |
| Daiwa | CNW518 High power | 258.00 | (—) |

| 2.M. TRANSCEIVERS | | £ | (c&p) |
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| Trio | TH21E Handheld | 228.00 | (—) |
| Trio | TM201A 25w F.M. mobile | 358.00 | (—) |
| Trio | TR751E 25w multimode | 649.00 | (—) |
| Trio | TS711E base station | 991.00 | (—) |
| Yaesu | FT290II Portable multimode | 429.00 | (—) |
| Yaesu | FT203R + FNB3 Handheld | 255.00 | (—) |
| Yaesu | FT209RH + FNB3 Handheld | 309.00 | (—) |
| Yaesu | FT270RH 45w F.M. mobile | 469.00 | (—) |
| Yaesu | FT726R base station (70cm optional) | 999.00 | (—) |
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| Icom | IC271E base station | 835.00 | (—) |
| Icom | IC3200E 2m/70cm F.M. mobile | 556.00 | (—) |
| Trio | TH205E Handheld | 218.00 | (—) |
| Trio | TH215E Handheld | 258.00 | (—) |
| Yaesu | FT23R Handheld | 249.00 | (—) |
| Icom | Micro II Handheld | 259.00 | (—) |

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| Trio | TH41E Handheld | 268.00 | (—) |
| Trio | TR3600E Handheld | 353.00 | (—) |
| Trio | TS811E base station | 1095.00 | (—) |
| Yaesu | FT703R + FNB3 Handheld | 289.00 | (—) |
| Yaesu | FT709R + FNB3 Handheld | 319.00 | (—) |
| Yaesu | 70cm module for FT726R | 349.00 | (—) |
| Icom | IC4E Handheld | 285.00 | (—) |
| Icom | IC04E Handheld | 299.00 | (—) |
| Icom | IC471E base station | 927.00 | (—) |
| Yaesu | FT73R Handheld | 269.00 | (—) |

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| Yaesu | FT690R 6m portable | 399.00 | (—) |
| Yaesu | 6m module for FT726R | 249.00 | (—) |
| Yaesu | 21/24/28 H.F. module for FT726R | 269.00 | (—) |
| Icom | IC1271E 1.2 GHz | 1140.00 | (—) |

| STATION ACCESSORIES | | £ | (c&p) |
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| A.K.D. | V.H.F. wavemeter | 24.95 | (1.50) |
| Yaesu | FF501DX low pass filter 30MHz 1kW | 37.50 | (2.00) |
| Trio | LF30A low pass filter 30MHz 1kW | 34.00 | (2.00) |
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| S.M.C. | Polar-phaser II 70 cms | 69.00 | (2.50) |

| ANTENNA SWITCHES | | | |
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| Welz | CH20A 900MHz SO239 skts. | 29.95 | (1.50) |
| SA 450N | 2way diecast 500MHz N skts. | 23.75 | (1.00) |
| SA 450 | as above but SO239 skts. | 17.50 | (1.00) |
| Drae | 3way N skts. | 19.90 | (1.00) |
| Drae | 3way SO239 skts. | 15.40 | (1.00) |
| CS 4 | 4way B.N.C. skts. 1500MHz | 30.39 | (2.00) |

| ANTENNA BITS | | | |
|---|---|---|---|
| HI-Q | Balun 1:1 5kW P.E.P. | 11.95 | (1.00) |
| Bricomm | Balun 4:1 1kW | 11.20 | (1.00) |
| Bricomm | 7.1MHz Epoxy Traps (pair) | 9.95 | (1.50) |
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| UR76 | 50 ohm coax dia. 5mm | per metre | 0.30 | (0.10) |
| UR70 | 70 ohm coax | per metre | 0.35 | (0.10) |
| UR95 | 50 ohm coax dia. 2.3mm | per metre | 0.40 | (0.10) |
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**FREQUENCY MODULATOR** adds FM to synthesized rigs or rigs with clarifier. Type FM1000, PCB kit **£3.00,** PCB built **£4.00.**

**RECEIVE CONVERTERS** 2, 4 or 6 Metre aerial input with 10 metre IF or 4, 6, 10 or 20 metre aerial input with 2 metre IF, 26dB gain, low noise with OSC output. Types RC2-10, RC4-10, RC6-10, RC4-2, RC6-2, RC10-2, RC20-2. PCB kit **£17.25,** PCB built and tested **£24.50,** Boxed kit **£29.25,** Boxed built and tested **£41.00.**

**TRANSCEIVE CONVERTER,** single board version of receive & transmit converters, 500mW output, with repeater shift facility. Types TRC2-10, TRC4-10, TRC6-10, PCB kit **£39,** PCB built and tested **£54,** Boxed kit **£54,** Boxed built and tested **£83.25.**

**TRANSMIT AMPLIFIER,** unswitched, suitable for Transmit Converters, Transceive Converters and MEON, 500mW in, 20W min output. Types TA2U2, TA4U2, TA6U2 PCB kit **£40.50,** PCB built & tested **£48.75.** Boxed kit **£45.00,** boxed, built and tested **£53.00.**

**RECEIVE PREAMPS** 2, 4, 6 or 10 metre, RF & DC switched, 0-20dB variable gain, low noise, 100W handling. Types RP2S, RP4S, RP6S, RP10S. Also masthead version DC coax fed, types RP2SM, RP4SM, RP6SM. PCB kit **£12,** PCB built and tested **£16.75,** Boxed kit **£20.25,** Boxed built and tested **£27.00.**

**NOISE SQUELCH** squelches rig when noise is high. Allows reception between noise bursts. Type NS1000, PCB kit **£7.25,** PCB built **£10.25.**

**VAT & P&P INC PRICES**
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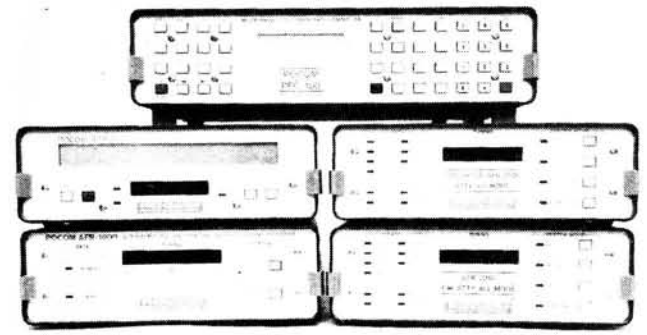
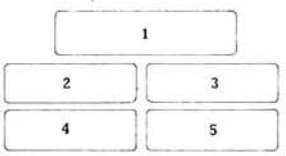
In its standard form the **POCOM 2010** is extremely versatile and capable of decoding most signals, yet it costs just **£716.** However, specialist users may want to be able to decode some of the more unusual transmissions that are around, so for them a range of expansion boards are available. These just plug straight into the **2010** and turn it into what must be the most versatile decoder on the market (the boards marked YES are fitted as standard).

| | AFR-2010 |
|---|---|
| RTTY Baudot CCITT No. 1 Standard 45/50/57/75/100/150/200 Baud | OPTION |
| RTTY Baudot CCITT No. 2 Standard 45/50/57/75/100/150/200 Baud | YES |
| RTTY Baudot CCITT No. 1 Variable 30-250 Baud, Accuracy 1/1000 Baud | OPTION |
| RTTY Baudot CCITT No. 2 Variable 30-250 Baud, Accuracy 1/1000 Baud | OPTION |
| RTTY Baudot CCITT No. 1 Bit-Inversion, Variable 30-250 Baud, Accuracy 1/1000 Baud | OPTION |
| RTTY Baudot CCITT No. 2 Bit-Inversion, Variable 30-250 Baud, Accuracy 1/1000 Baud | OPTION |
| RTTY 8 Channel 200 Baud Press Service (SID, KNA, etc.) | YES |
| NEW RTTY CODE 8 Channel 200 (300 Baud) Press Service (DPA, VWD, etc.) | OPTION |
| RTTY ASCII CCITT No. 5 Standard 110/150/200/300 Baud | YES |
| RTTY ASCII CCITT No. 5 Variable 30-250 Baud, Accuracy 1/1000 Baud | OPTION |
| RTTY Baudot Synchron-Printer, Variable 30-250 Baud, Accuracy 1/1000 Baud | OPTION |
| RTTY Baudot Mode 32, Variable 30-250 Baud, Accuracy 1/1000 Baud | OPTION |
| RTTY Autospec, Variable 30-250 Baud, Accuracy 1/1000 Baud | OPTION |
| MORSE (CW) 15-250 Characters Per Minute (CPM) | YES |
| TOR (SITOR/SPECTOR/AMTOR, ARQ-FEC according to CCIR 476-2), 100 Baud | YES |
| ARQ Multi Channel (Time Div. Multiplex, Moore) 2 Sub-channels 86, 96, 100 Baud | OPTION |
| ARQ Multi Channel (Time Div. Multiplex, Moore) 4 Sub-channels 172, 192, 200 Baud | OPTION |
| ARQ Multi Channel (TDM) Mode PLEX 2 Sub-channels 86, 96, 100 Baud | OPTION |
| ARQ Multi Channel (TDM) Mode PLEX 4 Sub-channels 172, 192, 200 Baud | OPTION |
| ARQ One Channel Standard 48, 64, 72, 85, 96 Baud | OPTION |
| FEC System with 7 BIT Code according to CCITT No. 3, 96, 100, 192, 200 Baud | OPTION |
| FEC System with 7 BIT Code Self Checking (Convulgenter Code) 30-250 Baud | OPTION |
| FEC System with 7 BIT Code according to CCITT No. 3, 30-250 Baud | OPTION |
| BIT ANALYSE (Analysis of received BIT format) | OPTION |
| AUTO SPEED-CHECK Baud Rate Indication 30-250 Baud with 1/1000 Baud Accuracy | YES |

**The price of individual expansion units is available on request and a fully expanded AFR 2010, capable of decoding virtually any transmission in any mode, costs about £1500.**

## INTRODUCING THE REST OF THE POCOM FAMILY






**1 — PFC 100**
**2 — AFR 8000**
**3 — AFR 2000**
**4 — AFR 1000**
**5 — AFR 2010**

**POCOM** decoders are manufactured in Switzerland by the Poly-Electronic company who are known throughout the world for the quality of their products. The **2010** is the flagship of their range and this is the one that we would recommend to professional and commercial users — it covers everything! The **AFR 8000** is similar to the **2010** (it uses the same software) but it has the added feature of a built-in LCD display which makes it ideal for mobile or marine use where a video monitor is not really practicable, although a video option available. The **AFR 2000** is again similar to the **2010** but in its standard form it is supplied without CW capability. A CW expansion board is available as an option. The **AFR 1000** is a budget priced ASCII, ARQ/FEC (SITOR/SPECTOR/AMTOR) and CW decoder which has many of the features of the **2010** but which is not upgradeable. Although it is not a decoder, it is worth mentioning that we can also supply the **POCOM PFC 100**, a versatile frequency controller for radios such as the NRD 515 and the ICOM R70.

Whether you are a professional user or a dedicated listener there is a **POCOM** decoder for you and, although the top of the range model costs about **£1500**, prices start from as little as **£395.** They may not be the cheapest on the market, but they are certainly the best! For more details send s.a.e. (at least 8"×6") for a free booklet which gives the full specifications of the entire **POCOM** range of decoders.

***This ad cannot really do justice to these marvellous pieces of equipment, so next time you are in the area, come in and try them for yourself – you will be convinced.***

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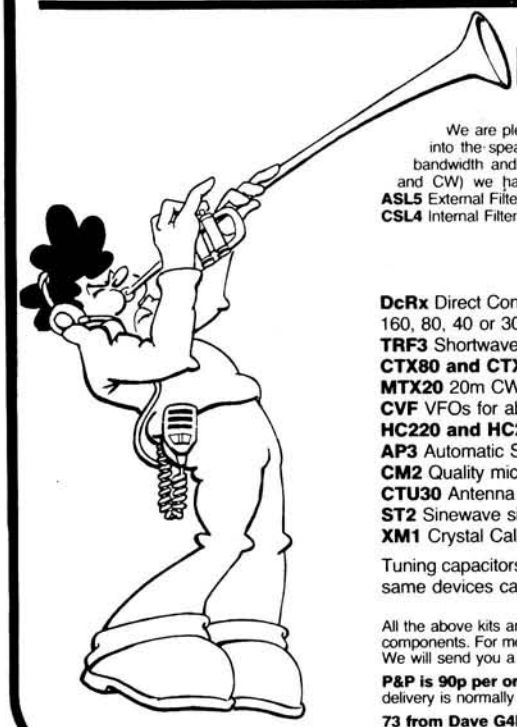

## FANFARE FOR NEW GOODIES!

We are pleased to announce two new dual bandwidth filters to enable you to enhance your receiver. The **ASL5** simply plugs into the speaker or headphone socket of your radio, while the **CSL4** fits within the set, (ie DcRx). Both feature a 300Hz CW bandwidth and fast roll-off for sharp selectivity on speech modes. These filters give improvements with every radio (FM, SSB and CW) we have tested to date. So you can have some fun with a constructional project, and upgrade your station too!

**ASL5** External Filter kit: **£14.90** — **Assembled PCB module: £22.50**
**CSL4** Internal Filter kit: **£9.90** — **Assembled PCB module: £15.90**

| | Kit | Assembled PCB |
|---|---|---|
| **DcRx** Direct Conversion Receiver for CW and SSB reception, versions available for 160, 80, 40 or 30/20 Metres) | **£15.30** | **£20.90** |
| **TRF3** Shortwave Broadcast receiver using TRF principle | **£14.50** | **£19.90** |
| **CTX80 and CTX40** QRP CW Transmitter for 80m and 40m bands | **£13.40** | **£19.40** |
| **MTX20** 20m CW Transmitter, adjustable power up to 10W RF | **£21.90** | **£27.70** |
| **CVF** VFOs for above TXs (one version per band) | **£9.90** | **£15.90** |
| **HC220 and HC280** 2m to 20m or 80m transverters, 10W RF | **£52.50** | **£83.50** |
| **AP3** Automatic Speech Processor with VOGAD level control | **£15.90** | **£22.80** |
| **CM2** Quality microphone kit with electret mic and VOGAD | **£11.20** | **£15.20** |
| **CTU30** Antenna Tuner, with balun, all HF bands up to 30W | **£24.90** | **£29.90** |
| **ST2** Sinewave side-tone/practice oscillator 1W audio. | **£8.60** | **£12.90** |
| **XM1** Crystal Calibrator, 8 o/p markers, usable LF to UHF | **£16.80** | **£21.90** |

Tuning capacitors for the DcRx receiver (except 160m version) are £1.50 each, you need two per receiver. One of the same devices can also be used for the CVF.

All the above kits are to build PCB modules. They include a circuit board, full instructions and all board mounted components. For more information on the above, or the rest of our range, simply drop us a line enclosing an SAE. We will send you a copy of our catalogue, and an information sheet on any kit you are particularly interested in.

**P&P is 90p per order.** Export prices are as above, but add £2.00 per kit for airmail delivery outside Europe. UK delivery is normally within 7 days.

**73 from Dave G4KQH, Technical Manager.**

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**TUBULAR TRIMMERS** 3pF @ **15p,** 6pF @ **15p,** 15pF @ **15p.**
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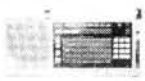

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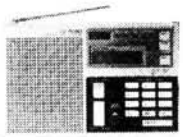

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**DRESSLER ARA 500 ACTIVE ANTENNA**

50MHz to 1300MHz
Gain 17dB Typical

**TECHNICAL SPECIFICATIONS FOR ARA 500**

| | |
|---|---|
| Gain | 17dB Typical (14-17dB) |
| Frequency Range | 50-1300MHz |
| Noise Figure | 1dB at 50-180MHz<br>1.5dB below 300MHz<br>2.0dB below 350MHz<br>2.7dB below 400MHz<br>3.0dB below 500MHz<br>3.8dB below 650MHz |

**£139.00**

Operation is possible up to 1300MHz with gain of 10dB
Noise 4-6dB
Intercept Point 3rd Order: +18dbm at Input
Post £3.00 or Securicor £7.00 extra

Both antennas come complete with 7 metres of cable, interface, power supply and brackets.

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## PRE-AMPS – NEW MODELS

| MODEL | FREQ. | NOISE | GAIN | POWER | PRICE |
|---|---|---|---|---|---|
| EVV1296C | 1.25-1.3GHz | 0.9-1.2 | 16-18dB | 100W | £162 |
| EVV700SMD | 430-440MHz | 0.5-0.9 | 15-18dB | 500W PEP | £124 |
| EVV2000SMD | 144-146 | 0.6-0.9 | 16-18dB | 1KW PEP | £124 |
| EVV200VOX | 144-146 | 0.6-0.9 | 16-18dB | 700W PEP | £112 |
| EV2GAAS | 144-146 | 0.6-0.9 | 15-18dB | 100W PEP | £75 |
| VV INTERFACE FOR ABOVE PRE-AMPS | | | | | £31 |

## RECEIVE PRE-AMPS

| MODEL | FREQUENCY | NOISE | GAIN | PRICE |
|---|---|---|---|---|
| EWPA 560 | 50-600-1GHz | | 16.5dB-1dB | £79 |
| EWPA 560(N) | 50-600-1GHz | | 16.5dB-1dB | £89 |
| IP3 order | +18dBM | | | |
| ERPA 1296 | 1.25-1.30 | 0.8 | 17-18dB | £120 |
| ERPA 435 | 430-440 | 0.5 | 15-18dB | £70 |
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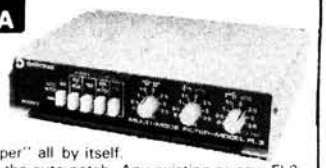

Model FL3 represents the ultimate in audio filters for SSB and CW. Connected in series with the loudspeaker, it gives variable extra selectivity better than a whole bank of expensive crystal filters. In addition it contains an automatic notch filter which can remove a "tuner upper" all by itself.
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*Above prices include Carr/Postage & VAT, goods new or in good cond. 2×18p stamps for List 39/2 allow 14 days for delivery.*

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# TX-3 RTTY / CW / ASCII TRANSCEIVE

All the features you've ever wanted in this really top class program. Some of the facilities are: Split-screen, type-ahead, receive screen unwrap, 24 large memories, clock, review store, callsign capture, RTTY auto CR/LF, CW software filtering and much more. Uses interface or T.U. For **BBC-B** and **CBM64**. Tape £20, disc £22. For **VIC20** we have our RTTY/CW transceive program. Tape £20.

# RX-4 RTTY / CW / SSTV / AMTOR RECEIVE

This is still a best-selling program and it's easy to see why. Superb performance on 4 modes, switch modes at a keypress to catch all the action. Text and picture store with output to screen, printer and tape/disc. An essential piece of software for trawling the bands. **SPECTRUM** needs no hardware, **BBC-B, CBM64** and **VIC20** need interface. Tape £25, BBC or CBM64 disc £27.

**TIF1 interface** has 2-stage RTTY and CW filters for improved reception and transmit outputs for MIC, PTT and KEY. Kit £15 (assembled PCB + cables and connectors) or ready-made £25 in a box with all connections. Extra MIC leads for extra rigs £3 each.

**BBC World map and locator** shows daylight and darkness zones and realtime clock updated as program runs. Accepts input of lat/long, QTH or Maidenhead locator, NGR or one of 245 place-names. Prints distance, bearing, VHF contest score and long patch details. Plots distant station and great circle path on map. Runs on **ELECTRON** also. Tape £7, disc £9.
For **CBM64, VIC20, SPECTRUM** we have our original locator program (no map, NGR or placenames) tape £7.

**Morse Tutor** is now fully revised with every feature to learn morse the quick and easy way. Graded learning for beginners and 40 plain language texts for test preparation. Tape £6 for **BBC-B, ELECTRON, CBM64, VIC20, SPECTRUM**. The original **ZX81-16K** program is still available at £6.

**Logbook** date, band, mode, call and remarks for all your contacts. Easy to use, printout to screen or printer, callsearch. For all the above computers, tape £8.

**RAE Maths** All the practice and testing you need for the exam. For all the above computers inc. **ZX81-16k**, tape £9.

All BBC and CBM64 programs are available on **disc** at £2 extra. All VIC20 programs (except locator) need expansion.

Prices include VAT and p&p, 1st class inland, airmail overseas, normally by return. Eire, C.I., BFPO deduct 13%.

Access **technical software** (P.W.) BARCLAYCARD VISA

**Fron, Upper Llandwrog, Caernarfon LL54 7RF. Tel. 0286 881886**


## Gazetted

I was amazed to read in L. A. Moxon's letter in the March issue that "Amateur use of the 10MHz band was granted at the last European Amateur Radio Conference . . .". I just couldn't believe it—I've heard nothing from the Home Office.

You see, as a fully paid up Licensed Amateur it is really quite important that I should know of any changes in the regulations. So I had a look at the latest list of "terms, provisions and limitations" sent to me by the Home Office. I know it's dated as long ago as August 1977, but this is the latest official information that I have been sent to help me to operate within the law.

Could it be that they've changed things without telling me? No, they're bound to tell me according to Clause 12 on page 3 of this yellowing but important legal document. It says that no less a person than the Secretary of State will let me know, ". . . by a notice in writing served on the Licensee . . .".

Oh, but wait a minute, there's an OR here: ". . . or by a general notice published in the London, Edinburgh and Belfast Gazettes . . .".

So I went to my newsagent on the corner. "Never heard of them. Do they do Bingo? Might stock it if they did and if they did a Birmingham one. I've got *The London Gaze* though." So I got that, but apart from thinking it must be very warm in London if people can go around dressed so lightly, I found nothing about 10MHz at all.

Perhaps they wrote and the postman couldn't find Droitwich. Maybe next time he'll home in on 200kHz! Anyway, thanks to you and Mr Moxon for letting me know.

***John Mayall G3VPH***
***Droitwich, Worcs.***

PS: Imagine, a 10MHz band! YIPEEEEEEEEE!

*Although licence administration costs must obviously be kept down, it doesn't seem unreasonable to expect that updating slips covering the previous year's changes should be sent out with the annual renewal reminder from Chesterfield. After all, a subscription to one of the* Gazettes *will cost you an arm and a leg.—Ed.*

## Morse Testing

In his letter in *PW*, January 1987, Norman Dickinson asks why the RSGB took on Morse testing for the amateur licence. I should have thought that this was obvious but if it needs to be spelt out, it was "to give the radio amateur a better service" and, I believe, it does just that.

The facts are:

1. The RSGB service is not restricted to 9–5 office hours and thus saves many candidates having to take a day off work or leave in order to attend.

2. The RSGB service is available to most candidates within a reasonable distance of their homes, and thus does not involve expensive long distance travel.

3. The RSGB service is even now offering many more centres for testing, and still more will come on stream as county teams become active. Eventually there will be a centre operating in every county of the UK.

4. The RSGB service exam centres are made available at times as required and convenient to the local

# PW COMMENT

## Our Society

WHILST CHATTING WITH VISITORS to the *Practical Wireless /Short Wave Magazine* stand at the recent EDXC On The Road Show in Birmingham, one visitor, a regular *PW* reader who is both a broadcast listener and a licensed amateur of long standing, remarked to me that although he liked the magazine, he was concerned at what appeared to be a campaign of attacks on the RSGB in our letter pages. Were we anti-RSGB, he wondered.

I explained that the reason the letters were there was that RSGB policy had prevented the publication in *Radio Communication* of virtually any comment or argument which criticised the Society, or which put forward a view that was contrary to official Society policy. It was our feeling that this embargo is most unhealthy for UK amateur radio in general, and for the future of the RSGB in particular, and that there **should** be a forum for public debate, which led us to the conclusion that if *RadCom* would not allow it to take place in their pages, then we should. The amateur in question told me that he had not previously realised the situation, and he would in future look at our letters pages in a totally different light.

I know that there are a number of senior RSGB members who support the spirit of this embargo, for in recent months I have several times received comments, in response to views expressed in our letters pages, effectively saying: "Unless a member is prepared to stand for election to Council, he has no right to criticise. He should simply pay his subscription and keep quiet." In my opinion, such an attitude is no more helpful than that of the "wally" element in our hobby, who would tear down everything.

Because of all this, I was pleased to see that *RadCom*'s February issue carried the first instalment of a new feature entitled *I don't agree . . . but do you?* which is intended to give RSGB members the opportunity to voice "non-popular opinion, especially non-official opinion".

The format of the new feature is that the letter of "non-popular opinion" is balanced by one presenting the opposing view. The first offering was the case for 10MHz s.s.b., put forward by Les Moxon G6XN (see *PW*, March 1987) and answered by Martin Atherton G3ZAY, Chairman of the RSGB HF Committee. According to the introduction to the feature, written by Peter Chadwick G3RZP, Chairman of the Technical and Publications Committee, neither contributor had seen the other's letter. However, as Les Moxon's views on this particular topic are already well-known at Lambda House, and as Martin Atherton merely re-stated "official" RSGB thinking, it is hardly surprising that they appeared to be mutual point-by-point rebuttals. It will be interesting to read the report to be compiled by Ian White G3SEK on the views expressed by members in response to these two letters.

Although the new feature is undoubtedly a step in the right direction, I cannot help feeling that it is but a very small one. Why are "RSGB-controversial" subjects taboo? What exactly is the difference between non-popular and unpopular? (My dictionaries, so far as they acknowledge the existence of a word "non-popular", think they're the same.) And as for trying to work out the precise implications of the assumption that "non-official opinion" is a sub-set of "non-popular opinion", well, my thought-processes are still reeling!

It is, I think, a pity that RSGB Council and the Technical and Publications Committee were not prepared to bend just that little bit further, to allow critical letters to appear within the normal *Members' Mailbag* pages of *RadCom*, with Editorial comments added where appropriate, rather than shunt them off into a special feature of their own.

***Geoff Arnold G3GSR***

needs. Some Saturday/Sunday exams are held and it is possible to book an evening session. Groups can arrange special sessions.

5. The RSGB service has been able to not only almost halve the previous fee, but to undertake to maintain that cut for at least two years.

Certainly, there have been problems, partly resulting from the introduction of a computerised system in an effort to reduce costs, but no more than might be expected in setting up any new venture. However, we believe that we are now fully operational.

The other point raised is the ever-present old faithful "why don't they tell us the result". The answer is that they don't for very good reasons:

(a) The examiners only have a quick look at the written papers initially—the marking is done after the session. This is very necessary, as time and care must be taken to be certain that poor writing does not contribute to a failure result. In the event of any doubt, the papers are referred to the Chief Examiner for a decision.

(b) The Society's contract requires that results shall be notified to the candidate in writing, and RALU will only accept such notice as proof of proficiency. On rare occasions when BT examiners broke the rules and gave candidates broad hints as to their results, much hassle was caused for the Licensing Authority, due to candidates writing in to initiate new callsigns without waiting for the necessary documents; the examiners themselves being cautioned and reminded of standard procedures.

(c) It must also be remembered that candidates come in all sorts of shapes and sizes, from all walks of life and every persuasion, and therefore one can expect that there will be a number of difficult ones. The examiners are volunteers and must be spared any possibility of unnecessary discord.

I feel that it would be remiss of me if I were to give, or allow others to give, the impression that the old service was anything but efficient. To do so would be far from the truth. Many of the present examiners were part of the old system, for numbered amongst us are several ex-Post Office/BT employees.

The Society has attempted to retain tried and tested procedures, and added some we feel improve our ability to give a better service to the amateur. Computerisation and the use of so many dedicated and volunteer examiners has enabled costs to be cut to the bone. Otherwise, little has changed.

I believe that we can guarantee that the teething troubles are now over, and Mr Dickinson's experiences will not be repeated.

Finally, a thank you to all who could have, but didn't, complain about early inconveniences, especially those who expressed appreciation for the examiners' efforts.

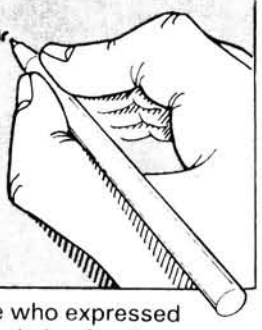
***A. N. Ianson G3GDO***
***Chief Morse Examiner RSGB***

*It would be unfair to the providers of the old service to imply that it was never available outside normal office hours. Morse tests had been carried out for some years at the Welsh Convention, and more recently at a number of rallies and conventions around the UK.*

*If it is true that BT Examiners broke the rules on only rare occasions, why is it that everyone I have talked to on the subject confirm that they were told the result there and then, but with the added instruction "don't write off until you get the official piece of paper". I know that's exactly what happened to me when I had to take the test in 1979 to reactivate my callsign.—Ed.*

**Send your letter 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 other letter published.**

**Letters must be original, and not duplicated to other magazines. We reserve the right to edit or shorten any letter. Brief letters may be filed via our Prestel Mailbox number 202671191. The views expressed in letters are not necessarily those of *Practical Wireless*.**



# OUR SERVICES

## QUERIES

We will always try to help readers having difficulties with a *Practical Wireless* project, but please observe 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 International Reply Coupons for overseas readers).
4. Write to the **Editor, "Practical Wireless", Enefco House, The Quay, Poole, Dorset BH15 1PP,** giving a clear description of your problem.
5. Only one project per letter, please.

## COMPONENTS, KITS AND PCB'S

**Components** for our projects are usually available from advertisers. For more difficult items, a source will be suggested in the article. **Kits** for most of our more recent projects are available from **CPL Electronics,** 8 Southdean Close, Hemlington, Middlesbrough, Cleveland TS8 9HE, telephone Middlesbrough (0642) 591157. The **printed circuit boards** are available from our **PCB SERVICE** (see page 1 of this issue).

## CONSTRUCTION RATING

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 experienced 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 his own.

## BACK NUMBERS AND BINDERS

Limited stocks of most issues of *PW* for the past 18 years (plus a few from earlier years) are available at £1.25 each, including post and packing to addresses at home and overseas (by surface mail).

Binders, each taking one volume of *PW,* are available price £5.50 to UK addresses, £5.75 overseas, including post and packing. Please state the year and volume number for which the binder is required. Prices include VAT where appropriate.

## CLUB NEWS

If you want news of radio club activities, please send a stamped, self-addressed envelope to **Club News, "Practical Wireless", Enefco House, The Quay, Poole, Dorset BH15 1PP,** stating the area of the country you're interested in.

## ORDERING

Orders for p.c.b.s, back numbers and binders, *PW* computer program cassettes and items from our Book Service, should be sent to **Post Sales Department, "Practical Wireless", Enefco House, The Quay, Poole, Dorset BH15 1PP,** with details of your credit card or a cheque or postal order payable to Practical Wireless. Cheques with overseas orders **must** be drawn on a London Clearing Bank.

Credit card orders (Access, Mastercard, Eurocard or Visa) are also welcome by telephone to Poole (0202) 678558. An answering machine will accept your order out of office hours.

## SUBSCRIPTIONS

Subscriptions are available at £13 per annum to UK addresses and £15 overseas, from **"Practical Wireless" Subscription Department, Competition House, Farndon Road, Market Harborough, Leicestershire LE16 9NR. Tel: (0858) 34567.** Airmail rates for overseas subscriptions can be quoted on request.

## Microwave Assembly and Dinner

At the 1987 Microwave Assembly and Dinner, on July 18, Mr Les Sharrock G3BNL is presenting one of the two lectures.

His lecture is designed to enable the newcomers to the microwave field to avoid some of the pitfalls and to gain from the many years of experience of G3BNL.

The outline of the presentation is:

1: Introduction and summary of frequency bands above 1GHz. Usual modes of operation for respective bands. What a newcomer may expect from microwaves. Discuss level of audience participation with respect to their collective usage of bands and individual.
2: Do you purchase or construct? Sources of available information published. Desirable test equipment, simple and advanced.
3: How to start on 23cm. Develop to higher bands.
4: A Gunn diode project for 10GHz and demonstration.
5: A narrow band approach to 10GHz and demonstration.
6: Phase-locking techniques.
7: Sites and access—restrictions.
8: Questions and Answers.

More details on the Microwave Assembly from ***F. T. Smith, 5 Pinfold Crescent, Penn, Wolverhampton.***

## Computer-Radio Club

A new computer-radio club has been formed called the **Atari ST Users on Radio Group** or ASTUR for short. It is based in Belgium but they are looking for UK ST users to exchange ideas and software.

Details of the group can be obtained from the chairman: ***Geeraert M.D., W. Elsschotlaan 21, B-8460 Koksijde, Belgium.***

You can always telephone him on Belgium 058 51 39 40 after 2100GMT.

## Logged any EA6s Lately?

Several English radio amateurs and short wave listeners either live permanently or have second holiday homes on the island of Mallorca, and are members of the Radio Club Cultural Mallorca.

This group was snapped in front of Palma Cathedral at the club's special exhibition station (EA6WQ) to mark the anniversary of the patron saint (San Sebastian). An antenna was slung between two rather short masts, but what a pity it could not have been hung on the top of the Cathedral itself.

Left to right are: Gabriel EA6VQ, Antonia EA6WQ, Austin EA6XG, Alan G4WUL, Jan EA6WV, Lon EA6XS, Mike EA6SX and Vic G4UPG (kneeling).

Photo by Douglas G3KPO

## Orkney Activity Month

Orkney is a relatively rare part of the UK. The callbook shows 34 licences (14 Class A and 20 Class B), but not all are active. With a view to stimulating some interest and to provide others with a chance to work Orkney, the Orkney Group of Radio Amateurs have decided to consider June as an Activity Month.

As many amateurs as can will make a special effort to be on the various bands. The suggested frequencies for operation are: (all in MHz and ±) 1.973, 3.753, 7.023, 7.053, 14.033, 14.253, 21.253, 28.8, 29.6, 70.26, 144.033, 144.353. Modes: c.w., s.s.b., f.m. and possibly RTTY.

You can get more information from ***Bill GM3IBU, QTHR*** or ***John GM4YBJ, QTHR.***

## Radio Club Highlight

As mentioned last issue, the Loughton & District ARS are celebrating their 25th Anniversary.

As a club they have a quarterly newsletter, which apart from containing club news also lists the diary of events, both of their club and also such national bodies as the RSGB and BARTG etc. They even mention other local clubs from time to time! Frequently amusing little articles are slipped in to keep the membership smiling.

Either taken place so far or planned is an enormous number of events, such as:

A film show on Narrow Gauge Railways of North Wales

A talk on Electrical Safety

Two weekends under canvas at Old Harrow and Hastingwood

25th Birthday weekend event and dinner

A visit to a local radio station

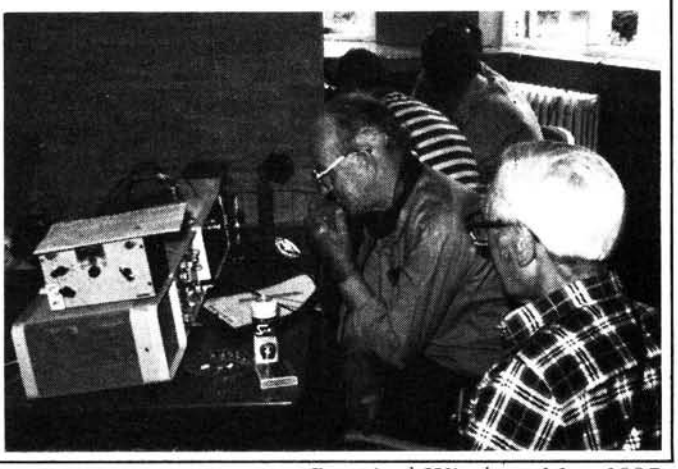
DF and treasure hunts

Organised trips to rallies.

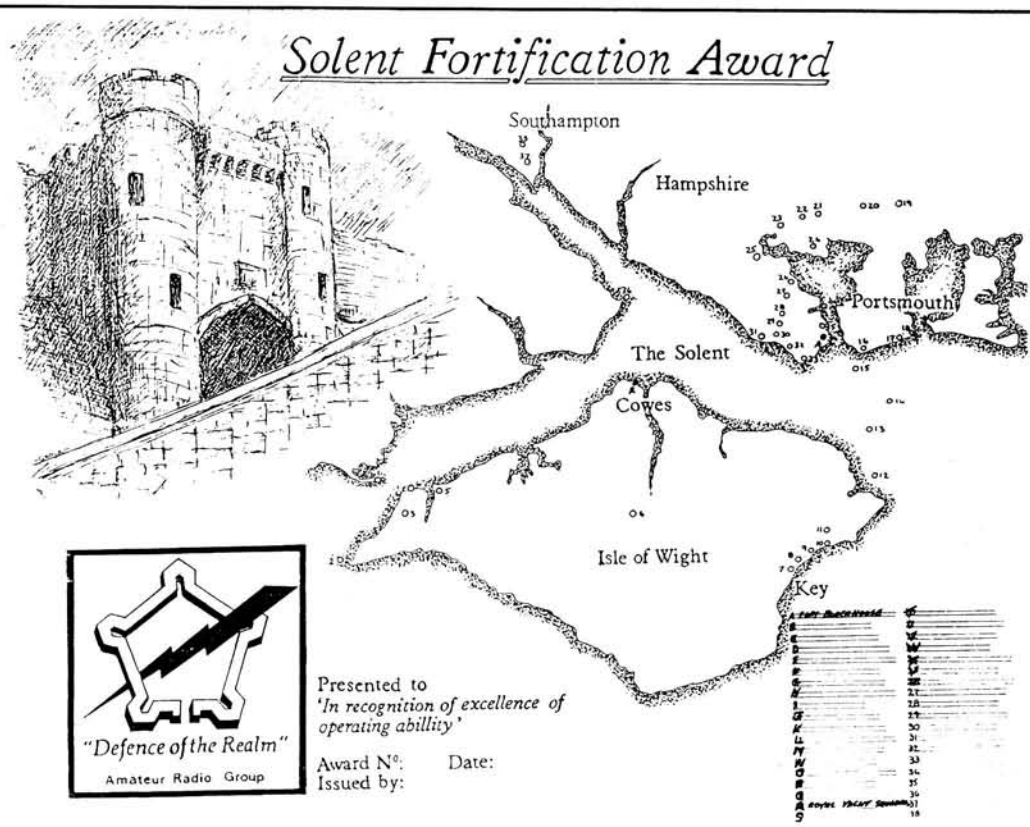
The list is almost endless. You can see the array of features laid on for members caters for all interests. That's what keeps a club going over the years. We wish them all the best for the next 25 years, too.

The illustrations show their special 25th Anniversary QSL card and founder member Jack G3OPA (holding the mic) and Bob G4JOK (logging) at the last event the club took part in.

If your club has something to shout about, let me know. Send your details and some photographs if possible to: Elaine Richards, Practical Wireless, Enefco House, The Quay, Poole, Dorset BH15 1PP.

## Solent Fortification Award




April '87 must be a popular month for awards. This award is based on the many defences of the Solent. A maximum of 26 locations will be selected, and during each year it is hoped to activate all stations on at least four consecutive weekends.

Operating will be conducted by various local clubs and newly formed groups. Both h.f. and v.h.f. are catered for and signal reports from short wave listeners are welcome.

All contacts will receive detailed individual QSL cards for each fortification worked.

The callsigns will be either GB0CD? or GB1CD?. The question mark will be the designated letter for the fortification concerned (A–Z).

Contacts on and after 4 April 1987 are valid. You don't need to send in the QSL cards, a list showing full details of the contacts should be certified by two other licensed amateurs.

The fee for this award is £2.50, and there are awards for v.h.f. and h.f.

Awards are issued in five categories:
HF (Zone 14) contacts required; Basic—7, Silver—10, Gold—13.
HF (outside Zone 14) contacts required; Basic—3, Silver—5, Gold—7.

All modes, all bands accepted. Please state for c.w., phone or mixed. One point per contact.
VHF (80km radius) contacts required; Basic—7, Silver—10, Gold—13.
VHF (400km radius) contacts required; Basic—3, Silver—5, Gold—7.
VHF (outside 400km radius) contacts required; Basic—1, Silver—2, Gold—3.

One point per contact on phone, two points per contact on c.w. or other modes.

Comments or queries should be sent to ***G6MWY, 72 Elmore Avenue, Lee-on-Solent, Hants PO13 9ES.***

## Special Event Stations

**GB2SMC:** Between 8 and 23 August it is planned to operate a special event station in connection with the celebrations for the 850th Anniversary of the founding of St Magnus Cathedral in Kirkwall. The primary mode will be s.s.b. on the h.f. bands from 3.5–28MHz as appropriate. There might be v.h.f. activity on 144MHz.

More details from ***Bill GM3IBU, QTHR.***

## Forthcoming AGMs

**Abergavenny & Nevill Hall ARC** have given me details of their AGM. It starts at 7pm (prompt) on Thursday April 16. The venue is above Male Ward 2, Pen-Y-Fal Hospital. ***GW4XQH on 0873 4655*** for more details.

## Yeovil QRP Convention

The Yeovil ARC is holding its third QRP Convention on Sunday May 10. It has been moved from October for the first time after many comments about it clashing with other events at that time.

The agenda for the day is:
0900—Talk-in commences on S22 using the callsign G8YEO/A.
0930—Convention Opens.
1030—Lecture: The Theory and Incidence of Chordal Hop Propagation by G3MYM. This will be followed by a discussion.
1200/1400—Lunch Break.
1400—Lecture: Construction Techniques by G4BUE. This will also be followed by a discussion.
1600—Prize Draw.
1700—Convention Closes.

Entrance to the Convention costs £1 including programme with lucky draw number. The venue for the event is: ***The Preston Centre, Monks Dale, Yeovil.***

## The America's Cup

I expect nearly everyone saw some of the coverage of the America's Cup recently. Some of the most spectacular camera shots were those of the on-board camera on *Stars and Stripes*.

The camera system, Yacht-Cam, was designed by Northampton television company, TV-2 Communications. It incorporates a dome antenna, developed and supplied by Marconi Communication Systems. TV-2 installed the camera on the 12 metre yacht, *Stars and Stripes*.

A camera was mounted on the yacht's mast, facing aft, beneath the main sheet boom where it could capture the crew at work. Pictures were sent from the camera, by cable, to a microwave transmitter which was mounted on the underside of the transom. The signals were then fed into the Marconi dome antenna and transmitted up to a helicopter circling overhead. Using a second microwave transmitter on a different frequency, the signals were re-transmitted to the studios.

## Can you Help?

Has any reader got an LM373 i.c. asks Mr Philips. If so would you contact ***Mr Bob Philips, 502 Warwick Court, Gateshead, Tyne & Wear NE8 1EY.***

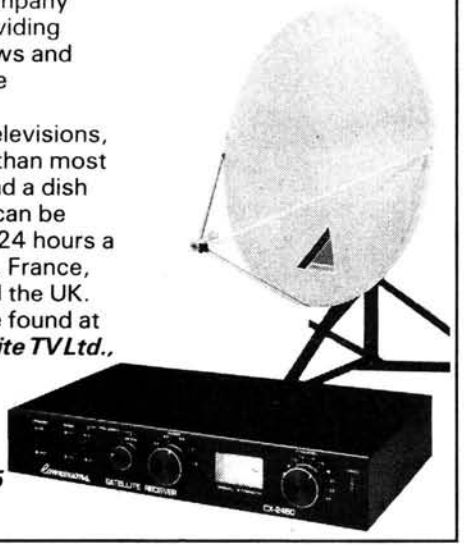
# NEWS . . . compiled by G4LFM

## Dorset Dishes

People living in Dorset now have their own company specialising in providing entertainment, news and arts by live satellite television.

Using existing televisions, a receiver smaller than most video recorders and a dish of 1.2m, pictures can be received for up to 24 hours a day from the USA, France, Germany, Italy and the UK.

The shop can be found at ***Dorset Dish Satellite TV Ltd., 4 Station Road, Parkstone, Poole, Dorset. Tel: 0202 749495***



## Oops!

In the March '87 issue we printed details of a new radio club, called the Twickenham and Teddington Wireless Club. Unfortunately we printed the wrong telephone number. The number should have been **John G0AKN** on **01-891 2820**. Apologies to all concerned.

## Michael Faraday Award 1987

The Michael Faraday Award was established by the Royal Society in 1986 to encourage practising scientists to do more to present their science to the general public. The Award is made annually by the Council of the Royal Society to the scientist or scientists who have done most to further, in the UK, the public understanding of science.

The first Michael Faraday Award was made to Professor Charles Taylor, University College Cardiff, for his outstanding presentations of physics and applications of physics, aimed at audiences from six-year old primary school children to adults.

Nominations are now invited for the 1987 Michael Faraday Award. Application forms are available from ***Ms Julia Sewell, The Royal Society, 6 Carlton House Terrace, London SW1Y 5AG.*** The closing date for applications is May 1.

## New Callsigns

In *Comment* in the February 1987 *PW,* readers were invited to propose interesting amateur callsigns which might be allocated from possible future series MAA–MZZ or 2AA–2ZZ.

Quite a few interesting suggestions were received, though it must be said that some of them were rather contrived.

In the opinion of the Editor, the clear winner of the £5 *PW* Gift Voucher was a Mr J. E. Catt, with his suggestion of a most appropriate callsign: M1AOW.

Thanks to all who wrote in, and especially to Alan Sweetman G4LRI for his information that the series 2AA to 2ZZ is already in use for shipboard radio stations.

## DATACOM

*DATACOM* is the newsletter for the British Amateur Radio Teleprinter Group, issued quarterly. Now it is being produced on 3 C90 cassettes and will cost £5 for the year's issues. Cassettes and wallets for posting are provided.

If you are blind or partially sighted, this could be the way for you to keep up to date with the things that BARTG are doing.

Subscriptions should be sent to ***Roy G3LAZ QTHR*** or by telephoning 0582 583996 (office hours) or 0582 65017.

## Rally Dates

**May 3:** The 4th Anglo-Scottish Rally will be held in Kelso's Tait Hall. The rally opens at 11am and closes at 5pm. There will be the usual talk-in on S22, traders' stands, club stands, hot and cold snacks, bar, raffles and Morse Tests, etc.

Entrance to the rally will be £1.00, but juniors and accompanying YLs and XYLs are most welcome and admitted free.

More information from ***Andre Saunders GM3VLB on 0573 24664.***

**May 3:** The Swansea ARS Rally is being held in the Patti pavilion, adjacent to the County Cricket Ground on the Swansea to Mumbles coast road (A4067). The rally is on from 10.30am to 5pm, with trade stands, bring and buy, c.w. test (pre-book with RSGB), bar, full catering and free lucky programme.

More details from ***Roger Williams GW4HSH on 0792 404422.***

**May 10:** The Swindon & District ARC are holding their Radio & Electronics Rally, as in previous years, at Oakfield School, Marlowe Avenue, Swindon. The rally starts at 10am and there will be talk-in on S22 and SU8 as well as GB3TD. There is free parking for those attending the rally, and a film show and other amusements for the children. Further information can be obtained from ***G8SFM on 066689 307.***

**May 17:** The annual rally for the Mid-Ulster ARC is being held at their usual venue of Parkanaur House, near Dungannon. The rally starts at 12 noon and there will be the usual trade stands, bring and buy, RSGB bookstall, QSL bureau, etc., in attendance. The entrance fee is £1, but all the proceeds from the rally go to the Stanley Eakins Memorial Fund. Further details from ***Sam White GI1BIW on 076 22 22855.***

**May 24:** Brief details here, The Maidstone Mobile Rally is scheduled for this date. More details from ***Alan Judge G6FZD on Maidstone 50709.***

**June 7:** The only information I have about the Spalding & District ARS rally is that it is taking place at Springfield Gardens, Spalding. ***Dennis G4OO on 0775 86382*** probably has more details.

**June 21:** The Denby Dale Radio Rally starts at 11am at Shelley High School. That's on the B6116 near Skelmanthorpe. Talk-in will be on S22, SU22 and 28MHz f.m.

For further details contact ***Gerald Edinburgh on Huddersfield 602905.***

**July 12:** The Worcester & District ARC are holding their Droitwich Rally at the High School, Droitwich. There is both free entry and parking at the rally site. All the usual trade stands will be there, too.

For the family, the organisers have laid on free transport to the local strawberry fields. More details from ***Steve College G0AOC, QTHR.***

**August 2:** The Rolls Royce ARC are holding their sixth mobile rally at the Rolls Royce Sports and Social Club, Barnoldswick. The rally opens at 11am and there will be excellent amenities available. More details from ***G4ILG on 0282 812288.***

**August 15:** The Wight Wireless Rally is being held at Arreton Manor, near Newport IoW from 11am to 5pm. Talk-in will be on S22 and GB3IW on 430MHz. There will be trade stands and various demonstration stations on the day. For further information contact ***G3KPO on 0983 67665.***

## Club Changes

The **Verulam ARC** have informed us of a change of club secretary. So, if you want more details of the club contact ***Hilary G4JKS on St Albans 59318.*** On the cards they have a lecture called "Wonderful World of Propagation" by G3LTP on May 26.

**Jack Tootill G4IFF** is the Secretary of the **Ipswich Radio Club**. He has written to tell us that his local telephone exchange is going electronic in about four years time. So what, you say!

Well, in readiness for the event local numbers have been changed. So Jack's number is now **0473 464047**.

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We have fitted a High performance HF Front-End made for us by AKD. The new HF section **is fitted internally** with switching circuits and a small toggle Switch on the rear apron to enable band change whereby the display changes to read actual frequency (100kHz-60MHz). The standard SO239 antenna connector has now been changed for an 'N' connector for coverage from 60-950MHz and an SO239 connector fitted for HF coverage 100kHz-60MHz. (UHF extended coverage is now standard as per our original MK2 modification up to 950MHz).

As an 'N' connector is now fitted to all RWC FRG9600s for VHF-UHF coverage it is possible to use a wide-band discone antenna such as the ICOM AH7000 which is supplied with low-loss coaxial cable and 'N' connectors. A dipole or long-wire antenna can be used for HF coverage with very good results. **This facilitates use of two antennas for all bands.**

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* We reserve the right to change specifications due to continuous development and modification of this product.

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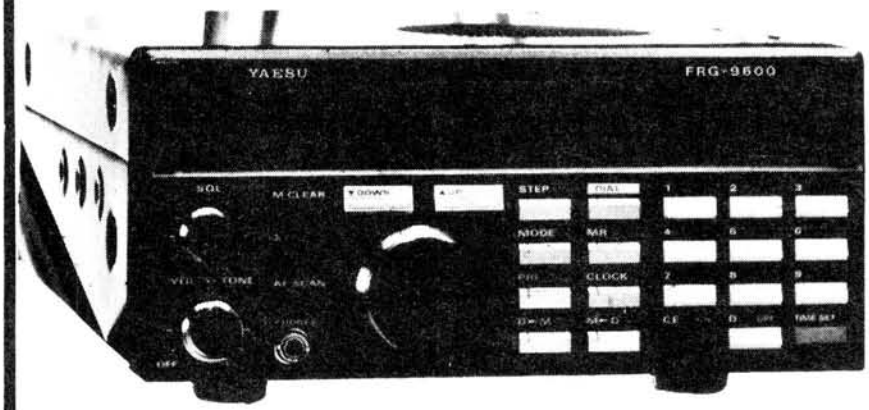


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**RWC Exclusive Base Station Complete HF-UHF Package** FRG9600 MK3 Model, Icom AH7000 ant, G5RV HF multiband, PA4C ac-13V dc adaptor, inclusive carriage UK £725.00.

**STOP PRESS: BBC Model B computer controller available soon (call for details). Or see it at the N.E.C.**

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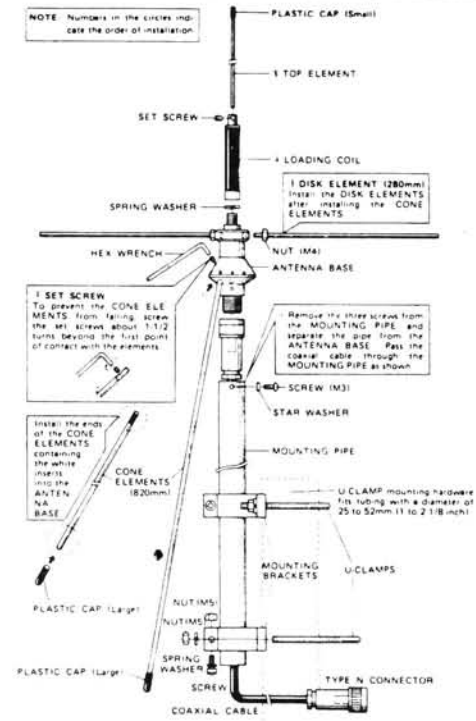


**SPECIFICATIONS**

| | | |
|---|---|---|
| Frequency coverage | Receive | 25 to 1300MHz |
| | Transmit | 50, 144, 430, 900, 1200MHz bands |
| Input power rating | | 200 watts |
| Input impedance | | 50 ohms |
| Supplied connectors | | Type N |
| Supplied coaxial cable | | 50 - 2V (50 ohm) |
| Type of antenna | | Discone |
| Length | | 1.7 meters |
| Weight | | 1kg |

**Icom AH7000** @ £82.50 (inc free carriage UK mainland).

### YAESU/RWC FRG9600 Options

**PA4C ac adaptor** £16.50 inc post.
**FIF232C RS232 computer interface** @ £75.00 inc post.
**Raycom GP900** 900-950MHz 3dB, base station ant @ £22.00 inc post.
**AM-FM wide & narrow IF filters** POA.
**RWC 9600 MK2 owners** HF mod @ £99.00 inc carriage (send unit).
**FRG9600 existing owners** HF & UHF mod – 100kHz-950MHz. Send unit carriage paid @ £129.00.
**YAESU FRG9600 Service Manual** (inc Cat Prog) @ £12.50 inc post.
**Raycom VHF-UHF Discone** 60-600MHz SO239 connector @ £27.50 inc carriage.
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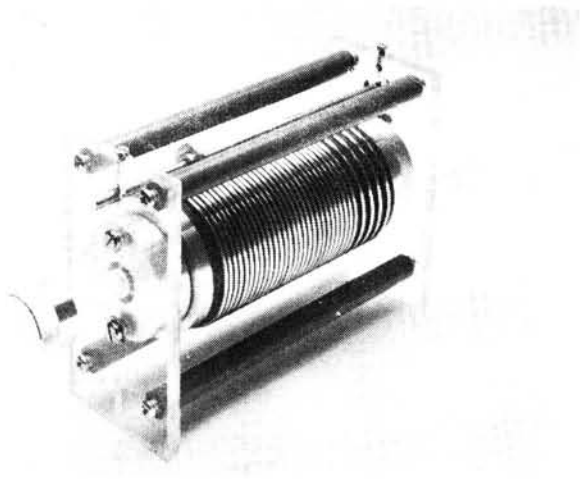
# PRODUCTS ... compiled by G8VFH

## Roller Coaster



The latest "Professional Series" development from Nevada is their RC26 "roller coaster" variable inductor. This precision unit is intended for use in high-power a.t.u.s and transmitter output stages.

The unit has been carefully designed by Ernie Quinnell G4JEV with, according to the leaflet, "meticulous attention to detail".

The Nevada roller coaster claims to have overcome the main problems with ex-government versions—the poor contact between the roller and moving coil—by using a unique design of roller suspension system. This minimises contact bounce and ensures the best possible contact between roller and coil.

The coil is made from silver-plated wire, wound onto a special r.f.-transparent Tufnol former and has an inductance of 1 to 27μH. The complete roller coaster will handle up to 1kW of r.f. power without flash-over or overheating.

The size of the unit, 55 x 105 x 160mm, has been arranged so that it can sit between two Nevada high-power variable capacitors to form a compact 1kW a.t.u. covering 1.8 to 30MHz.

Priced at £24.00, the RC26 is available from ***Telecomms, 189 London Road, North End, Portsmouth PO2 9AE. Tel: (0705) 662145.***

## RAE Questions

Those taking the RAE may be interested to know that a book has been written called *Radio Amateurs Question and Answer Reference Manual*. It is written by R.E.G. Petri G8CCJ and published by *WP Publications, 11 Wayville Road, Dartford, Kent DA1 1RL*. This is the third edition of the book and costs £6.95 plus £1 P&P in the UK.

The book is divided into 23 sections covering specific aspects of the RAE syllabus. The publicity on the book says that these sections, with 1100 questions, cover areas of the syllabus often neglected in books and courses.

The third edition includes two new sections, circuit recognition and using the scientific calculator.

The book also contains some basic computer programs for the Commodore 64, but which could be adapted for other machines.

## Short Antenna

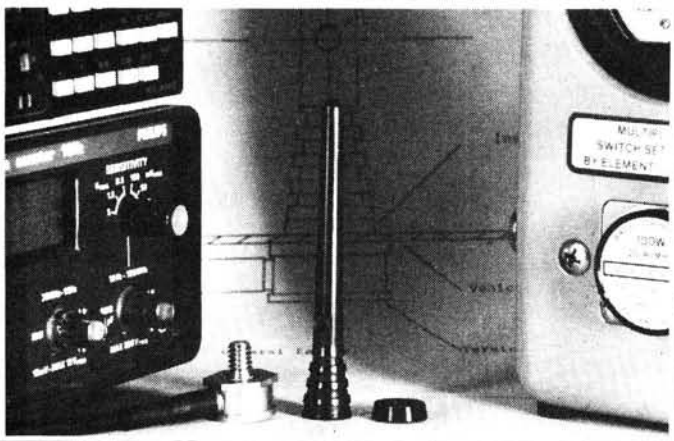
The roof-mounted Cellmaster cellular radio antenna designed and manufactured by Les Wallen Manufacturing Ltd of Ramsgate, Kent, has been awarded a 1987 British Design Award.

The antenna is only 88mm high and so is discrete and rigid enough not to be attacked by car-washes or resonate when cruising at "rep-speed" down the motorway. It is also claimed to be very difficult for a vandal to get a grip of.

Les Wallen designed the Cellmaster for his own small company, which specialises in antennas for all forms of mobile radio communications—p.m.r., marine, amateur and cellular.

The new antenna is machined from solid aluminium and brass and the complete unit is black anodised. It can be supplied with a small brass mount for through-roof installation, or with an alternative mag-mount. The bandwidth is claimed to be 70MHz, 890 to 960MHz, covering the complete cellular radio band as well as the 934MHz c.b. allocation.

For further information on the Cellmaster and other mobile antennas, contact ***Les Wallen Manufacturing Ltd., Unit 1, Trinity Place, Ramsgate, Kent CT11 7HJ. Tel: (0843) 582864.***



## Exotic Components

I have been sent details of the range of products made by the Antenna and Microwave Division of Adams-Russell Inc of Waltham, Mass, USA, who have just appointed Walmore Advanced Components as their UK agents.

They manufacture a range of high reliability, precision coaxial cable assemblies, double ridge and coaxial waveguide components and assemblies, broad-band and g.p.s. antennas. These products are widely used on military aircraft, ships and satellites of all types as well as ground-based systems.

A new range of instrument test cables capable of working at frequencies up to 26.5GHz is currently in pilot production.

Further information is available from ***Walmore Advanced Components Ltd., Laser House, 132/140 Goswell Road, London EC1V 7LE. Tel: 01-250 4143.***

## Timestep and Garex

Garex Electronics have acquired the design and manufacturing rights of the Timestep v.h.f. monitor receiver and the Timothy Edwards Mk II v.h.f. pre-amplifier from Timestep Electronics Ltd.

The deal is part of Timestep's rationalisation of their activities to allow them to concentrate on product development rather than production.

As far as Garex are concerned the acquisition fills a gap in their range of monitor receivers. The Timestep receiver is versatile and lends itself to a wide variety of applications. It can be made to work on spot frequencies in the range 18 to 230MHz with a choice of i.f. bandwidths. The pre-amplifier is available for frequencies of 45 to 205MHz.

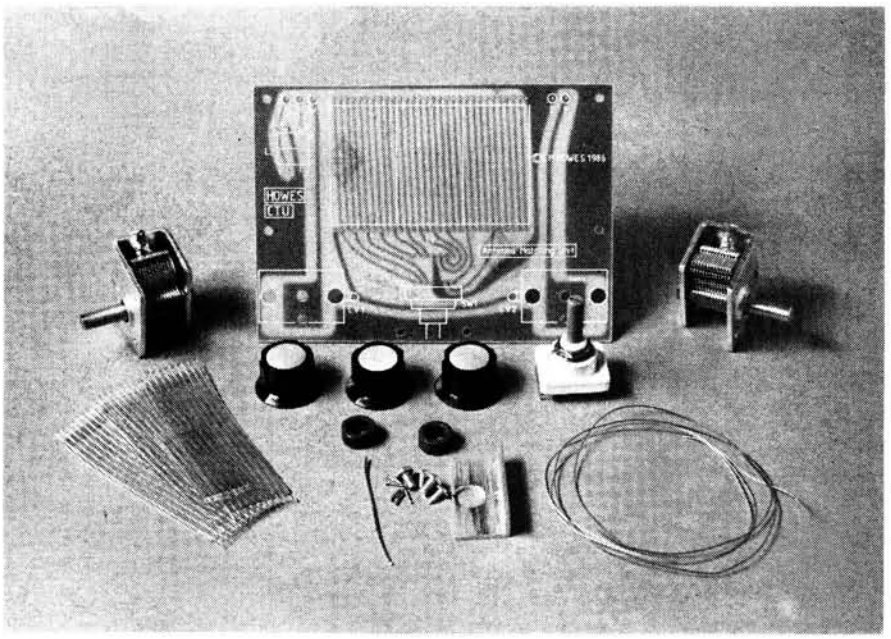
Further details are available from ***Garex Electronics, 7 Norvic Road, Marsworth, Tring HP23 4LS. Tel: (0296) 668684.***

Timestep are now concentrating on their weather satellite receiving equipment. Their Meteosat receiving system was chosen by the London Science Museum for the Space Exploration gallery. They can supply a complete system from dish to monitor for £799.00 plus VAT. Details from ***Timestep Electronics Ltd., Wickhambrook, Newmarket, Suffolk CB8 8QA. Tel: (0440) 820040.***

## Wrong Number

Unfortunately the telephone number given for Ant Products last month was wrong. It should have been 0977 85274. Apologies to all.

# Kit Construction– It's Easy




*So you've bought/built your receiving station or your low-power transmitting station, but how do you improve on the performance? How about an a.t.u. to match your station to your antenna. This month Elaine Richards G4LFM looks at the C.M. Howes Communications CTU30 a.t.u. kit.*

This simple a.t.u. is designed for use with short wave receivers and low power (30 watts max) transmitters. One of the main attractions of this kit, (apart from the price) is the use of a p.c.b. to mount all the components. This greatly simplifies the problem of mounting tuning capacitors that are at r.f. potential.

## Circuit Description

The a.t.u. utilises a standard "T" matching configuration with two Jackson variable capacitors and a main inductor with twelve taps. The on-board balun enables the a.t.u. to match a wide variety of balanced or unbalanced antennas to either 50Ω or 75Ω.

## Construction

The kit arrived well packed and included connecting wire as well as the main items. All you need to build the kit is a standard tool kit and some solder. The instructions supplied were very comprehensive and up to C.M. Howes usual standard, including a section on soldering for those attempting their first kit. Even if you have done a little home-construction before, it is well worth while reading all the instructions through before you start —just to refresh the memory.

The main inductor uses a very ingenious method of construction employing three pre-cut and stripped lengths of ribbon cable. The ribbon cables are soldered to the p.c.b. side by side and the p.c.b. track completes the turns and provides the tapping points, all very clever.

One tip when fitting the ribbon cables is to solder only the two outside wires at each end to start with, this is enough to hold the cable, but makes it easy to adjust the position if necessary. The range switch and air spaced Jackson variable capacitors are all mounted on the p.c.b. The only fiddly bits are wiring up the range switch and winding the balun but both operations are easily achievable with a little extra care and patience.

The completed kit should be mounted in a screened enclosure for best results. The only point to watch is that you should leave plenty of clearance around the variable capacitor shafts as they are at r.f. potential. You may wonder why this precaution is necessary. Well, if the unit is used with a transmitter, high r.f. voltages may be present on the capacitor shafts under certain load conditions. Even if you are only intending to use the a.t.u. for reception it is wise to take these precautions if only to minimise the detuning effect of the enclosure. The review kit was constructed by an experienced kit builder in about one hour.

## On the Air

The a.t.u. was initially tested with a low power transmitter on the amateur bands, with great success. The antenna used for this test was an array of parallel dipoles for 3.5, 7, 14, 21 & 28MHz all with rather narrow bandwidths. The a.t.u. was able to provide a good match with this antenna on all bands from 1.8MHz to 30MHz including the intermediate bands. Next test was to attempt to match this antenna on all frequencies between 1.8MHz and 30MHz, with the short wave listener in mind. Again the a.t.u. achieved this quite easily. As expected though, some frequencies required careful adjustment for a perfect match. The twelve tapping points on the main inductor were very useful for coping with difficult antennas.

## Summary

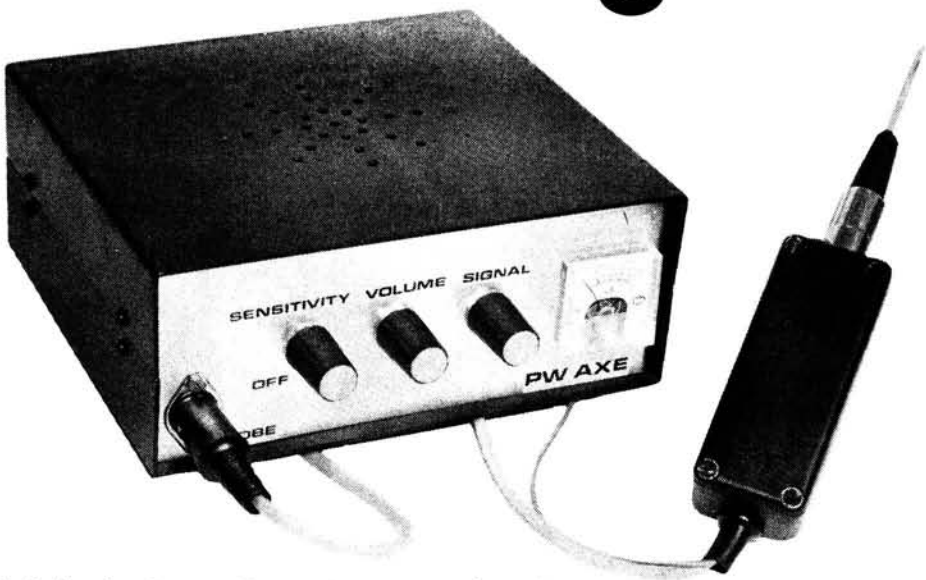
Overall this kit is a good first kit for the enthusiast, the small number of components combined with the comprehensive instructions ensure a good chance of success first time. Although ideal for the beginner the a.t.u. is a fully functioning unit which is also well suited for the QRP operator or short wave listener and represents good value for money.

The kit costs £24.90 or £29.90 for a ready assembled model (P&P is 90p in both cases) and is available from **C.M. Howes Communications, 139 Highview, Vigo, Meopham, Kent DA13 0UT. Tel: 0732 823129.** Many thanks for the review kit.

**Look out for the next Kit Construction. We look at a microphone pre-amplifier for your station.**

*This project by Jordan Milkov is bursting with versatility, it can fulfil the function of several pieces of expensive test equipment and yet remains relatively cheap and simple to build.*

# The PW "Axe" Signal Tracer




Despite the abundance of test instruments nowadays, some measurements are difficult to perform, unless one is ready to spend huge amounts of money and fill the bench to such an extent that no space is left for the device under test. The instrument described here has been used for years and has proved its versatility and usefulness. It is quite capable of replacing several much more expensive items of test equipment and can be used in one of several different ways. First and foremost it is an audio and r.f. signal tracer, but it can also be utilised as a resonance measuring device when used in conjunction with a reasonable quality signal generator as well as test bench audio amplifier.

## Circuit

As can be seen from the circuits in Fig. 1 and 2, the tracer consist of four stages, a probe, high gain pre-amplifier, power amplifier and signal strength indicator.

The probe is the most essential and original part. It is an emitter follower, which works as a detector for a.m. and r.f. signals. The bias circuitry around transistor Tr1 is selected in such a way that it passes the l.f. signal when applied to input 3 and demodulates the h.f. signals when applied to inputs 1 and 2. In this way, the probe can be used as an ordinary high impedance signal tracer. But when a resonant circuit is connected to input pin 1 in series with an a.m. signal generator as shown in Fig. 6, the output voltage of the probe sharply increases when the resonant frequency of the circuit coincides with the frequency of the signal from the generator.

A relatively high frequency transistor, a BF180, is used in the probe and is protected against high input voltages by means of two back-to-back connected Zener diodes D1 and D2. The probe is connected to the pre-amplifier via screened cable to SK2, with R5 providing adjustable attenuation of the signal from the probe giving a suitable level for driving the pre-amplifier.

The pre-amplifier consists of two directly coupled high gain stages. High linearity and a low distortion level are achieved by means of double negative feedback. Potentiometer R15 functions as an ordinary volume control feeding the power amplifier p.c.b.

The Maplin BRO2C amplifier p.c.b. uses a TBA810P i.c. as an active device, and it will deliver around 1 watt of good quality audio into an 8Ω loudspeaker.

A simple millivoltmeter is used as a signal indicator, connected to the output of the pre-amplifier. The input

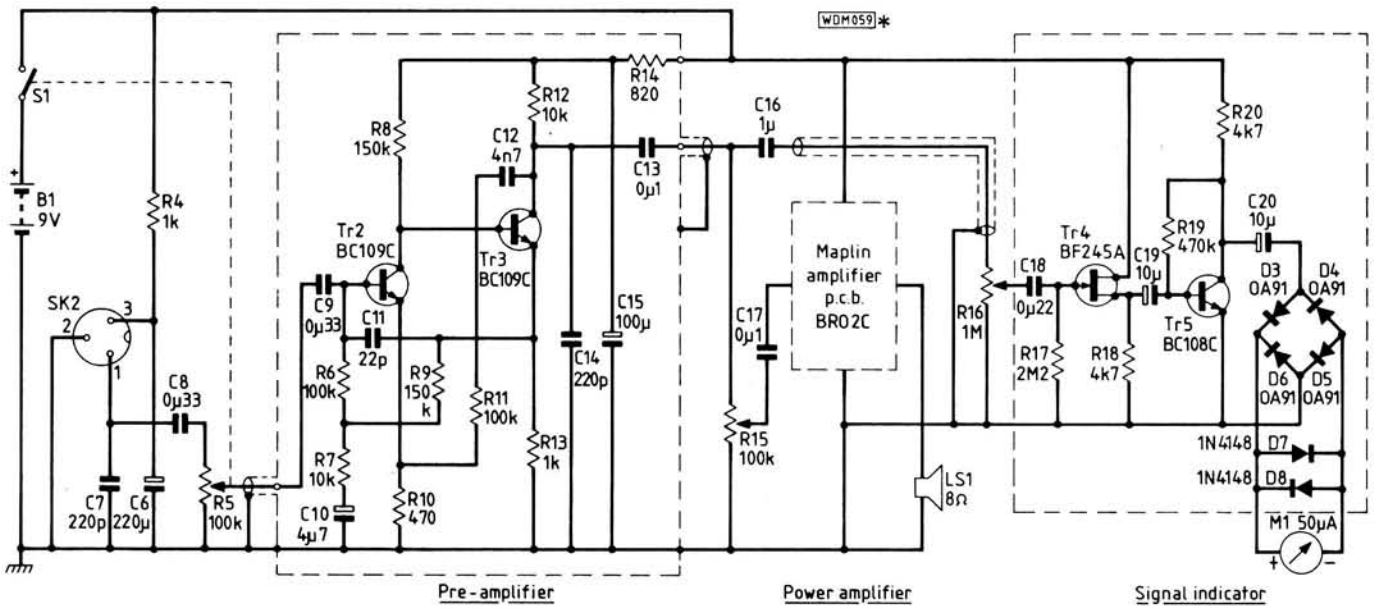



**Fig. 1: Circuit diagram of amplifier and indicator**

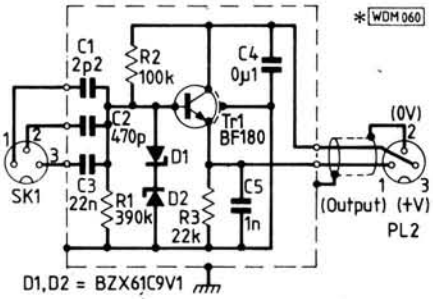
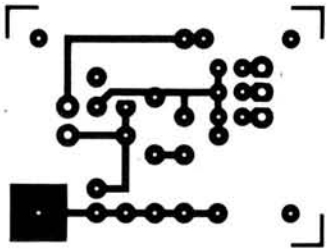
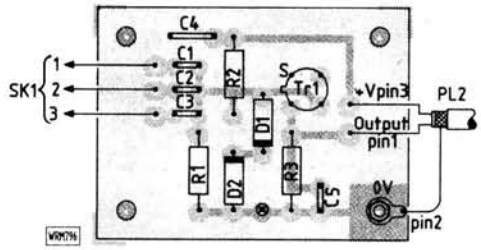
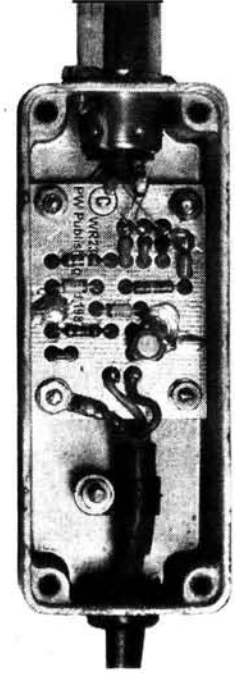



**Fig. 2: Circuit diagram of probe**

**Fig. 3: Full size double sided track pattern and component layout for probe p.c.b.**



**Internal view of probe. Note external ground lead connected to p.c.b.**

impedance of the signal indicator is approximately 2MΩ and therefore has no loading effect on the signal going to the power amplifier. The sensitivity of the signal indicator is controlled by adjustment of R16, the wiper of which feeds Tr4 via C18. The output of Tr5 is fed to a bridge of diodes, the output of which drives a 50µA panel meter. If the surge current through M1 during switch-on seems excessive diodes D5 and D6 can be replaced by two electrolytic capacitors 100µF/16V. Diodes D7 and D8 protect the meter. The whole instrument is powered by six 1.5 volt batteries.

## Construction

The probe p.c.b. is housed in a small elongated die-cast box for ease of use, a double-sided p.c.b. track pattern and component layout for the probe can be seen in Fig. 3. A three-pin DIN socket provides a means of terminating the input of the probe. Using this method of termination several DIN plugs can be made up for specific tasks. The first has a short length of 16 s.w.g. tinned copper wire connected to pin 1 enabling the probe to be used as a hand-held signal tracer. Another can be equipped with three miniature insulated croc clips on short lengths of wire, for resonance tests. If the probe is carefully constructed the unit can function up to v.h.f.

A single-sided track pattern and component layout for the pre-amplifier is shown in Fig. 4. The pre-amplifier and signal indicator circuits are very sensitive, and should be housed in an earthed aluminium project box. All signal leads to and from the pre-amplifier and signal indicator should be made in screened lead.

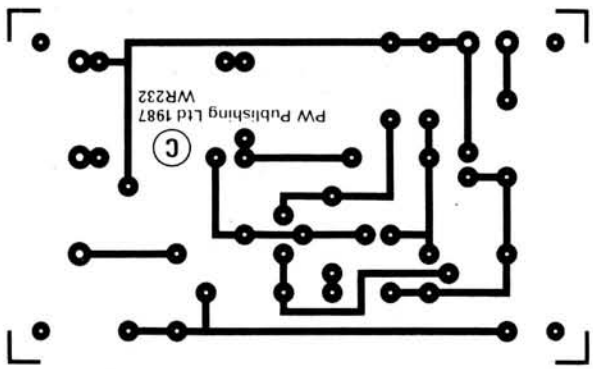
As mentioned earlier the active component used in the power amplifier stage is a TBA810P, and this along with a custom made p.c.b. is available from Maplin Electronic Supplies. Construction details are given in their latest catalogue, along with suggested circuits for tone control networks which could be a useful addition to the project especially when testing phono cartridges and tape heads. If the unit is to be used for long periods as a test bench amplifier, it would be sensible to make alternative arrangements for powering the project. The Maplin amplifier module could easily be replaced by any sensitive power amplifier module.

## Applications

Signal tracing is a well known test procedure so there should be no need to explain the technique. Resonance measurements are of more interest and will be explained in detail.

The basic arrangements for measuring the frequency of a tuned circuit are shown in Fig. 6. As you can see the "grounds" of the signal generator and the probe are connected together. The generator should be switched to amplitude modulation (a.m.).

The outlet of the signal generator is connected to the tuned circuit under test via capacitor Cx the value of which depends upon the test frequency, 10pF for frequencies up to 1MHz, and 4.7pF for higher frequencies. The accuracy is higher with smaller values of capacitor. But it is clear that with 4.7pF capacitor on one side of the circuit and 2.2pF on the other, not much energy can pass through it, so the output voltage of the signal generator should be around 50mV. The measurement can now start with the frequency of the signal generator gradually being changed from lower to higher frequencies. When the generator frequency is equal to the resonant frequency of the circuit under test, the sound of the demodulated audio should increase sharply in volume. At this point you may need to adjust R5 and R15 to a more comfortable level, R16 is adjusted for mid-scale reading on panel meter M1. A



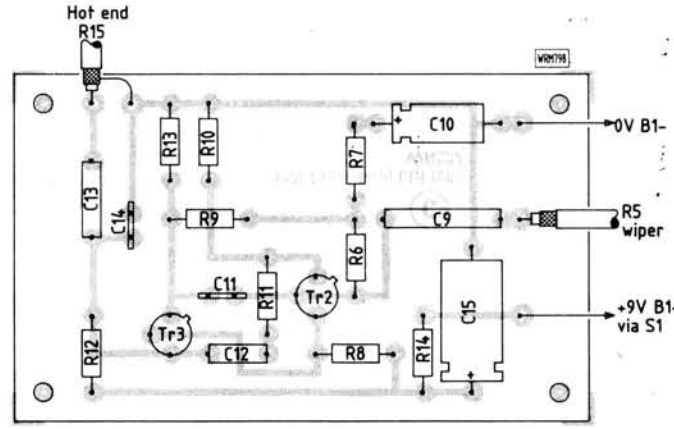




**Fig. 4: Full size track pattern and component layout for pre-amplifier p.c.b.**

slight change in the generator's carrier frequency either side of maximum reading should confirm the exact point of resonance. It should be pointed out that because of the very low voltages involved, there may be no audible signal whatsoever above and below the resonant frequency. Measurements using signal peaks as indicated are more accurate than those using troughs, as the minimum or zero signal state could be masked by equipment noise. This method can be used for "cold" tuning of the circuits in a receiver, with the receiver's power supply switched off and disconnected. In this situation, the generator's output is connected to the receiver's chassis, while pin 2 of the probe should be connected to the non chassis end of the resonant circuit. The previously described test procedure can now be followed. The circuit under test can also be tuned to a desired resonant frequency by adjusting the cores and trimmers associated with the circuit.

Measurement of inductance and self-capacitance of coils is achieved by the following method: an unknown coil is connected between pin 1 of the probe and the signal generator using a suitable coupling capacitor Cx. A high tolerance capacitor is then placed across the coil and tested using the established procedure. The inductance in µH is equal to:

$$L = \frac{25330}{(C+Co)f_1^2} \qquad (1)$$

where: C is the parallel capacitor in pF; Co is the coil self-capacity and $f_1$ is the resonant frequency in MHz.

To measure Co, disconnect C and measure the self-resonant frequency of the coil—$f_2$. Then Co is equal to:

$$Co = \frac{Cf_1^2}{f_2^2 - f_1^2} \qquad (2)$$

Capacitor C should be selected so that $f_2/f_1 > 2$. When measuring low values of inductance the parallel test capacitor may need to be changed for a smaller value of around 10 to 15pF. After determining $f_2$ deduct it from the value of the capacity corresponding to $f_2$.

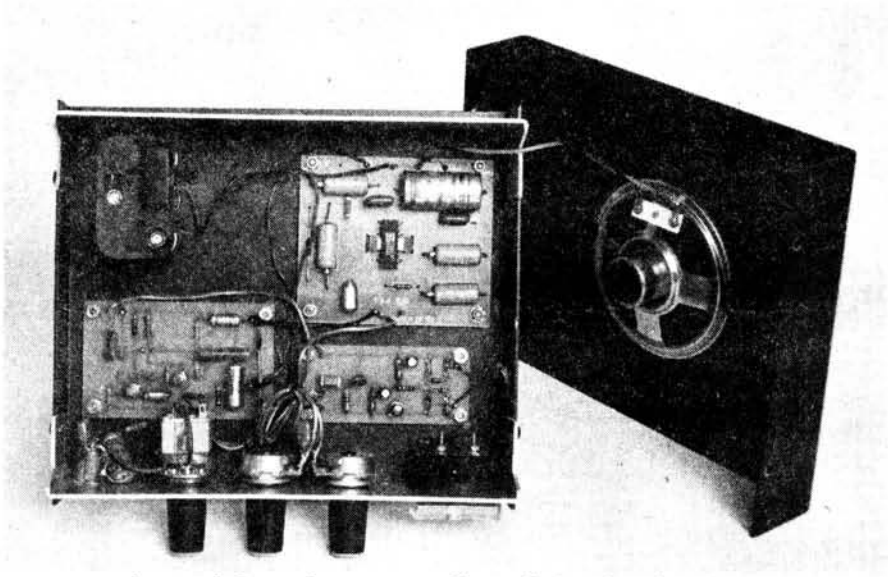
For measurement of unknown capacitance, follow the same procedure with a coil of known inductance L and self-capacitance Co and use the following formula.

$$C = \frac{25330}{Lf^2} - Co \qquad (3)$$

The probe can be used for measuring high values of inductance when used in conjunction with an audio signal generator. In this case both the audio generator and the resonance circuit are connected between pin 3 on the probe and ground, resonance is again shown with a peak in signal level.

The same principles are applied to measure the specific inductance of unknown pot cores. Wind the number of turns (n) you intend to use on the pot core bobbin. Assemble the pot core and follow the procedure mentioned previously. Calculate L using formula 1, then the specific inductance is:

$$AL = \frac{L}{n^2} \qquad (4)$$



**Internal view of prototype. Note all signal paths wired in miniature screened cable**

## Testing Crystals

Connect the crystal or ceramic filter as shown in Fig. 7a and 7b. The resonant frequency is again indicated by a sharp increase in signal amplitude. We cannot really say that we are accurately measuring the crystal's frequency as this test method is not that exact, but at least we will know whether the crystal is in order and if the frequency on the can is the fundamental frequency or harmonic.

## Testing Varicaps

Connect a coil with a known inductance and Co across the Varicap as shown in Fig. 7c. Also connect a suitable value capacitance in parallel with the coil, to bring the measurements within the range of the signal generator. Use three 9 volt batteries in

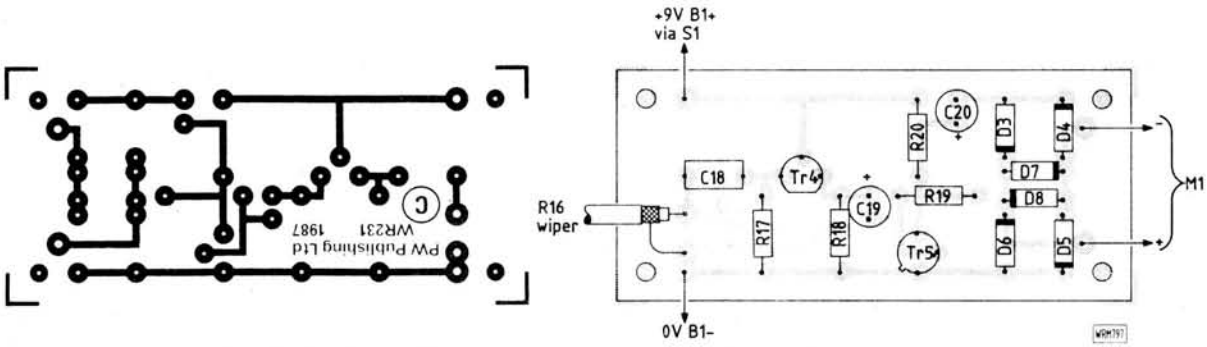



**Fig. 5: Full size track pattern and component layout for indicator p.c.b.**

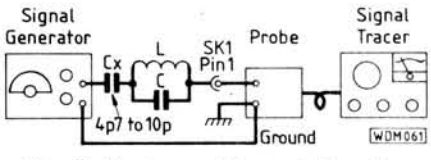



**Fig. 6: Equipment layout showing probe connections used for resonance testing**

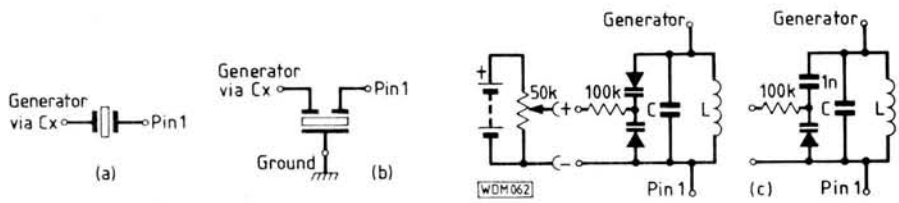



**Fig. 7: Component connection points used for resonance testing**

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|---|---|---|
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| 820Ω | 1 | R14 |
| 1kΩ | 2 | R4,13 |
| 4.7kΩ | 2 | R18,20 |
| 10kΩ | 2 | R7,12 |
| 22kΩ | 1 | R3 |
| 100kΩ | 3 | R2,6,11 |
| 150kΩ | 2 | R8,9 |
| 390kΩ | 1 | R1 |
| 470kΩ | 1 | R19 |
| 2.2MΩ | 1 | R17 |

*Potentiometers*

| | | |
|---|---|---|
| 100kΩ *Log* | 1 | R15 |
| 1MΩ *Lin* | 1 | R16 |

*Potentiometer with S1 d.p.s.t.*

| | | |
|---|---|---|
| 100kΩ *Log* | 1 | R5 |

**Capacitors**

*Monolithic ceramic*

| | | |
|---|---|---|
| 220pF | 2 | C7,14 |
| 470pF | 1 | C2 |
| 1nF | 1 | C5 |
| 22nF | 1 | C3 |
| 0.1μF | 3 | C4,13,17 |

*Miniature plate ceramic*

| | | |
|---|---|---|
| 2.2pF | 1 | C1 |
| 22pF | 1 | C11 |

*Miniature dipped polyester*

| | | |
|---|---|---|
| 0.33μF | 2 | C8,9 |
| 1μF | 1 | C16 |

*Miniature layer polyester*

| | | |
|---|---|---|
| 4.7nF | 1 | C12 |
| 0.22μF | 1 | C18 |

*Axial electrolytic 16V*

| | | |
|---|---|---|
| 4.7μF | 1 | C10 |
| 100μF | 1 | C15 |
| 220μF | 1 | C6 |

*Electrolytic p.c.b. type 16V*

| | | |
|---|---|---|
| 10μF | 2 | C19,20 |

**Semiconductors**

*Transistors*

| | | |
|---|---|---|
| BC108C | 1 | Tr5 |
| BC109C | 2 | Tr2,3 |
| BF180 | 1 | Tr1 |
| BF245A(1) | 1 | Tr4 |

*Diodes*

| | | |
|---|---|---|
| BZX61C 9V1 | 2 | D1,2 |
| OA91 | 4 | D3–6 |
| 1N4148 | 2 | D7,8 |

*Integrated circuits*

TBA810P or equivalent (see text)

**Miscellaneous**

BR02C p.c.b. plus components (see text); Loudspeaker 3in 8Ω 1watt; Panel meter 50μA f.s.d.; Battery holder 6 x AA type; Aluminium project box; Die-cast box (RS 509–923); Plugs 3-pin DIN (3); Sockets 3-way DIN (2); p.c.b.s (3); Croc clips, insulated (4); Miniature screened cable; Miniature 2-core individually screened cable; Knobs (3); Strain relief grommet; Veropins; 6BA nuts, bolts, washers and solder tags

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London NW2 3ET
Tel: 01-450 0995


series as a voltage source. Connect the tuned circuit between pin 1 of the probe and the output of the generator via Cx. Plot the respective resonance frequencies fi against several applied bias voltages. Calculate the capacitance of the Varicap for each voltage applied:

$$C_{var} = \frac{25330}{Lf_1^2} - C - Co \qquad (5)$$

You will note that because of power losses in the measuring circuit, the peak is not as sharp as in other measurements.

## Frequency Comparison

One additional application of the probe is to compare two unmodulated frequencies. An r.f. or audio signal generator and an oscillator with unknown frequency are both connected between pin 3 and the ground connection of the probe. Next gradually change the frequency of the signal generator, when its frequency equals that of the unknown oscillator a clear beat note will be heard in the loudspeaker. On both sides of this frequency the sound will have a trembling quality about it. This behaviour can also be observed on the signal indication meter.

This principle can be used to adjust the speed of tape recorder decks, by comparing a single audio tone from a test tape made on another accurately aligned machine, with a tone from an audio generator.

The reader can easily extend the field of application of the instrument to serve his, or her, individual needs. ***PW***

# PAST GEMS

## Radio Ramblings

*Practical Wireless*
*October 29, 1932*

### Operating Receivers from DC Mains

A wireless friend of mine had a nasty and unexpected shock the other day whilst following the apparently safe occupation of weeding his garden. He was working in one corner and quite by accident ran against the aerial lead-in with his face. Luckily his cheek and the wire were only in contact for a fraction of a second, but it was quite long enough to make him give a wild yell and to use unbecoming language. He was baffled to know how the aerial could possibly be charged with electricity for, although he was using a newly-constructed d.c. mains receiver he thought that every precaution had been taken to make it quite safe. It was only after making a number of enquiries that he discovered that the positive supply main was earthed at the power station. As a result the negative was "alive" and, being connected to the aerial (through the tuning coil), it was capable of giving a nasty shock. The whole trouble was easily corrected by putting a 0·0001μF fixed condenser in series with the aerial lead. As a further safety measure a 2μF condenser was also wired in series with the earth lead. As a matter of fact, when feeding any set from the d.c. mains, either direct or through an eliminator, it is always wise to isolate the mains from both aerial and earth by fitting condensers as just mentioned. Not to do this is against the rules of the electric supply companies and is in contravention of the conditions of fire insurance policies.

## World of Wireless

*Practical Wireless*
*November 12, 1932*

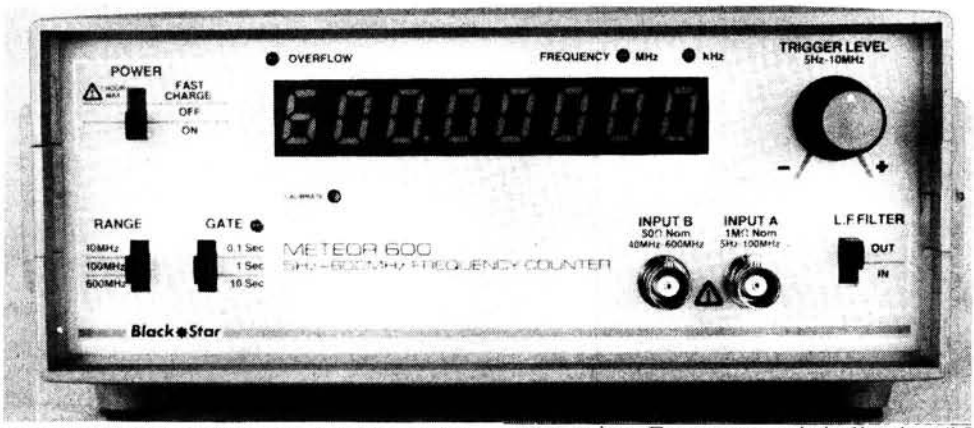
### Catching "Pirates" Again

I suppose you know that the Post Office Engineers are "on tour" with their notorious detector vans again. And you have probably read in the daily papers of the magic devices the vans contain for tracing pirates. A writer in one daily even went so far as to say that the "secret devices" employed by the engineers were so sensitive as to detect the presence of a portable set which was not even in use. I should think the "secret devices" would receive something of a shock if they were put into action anywhere near a factory where hundreds of sets are being turned out every day.

# ★ Special Offer ★

# 600MHz FREQUENCY COUNTER

## Just £144.90 including mains p.s.u., user and workshop manuals, and a telescopic BNC antenna




As a result of the great popularity of our reader offer on the Black Star Meteor 1500 1.5GHz frequency counter in our August 1986 issue, we are pleased to be able to repeat the exercise, but this time with a slightly less exotic (and less expensive!) instrument.

Covering frequencies from 5Hz to 600MHz (and typically 2Hz to 700MHz), the Black Star Meteor 600 will be invaluable for frequency checking in Amateur stations operating in all bands up to 430MHz (70cm), as well as in the servicing and adjustment of other audio frequency and radio frequency equipment.

The Meteor 600 has input impedances of 1MΩ//30pF up to 100MHz and 50Ω above 40MHz. A low-pass filter with a cut-off frequency of 50kHz can be switched into circuit when making audio frequency measurements, to get over any problems due to r.f. interference from nearby powerful transmitters. Gate times of 0.1, 1 and 10 seconds are available, with measurements updated every 200 milliseconds. The 10MHz timebase crystal oscillator has a temperature stability of typically ±2.5 p.p.m. over the range 0°–40°C, and an ageing rate of less than 5 p.p.m. per year. More performance details are given in the table.

The frequency readout uses an 8-digit, 0.5in, 7-segment red l.e.d. display with automatic decimal point and leading zero suppression. Frequency unit indication (kHz or MHz) and overflow warning are by l.e.d.s.

The Meteor 600 is housed in a sturdy ABS case measuring 219 × 240 × 98 mm, fitted with a tilt stand, and weighs 980g. Power requirements are 9V d.c. at 600mA (max), from the supplied mains adaptor/charger or from optional internal NiCad cells. Battery life is typically 6 hours per charge using 1.2Ah "C" cells. **Please note that we CANNOT supply batteries.**

The instrument is designed and manufactured in the UK and is covered by a one-year manufacturer's guarantee. It comes complete with a mains adaptor/charger and a comprehensive User's Instruction Manual as standard.

To increase the value of our offer to *Practical Wireless* readers, we are including with each order despatched: a telescopic r.f. pick-up antenna with BNC plug fitting and a Service Manual (together usually retailing at £14.78, including VAT) entirely free of charge.

| Frequency Range | Sensitivity (min) | Resolution Gate time 0.1s | 1s | 10s |
|---|---|---|---|---|
| 5Hz–10MHz | 5mV | 10Hz | 1Hz | 0.1Hz |
| 10MHz–100MHz | 10mV <50MHz<br>25mV >50MHz | 100Hz | 10Hz | 1Hz |
| 40MHz–600MHz | 25mV | 1kHz | 100Hz | 10Hz |

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Complete the coupon in ink, giving your name and address clearly in block capitals. Send it with your cheque to: Practical Wireless, Counter Offer, Enefco House, The Quay, Poole, Dorset BH15 1PP. If you wish to pay by credit card (Access, Mastercard, Eurocard or Visa only), please fill in your card number and sign the coupon where indicated. The price includes carriage and insurance, and VAT where applicable.

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*This feature will become a regular part of the magazine and will be very wide ranging. It will cover small constructional articles to help you get building and also articles explaining in simple language the sort of things you may have found confusing. Input from you as to what you would like to see described, or useful projects to build, would be most welcome and should be sent to me either QTHR or via the editorial office. I look forward to hearing from you.*

# Practically Yours

*by Glen Ross G8MWR*

## DB What?

One of the things that you see an awful lot of in the amateur radio literature is the magic "dB". Quoted in all the adverts for new gear, thrown around with gay abandon by the authors of antenna and pre-amp specs and used in a hundred and one other ways. Usually this is done to obtain one of two ends, either to impress the customer or to befuddle the poor devil into thinking the product must be good. The big thing is that they nearly always get away with it because the average amateur hasn't a clue what it is given in a completely meaningless way.

## What is it?

The term is derived from the Bel which is used as a measurement of sound and, like nearly all the units we use, it is too large to be manageable, so the normal unit is smaller (1/10th) and is known as the decibel. It is a fundamental property of the human ear that the response to changes in sound level is not linear but logarithmic and this is what makes this unit so useful.

## The numbers

Large changes in quantity can be represented with a small range of numbers. Each time we increase the level by a factor of ten we add only 10dB to the original figure. Hence 20dB is times 100; 30dB is times 1000 and 60dB represents times 1 000 000 above the original level.

The next thing to grasp is that the term dB by itself it means virtually nothing except in the audio field. When we use it in other contexts it is simply used to express a ratio between two things. These could be voltages, currents, powers or even bags of carrots. They also appear to change value in themselves according to what you are trying to express. A doubling of voltage is expressed as being +6dB whilst a doubling of power is shown as only +3dB. The real point is that unless a reference is given the "dB" bit is pointless.

## A Good Example

This may seem an odd example to take but it illustrates just how useful and adaptable our dB friend really is. The output of a power supply is normally expressed in volts but it could also be indicated using dBs. Suppose I tell you that the output from a particular power supply is +6dB this tells you nothing at all. If I use the correct way and say that the output is +6dBV (the V standing for 1 volt) then all is revealed and you know that the output is in fact two volts; 6dB above the reference of 1 volt. If I now increase the output to four volts I can then say that I have increased the previous output by 6dB (doubled) or I can say that the output is now 12dBV. If we were working with much lower voltages I could have used dBmV to set the reference level at 1 millivolt or even dBμV if I wanted to refer to 1 microvolt. In the last case an increase of +6dB would obviously mean a much lower voltage than in our first example.

## Power and Gain

The reference levels for power would usually be quoted as dBW to indicate a reference of 1 watt and this is the way the newer amateur licence schedules are worded. They could also be quoted as dBm, which would indicate that the reference was 1 milliwatt. Another common use is to indicate the gain of an antenna and here we run into great difficulties. If I say that an antenna has a gain of 10dB does this mean that it has less gain than an antenna from a rival manufacturer who claims that his has a gain of 11.5dB? The answer is that from the information given you cannot possibly know. The 11.5dB might well get your money and that is what the manufacturer is after but you could end up with less gain than if you had bought the other antenna.

## The Problem

The snag, of course, is that the reference is missing. Is it dB over a dipole or over that thing, beloved of all antenna makers, an isotropic radiator? The point is that a dipole has a gain of nearly 3dB in its favoured directions when compared to an isotropic radiator. If the man claiming 10dB is using gain over a dipole and the manufacturer claiming 11.5dB is using an isotropic reference then the 10dB antenna will actually give you about 1dB more gain then the 11.5dB antenna. Many makers do not quote this reference and leave you, rather like the antenna, up in the air.

## Exceptions

In some cases it is not required to give an absolute reference level but this is only true in cases where the reference is obvious or can be reasonably assumed. For instance in the case of a pre-amplifier, if the gain is quoted as 20dB it is assumed that the reference is the voltage applied to the input of the unit. It is also assumed, as in the case of power amplifiers where the dB rating is referenced to the power applied to the input, that the device is linear. If you crank the input up to the point where you get compression then the rating no longer holds. This degree of compression is also quoted using our friend the dB and is usually the point at which an increase of input of 3dB causes an output increase of only 2dB, this giving the 1dB compression figure.

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## Royal Blue

Photo Acoustics have pleasure in presenting the ROYAL BLUE — a Short Wave Listeners folded dipole antenna that covers 2-30MHz. Its neat and compact design (just 6' tall) makes it ideal for unobtrusive outdoor or indoor use. It will work quite happily on your roof or stood in the corner of your shack. It is a truly versatile antenna that will pull in the DX and which works exceptionally well with modern receivers such as the Yaesu FRG8800, Icom R71, Trio R2000 and so on.

To buy this superb new antenna, just send us £25. plus £3 for postage and packing and we will rush one to you.

## Receivers

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| Yaesu FRV6800 VHF converter for FRG8800 118-175MHz | 100.00 | (3.00) |
| Icom R71E HF general coverage receiver | 825.00 | (7.00) |
| Icom RC11 remote control unit for ICR71E | 62.00 | (2.00) |
| AR2002 VHF/UHF scanner 25-550MHz and 800-1300MHz | 487.00 | (5.00) |
| FRG9600 VHF/UHF scanner 25-950MHz | 525.00 | (5.00) |
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## Icom

| | | | |
|---|---|---|---|
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| IC735 | New HF Transceiver | 949.00 | (—) |
| PS15 | P.S. Unit | 158.00 | (4.00) |
| PS30 | Systems p.s.u. 25A | 343.85 | (—) |
| SM6 | Base microphone for 751/745 | 46.00 | (1.00) |
| IC290D | 2m 25w M/Mode | 542.00 | (—) |
| IC02E | 2m H/Held | 299.00 | (—) |
| IC04E | 70cm handheld | 299.00 | (—) |
| BC35 | Base Charger | 70.15 | (1.50) |
| HM9 | Speaker mic | 21.85 | (1.50) |
| BP3 | Std Battery Pack | 29.90 | (1.50) |
| BP4 | Empty Battery Pack | 9.20 | (1.50) |
| BP5 | High Power Battery Pack | 60.95 | (1.50) |
| CP1 | Car Charging Lead | 6.90 | (1.50) |
| DC1 | 12v Adaptor | 17.25 | (1.50) |
| **NEW** | | | |
| ICOM 761 HF | general coverage transceiver with internal PSU and auto ATU | 1999.00 | (7.00) |
| IC48E | 10W 70cms FM mobile | 449.00 | (3.00) |
| IC28F | 25W FM mobile (Tiny) | 359.00 | (3.00) |
| IC28H | 45W FM mobile (Tiny) | 399.00 | (3.00) |
| IC-Micro | 2 mini hand portable LCD display 1W | 259.00 | (2.00) |

## Power Supplies

| DRAE | | | BNOS | | |
|---|---|---|---|---|---|
| 4 amp | 40.50 | (2.00) | 6 amp | 69.00 | (2.50) |
| 6 amp | 53.00 | (2.50) | 12 amp | 115.00 | (3.00) |
| 12 amp | 86.50 | (3.00) | 25 amp | 169.00 | (4.00) |
| 24 amp | 125.00 | (4.00) | 40 amp | 345.00 | (4.00) |

## Aerial Rotators

| | | | |
|---|---|---|---|
| DAIWA MR750E | Heavy Duty rotator. Can have up to 4 motors | 254.10 | (4.00) |
| KR400 | Med H. Duty | 139.00 | (3.50) |
| KR500 | 6 core Elevation | 149.95 | (3.50) |
| KR400RC | 5 core Medium Duty | 169.00 | (3.50) |
| KR600RC | 6 core Heavy Duty | 219.00 | (3.50) |
| KC038 | lower mast clamps | 17.45 | (2.00) |
| KS065 | Rotary Bearing | 26.00 | (2.50) |
| AR1002 | Lightweight VHF Rotator | 52.95 | (3.50) |

## Switches

| | | | |
|---|---|---|---|
| Sigma | 2 way SO2J9 | 17.50 | (1.00) |
| Sigma | 2 way 'n' Skts | 22.95 | (1.00) |
| Welz CH20A | 2 way SO2J9 | 30.75 | (1.00) |
| Welz CH20N | 2 way 'n' Skts | 54.00 | (1.00) |
| Drae | 3 way SO239 | 15.40 | (1.00) |
| Drae | 3 way 'n' Skts | 19.90 | (1.00) |

## CW/RTTY/Equipment

| BENCHER | | P&P |
|---|---|---|
| BY1 | Squeeze Key. Black base | 67.42 | (2.00) |
| BY2 | Squeeze Key. Chrome base | 76.97 | (2.00) |
| **HI-MOUND MORSE KEYS** | | |
| HK708 | Straight Key | 21.50 | (2.50) |
| HK702 | Deluxe version of above on Marble Base | 42.50 | (3.00) |
| HK706 | Straight key | 23.00 | (2.50) |
| HK707 | Straight key | 22.25 | (2.50) |
| MK704 | Squeeze paddle | 20.00 | (2.50) |
| MK705 | Squeeze paddle on Marble Base | 32.20 | (3.00) |

## CW/RTTY/Equipment (cont.)

| NEW RTTY-EQUIPMENT | | | |
|---|---|---|---|
| PK-232 | Packet, Amtor, RTTY, CW, ASCII transceive in one unit. Works with any computer equipped with an RS232 interface. 12V operated | 269.95 | (3.50) |
| FAX-1 | NEW HF Fax receiver. Obtain weather maps, press photographs and satellite cloud cover detail on any Epson FX-80 compatible printer. 12V operated | 269.95 | (3.50) |
| AMT-2 | Terminal Unit RTTY AMTOR ASCII CW | 245.00 | (3.00) |
| AMT-2 CBM64 | Software for the above for the Commodore 64 | 51.75 | (2.50) |
| AMT-2 VIC20 | Software for the above for the Commodore VIC 20 | 51.75 | (2.50) |
| AMT-2 BBC B | Software for the above for the BBC B | 44.85 | (2.50) |
| **KEYERS & ACCESSORIES** | | | |
| Star Master Key | Electronic Keyer | 54.70 | (3.00) |
| NEW Star | Masterkey electronics CMOS memory keyer | 95.00 | (3.00) |
| TRX3 | Morse Oscillator | 13.65 | (1.50) |
| Datong | D70 Morse Tutor | 56.50 | (2.50) |

## Heatherlite

| | | | |
|---|---|---|---|
| HF | Explorer amplifier 1Kw output | 967.00 | (15.00) |
| 2M | Explorer amplifier with single 4CX250B and built in PSU | 485.00 | (15.00) |
| 2M | Explorer with single 4CX350A and built in PSU | 525.00 | (15.00) |
| **YAESU MICROPHONES** | | | |
| FT227 | 4 pin, no scan buttons | 23.00 | (1.50) |
| FT227RH | 6 pin, scan buttons | 25.00 | (1.50) |
| FT202 207 208 | 6 pin gold, no scan buttons | 25.00 | (1.50) |
| FT720 | 6 pin gold, scan buttons | 27.00 | (1.50) |
| FT290 290 230 730 | 7 pin, scan buttons | 25.00 | (1.50) |
| FT480 680 780 726 77 | 8 pin, scan buttons | 25.00 | (1.50) |
| FT2700 270 | 8 pin, scan buttons | 25.00 | (1.50) |
| FT757 | 8 pin, scan buttons | 25.00 | (1.50) |
| **TRIO MICROPHONES** | | | |
| TR500 8300 2200 2000 | 4 pin, no scan buttons | 23.00 | (1.50) |
| TR7400 8300 8400 7400 9000 9300 | 6 pin, scan buttons | 25.00 | (1.50) |
| TR3000 711 811 770 790 | 8 pin, scan buttons | 25.00 | (1.50) |
| TM201 401 2550 | 8 pin, scan buttons | 25.00 | (1.50) |
| **ICOM MICROPHONES** | | | |
| IC240 | 4 pin, no scan buttons | 23.00 | (1.50) |
| IC255 260 290 | 8 pin, no scan buttons | 23.00 | (1.50) |
| IC2KL 271 37 | 8 pin, scan buttons | 25.00 | (1.50) |
| **KDK MICROPHONES** | | | |
| A030 | 5 pin, scan buttons | 25.00 | (1.50) |
| A033 | 6 pin, scan buttons | 25.00 | (1.50) |
| 2016, 2025 | 4 pin, no scan buttons | 23.00 | (1.50) |
| **FDK MICROPHONES** | | | |
| | 4 pin, no scan buttons | 23.00 | (1.50) |
| | 6 pin, scan buttons | 25.00 | (1.50) |
| **STANDARD MICROPHONES** | | | |
| ALL except C58 | 7 pin, scan buttons | 25.00 | (1.50) |
| C58 | 7 pin, scan buttons | 25.00 | (1.50) |
| **FOR HAND PORTABLES** | | | |
| SW1 | IC2E IC4E IC02 IC04 with single earphone | 14.00 | (1.50) |
| SW1M | no earphone | 12.50 | (1.50) |
| SW2 | TR2500 3500 TH21 TH41 with single earphone | 14.00 | (1.50) |
| SW3 | TH2400 with single earphone | 14.50 | (1.50) |
| SW3M | no earphone | 12.50 | (1.50) |
| SW4 | TH209 203 with single earphone | 14.50 | (1.50) |
| SW4M | no earphone | 12.50 | (1.50) |

## Aerials

| | | | |
|---|---|---|---|
| 12 ele 7L | special for 2 metres | 25.00 | (4.00) |
| G5RV | Full size 102' | 16.75 | (2.50) |
| G5RV | Half size 51' | 14.25 | (2.50) |
| HB9CV | 2 metres | 3.95 | (3.00) |
| HB9CV | 70cms | 3.95 | (2.00) |
| 2 metre | Slim Jim | 8.95 | (3.00) |
| 1:1 & 4:1 | Baluns | 12.95 | (2.00) |
| 3.7 and 7.1MHz | Traps (pair) | 9.50 | (2.00) |
| Dipole | Centrepieces | 2.25 | (0.50) |
| Copper wire | 50M rolls hard drawn | 7.95 | (2.50) |
| 2N8 | 2M 5/8 wave 4.5dB gain | 24.50 | (3.00) |
| 2L | 2M 5/8 wave | 14.75 | (3.00) |
| 2P8 | 2M 1/4 wave | 3.50 | (1.50) |
| 430 | 70cms 5/8 5/8 wave 6.3dB gain | 27.75 | (3.00) |
| Dipole 220 | 2M 2Kms mobile | 24.75 | (3.00) |
| 2M20X | High Gain 2M 70cms mobile | 37.75 | (3.00) |
| Gutter Mounts | | 6.50 | (2.00) |
| 3M Leads | | 6.50 | (2.00) |
| Lampel Mag Mounts | | 20.50 | (3.00) |
| **BOOKS** | Confidential Frequency List (NEW Edition) | 5.95 | (0.75) |
| | Air Traffic Radio | 2.25 | (0.75) |
| | VHF UHF airband frequency list | 3.95 | (0.75) |
| | The Complete guide to VHF UHF frequencies 25-2000MHz (NEW) | 4.95 | (0.75) |
| | The International VHF FM guide | 2.00 | (0.75) |
| | GUIDE TO FACSIMILE STATIONS | 9.95 | (1.00) |
| | Towards the RAE (Questions and answers book) | 4.25 | (0.75) |
| | Logbooks | 3.50 | (0.75) |
| **SPECIAL OFFER** | | | |
| Alinco ALM200E | 2 metre handheld with 3W amplifier ONLY | 269.95 | (3.00) |
| Alinco ALR206E | 25W FM mobile transceiver | 249.95 | (3.00) |
| Tonna | 21 ele ATV old style (few only left) | 27.90 | (5.00) |

**NORTH LONDON AGENT:** JIM SMITH G3HJF, 64 Galley Lane, Arkley, Barnet, Herts, EN5 4AL. For a demonstration of selected equipment, please **Tel: 01-449 7135** 10am-7pm Monday-Saturday. Only 2 miles from M25

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Access VISA

# I Have a Message for You

*Tony Smith G4FAI looks at third-party traffic handling*

Ask the average British amateur about the difference between amateur radio here and in the US, and the reply will almost certainly include, "Of course, the Americans can send third party messages, and we can't". An interesting comment, but what does it actually mean?

The name of their national society, The American Radio Relay League, provides a clue. From the earliest days, US and Canadian amateurs passed messages over the air on behalf of others, relaying traffic from one station to another, and it was with this activity in mind that ARRL was formed in 1914.

Over the years networks have been created for passing traffic to and from all parts of North America, plus a number of overseas countries where third party working is also permitted. For many amateurs message handling is their main radio operating activity, and it is surprising to an outsider to find how complex, demanding, and satisfying, it is for those participating.

Put simply, it is a system which allows amateur radio stations to originate, relay, receive and deliver greetings and other personal messages of a non-business nature, on behalf of non-amateurs. It does not compete with other services since there are no charges made, and no guarantee of delivery is given. It is closely allied with the Amateur Radio Emergency Service (ARES). Local traffic is often handled by ARES nets, and the regular operation of standard procedures through this arrangement provides invaluable training and experience to back up ARES when it responds to emergency calls.

## Complex System

There is much more to it than that, however, as can be seen from the detailed arrangements promulgated by ARRL to ensure that standards are maintained, and the good name of amateur radio preserved.

There are two types of net, those which are independent, and those linked together through the ARRL National Traffic System, with many of the former using ARRL recommended procedure. NTS is the largest organised system of nets and comprises four separate levels, together with a Transcontinental Corps (TCC). "Local" nets, usually emergency orientated and often operating on v.h.f., handle local traffic, and receive and deliver messages from other levels, depending on how often they meet.

At the next level are the "section" nets, covering the 73 ARRL geographical sections in the US and Canada. Above these, in daily operation, are the "region" nets, covering call area, or groups of States and Provinces. Finally there are NTS "areas" corresponding roughly with time zones.

NTS completes two cycles a day, one daytime and one evening. Traffic originating locally progresses through the various nets up to area level, and is transmitted from area to area by the TCC. When traffic is transferred to another area, the sequence is reversed, with messages passing down through the various levels until delivery can be effected at section or local level. By having two cycles a day messages can, in theory, be passed from coast to coast and a reply received within 24 hours, although this is not always possible.

When an emergency occurs, NTS can go partial or complete emergency operation as necessary, handling medium or long distance traffic at the request of ARES which, itself, handles local traffic arising from specific emergencies.

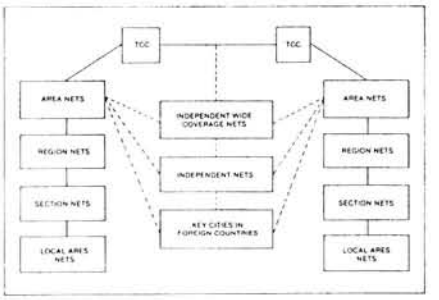


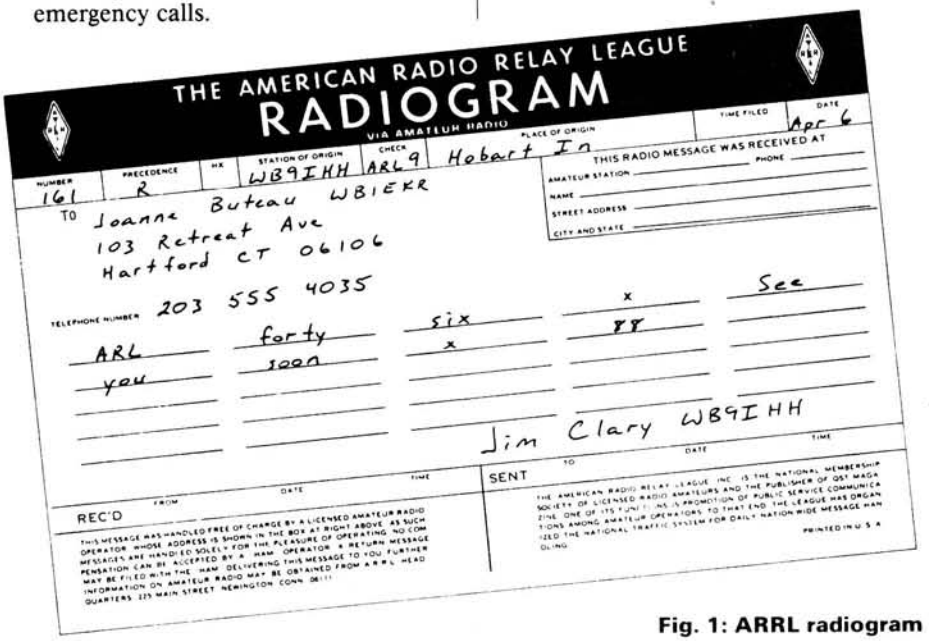

**Fig. 2: Emergency communications linked nets**

## Basic Procedures

The standard message form has a number of features which must be complied with to ensure a smooth and accurate flow of traffic. Each message has a serial number; a precedence code; optional handling instructions for the station finally receiving the message prior to delivery; details of the station originating the message; and a check figure indicating the number of words in the next. The destination address and telephone number is set out in standard format, and the text, as far as possible, is limited to a maximum of 25 words. Some standard messages for both routine and emergency work are number-coded to speed up traffic, and are decoded before delivery.

The procedures originated in c.w. operating, and include some of the abbreviations we find listed in this country which we rarely find use for! "Break-in" comes into its own. If the receiving operator misses a word he simply presses his key to interrupt transmission from the other station, and sends the last word he copied correctly. The transmitting station repeats the missing word and continues with the message. In telephony the receiving operator, using VOX, simply interrupts with the last word copied. When break-in is not used, missing words are asked for by one of the phrases "word after . . .", "word before . . .", or "between . . . and . . .", abbreviated on c.w. to WA, WB and BN.

Messages received should be relayed or delivered within 48 hours of receipt, although the intention is that they should be dealt with as soon as possible. They are delivered by post, tele-


THE AMERICAN RADIO RELAY LEAGUE
RADIOGRAM
VIA AMATEUR RADIO

NUMBER 161 | PRECEDENCE R | HX | STATION OF ORIGIN WB9IHH | CHECK ARL 9 | PLACE OF ORIGIN Hobart In | TIME FILED | DATE Apr 6

TO Joanne Buteau WB1EKR
103 Retreat Ave
Hartford CT 06106

TELEPHONE NUMBER 203 555 4035

ARL forty six x See
you soon xx

Jim Clary WB9IHH

THIS RADIO MESSAGE WAS RECEIVED AT
AMATEUR STATION PHONE
NAME
STREET ADDRESS
CITY AND STATE

REC'D FROM DATE TIME
SENT TO DATE TIME

THIS MESSAGE WAS HANDLED FREE OF CHARGE BY A LICENSED AMATEUR RADIO OPERATOR WHOSE ADDRESS IS SHOWN IN THE BOX AT RIGHT ABOVE. AS SUCH MESSAGES ARE HANDLED SOLELY FOR THE PLEASURE OF OPERATING, NO COMPENSATION CAN BE ACCEPTED BY A HAM OPERATOR. A RETURN MESSAGE MAY BE FILED WITH THE HAM DELIVERING THIS MESSAGE TO YOU. FURTHER INFORMATION ON AMATEUR RADIO MAY BE OBTAINED FROM ARRL HEADQUARTERS 225 MAIN STREET NEWINGTON CONN 06111

THE AMERICAN RADIO RELAY LEAGUE INC. IS THE NATIONAL MEMBERSHIP SOCIETY OF LICENSED RADIO AMATEURS AND THE PUBLISHER OF QST MAGAZINE. ONE OF ITS FUNCTIONS IS PROMOTION OF PUBLIC SERVICE COMMUNICATIONS AMONG AMATEUR OPERATORS TO THAT END, THE LEAGUE HAS ORGANIZED THE NATIONAL TRAFFIC SYSTEM FOR DAILY NATION-WIDE MESSAGE HANDLING.

PRINTED IN U.S.A.

**Fig. 1: ARRL radiogram**

phone, or in person. Confirmation copies are available by mail in the latter cases, and replies to all messages can be accepted.

## Net Discipline

The efficiency of network operation depends very much on the performance of the Net Control Station (NCS). His signal should be well received by all stations to avoid unnecessary relaying of instructions. He must be a highly skilled operator, totally familiar with all routines, procedures, codes and message routes.

Individual net members need to be familiar with codes and procedures, and to observe net discipline. A single member can create confusion and delay if he does not observe the rules. He may report into the net at the wrong time; fail to give his traffic list when reporting in; break in without authority from the NCS; call other net members without permission; fail to respond promptly when the NCS calls him; or leave the net without prior notification.

## Beginners Welcome

Training is, accordingly, very important, and many slow-speed traffic nets operate in the novice bands to help newcomers learn procedures and gain confidence in message handling. An article in QST[1], reprinted by ARRL in its *1983-84 Net Directory*, gives an example of this type of operation:

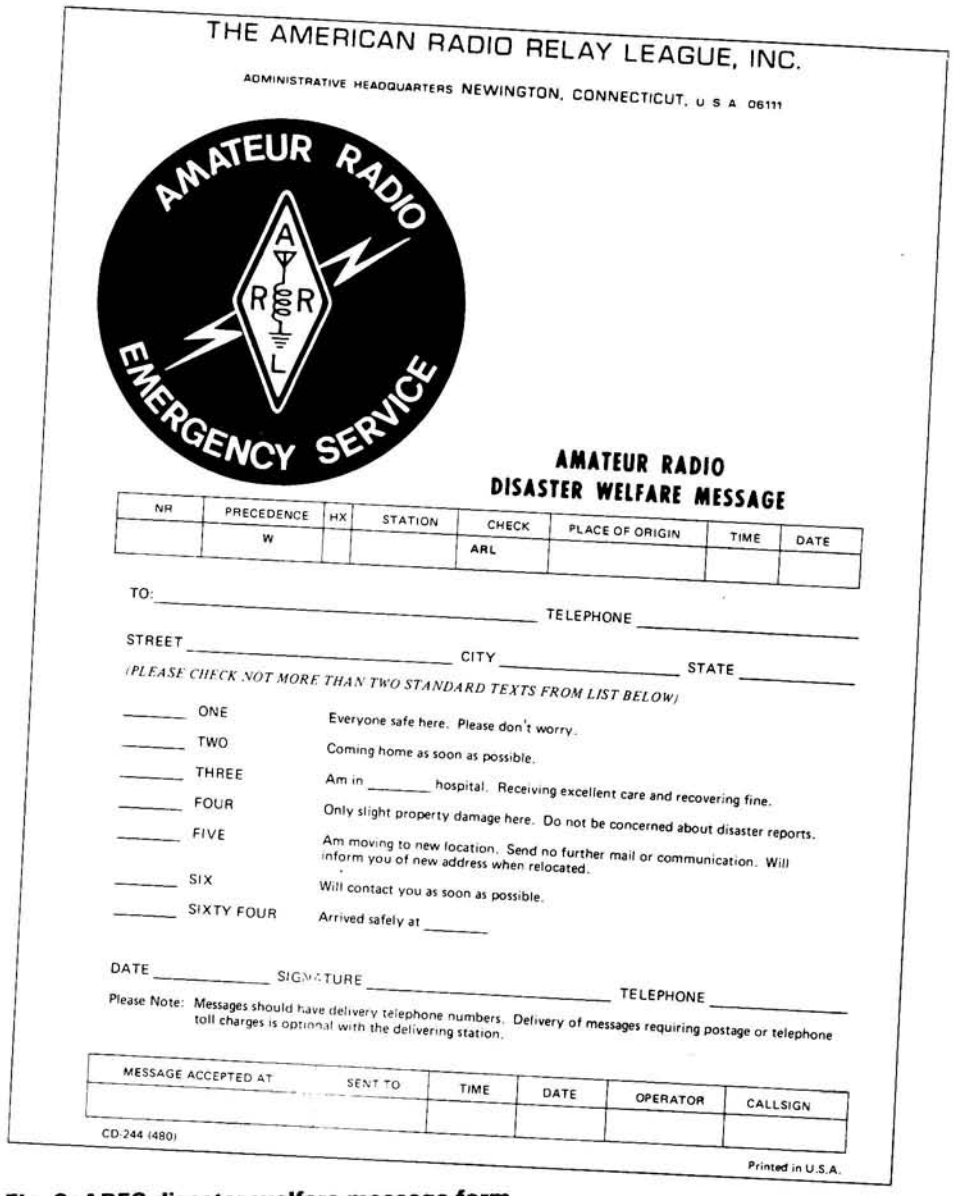
The NCS calls in the net at about 10w.p.m. "CWN (Colorado–Wyoming Net) de W0HXB QND (net now in session ) pse QNZ (zero beat my signal) CWN de W0HXB QNI K (stations wishing to check in go ahead)".

The newcomer wishing to call in sends a single letter. e.g. M. The NCS repeats the letter when he is ready. The stations calling in transmits, "de WN0WEM QRU (I don't have any traffic)".

NCS replies at the same speed as the caller, "WN0WEM ge R AS (good evening, I acknowledge that you have no traffic, please stand by)". Later, NCS may ask for details of the new station, officially welcome him to the net, and ask him to check in as often as he can.

The newcomer probably won't be asked to handle traffic until he has called in a few times. Eventually he will be sent by NCS to another frequency to take a message, "WN0WEM KOTER up 3 Denver (both stations QSY up 3kHz and pass one message for Denver)". The receiving station calls the station having the traffic, who will transmit it in the standard ARRL format. When the exchange is completed, both stations return to the net frequency to wait further instructions, or to be excused from the net.

NCS sends "WEM", which is acknowledged by a symbol such as a dot, dash, HR (here), or C (yes). "QRU QNX tnx QNI (we have no traffic for you, you are free to leave, thanks for checking in)". W0WEM finally checks out, "W0HXB de WN0WEM ge", or CWN de WN0WEM ge", and makes arrangements to deliver the message he has received from K0TER.



THE AMERICAN RADIO RELAY LEAGUE, INC.

ADMINISTRATIVE HEADQUARTERS NEWINGTON, CONNECTICUT, U S A 06111

AMATEUR RADIO EMERGENCY SERVICE

**AMATEUR RADIO DISASTER WELFARE MESSAGE**

| NR | PRECEDENCE | HX | STATION | CHECK | PLACE OF ORIGIN | TIME | DATE |
|---|---|---|---|---|---|---|---|
| | W | | | ARL | | | |

TO: _____ TELEPHONE _____

STREET _____ CITY _____ STATE _____

*(PLEASE CHECK NOT MORE THAN TWO STANDARD TEXTS FROM LIST BELOW)*

_____ ONE — Everyone safe here. Please don't worry.

_____ TWO — Coming home as soon as possible.

_____ THREE — Am in _____ hospital. Receiving excellent care and recovering fine.

_____ FOUR — Only slight property damage here. Do not be concerned about disaster reports.

_____ FIVE — Am moving to new location. Send no further mail or communication. Will inform you of new address when relocated.

_____ SIX — Will contact you as soon as possible.

_____ SIXTY FOUR — Arrived safely at _____

DATE _____ SIGNATURE _____ TELEPHONE _____

Please Note: Messages should have delivery telephone numbers. Delivery of messages requiring postage or telephone toll charges is optional with the delivering station.

| MESSAGE ACCEPTED AT | SENT TO | TIME | DATE | OPERATOR | CALLSIGN |
|---|---|---|---|---|---|
| | | | | | |

CD-244 (480)

Printed in U.S.A.

**Fig. 3: ARES disaster welfare message form**

## A Sense of Purpose

Once the business of the day is dealt with and a net is no longer QND (controlled by a NCS), it becomes QNF (not controlled), and is free for rag-chewing, personal exchanges, etc, much as nets are in Britain. The overall objective of the net, however, creates a sense of purpose and satisfaction which cannot be achieved by informal activities alone. As ARRL puts it, "Nets in general cannot be successful if there is nothing to do. There must be some form of activity in which all member stations can participate, and traffic is admirably suited to this purpose".

There are no specific NTS modes or frequencies. Telephony, c.w., and RTTY are used. Each net selects its own frequency, and the Net Directory lists all nets, frequencies, and times in the US and Canada. Additionally it provides much practical advice on network operation. The basic handbook is the *Public Service Communications Manual*, which sets out the procedures and rules, covering ARES and other emergency operations as well as NTS working.

Local and section nets are open to all amateur stations in their coverage area who wish to call in with traffic, or are willing to receive it. At region and area level nets are more formal, and consist of representatives of sections and designated liaison stations. Other stations reporting in from outside the

| | |
|---|---|
| HXC | Report date and time of delivery to originating station |
| HXE | Delivering station get reply from addressee, originate message back |
| HXF | Hold delivery until . . . (date) |

**Fig. 4: Examples of handling instructions (HX). Their use is optional with originating stations, but if originated they become mandatory for all relaying stations**

coverage area with traffic will be accepted, provided they can cope with the speed and protocol of the net.

## G-NTS?

It seems a great pity we cannot have something similar in Britain. There is no national telegram system anymore, so it could hardly be claimed that amateur free messages would be detrimental to a commercial service.

RAYNET, already involved in training in message handling, in preparation for emergency situations, could benefit enormously from the greatly increased operating opportunities presented, and undoubtedly many more amateurs would be attracted to an expanded public service concept. The popular image of amateur radio would be enhanced, and public demonstrations of our hobby would be much more attractive if a message-carrying service could be offered.

The present regulations permit very little third party traffic, although in recent years there have been some relaxations, notably in Jamboree-on-the-Air, where special event stations are now permitted to carry Scout and Guide greetings. There have also been some changes which allow RAYNET more activities than previously. If the process continues, there may yet come a day when a national traffic system takes to the air in the UK.

Much preparation would be needed to make it a success. It would certainly add a new dimension to the word "communication" in the context of amateur radio.

## RSGB Comment

**The RSGB outlines the present position with regard to third party traffic on the amateur bands.**

At present, licensed amateur stations in Britain may send messages on behalf of third parties only during disaster relief operations or during exercises conducted by the "user" services, i.e. British Red Cross Society, St John Ambulance Brigade, County Emergency Planning Officers, or the Police, at the request of those services. During a disaster relief operation, a representative nominated by a user service is permitted to operate an amateur station under the direct supervision of the licensee.

Since October 1982 a relaxation of the amateur licence regulations has

| Precedence | Meaning |
|---|---|
| EMERGENCY | Life or death urgency. Includes official welfare agency messages vital to the relief of a stricken populace. On c.w./RTTY must always be spelled out. |
| PRIORITY | Important messages having a specific time limit; official messages not in emergency category; press despatches, and emergency traffic not of utmost urgency; notice of death or injury in a disaster area. Abbreviated "P" on c.w./RTTY. |
| WELFARE | Enquiries as to health and welfare of an individual in a disaster area or advice from the area that all is well. Handled only after all emergency and priority traffic is cleared. Abbreviated "W" on c.w./RTTY. |
| ROUTINE | Covers most traffic in normal times. In disaster situation will be handled last, or not at all, when circuits are handling higher precedence traffic. |

**Fig. 5: ARRL Recommended precedence codes. The precedence always follows the message number, e.g. 207R on c.w., and "Two zero seven routine" on telephony**

| Code | Meaning |
|---|---|
| QNA* | Answer in prearranged order |
| QNC | All net stations copy |
| QNE* | Entire net stand by |
| QNO | Station is leaving the net |
| QNU* | The net has traffic for you. Stand by |
| QNY* | Shift to another frequency (or to . . . kHz) to clear traffic with . . . |

*for use by net control stations only

**Fig. 6: Examples of ARRL QN signals for use in c.w. nets only. These are not intended for other amateur use. In telephony nets the actual words are used**

| Emergency | |
|---|---|
| One | Everyone safe here. Please don't worry. |
| Seven | Please reply by Amateur Radio through the amateur delivering this message. This is a free public service. |
| Nine | Additional . . . radio operators needed to assist with emergency at this location. |
| Twenty-six | Help and care for evacuation of sick and injured from this location needed at once. |
| **Routine** | |
| Forty-six | Greetings on your birthday and best wishes for many more to come. |
| Fifty-four | Many thanks for your good wishes. |
| Fifty-six | Congratulations on your . . ., a most worthy and deserved achievement. |
| Sixty-eight | Sorry to hear you are ill. Best wishes for a speedy recovery. |

**Fig. 7: Examples of the ARRI numbered radiograms. When these codes are used, the letters are ARL are sent to signify that a spelled out number in the message refers to a complete text bearing that number on the ARL list**

The United States has special arrangements permitting US amateurs to exchange third-party traffic with amateurs in:

| | |
|---|---|
| Antigua & Barbuda | Dominican Republic |
| Argentina | Ecuador |
| Australia | El Salvador |
| Bolivia | Ghana |
| Brazil | Guatemala |
| Canada | Guyana |
| Chile | Haiti |
| Colombia | Honduras |
| Costa Rica | Israel |
| Cuba | Jamaica |
| Jordan | St Lucia |
| Liberia | St Vincent |
| Mexico | The Gambia |
| Nicaragua | Trinidad & Tobago |
| Panama | United Nations |
| Paraguay | (Geneva—4U1ITU) |
| Peru | Uruguay |
| Pitcairn Is* | Venezuela |

*informal agreement

**Fig. 8: Countries having third party agreements with the US. Many of these countries have similar arrangements with Canada**

allowed, on an experimental basis, non-licensed persons to speak into the microphone of a Special Event station to send simple greetings messages to other amateur stations, subject to the following guidelines:

(i) Each greetings message must not exceed two minutes.
(ii) Each person may pass only one message to a particular station.
(iii) The licensee must identify the station and operate the transmitter controls at all times.
(iv) Messages can only be sent to other stations within the UK.

The RSGB intends to explore the potential of third party messages both internally within the UK, and internationally, particularly with regard to the public service aspects of the hobby. At the time of writing (January 1985), the Society is in negotiation with the DTI, seeking to extend the existing special event callsign third party experiment to a number of overseas countries, namely the USA, Canada, Australia, New Zealand and the Falklands.

Further extensions, leading towards a national traffic system, such as that in the USA, would require much negotiation over a long period of time. Whilst it is not opposed to the idea, the Society's view is that a slow advance, with adequate time to study its effect, is by far the best long term approach to this issue.

## Thanks

The author is grateful to ARRL for providing information used in the preparation of this article.

(1) *Checking Into Slow-Speed Nets* by Peter Hills W0HXB and Robert Halprin K1XA, *QST*, December 1976.

***PW***

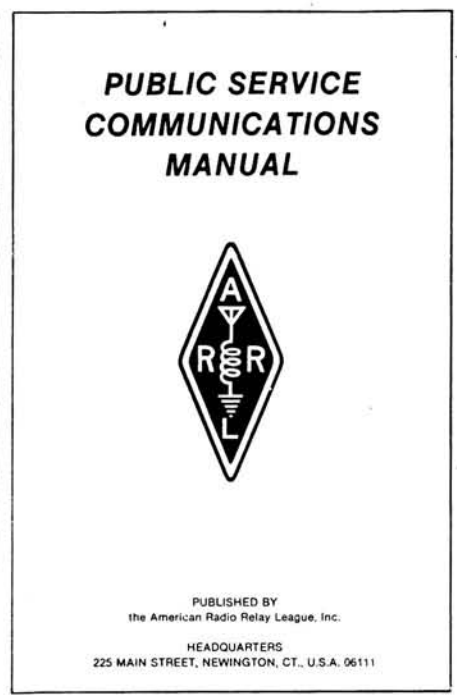



**Fig. 9: Cover of Public Service Communications Manual**

# NEWS EXTRA

## Club Changes

**Medway ARTS** are moving QTH. The new address is Matthews Riding School, Lower Rainham Road, Gillingham, Kent. If you want more details of what the club is getting up to then contact ***Peter Poole G4EVY, QTHR*** or ***David Axford G4LHU.***

One thing the club does mention is that the new QTH has got a larger meeting area and lots of parking, but there is a licensed bar too!

**Bury St Edmunds ARS** also have a new meeting place. Their new address is the County Upper School, Beetons Way, Bury St Edmunds. The meetings are held on the third Tuesday of the month at 7.30pm.

New members are welcome says Chris G1FUU on Stanton 50271.

**Norfolk ARC** have also made some changes to their line-up. Their programme secretary has moved on to pastures new. So, until the AGM, Mike Cooke G4DYC on Dereham 850591 will be holding the fort.

Yet another club has made changes. Ian Cope G4IUZ on Hatfield 65707 has taken over the post of secretary for the ***Edgware & District Radio Society.***

## Did You Know?

I've almost finished reading the *Annual Report 1985/86* from the Radio Regulatory Division, DTI. It sounds really boring, but it is actually very interesting. Over the next few months I shall be bringing some of the more interesting facts to light in these news pages.

The first thing that intrigued me was the table of Wireless Telegraphy Act Prosecutions.

There were other details like the fines imposed (a total of £102 166 for all offences) and costs awarded (£39 612 for all offences). There were a total of 721 forfeiture orders, too.

A free copy is available from, The Librarian, Radio Comms Div., Waterloo Bridge House, Waterloo Rd., London SE1 8UA. Tel: 01-275 3072.

| Categories | People Prosecuted | People Convicted |
|---|---|---|
| CB (a.m.) | 440 | 438 |
| CB (f.m.) | 462 | 458 |
| Unlicensed radio broadcasters | 128 | 124 |
| Unlicensed amateur radio | 5 | 5 |
| PMR | 17 | 17 |
| Cordless telephones | 15 | 14 |
| Illegal Reception | 4 | 4 |
| Marine | 10 | 10 |

## Peace to the World

This is a contest organised to strengthen relations among radio amateurs of the world, and allow them to fulfil the requirements for the diplomas offered by the Radio Sport Federation of the USSR and the Krenkel Radio Club of the USSR.

The contest is open to licensed amateurs and listeners world wide. There are four different awards available:

A: single-op, single band
B: single-op, all bands
C: multi-op, all bands, single transmitter (this includes all clubs)
D: listeners

The contest runs from May 9 2100UTC to May 10 2100UTC. The bands and modes will be s.s.b. and c.w. on 3.5, 7, 14, 21 and 28MHz as well as through satellites RS and OSCAR with downlinks on 28MHz from 144MHz. These count as a separate additional band. No cross mode QSOs allowed.

Activity must be contained within the following allocations: c.w. 3505–3600, 7005–7100, 14010–14100, 21010–21160 and 28010–28200kHz s.s.b. 3600–3650, 7040–7100, 14150–14350, 21200–21450 and 28400–29100kHz.

Exchanges must consist of RS, RST and serial QSO number, (USSR stations send RS, RST and Oblast number e.g. 579021 or 57021).

Each QSO made within a continent scores 1 point and QSOs between continents 3 points.

Listeners score 1 point for one-way receiving, 3 points for two-way QSO receiving, one way receiving is both callsigns and one check number, two-way is both check numbers.

Stations may be worked on each band on either mode but not both.

QSOs in the contestant's own country count only for multiplier.

There is one multiplier on each band for each country worked, the total multiplier is the sum of countries or territories worked on all bands.

All log sheets must be sent in by 1 July 1987 to ***CQ-M Contest Committee, PO Box 88, Moscow, USSR.***

*Martin Ehrenfried G8JNJ describes how to carry out some most useful and versatile modifications to the AR-2001 scanning receiver.*

# Modifications to the AR-2001 Scanning Receiver

Having owned an AR-2001 scanning receiver since its introduction into the UK I have been impressed with its r.f. performance, although I believe some of the operating facilities (standard on other receivers) are limited on this particular model. AOR have now superseded the 2001 with the 2002. This has a few extra features such as extended frequency coverage, l.e.d. S-meter and up/down frequency tuning knob. But basic facilities such as an output switched by the squelch line, and capable of controlling external devices are still missing. This article describes a number of modifications to the AR-2001 scanning receiver, which by adding extra facilities have extended its present functions. However it should be noted that some items such as the cassette recorder interface can also be used with the 2002 and 2001 variants such as the Regency MX5000 and MX7000.

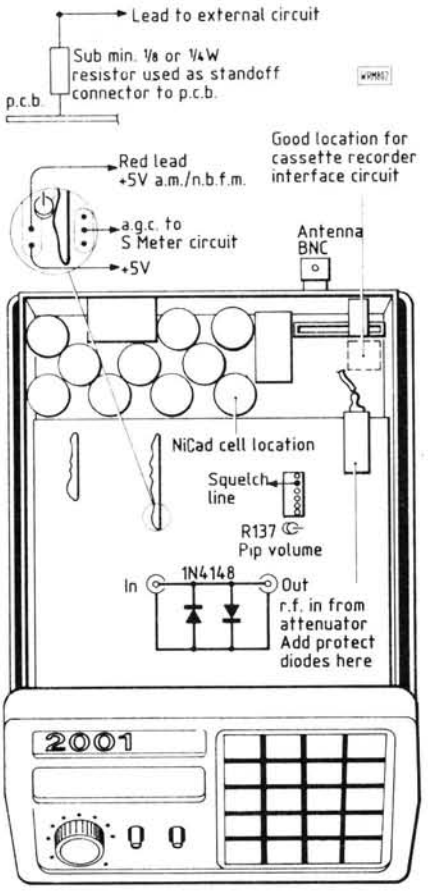



**Fig. 1: Internal layout of AR-2001**

As with all modifications to commercial equipment you should have confidence in your own constructional ability before undertaking any work, and also be aware that any modifications may invalidate the guarantee offered by the retailer. Having said that, the modifications are all simple and with care can be easily implemented.

Before starting on any work it is worthwhile reading through this article and deciding exactly which modifications are to be undertaken, as users may not have the same requirements, and not implementing some of the suggestions may make the choice of items such as connectors more flexible. Once a decision has been made as to what is required, it is worth taking a look inside the receiver and deciding how to achieve it! The time taken to do this is always well spent, particularly as mistakes tend to be expensive with the packing density of modern components in Japanese equipment.

## Case Removal

Removal of the case is very simple. First remove the four small cross-headed screws which attach the two plastics case halves to the chassis at the rear of the case. Then remove the two similar screws located at the front on the underside of the receiver. This allows the two case halves to be separated from each other at the rear and withdrawn from the front moulding. Take care whilst doing this as the bottom housing contains the loudspeaker and is attached to the main chassis by very fine cable and a rather delicate clip-in type connector. This has to be released by means of a small bladed screwdriver inserted between the clip and the connector shell before it will separate. Once this is done it is possible to completely remove the case halves from the main chassis, leaving easy access to the main circuit board.

## Battery Pack

One of the first problems encountered was the lack of portability of the equipment. I considered that the versatility of the receiver would be increased dramatically if only it were possible to carry it around, say in a briefcase, and be able to use it without needing to find an external power supply.

Examination of the receiver shows an area at the back of the chassis which I assumed was originally intended for an internal mains power supply. It is possible to make up a NiCad battery pack which will fit into this space, and with average usage will give over two hours operation (see Fig. 1).

The choice of batteries is of course

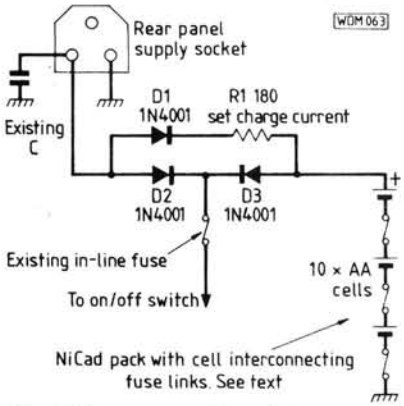



**Fig. 2: Battery pack and charger wiring showing NiCad fuse link system. (See text)**

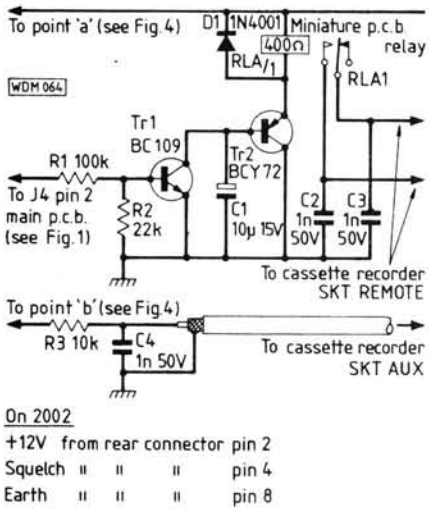
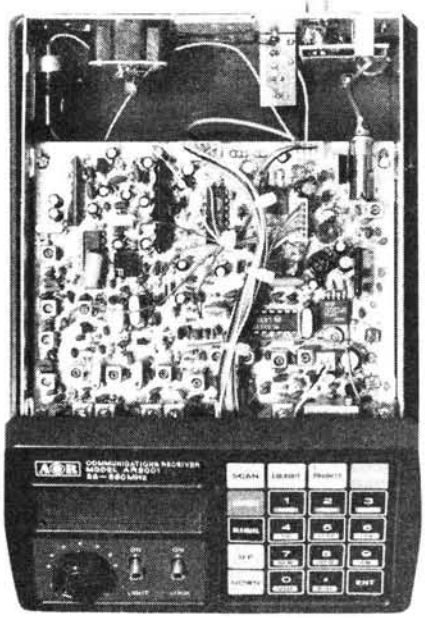
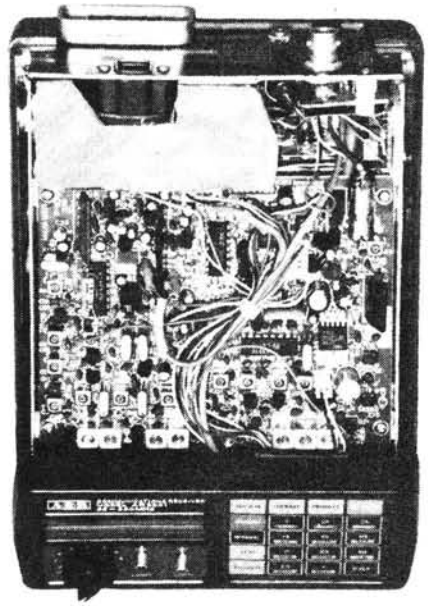



**Fig. 3: Cassette recorder interface circuit**



**Internal view of unmodified AR-2001**



**Internal view of author's modified AR-2001**

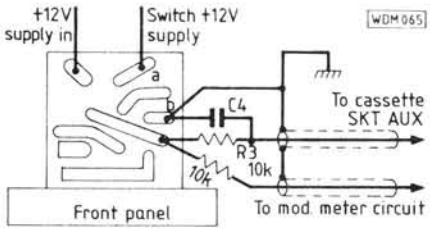



**Fig. 4: Connections to volume control p.c.b.**

limited by the space available, but it is possible to fit 10 AA size cells into the receiver if they are first made up into a pack. Many companies have special offers on NiCad cells and it should be possible to obtain a set relatively cheaply by shopping around. The best type to obtain for this purpose are those with a plastics insulating sleeve around the body of the cell and connecting tags attached to each end, as this eases interconnection between cells. Although it is perfectly possible to solder directly to the cells one has to take care not to damage them internally by prolonged application of the soldering iron.

To make up the pack it is necessary to reposition the in-line fuse holder. This is in the supply lead, between the power socket and the main board. The best location for this is on the back-panel above the external loudspeaker socket. You may find it necessary to extend the power lead to achieve this. The next step is to fit the NiCad batteries in place, vertically around the rear of the power connector socket. It is best to do this with the cells in a discharged state to avoid accidental damage, as NiCads can easily provide high short circuit currents. One tip at this point is to slip some thin card between the cells and the surrounding metalwork, otherwise when the cells are made up into a pack it will not be possible to reinsert them into the case.

When you are satisfied that the cells are in the position you want them to be, place some sticky tape over the ends of the cells. This allows the whole pack to be withdrawn from the chassis whilst the cells remain in their correct relative positions. Next without disturbing the pack too much glue the cells together with a fairly flexible adhesive such as Evo-Stik. Leave the pack to set overnight, and then connect the cells in series. It's advisable to use very fine gauge insulated wire to do this, so that in the event of a short circuit between adjacent cells the wire will act as a fuse and no damage will result. The final assembly consists of wrapping the pack round with some broad adhesive tape, in order to provide an extra layer of insulation. The ends of the pack should also be treated in this way. It should now be possible to insert the completed pack back into the receiver, taking care not to damage the small p.c.b. associated with the loudspeaker socket in the process.

The receiver supply now has to be wired as shown in Fig. 2. This permits the cells to be charged externally by means of the supplied 12V mains adaptor. This is possible because the off-load output voltage of the adaptor is in the region of 20V. The simple charging circuit shown just consists of a current limiting resistor. This has been used very successfully, but a more sophisticated version providing a constant current could be substituted. Note that in both cases it is best to choose a charging current below 1/10th of the ampere-hour rating of the cells. This is to prevent overcharging of the cells if the mains adaptor is used continuously, although the charging rate will be reduced when the receiver is switched on, as the supply voltage falls to a lower level.

## Cassette Recorder Interface

Another application for the receiver is logging usage of a communication channel. This involves connecting a cassette recorder to the receiver and operating the machine by means of the squelch circuit. This is very simple to achieve as a squelch circuit control line exists on one of the multiway connectors on the top circuit board.

The interface circuit is shown in Fig. 3. Capacitor C1 provides a short delay after the squelch closes, in order to prevent rapid stop/starting of the recorder on weak signals. Altering the value of C1 will vary the delay time, 10µF being chosen as an optimum. The audio feed is taken via a 10kΩ resistor from the top end of the volume control (see Fig. 4). This gives a constant output level irrespective of volume or squelch control setting. Another bonus is that the "pip" associated with keyboard entries is not present at this point.

All new internal connections to the receiver should be made with miniature screened cable, the braid only being connected at the chassis where the external connector and decoupling capacitors are fitted. This is to avoid "hash" or switching transients from the microprocessor control board being radiated externally by interconnecting cables.

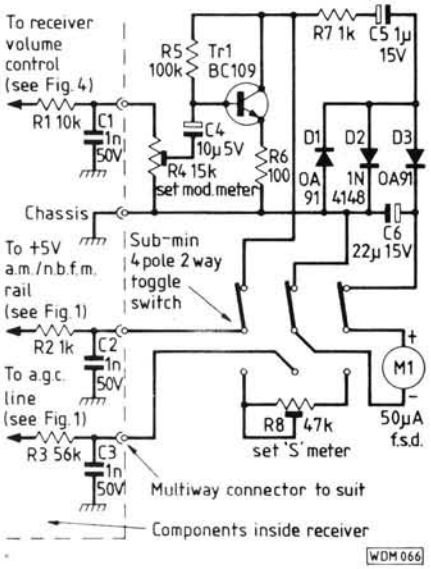



**Fig. 5: Signal and modulation meter circuit**

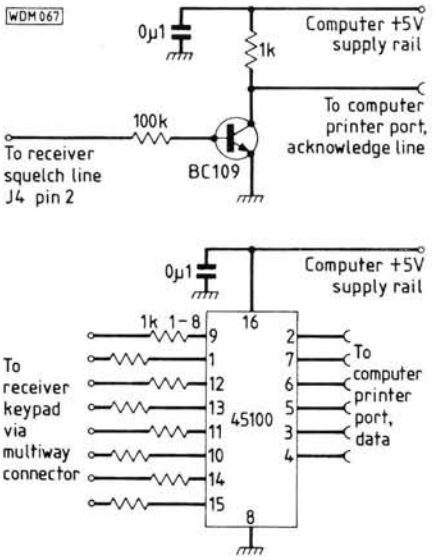



**Fig. 6: Circuit for computer interface**

## Signal Strength / Modulation Meter

Another useful feature is some form of signal strength indication, and as the most expensive item is likely to be the actual meter, it is easy to provide a simple modulation measurement facility at the same time.

Consider first the signal strength meter. The receiver has an a.g.c. rail associated with the a.m. and n.b.f.m. demodulator circuits. This is at approximately 5V (the supply rail voltage) under no signal conditions, and falls to a minimum of approximately 2.5V under strong signal conditions. All that is required is a simple voltmeter circuit connected between the 5V supply rail and the a.g.c. line. As a supply rail has to be taken from the receiver we can use this to power the modulation meter circuit. This consists of a single stage transistor amplifier, feeding a diode pump circuit which provides a d.c. level for the meter. A miniature toggle switch selects the signal strength or modulation meter function, see Fig. 5. Note that the meter only operates on a.m. and n.b.f.m., and that in the w.b.f.m. position the meter will give a slightly negative reading. If you find this annoying, adjustment of the left-hand mechanical stop on the meter movement will prevent scale readings below zero.

It is necessary to locate the 5V and a.g.c. rails on the top receiver p.c.b., see Fig. 1. The connections are made to these points by means of 0.125W resistors soldered to the p.c.b. and used as stand-off points for connection to miniature screened cable. The inclusion of resistors at these points reduces the possibility of damage occurring to the receiver should any external faults occur, in say the metering circuit, or during the mating of multiway connectors. They also provide an extra degree of decoupling on the control rails.

Depending on how accurately you require the meter to be calibrated either of the two following methods can be used. The simplest way is just to use a meter scaled 0–10. Switch to the signal strength position, tune the receiver to the strongest signal you can receive (a hand-held transceiver in the same room as the receiver is pretty strong!) and set potentiometer R8 for full scale deflection. Now switch to modulation, select n.b.f.m. on the receiver, and with no signal received set potentiometer R4 to give a reading of 20 per cent f.s.d. The more accurate method requires the use of a calibrated signal generator. Calibration of the signal strength meter is carried out as before, but this time the level of output from the signal generator is noted at each of the main meter scale divisions. The signal generator is then set to give a 60 per cent a.m. 400Hz modulation output. The meter should be set to read 60 per cent of f.s.d. by means of potentiometer R4. Selecting n.b.f.m. and applying 6kHz f.m. 400Hz modulation should give the same meter reading. A quick check of different levels and types of modulation should give suitable meter readings up to 8kHz f.m. and 90 per cent a.m. modulation depths.

Using the measured levels it should now be possible to produce a calibrated scale for the meter, or alternatively a calibration chart, the accuracy of measurements being limited by the linearity of the receiver demodulators, and also the bandwidth of the i.f. filters. Note that on f.m. the meter reading are only valid if 400Hz modulation is present, due to the de-emphasis characteristics of the receiver, however it is still possible to approximate on speech and it has proved to be as accurate as a commercial unit once calibrated.

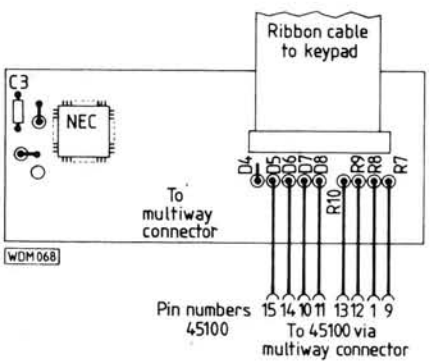



**Fig. 7: Control p.c.b. layout showing C3 (scan speed) and connections for parallel computer control of keypad**

## Miscellaneous Items

One irritating feature of the standard receiver is the high audio level of the keyboard entry "pips". It was first hoped to make the level of the "pips" vary with the setting of the volume control, however due to the nature of the squelch circuit this is not practical. The best compromise found has been to reduce the level. This is achieved by changing R137 from 1kΩ to 10kΩ, see Fig. 1.

As the receiver was being used as an item of test equipment in a workshop it was decided that some form of r.f. input protection was desirable. This was achieved by adding a pair of Schottky diodes in the usual anti-parallel configuration across the receiver input, after the 10dB attenuator network on the rear of the BNC input connector. This was so that under very strong signal conditions it would be possible to reduce the r.f. level present across the diodes, and hopefully stop them from being an additional source of cross/inter-modulation, although at this level the receiver would already be overloaded. Whilst doing this modification it is worthwhile fitting a higher quality BNC connector in place of the cheap Japanese socket, as this type only has two wire prongs to make contact with the centre pin of the plug and soon fails.

Compared with a previously owned receiver the scan rate of the AR-2001 seemed very slow, it is possible to

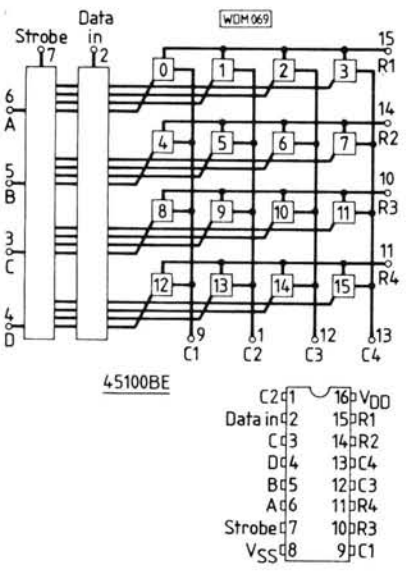



**Fig. 8: Additional information on 45100 i.c.**

increase the speed by reducing the value of C3 on the microprocessor control board from 33pF down to a minimum of 10pF, 18pF being the optimum, see Fig. 7. This does have the disadvantage of reducing the HOLD period of the DELAY function so this has to be weighed against any increase in scan rate that may be desired. This modification also had the effect of moving two "spurious carriers" on the receiver out of the 144MHz and 430MHz amateur bands, allowing continuous scanning without stopping on the spurii. This will not move all the spurious responses on the receiver but it may move some of them.

Another problem is the level of "hash" radiated from the case of the receiver, particularly if the supplied telescopic antenna is used. This can be improved by screening the inside of the case with stick-on aluminium tape or foil, or alternatively spraying with r.f. shielding aerosol (RS 551–570). The aerosol is quite expensive but you do get a large can which is useful for other e.m.c. problems around the workshop. Using either method be careful to check for any potential short circuits which could arise when the case is replaced.

## Summary

The AOR scanning receiver has proved to be an excellent piece of equipment, although in its basic form it lacks some of the more sophisticated features available on other scanning receivers. I hope that from the modifications outlined in this article, present and future owners will find further applications for the receiver.

## Computer Interface

AOR produce an interface board for use with the receiver, which bolts in place of the front panel and allows any computer with an RS232 interface to control the receiver. However examination of the specifications for the interface does not give any indication of any extra facilities made available on the receiver other than a signal strength meter display on the computer. Almost the same facilities can be made available at a fraction of the cost providing the computer used has a parallel I/O port.

To achieve this, the receiver keyboard has a cross-point matrix format, duplicated in part by a 45100 c.m.o.s. switch array. This accepts a four-bit address word which selects each of the cross-points to be connected, and also data and strobe inputs to select if the cross-point is opened or closed. The computer can then duplicate, by means of outputting the correct data to the c.m.o.s. switch, most of the keyboard commands. Note that not all commands are required, as the SEARCH, PRIORITY, LOCK OUT and CLOCK functions can be achieved by the computer with suitable software. This permits the use of a single 4 × 4 matrix switch, although a couple of extra i.c.s could be added to provide the missing functions if required. The circuit in Fig. 6 shows the interface circuit, and Fig. 7 the connection details.

The best point to connect to the keyboard is just below the multi-way strip connector used to terminate the ribbon cable from the keyboard. This is located on the control board, at the rear of the front control panel. Miniature resistors are used as termination points for connections to the keyboard, again in order to provide a degree of protection to the receiver under fault conditions, and to help reduce re-radiation of "hash" from the microprocessor control board. Beware when soldering near the ribbon connecting cable as it will melt very easily, it is best to hold it out of the way with some tape, or disconnect it completely when working on the p.c.b.

The facilities which could be provided by the receiver/computer combination are now only limited by the imagination and software writing ability of the user. Here are some suggestions:

Monitoring of channel occupancy with a bar chart style indication of usage

Providing extra memories

More than one PRIORITY channel

Intelligent scanning of memories

The most important frequencies being checked more often

Electronic logging of time and frequency information

Selective recording of traffic on specific channels (with a cassette recorder also controlled by the computer).

These are just a few of the most obvious ideas which spring to mind, each user may have their own ideas. The flow chart for a simple computer control program is shown in Fig. 9.

Note that the c.m.o.s. switch has to be commanded ON and OFF for each "press" of the keyboard. Failure to do this leaves the keyboard "locked-up" so it is important to include an initialisation routine at the start of the program to "switch off" every location in the matrix. this prevents a "lock-up" occurring when the computer is first connected to the interface as spurious data may be fed into the switch. The rest of the program consists of routines to convert computer keyboard commands into the correct input/output format for control of the c.m.o.s. switch. A feed from the receiver squelch circuit to the I/O port allows the computer to determine when a signal is present, the results of which can be presented in a number of ways, depending on the program. **PW**

### Switch Sub-routine

| | |
|---|---|
| Set data pin high<br>Set location<br>Set location + strobe pin high<br>Set location | Cross switches location on |
| Set data pin low<br>Set location<br>Set location + strobe pin high<br>Set location | Cross switches location off |
| Return | |

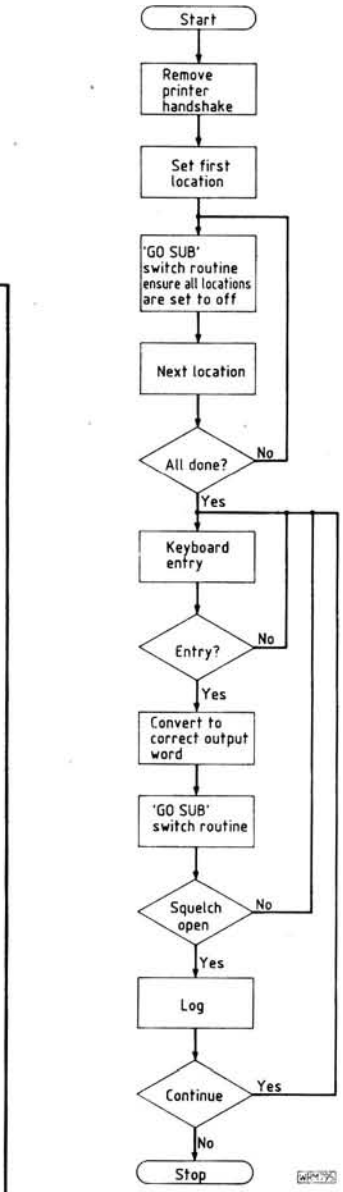



**Fig. 9: Flow chart showing suggested program of events**


**Installed modulation and signal meter showing suggested calibration**

# Antenna Radiation Patterns Computerised–4

*In this, the concluding part, F.C. Judd G2BCX & Dr L.W. Brown G0FFD deal first with "linear radiators"*

An example of a linear radiator is a long wire antenna consisting of a finite number of half-waves end to end in one continuous length. Such an antenna may consist of an odd or even number of half-waves although the overall length is normally referred to a complete number of wavelengths, thus three half-waves become 1.5λ, 6 half-waves become 3λ and so on. A number of amateur h.f. band allocations make it possible to operate long linear radiators harmonically. As an example a half-wave radiator for 3.5MHz, approximately 30m long, will function as a full-wave antenna for 7MHz (2 half-waves), a 2λ antenna for 14MHz (4 half-waves) or as a 4λ antenna for 28MHz (8 half-waves).

The reason for this may be apparent from Fig. 4.1 (computer produced) which shows the voltage and current distribution at operating frequency for a linear radiator 2λ long. Such an antenna could also be **voltage** fed at any harmonic frequency e.g. at a frequency two, four or eight times the original fundamental frequency, or at a half or quarter of that frequency. Details concerned with harmonic operation and other methods of feeding r.f. to long wire antennas will be found in some of the references included at the end of Part 1, for example, the *ARRL Antenna Handbook*.

The computer produced radiation pattern shown in Fig. 4.2 is for a linear radiator (long wire if you prefer) of 2λ long, or 4 half-waves, the current flow-

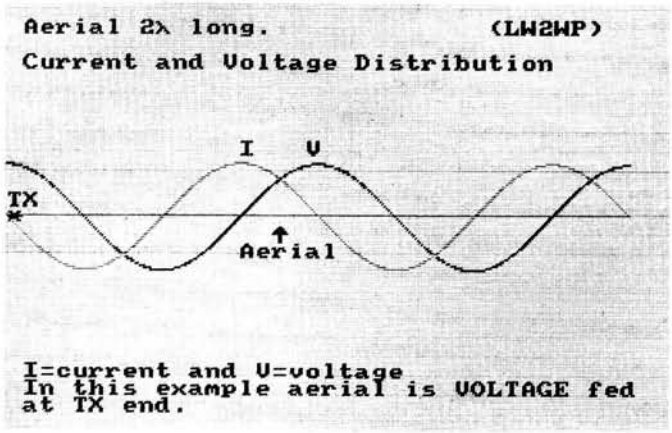



**Fig. 4.1: Voltage and current distribution on a linear radiator 2 wavelengths long. (see text regarding harmonic operation)**

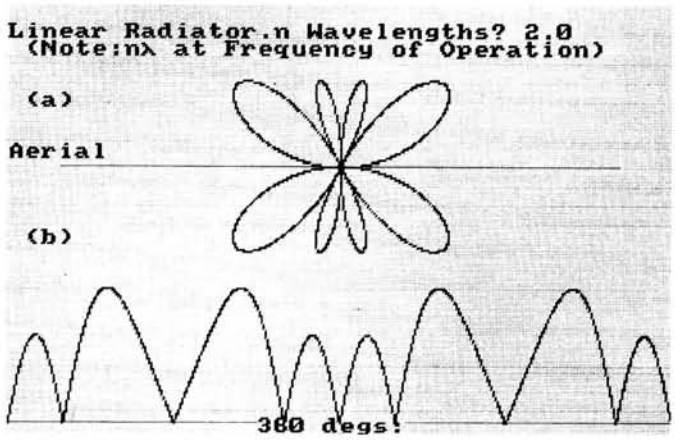



**Fig. 4.2: (a) Polar pattern. Radiation at fundamental frequency of a linear radiator 2 wavelengths long. (b) For same radiator but as a Cartesian plot. (Horizontal mode)**

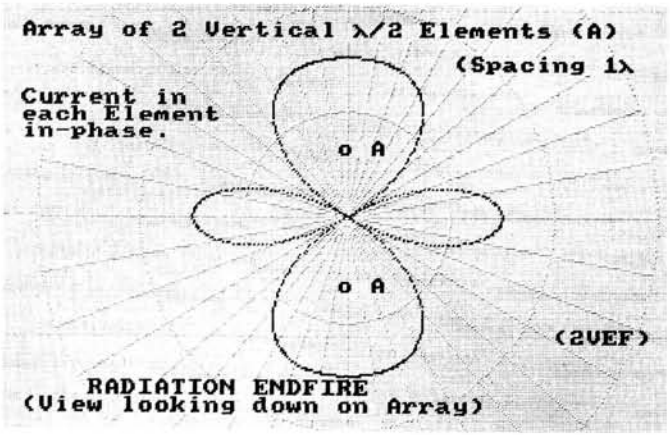



**Fig. 4.5: Radiation pattern from a 2 element Endfire array. Element spacing 1 wavelength**

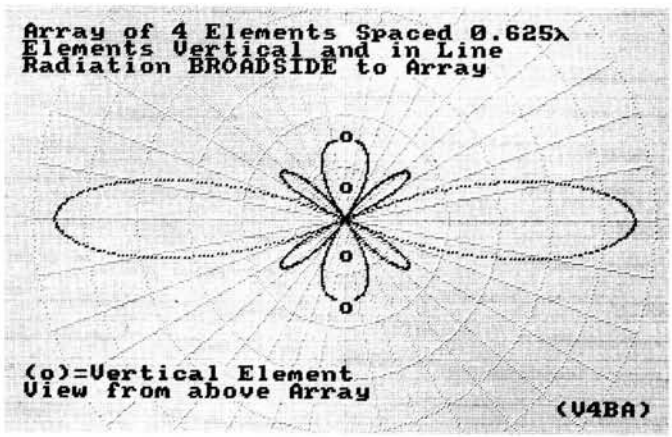



**Fig. 4.6: Radiation pattern. Broadside array consisting of 4 vertical half-wave elements**

ing in each adjacent half-wave being in phase opposition, hence the reason for the large number of lobes although there will always be four main lobes for any linear radiator 1λ long or more at operating frequency as we shall see.

It may not have gone unnoticed that Fig. 4.2 shows not only the polar radiation pattern for a linear radiator 2λ long but also a "Cartesian" plot, this being another way of plotting radiation magnitude, over 360° for horizontal patterns and 180° for vertical patterns. Cartesian plots can be obtained experimentally by using continuously rotating scale model antennas operated at u.h.f., the signals from which are fed via a detector and d.c. amplifier to a synchronised pen chart recorder.

Next we have the polar pattern for a linear radiator 2.5λ long (odd number of half-waves) and although as Fig. 4.3 illustrates, there are still four major lobes, the angles of these with respect to the radiator itself are smaller and there is a further increase in the number of minor side lobes. This is even more apparent in Fig. 4.4 which is the polar radiation pattern for a linear radiator 4λ (8 half-waves) long. If this radiator were operating at a fundamental frequency of 28MHz the radiation pattern would be as shown and its physical length would be about 30m. Therefore, it could be operated as a single half-wave at 3.5MHz, a full-wave (2 half-waves) at 7MHz and so on.

When an antenna of this nature is operated harmonically, the four main lobes have quite considerable gain over a single half-wave, particularly at the higher frequencies.

## Multi-element Antenna Arrays

Antenna arrays (other than parasitic systems) can be built up by using a number of separate half-wave elements in various combinations for operation either vertically or horizontally. Some of these are known as **broadside** and/or **endfire** arrays. The former because maximum radiation is broadside (at right angles) to both sides of the array and the latter because maximum radiation is from both ends but in line with the axis of the array. Reflector systems are sometimes used with arrays of this nature.

Broadside and/or endfire arrays may consist of two or more driven elements with different spacing between these and with the current in each element having a specific phase relationship. From this it will be apparent that many different combinations are possible. The first example is a simple array with two driven elements spaced 1λ apart and with the current in each phase. As can be seen in Fig. 4.5 the fairly large side lobes are at right angles to the axis of the array but maximum radiation is from both "ends" which makes this an endfire system[1].

## Broadside Arrays

Arrays consisting of two elements, or more can also be arranged to produce broadside radiation with the requisite spacing between the elements and the phase relationship of the current flowing in each. We now show two examples of the radiation patterns produced by multi-element arrays and which also illustrate the gain possible in each main lobe over that from a single element, e.g. a dipole. The first (Fig. 4.6), is the radiation pattern from an array of four vertical half-wave elements spaced 0.625λ apart and with the currents in each element in phase. Radiation is **broadside** to the array and the relatively narrow main lobes suggest that there will be considerable gain from these.

The final contribution in this respect, is a dual illustration (Fig. 4.7)

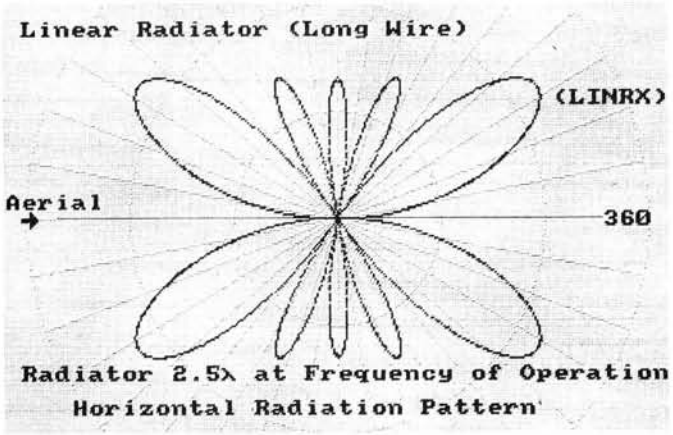



**Fig. 4.3: Radiation pattern: Linear radiator 2.5 wavelengths long. Note increase in number of minor lobes**

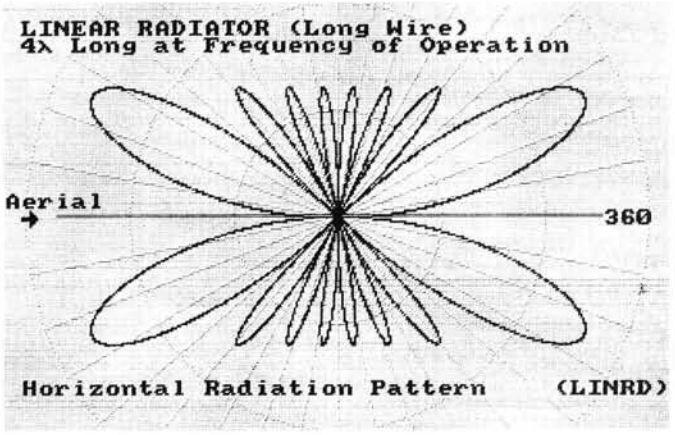



**Fig. 4.4: Radiation pattern. Linear radiator 4 wavelengths long. Note number of minor lobes and that main lobes are at a smaller angle to the radiator. (see text)**

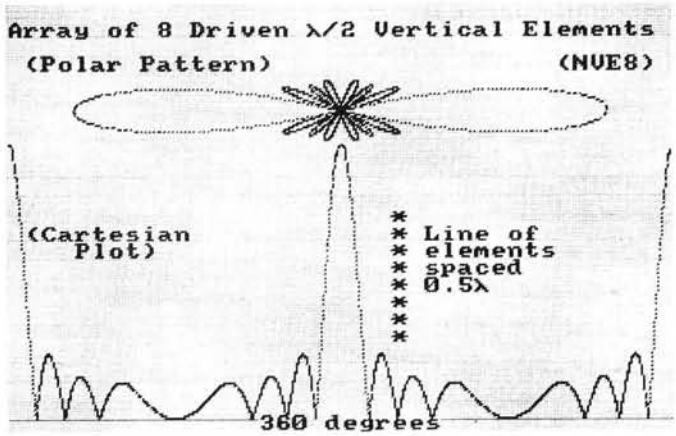



**Fig. 4.7: Broadside array of 8 vertical half-wave elements. Polar pattern and Cartesian plot. (See text regarding gain from each main lobe)**

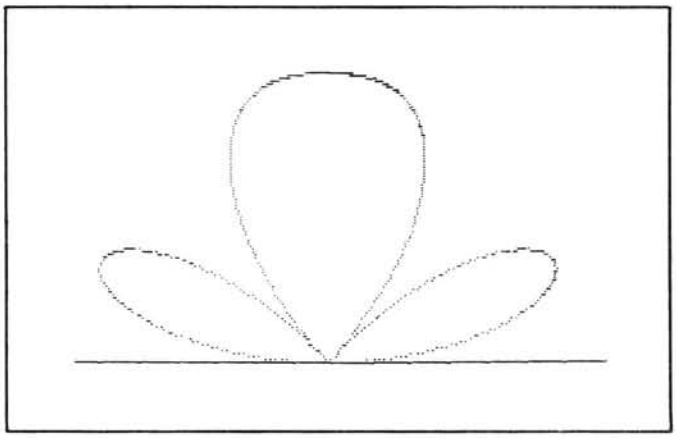


**Fig. 4.8: Computer print-out from a program simplified for the Sinclair Spectrum and produced by John Harrison, G1FLP. (See text for program)**

consisting of the polar radiation pattern, plus a Cartesian plot, that would be obtained from a **broadside** array consisting of eight vertical half-wave elements. Current in each element is in phase and the spacing between each is 0.5λ. The very narrow main lobes suggest a gain from each in the region of 20dBd.

## Simple Computer Programs

With the exception of those illustrated in Part 3, most of the computer programs used to produce the graphically enhanced print-outs featured in these articles were of necessity slightly more complex. Such "graphics" can be added to the simple programs. Most, if not all, of the simplified programs in Part 3 can also be used with other makes of computer and to this end, John Harrison G1FLP very kindly assisted with his Sinclair Spectrum computer proving that this can be done. Whilst he tried out several programs, all successfully, we include one which is an "input" program to provide vertical radiation patterns from a horizontal dipole at given height above ground.

The program is as follows:

```
10 CLS
20 INPUT "Magnitude of plot 100
   or so ?"; M
30 INPUT "Height of dipole above
   ground (wavelengths) ?"; H
40 FOR A=0 TO PI STEP 0.01
50 LET R=ABS(M*SIN(2*PI*H*SIN(A)))
60 PLOT 125+R*COS(A),40+R*SIN(A)
70 NEXT A
80 PLOT 20,40: DRAW 210,0
```

Note: The height is entered as a fraction of a wavelength, or a whole number e.g. 0.25, 0.5, 0.75, 1.0, 1.5 (any intermediate value). The magnitude value (M) can be altered to suit the size of the v.d.u. screen. A print-out for a height of 0.75λ (made on a small printer) is shown in Fig. 4.8.

## References

(1) *Broadside and Endfire Antenna Systems* by F.C. Judd G2BCX. *Practical Wireless*, Nov 1985.

# NEWS

## St George's Day Award

There are three stations taking part in the celebrations, GB0SGD, GB4SGD and GB6SGD. They will be QRV from April 19 until May 16 on as many bands as possible. A QSO with any one of the three will count towards the St George's Day Award.

This award will once again be available to s.w.l.s on a heard basis. As well as a QSO with any one of the above 3 stations, all those wishing to apply for the award may do so by fulfilling the following:

All applications from G stations need 8 further QSOs with stations from England. Applications from Europe need 5 further QSOs with England. Applications from the rest of the world need 3 further QSOs with England.

QSL cards are not required to confirm the other stations, log extracts only are needed.

For stations contacting the special event stations there will be a special QSL card.

The cost of the award is from the UK £1.50, Europe 6 IRCs and the world 8 IRCs.

The qualification period is from 19 April to 16 May.

For more details contact ***G4KHF, "Leon", Lutton Gowts, Long Sutton, Spalding, Lincs PE12 9LQ.***

## New BBC Shop

Less than a month after the premises were flooded and existing stock destroyed by burst pipes, London's first shop specialising in coverage of rapidly growing world of international television and radio was opened.

The BBC World Shop, located on the corner of the Bush House Arcade in the Strand, is now offering a comprehensive range of specialist books and other reference material relating to international broadcasting. The shop plans to develop its mail order business and expand its work in selling BBC English by Radio and Television courses and BBC Enterprises products including videos, records and cassettes.

The BBC World Shop will also continue to stock a range of BBC External Services special gifts including tee-shirts, ties, mugs and golf umbrellas.

My favourite gift they will be selling are BBC paperweights made of stone fallen from the fabric of Bush House itself!

## IBC 1988

The next International Broadcasting Convention, IBC 88, will be held in Brighton from September 23–27.

The Convention will be held in the Metropole Conference and Exhibition Centre, the Grand Hotel and the Brighton Centre. The esplanade fronting and linking the three locations will be used for outside exhibits.

As usual there will be a technical programme of papers by specialist authors, an exhibition of the latest broadcasting equipment by leading world manufacturers and a social programme including a special ladies programme for people accompanying full time Convention delegates. During the Convention the IBC Award will be presented.

Further information can be obtained from the ***IBC Secretariat, Institution of Electrical Engineers, Savoy Place, London WC2R 0BL. Tel: 01-240 1871.***

## Hamigos en le sol!

A new radio club has been formed for foreigners residing in or visiting Spain. Their idea is to help visiting amateurs to contact those living in Spain or other visitors.

If any amateurs going to Spain care to send an s.a.e. to G3IAG/EA7FSF/ZB2IE, he will send details of the club, membership list and info on obtaining a Reciprocal Licence. You would obtain a copy of their newsletter too.

Oh yes, the name of the radio club really is Hamigos en le sol—brilliant!

You can contact ***Fred Pilkington, at 24 High Street, Cheveley, Newmarket, Suffolk CB8 9DQ.***

## Can You Help?

A reader in Australia would like a service manual or circuit for an Aruin communications receiver type CV-920B/URR and the i.f. unit type AM-2477B. A photocopy would suffice. Please contact ***P. J. Lawrence, 39 Central Avenue, Maylands, West Australia 6051.***

Mrs Clark has a large number of old *Practical Wireless* magazines, some back as far as early 1940. She is loath for them to be dumped as waste paper, but is looking for a home for them. If you would like these magazines then contact ***Mrs J. M. Clark, 48 Freame Way, Gillingham, Dorset SP8 4RA.***

## SARCON '88

The Scottish National Amateur Radio Convention has been booked for Sunday September 13.

The venue is the Magnum Leisure Centre, Irvine, Ayrshire. This means that there will be plenty of things for all the family to do. The Magnum Centre has two swimming pools and also twin flumes—the first giant water slides to be opened in Scotland. There is a skating rink, indoor bowling greens, bar and catering facilities and a theatre for the radio lectures.

More details can be obtained from ***Bob Low, 2 Craigie Place, Crosshouse, Kilmarnock, Ayrshire KA2 0JR.***

# Test Methods and Equipment Part 2

*Meter movements are designed to read either direct current (d.c.) and voltages or alternating currents (a.c.) and voltages. The multimeter combines both facilities as well as provision to measure resistances. Ray Steele examines d.c. meters in Part 2 of this series.*

Direct current is steady and unvarying, usually from batteries and accumulators. Alternating current on the other hand has a frequency component, 50Hz in Britain and 60Hz in the USA, when supplied by generators for domestic consumption.

## Galvanometers

A diagram of the original and best is shown in Fig. 2.1. Its main advantage is its mirror movement which deflects a spot of light on a scale hence there is no weight from a pointer needle. Its main disadvantage is that it is delicate and therefore not often found outside laboratories. The drawing shows a wire suspended between the faces of a horseshoe magnet. When the wire carries the current it is measuring, the coil is magnetised and repelled by the permanent (horseshoe) magnet. This repulsion causes the coil of wire to twist, carrying the mirror with it and the amount of twisting is proportional to the current in the wire.

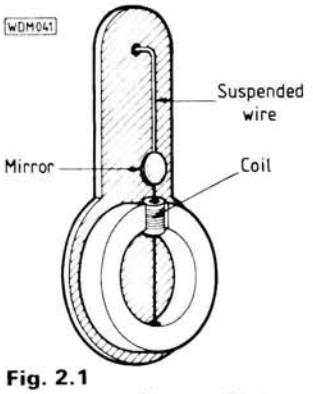


Fig. 2.1

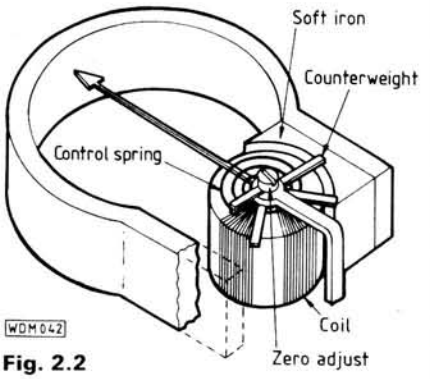


Fig. 2.2

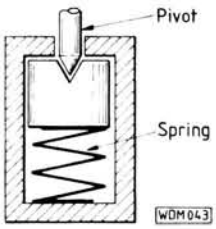


Fig. 2.3

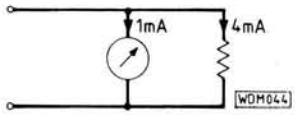


Fig. 2.4

## D'Arsonval Movement

The d'Arsonval movement is named after its inventor and is more rugged than the suspension galvanometer. It also has various adjustments to compensate for the knocks and shocks of field use and hundred mile trips in service vans. One adjustment that is readily available on the face plate is the "set zero adjust" to centre the zero reading.

The construction of the D'Arsonval movement is shown in Fig. 2.2. A horseshoe permanent magnet has soft iron pole pieces to form a uniform magnetic field in the gap. The coil of wire in the air gap develops a torque when current passes through it, this torque is given by the equation:

$$T = NAIB$$

where T = torque in newton metres
N = number of turns
A = coil area
I = current
B = flux density

Flux densities range from 0.15Wb/m² to 0.5Wb/m² and coil areas from 2.5sq cm to 0.5sq cm. The opposing torque is provided by two phosphor bronze springs of uniform thickness and precision manufacture to prevent kinking during use. The needle also has three weights. These counter weights are adjusted in the factory for accurate deflection at various readings. The moving parts pivot on an Incabloc assembly similar to that used by watch manufacturers, Fig. 2.3. Any shocks to moving parts are absorbed by the spring in the Incabloc.

## Current Meters

The basic meter movement described previously can usually take about 1mA and provide full scale deflection. Therefore currents higher than this must be diverted (shunted). The d.c. resistance of the coil is usually about 100Ω giving a voltage drop of 0.1V. If 5mA needs to be measured then 4mA must be diverted through the shunt, Fig. 2.4. The voltage across this shunt will still be 0.1V since it is a parallel circuit. Therefore the resistance must be:

$$= \frac{0.1}{4} \times 1000 = 25\Omega$$

Several shunts can be connected as in Fig. 2.5 and the value of each shunt calculated as before since the voltage drop across each shunt will have to be no more than 0.1V. A make-before-break switch is shown in Fig. 2.5, since the meter must never be left unprotected.

An Ayrton Universal switch is an alternative to a make-before-break switch, Fig. 2.6a. In this arrangement, all the shunts are in series which makes the calculations a little more complicated. There will be as many simultaneous equations as there are shunts. An Ayrton switch with two shunts is shown in Fig. 2.6b. Let's calculate the values of R1 and R2 to read 10mA and 100mA. In the 10mA position, R1 and R2 are in parallel with the meter. Since the meter takes 1mA, R1 and R2 have to cary 10mA – 1mA = 9mA.

$$R1 + R2 = 0{,}1V/9mA$$
$$= 11\Omega$$

In the 100mA position, Rm and R1 are in parallel with R2. Since the combination of Rm and R1 must not carry more than 1mA, R2 must carry the rest i.e. 100mA – 1mA = 99mA.

$$R2 = \frac{1mA\ (Rm + R1)}{99mA}$$

$$= \frac{100 + R1}{99}$$

Substituting for R2 in the previous equation gives:

$$R1 + \frac{100 + R1}{99} = 11$$

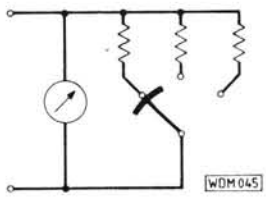



Fig. 2.5

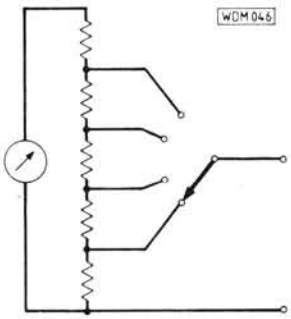



Fig. 2.6(a)

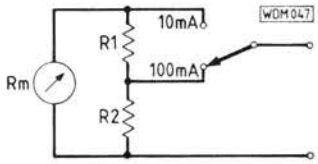



Fig. 2.6(b)

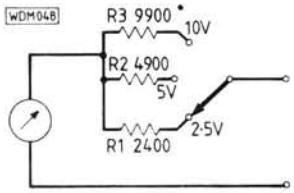



Fig. 2.7

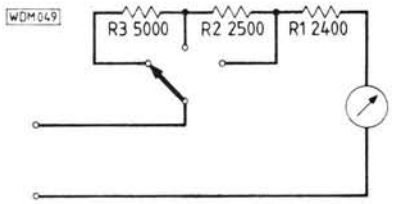



Fig. 2.8

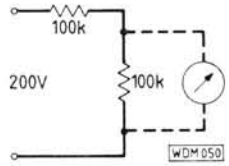



Fig. 2.9

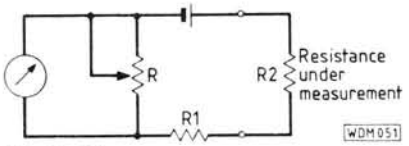



Fig. 2.10

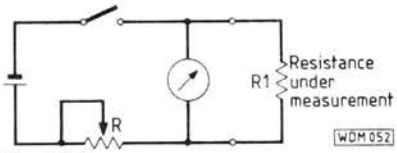



Fig. 2.11

$$99R1 + 100 + R1 = 1089$$
$$100R1 = 989$$
$$R1 = 9.89\Omega$$

Substituting for R1 in R1 + R2 = 11

$$9.89 + R2 = 11$$
$$R2 = 1.11\Omega$$

It can be seen that the value of the shunt goes down rapidly with an increase in current. Amps meters (usually called ammeters) are usually designed to measure 20μA to 50μA and up to 500μA using external shunts. The external shunts are not wire wound or carbon resistors but thick sheets of metal to provide the low resistances and carry the large currents. They also present a wide surface area to permit heat dissipation.

## Volts Meters

The basic meter movement can also be modified to read voltages. Volts Meters are usually called voltmeters. Since the meter can drop only 0.1V, the rest must be dropped across a resistor in series with the meter Fig. 2.7. Several resistors are employed to cover the required ranges and selection is by means of a switch.

Let's design the meter to read 2.5V, 5V and 10V. To read 2.5V, R1 will be in series with Rm:

$$R1 + Rm = \frac{2.5V}{1mA}$$
$$= 2500\Omega$$
$$Rm = 100\Omega$$

So

$$R1 = 2400\Omega$$

On the 5V range:

$$R2 + Rm = \frac{5V}{1mA}$$
$$= 5000\Omega$$
$$Rm = 100\Omega$$

So

$$R2 = 4900\Omega$$

On the 10V range:

$$R3 + Rm = \frac{10V}{1mA}$$
$$= 10\,000\Omega$$
$$Rm = 100\Omega$$

So

$$R3 = 9900\Omega$$

Instead of the arrangement in Fig. 7, all the resistors can be arranged in series as in Fig. 2.8, but the values will not be the same as those in Fig. 2.7.

R1 still equals 2400Ω but part of R2 is provided by R1 + Rm so the new R2 will be:

$$5000 - 2500 = 2500\Omega$$

Similarly, part of R3 will be provided by R2 + R1 + Rm. So the new R3 will be:

$$10\,000 - 5000 = 5000\Omega$$

These new values are shown in Fig. 2.8.

Most instruments have a full scale deflection of 2.5V with switchable ranges of 25V and 250V. A separate external socket provides a 1000V facility. Multipliers can be used externally to provide higher measurement ranges.

One of the important assets of a voltmeter is its sensitivity. This is quoted as so many ohms per volt and most good meters have a sensitivity of 20 000 ohms per volt. This is essential to avoid loading the circuit under measurement.

An example will illustrate this point. A 200V supply across two 100kΩ resistors in series is shown in Fig. 2.9. There is 100V across each resistor. Using the 100V range on the meter means applying a resistance of 100 × 20 000 = 2MΩ across the 100kΩ resistor giving an effective resistance of 95kΩ. The power supply now sees 100kΩ in series with 95kΩ and drops only 97.4V across the 95kΩ combination of resistor and meter. Compared to the true value of 100V before the meter loaded it down, this is 97.4 per cent accurate.

The meter we were designing earlier has a sensitivity of only 1000Ω per volt since full scale deflection was obtained with 10V across 10 000Ω, 5V across 5000Ω and 2.5V across 2500Ω. On the 100V range this meter will present 100 × 1000Ω = 100kΩ. Placing this across another 100kΩ results in only 50kΩ. The 200V supply now sees 100kΩ in series with 50kΩ and drops only 66.66V across the resistor and meter combination. This results in a reading that is only 66.66 per cent accurate. So, although the previous reading of 97.4V was not one hundred per cent accurate, it was certainly much better than this one.

## Ohm Meters

There are two types of ohm meters (usually called ohmmeters), the series and shunt types. The series type is the one in most common use, Fig. 2.10.

The basic meter movement is converted to read resistance by including a power supply, usually a battery. Using standard resistors, the meter deflection is noted and the positions marked off in ohms. The combination is called a series ohmmeter because the resistor under measurement is in series with the meter and power supply. R is the "set to zero" adjustment and needs adjustment as the battery gets older. Resistor R1 is a limiting resistor and safeguard the meter movement. To adjust the meter for zero reading, the terminals are short circuited and R adjusted. This gives the familiar zero reading on the right hand side of the scale, working up to infinity on the left-hand side when the terminals are open circuited.

The shunt ohmmeter, Fig. 2.11 is not usually found outside laboratories. In this arrangement, the resistance under measurement, the meter and power supply are all in parallel with each other. Because of this arrangement a switch is required to disconnect the

battery when not in use or it will be drained.

When the meter terminals are open circuited, all the current flows through the meter and the needle reads full scale. When the terminals are short circuited, the meter is bypassed and no current flows through the meter which reads zero. Standard resistors can be used to calibrate intermediate values on the scale.

Most good instruments come with at least three ranges ×1, ×100, ÷100 and one or two internal batteries. A balanced bridge gives more accurate measurements but an ohmmeter is portable and easier to use. An ohmmeter is, of course, not strictly necessary for measuring resistance since resistance can be calculated from measuring voltage and current and applying Ohm's Law (R = V/I). How to connect a voltmeter and ammeter in circuit is shown in Fig. 2.12. Most multimeters incorporate an ohmmeter with a voltmeter and ammeter so there is little need for the arrangement of Fig. 2.12.

## Multimeters

In addition to measuring d.c. current, voltage and resistance, multimeters must also be capable of measuring alternating current. A switch is usually included to select a.c. or d.c. and the principles of measuring a.c. will be described in a later episode. Multimeters usually employ a single range selector switch to switch between current, voltage and resistance ranges, Fig. 2.13. Current ranges are usually 0–1mA, 0–100mA, 0–1A and 0–10A. Higher ranges require external shunts. Voltage ranges are usually 0–2.5V, 0–25V and 0–250V.

Some points worth noting in the use of multimeters are to be aware of the sensitivity as discussed earlier in voltage measurements. The polarity must also be respected. Reversing the positive and negative terminals could lead to a bent needle when the needle deflects sharply against the zero stop. Unknown voltages and currents must be measured on the highest ranges, switching down to lower ranges gradually.

Before we leave the basic meter movement, we must examine two refinements usually incorporated: temperature compensation and damping.

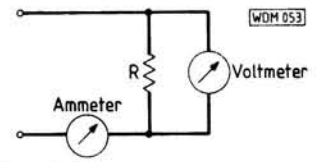


Fig. 2.12

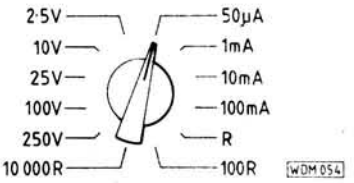


Fig. 2.13

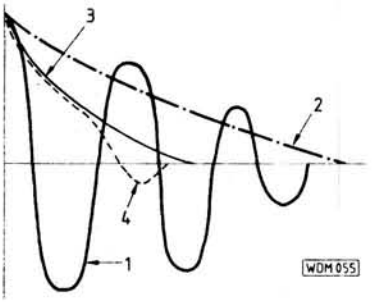


Fig. 2.14

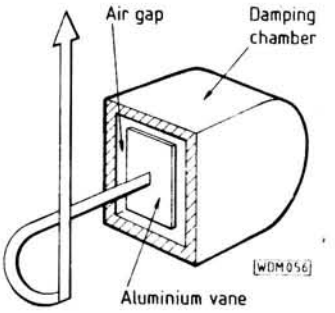


Fig. 2.15

## Temperature Compensation

If an instrument is designed and calibrated at a certain temperature, and operated at a higher temperature, the meter will read low by approximately 0.2 per cent for every degree celsius increase. Three sources contribute to this. These are a change in magnetic field strength, coil resistance and spring tension. Both magnetic field strength and spring tension decrease with increases in temperature but coil resistance increases.

To compensate for temperature changes, a swamping resistor may be placed in series with the meter coil but then a higher voltage is necessary for full scale deflection since the resistance has effectively increased. Swamping resistors are made of manganin and copper in ratios of 20:1 extending to 30:1.

## Damping

Damping is required because the needle would oscillate about its final value before coming to rest, causing a delay in obtaining a reading. The needle would also oscillate about zero each time the terminals are disconnected. This is shown by curve 1 in Fig. 2.14. Damping can be provided electromagnetically or mechanically. Care must be taken not to overdamp the movement, curve 2. In fact too much damping could mask the true reading. The right amount of damping is shown by curve 3. In reality, a half oscillation, curve 4, is permitted rather like the springs on a car in good condition. This slight oscillation leaves some room for wear.

Electromagnetic damping can be provided by two methods. The coil can be wound on an aluminium frame so that eddy currents are induced in it. This opposes the direction of movement. A similar idea but producing a back e.m.f. this time can be produced by connecting a resistor in parallel with the coil. Rather than calculate the value of resistor required, it is quicker to try different values to find one that produces the desired result.

Finally, mechanical damping can be employed using a light aluminium vane, Fig. 2.15, to avoid loading down the pointer. The damping is dictated by the clearance of the vane within the chamber. The smaller the space between the edge of the plate and the chamber, the greater the damping as the air is forced out through a narrower gap.

Part 3 will examine a.c. measurements, the various methods of achieving these and the advantages and disadvantages of each method.

# ERRORS & UPDATES

## *PW* Cover, March 1987

A number of readers have written in to point out that the Union Flag flying from the telescopic antenna of the Lowe HF-125 receiver is upside down—a recognised signal of distress!

David Monkhouse of Lowe Electronics, Matlock, who organised the photography on our behalf, assures us that this was intentional, and is meant to signify the generally distressed state of the UK radio manufacturing industry!

## Discriminating Continuity Tester, Apr. 1987

Our sincere apologies to the contributor of this article, who we somehow managed to rename. The real author was M. P. Corke.

## Automatic NiCad Charger, Oct. 1986

In the circuit diagram, Fig. 1, and the component layout, Fig. 3, a connection should be added between the mains-lead earth-wire and the aluminium box housing the project.

# Packet Radio

*Packet radio is no longer a new mode. It has been in existence for some two to three years now and is growing every day says Roger Cooke G3LDI in this new series.*

It started in America, in Tucson to be precise. It was developed there by a bunch of very enthusiastic and devoted amateurs in the early part of this decade. It was a follow-on of the protocol originated by another group of amateurs in Vancouver. In order to have a single mutually agreed protocol for operation through the Phase 3B satellite, a meeting was hosted by AMSAT in 1982. From that meeting the presently accepted protocol known as AX.25 evolved and is now recognised by the IARU as the international standard. It is named after the X.25 international commercial standard protocol, upon which it is based.

From here it quickly spread to other countries, helped on its way by articles describing this "new type of radio" in magazines such as *QST*. A group in Norwich were using the Cambridge packet system[1] with BBC B microcomputers and were at the same time building TAPR 1 TNC kits imported from the USA. By June 1984, Reg G8QR and Donny G3PMQ (now sadly a silent key) were active. Several more of us followed in their wake and we were soon on the h.f. bands.

## What is Packet?

Packet radio is a form of data communication. So are RTTY, ASCII and AMTOR. Every mode has its appeal and its devotees and if you are fundamentally opposed to RTTY and the like, please stop reading here because packet is just as infectious!

RTTY has been around since the late fifties in England, and Norwich figured quite extensively in those days with the pioneer work of Bill G3CQE—now incidentally quite active on packet. I was also very active on RTTY but compared to packet it has several disadvantages. The error rate can be high under QRM and QSB. The frequency can only be used by one station at a time and if he is a slow typist, that can be a very long time. The transmitter is also working at 100 per cent duty cycle, a waste of power and a waste of frequency.

AMTOR came to the rescue of the error rate inasmuch that three characters are transmitted and an acknowledgement is required from the receiving station before the next three characters are transmitted. If no acknowledgement is forthcoming they are repeated until an acknowledgement is received. This is much better but one frequency is required for a pair of stations as this is a synchronous method of communication, the stop and start bits are discarded and the transmitter is synchronised to the receiver, rather heavy on the TX/RX relays!

AX.25 packet is a very clever extension of AMTOR. Principally it is a similar system to AMTOR but with lots of additional advantages. With each transmission, a computed value called a "frame check sequence" (FCS) is sent, which allows the receiving station to check for errors. If none are found the receiving station sends an acknowledgement. If the transmitting station does not receive an acknowledgement (ACK) it automatically retransmits the package.

As a packet also contains callsigns, a station will automatically ignore any packets not addressed to it. Therefore, several QSOs can take place on the same frequency at the same time. This is called time-domain multiplexing, a mode aware of frequency conservation! The only disadvantage of this has evolved from the fact that on h.f. we do not as yet have a frequency allocation so packet has "squeezed" itself just above the RTTY segment i.e. 14·103 to 14·109MHz. When propagation is good a listen there will make it obvious that a larger segment is becoming essential. The delay time before getting replies to packets can sometimes be quite long on a busy channel.

The format of a typical AX.25 packet is shown in Fig. 1.1. Referring to this diagram you can see that a packet consists of six "frames" of digital information. Each packet is a basic message typed in by the operator sandwiched between information required by the protocol. The TNC uses a "bit oriented protocol" based on a standard called High Level Data Link Control (HDLC). Using the protocol, the beginning and end of the message are flagged, rendering the "start" and "stop" bits for each character unnecessary when the packet is transmitted in "synchronous" format. The flag frames are special eight-bit binary sequences as shown to provide message synchronisation.

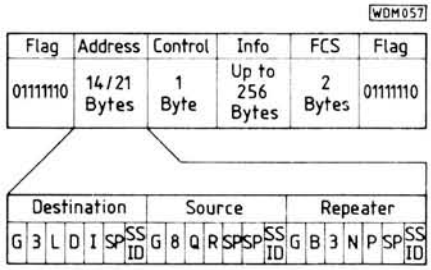



**Fig. 1.1**

The start flag is followed sequentially by four frames or fields, the first of which is the address field. This field consists of the calls of the destination and source stations and up to eight repeater station callsigns, if used. Each callsign subfield has seven bytes, the first six of which are the actual call with spaces if necessary, the seventh of which is an SSID, which is a Special Station IDentifier. This is a number for 0 to 7 and allows a station to have up to eight TNCs active at one time. Therefore, if you connect to G3LDI on h.f., that will be via my TNC200 and if you connect to G3LDI-1 that will be via my TAPR-1 on 144MHz.

The control field is used to convey the purpose of the packet. It identifies packets with connect/disconnect requests, acknowledgements or requests for re-transmissions.

The information field is the actual data to be sent from the keyboard, whether it be general chat typed in by the operator, converted into an ASCII string, or binary data, such as a compiled computer program, anything in fact as long as it is no more than 256 bytes long. If the packet is identified by the control field as one performing a connect or similar function, the data field may be absent.

The FCS field consists of a special 16-bit number calculated by both the transmitting and receiving stations. Only when these numbers are equal will the packet be accepted and an ACK sent.

The final flag field is recognised by the receiving TNC and marks the end of the packet.

## The Packet Station

In order to operate on packet, three basic items of equipment are essential; a terminal, a Terminal Node Controller (TNC) and a transceiver.

The terminal can be a v.d.u. producing ASCII characters, a personal computer, or even a mainframe computer. The most popular terminal in use in England to date is the BBC micro. A terminal program written by Donny G3PMQ, for the BBC, produced a split screen display and allows use of memories, etc. I personally use a Xerox 820

computer with a WORLI Bulletin Board System and a terminal Emulator.

The heart of any packet system is the TNC. It has one port connected to the terminal or computer via the RS232 line and communicates by asynchronous ASCII format from the transmission baud rate. The TNC then converts the information from the terminal into a packet ready for transmission by attaching the Address, Control and FCS information and the flags to mark the beginning and end of the packet.

The second port of the TNC connects to the transceiver speaker, microphone and p.t.t. lines. Upon transmission of the packet, a.s.f.k. is injected into the mic input at the channel baud rate. On receive, the whole procedure is reversed. The audio tones from the speaker are decoded by the YTNC which removes the Address, Control and Flag data and if the FCS checks, passes the information to the terminal and then transmits an ACK.

There is nothing special about the transceiver if you intend to operate on v.h.f. except to say that the audio response must be adequate at 2200Hz, most rigs are. On h.f., it is necessary to have a fine degree of tuning, stability is very important, as is selectivity and if possible, digital readout to tens of hertz can be very helpful. A tuning indicator can also be a great help for the newcomer to the mode.

A typical packet station is wired up as in Fig. 1.2. The TNC can be a home-made item, one made up from a kit, or a ready built and boxed one. There are lots to choose from and the price varies according to the facilities provided. However, the price has dropped considerably from the time when the group in Norwich first bought the TAPR 1. Pac-Comm now offer a kit for £135 if you are a member of AMRAC[2] or £150 if not and this seems to be a very popular TNC.

Whatever TNC you choose, the manual usually is most explicit in describing the connections to make,

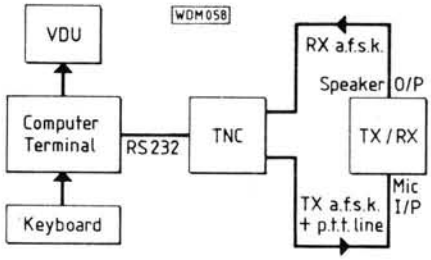



**Fig. 1.2**

including the RS232 line, the most complicated one, so setting up the basic packet station is not too difficult and a degree in computer engineering is not a pre-requisite. Assuming the interconnections have been correctly made, the parameters on the TNC have to be set correctly. For v.h.f. operation, the default values may suffice, the important one to remember is the communications baud rate which for v.h.f. operation is normally 1200 baud. Spend some time on 144MHz just getting used to the mode with your locals, if you have any. A contact is established by making a "connection" with the required station. Once this is achieved, all information is transmitted in packets every time carriage-return is pressed. The information then appears on the screen of the other station. Should any other station try to connect to either of you while in QSO, the TNC will automatically send a "busy" signal and disconnect them, unless there is a multi-connect feature on the TNC.

With some experience you will soon learn what parameters to change and what to leave alone. I would suggest switching Digipeat to off, because otherwise some local is bound to have a bit of fun at your expense! Paclen (the length of the packet information) should be set to about 80 for v.h.f. and I would suggest 40 for h.f. operation.

Most articles seem to have a leaning towards v.h.f. and whilst there is a lot of experimental work to do there, a whole world awaits you on the h.f. bands. There are well over 50 countries active (I have worked 44) and quite a few Bulletin Board Systems to check into: take a look on 14·103 to 14·109MHz l.s.b. and get used to tuning stations in. Don't forget the baud rate is 300 for h.f. operation and you will find that the tuning is quite critical. When in QSO it is conventional to send ">>" at the end of each transmission (not the end of each packet) to indicate you are waiting for a reply. This makes for a tidy presentation on the screen and also makes conversation easier.

This covers the essentials for getting on to a very fascinating mode. Other frequencies to look at are 3·600 and 7·035MHz. Sunday mornings can find some G stations on 3·5MHz and during the evenings there are some European activity. As I mentioned before, we need a definite allocation. The packet population is estimated to have increased from about 500 in 1983 to about 20,000 by the end of 1986. We cannot operate in the RTTY segment as has been suggested as the two modes are not compatible, but, operating where we are at present we are regarded as intruders in much the same way as RTTY was in the late fifties. The problem is getting worse the longer it is left.

In the next article I will cover some of the jargon associated with packet, take a closer look at the TNC and its parameters and a look at some other goodies such as packet switches, BBS systems, etc.

Happy Packeting.

## References

[1] Cambridge University Computer Laboratory Packet—G6GIX and G8WJL. G3LDI—Member of Norwich and District AX.25 Group.

[2] AMRAC. Amateur Radio and Computing Club, c/o Tony Trigell, Gleness, East Boldre, Brockenhurst, Hants SO42 7WD.

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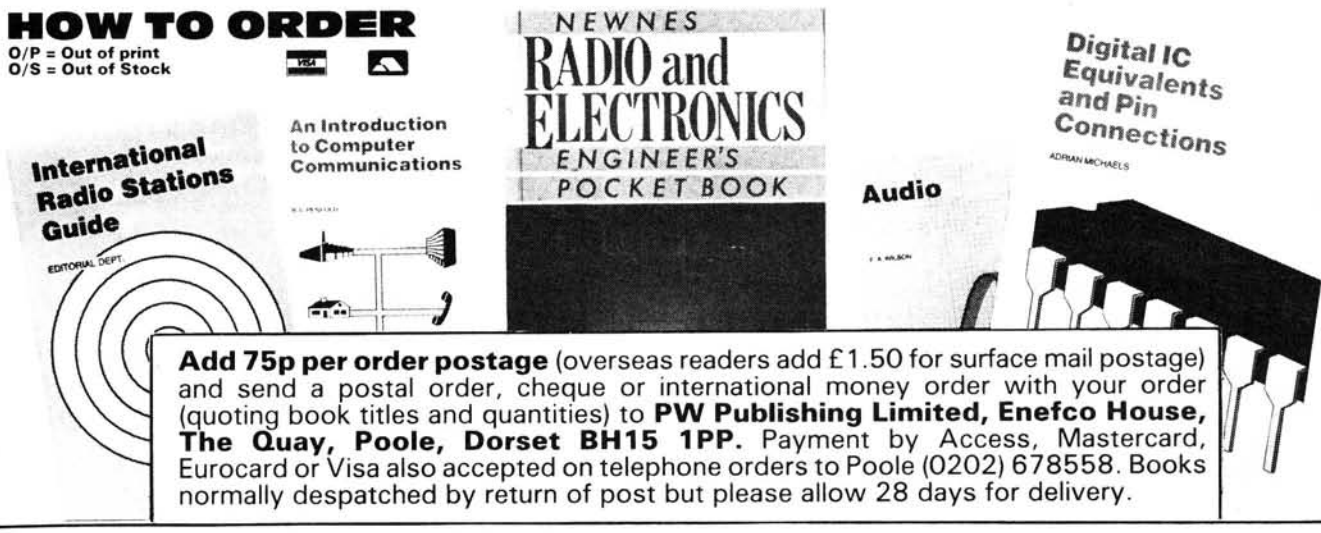


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# PW REVIEW

*Ken Michaelson G3RDG takes a look at the latest 144MHz band mobile offering from Icom—the IC-28E*


It has been some time since I operated mobile, although the last occasion whetted my appetite for v.h.f. What always surprises me as I use some of the newer units is the fact that everything gets smaller, and yet offers more facilities than before.

But to begin. The equipment arrived, and when unpacked, I found that Icom had supplied everything needed for installation. The accessories available included the microphone, provided with a TONE BURST button and UP/DOWN switches, a microphone hanger, mounting bracket, self-tapping screws, threaded screws and nuts and even the lugs for soldering on the end of the power supply cable were supplied. I took the unit out of its packing and examined the actual transceiver.

I am sure that this is the smallest v.h.f. mobile rig I have ever seen. It measures only 140 × 50 × 148.5mm, including the rear finning. It weighs only 0.95kg. The finish is in matt black with the words ICOM IC-28E VHF FM TRANSCEIVER on the top. The mobile bracket is simple enough, just shaped like the letter "E" without the centre projection, and there are four slit openings for attachment to any part of the vehicle that the owner might find convenient. In my case, I already had four screws projecting from the panel under the fascia from the time that my Yaesu FT-480R used to be installed, but the openings in the Icom bracket were on slightly different centres. This was overcome simply enough with a metal plate drilled to fit over the existing bolts, and having four threaded screws projecting from behind the new piece of metal in the correct positions to fit directly into the slots of the Icom bracket.

## Power Lead

Next the power lead had to be installed. This is a substantial length of twin cable, coloured red and black with a fuse in each lead. One end has the male section of a special plug and socket (the socket being on another piece of short cable emerging from the rear of the rig). This is a very convenient method of connection, far better, in my opinion, than the two-pin socket with a screw ring which seems to be the standard fitment on most mobile rigs.

Incidentally, the antenna connection is of the same type, that is to say it has a length of coaxial cable appearing from the set with an SO239 line socket making the connection of the PL259 plug from the antenna a simple matter. Both the antenna SO/PL259 assembly and the special plug/socket connection of the power line are suitably shrouded. After a little bit of a problem which necessitated the use of a feed wire through one of the bulkhead holes to pull the power cable through, it emerged and I was able to pull it along the side of the engine compartment (the battery on my vehicle is under the bonnet). I now utilised the two lugs supplied, and soldered them on to the ends of the cable. The holes in the lugs were large enough to allow them to fit over the bolts of the battery clamp. The starter cable, etc., and the earth return are attached to the battery on my vehicle with battery clamps, but I am not sure what the position would be if the car cables were attached to the battery with the conical type of termination which is used on a number of cars today. The power cable must not be connected to the cigar lighter socket if there is one provided in your car because the current required by the unit is too great.

## Next Step

Having installed the transceiver and wired up the power supply the next thing to do was to erect the antenna. The one supplied to use with the IC-28E was a TAP model 3016 $\frac{1}{4}\lambda$ whip manufactured by Antiference, together with their model K220 magnetic mount. The mount is supplied provided with a respectable length of coaxial terminating in a PL259 plug so all that was necessary to do was to place the mag mount on the centre of the roof of the car and run the cable through the top of the rear door, down the side and along to the front under the carpet. I completed this in a very short time and connected the PL259 plug to the female SO239 coming out of the rear of the unit. Everything was now ready but before describing the IC-28E in operation, I will just mention some of the technical specifications of the equipment.

The frequency range for the transmitter is 144MHz to 146MHz but for the receiver there is a greater spread, the range being 138 to 174MHz. The channel spacing is programmable to either 12.5 or 25kHz. The frequency control is by a digital p.l.l. synthesiser, c.p.u. based at either 5kHz or 6.25kHz depending on the particular variation used. This unit had 6.25kHz steps, so that it was programmable at 12.5 or 25kHz channels. It can be operated in either simplex or semi-duplex mode with a programmable offset.

The memory contains 21 channels. The unit requires 13.8V d.c. with negative ground, and the current requirement at this voltage is approximately 6 amps on high power (25 watts) or 3 amps on low power (5 watts). On receive at maximum audio output the unit takes 800mA, but when it is squelched only 450mA. The antenna impedance is the usual 50Ω. The transmitter modulation system is variable reactance frequency modulation with a maximum frequency deviation of ± 5kHz, and the specification states that spurious emissions are more than

60dB below the carrier. A 600Ω electret condenser microphone is supplied, with PUSH TO TALK and SCANNING switches and the model I had to review also had a 1750Hz tone burst switch.

## The Receive Side

The receive section of the unit is a double conversion superheterodyne, the first i.f. being 17.2MHz and the second 455kHz. It is designed to accept the same type of modulation as that transmitted, namely f.m. I had no means of testing the figures given for firstly, the selectivity which is more than 12.5kHz at –6dB and less than 25kHz at –60dB, and secondly, the sensitivity which is less than 0.18μV for 12dB SINAD, but I can only say that in operation I had no trouble in conducting any QSO which came along, and, in fact, the first CQ call I put out from the car on 145.500 brought back a chap from Brighton. (My position at that time was driving along the North Circular Road, London NW11!) The audio output is more than 2.4 watts at 10 per cent distortion into an 8Ω load with an audio output impedance of 4/8Ω. That is as far as I propose to go with regard to the specification of the rig. The most interesting thing is its actual operation.

When sitting in the driving seat of the car and looking at the unit one notices that the l.c.d. (liquid crystal display) is particularly large. In fact, the four main digits which give the frequency are approximately 8mm high. They have a very wide viewing angle which enabled me to see the display even in bright daylight, without changing my position. Still on the subject of the l.c.d., a built-in light sensor automatically adjusts a dimmer circuit to control the backlighting of the display to suit day or night operation. I found this feature extremely helpful when operating after dark as one could glance down at the display and then back to the road without any effort. There are 21 memory channels, all of which are controlled from the unit or from the UP/DOWN switches on the microphone, and all the memories can be scanned or a group of frequencies scanned also from the microphone.

## Operation

To commence operation, turn the rig on! There is a combined volume control ON/OFF switch, but this switch is a "push on/push off" type, so push on. Then starting at the top left of the front panel there is a "push on" switch with the marking DUP above it. This stands for duplex and will, in sequence, give you the choice of simplex when nothing is shown on the top line of the display area, but the first push gives you a transmit frequency 600kHz lower than your receive frequency when "–DUP" appears on the display, or with another press give you a transmit frequency 600kHz higher than your receive frequency, in which case "+DUP" appears on the display. Yet another push returns you to simplex operation. Very efficient.

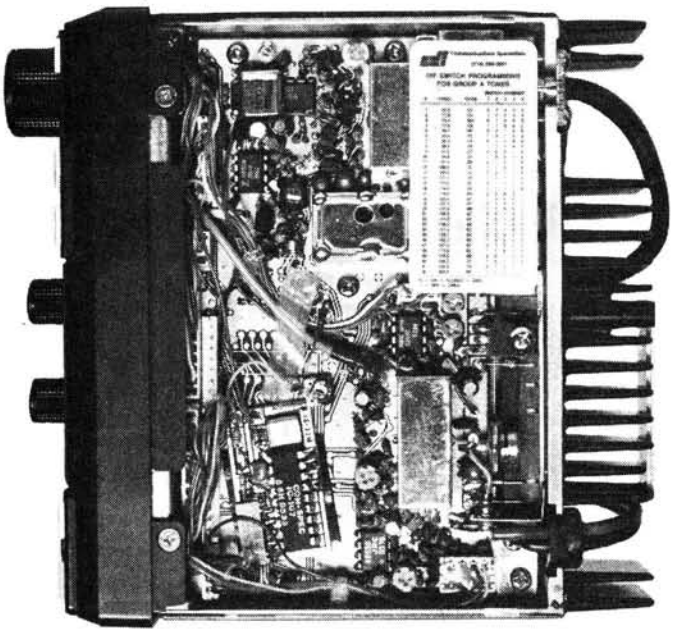
Next to the DUP is a two-colour l.e.d., (light emitting diode). When in the receiving mode the l.e.d. shows green, but when transmitting it changes to red. The l.e.d. is off when the squelch circuit is closed and the receiver is muted. Below these two controls is the tuning control. Turning this clockwise increases the frequency, anticlockwise decreases it. The frequency is increased or decreased in definite steps with a light-spring control to define each step. The step rate is decided upon by programming it into the unit but again, more of that later.

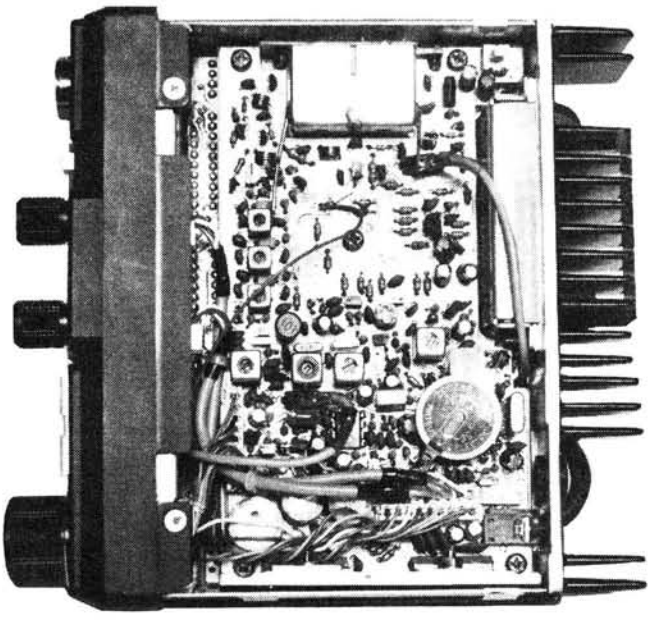
To the right of the tuning control are two horizontal bars, either end of which can be pressed to operate a switch. In the case of the top bar, pressing the left hand end causes the unit to operate with the tuning knob as a v.f.o., but pressing the other end selects the "memory" mode. The lower bar might be called the "up/down" switch as when in the v.f.o. mode, if the left hand end is pressed the selected operating frequency will be decreased by 1MHz. Pressing the other end increases the frequency by the same amount. However, when the right hand end of the upper bar is pressed, putting the rig into the "memory" mode, the lower bar acts differently changing the pre-programmed channels in the memory either up or down according to which end is pressed.

Returning again to the top of the front panel, to the right of the transmit/receive l.e.d. indicator are two more "push on/push off" micro switches. The left hand of these two is labelled either TONE in the case of the IC-28A (which is the American version) or CALL in the European version which is the one I have for review. In the European version this CALL switch is intended to recall ones highest priority or most often used frequency. This "priority" frequency is stored in channel 21, which is programmed in the same way as all the other channels. To the right of the CALL button is the WRITE switch. This is more or less self explanatory, except that to confuse matters it functions in different ways according to the position of the v.f.o/memory bar below it.

In the v.f.o. mode, pressing the WRITE switch for about 0.5s will store the frequency shown on the display area in the channel number also shown, the entry being confirmed by three short tones being emitted by the unit. In the memory mode, pressing the switch for the necessary 0.5s, and waiting for the three tones will transfer the memory stored frequency to the v.f.o., the letter M disappearing from the display. This operation does not affect the contents of the memory channel.

Proceeding to the right hand top of the front panel, there are two more micro-switches, the left hand one being



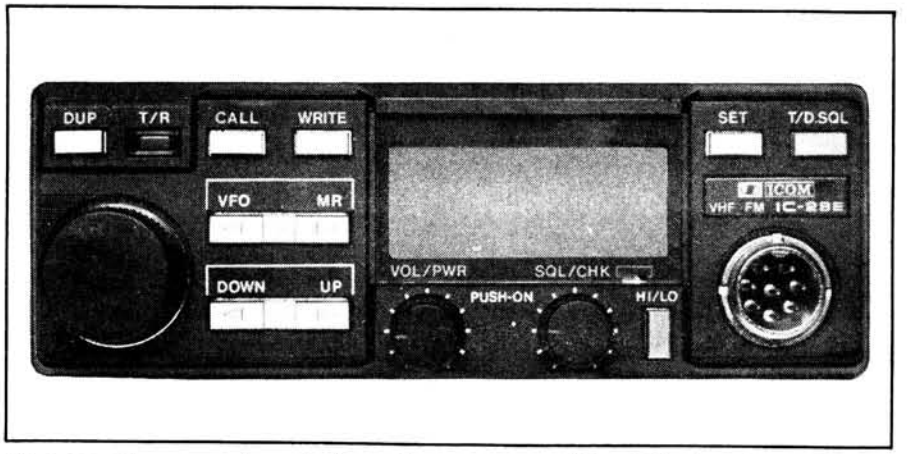


labelled SET and the right hand one T/D SQL, (tone squelch/digital squelch switch). The SET switch functions in different ways, in the first place according to the model type, (American or European), and secondly whether the unit is in the v.f.o. or memory mode.

Since this was the European version, the first pressure of the SET switch when in the v.f.o. mode allowed the setting of the transmit offset frequency. When the switch was pressed the flashing indication OW, (offset write), appeared on the top line a little right of centre and either F for fixed or P for programmable appeared in the display according to which way the UP/DOWN bar happened to be set. The standard offset is 600kHz either plus or minus and is classed as fixed. To alter this I had to press the UP/DOWN switch at either end when the F or P would alternate in the display. With the P showing I could then alter the offset by turning the v.f.o. control until I had the value of the offset I required. In fact, the programmable offset can be any value between 0 and 7.99MHz. The second pressure of the set switch brought the value of the frequency step on the display, together with a flashing TS, (tuning step), appearing in the lower left of the display area.

The step rate can be set at either 12.5kHz or 25kHz by moving the v.f.o. control and the return to normal operation is achieved by a further pressure on the SET switch when all the flashing indicators disappear and the v.f.o. reading returns. Pressing the DUP would now give me simplex, –duplex or +duplex with either fixed 600kHz offset or whatever programmable offset I had decided upon. Placing the v.f.o./memory bar in the memory mode and pressing the SET switch once caused SKIP to appear just to the left of the inverted video M for memory at the bottom right hand corner of the display and enabled me to control the SKIP function. This feature allows memory channels to be deleted from the normal scanning sequence when the memories are being scanned.

As neither the Digital Code Squelch unit (UT-28), nor the Tone Squelch unit (UT-29), were fitted to the review




rig I cannot comment on their workings. As far as this unit was concerned, nothing happened when this switch was operated as it would be used in programming both the UT-28 and UT-29. At the centre of the bottom line of the display was the S/RF indicator. This is a horizontal line increasing slightly in thickness to a maximum of about 3mm at the right hand end and is about 18mm long. When in the receive mode it acts as an S-meter with the figures 1, 5 and 9 showing above the line, and when in the transmit mode, on low power displays only five segments. When on high power all the segments appear. The HIGH/LOW power switch is situated to the right of the SQL/CHK control and switches alternately between 5 watts (low power) and 25 watts (high power).

I have described all the many functions of this compact rig, and would suggest to future owners that they read and read again, the very well written manual supplied with the units. The facilities are so numerous and offer so many variations of operation, that in order to take full advantage of them one has to understand completely what is going on. As far as I was concerned I endeavoured to use as many of the facilities as I could, but I found myself stopping the car at times, to have a look at the manual!

In use I found that the unit got very hot, but I can only assume that this was perfectly normal as the size of the set would compel all the components to be very close together. I had only one criticism to make, and that could perhaps be dismissed because of the way I operated. But I felt that the position of the tone burst switch at the rear of the microphone was the wrong place for it. I personally found difficulty in pressing this button and changing my grip to press the p.t.t. switch at the side of the microphone. I would have preferred some automatic means, preset, so that when working repeaters the tone would be sent initially by pressure of the p.t.t. switch. It was easy enough when stationary in the car or when using the rig in the shack, but when actually driving the car, I found it awkward. Aside from that, there were no complaints.

I used the IC-28E with great pleasure both in the car and working from home on a 12V supply with a pair of crossed dipoles as the antenna. I had many QSOs with nothing but compliments for the quality and clarity of the speech and would consider the unit as ideal for mobile work, particularly for the owner of a smaller car where its installation would prove no problem due to its small size.

## Price

The price of the rig is £325 inclusive of VAT, the TAP 3016 whip antenna costs £10.87, and the K220 mag mount is £13.97, both prices including VAT. I am told that carriage is free on the IC-28E, and in the case of the antenna and mag mount, they will be included in the carriage free arrangement if purchased at the same time as the transceiver. Thanks for the loan of the equipment is due to ***Thanet Electronics Ltd., Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859.*** **PW**

# BOOKSHELF

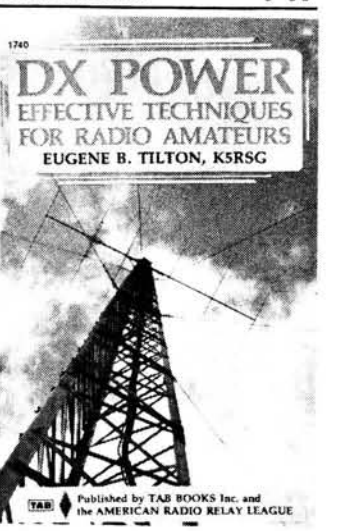
**DX POWER Effective Techniques for Radio Amateurs by Eugene B. Tilton K5RSG.**
**Published by Tab Books Inc and the ARRL. Available from John Wiley & Sons Ltd, Baffins Lane, Chichester, Sussex PO19 1UD. Tel: 0243 784531.**
**244 pages, 130 x 208mm (paperback).**
**Price £8.90**
**ISBN 0 8306 1470 X**

The book describes itself as a complete survival manual for every radio amateur entering the competitive fray of DXing.

The first thing to bear in mind when reading this book is that it is written by an American for mainly the American market. They seem to be a little more enthusiastic about the "sport" of DXing than we are. But quite a lot of the information in the book is useful to all radio amateurs. The first chapter, about DX and DXers, is very funny—it's an irreverent look at DXing. Worthwhile reading as it keeps the hobby in perspective.

The following chapters are full of information of how to find your DX and get them to notice you, what tricks and gadgets you can use to better your chances and your station.

The whole book has been written in a very easy-to-read style and could prove useful to many s.w.l.s and amateurs.



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# On The Air

## On The HF Bands

Reports to Paul Essery G3KFE
Practical Wireless, Enefco House, The Quay, Poole, Dorset BH15 1PP

Since this is the first time round in *Practical Wireless*, let me introduce myself; I used to be the author of the "Communications and DX News" piece each month in *Short Wave Magazine*, and the management of *PW* have transferred the column to the pages of *Practical Wireless* and given it a new name—all that will be needed in the future to make it complete is a goodly supply of input from you, the readers.

As to the nature of that input, what we need is some hint of what's been going on in your station during the previous month, including the choice DX worked—this being separated by bands and modes, so the tiny columnar mind can understand and extract it in the right places when putting the piece together against the clock. Lists of course should leave out that which doesn't seem to you to be DX—and, yes, we agree that one man's idea of DX and another's are in fact totally different.

Thus to the new chum. His first QSO, with Joe down the road, is, for the moment, real DX, even if it pales a little beside the first W or the first VK, or the first pile-up he cracks. It is our pleasure to read about that as much as it is to read that old-timer XYZ cracked the 3Y1 pile-up on the first call. In other words, report what you find interesting. Also, of course, we are always interested to hear of your other adventures on the periphery of the hobby, such as putting antennas back up, or ejecting an immigrant troop of hedgehogs from under the shack floor (yes, it's happened before!), which provide a laugh for all, and maybe give someone else a new slant on the problems in his own amateur radio.

Send your letters every month to me, at the *PW* address, Enefco House, The Quay, Poole, Dorset, BH15 1PP, by the dates indicated.

### Ladders

No, not the things you use for improvised antenna supports, but rather a small competitive element. Given a reasonable degree of support we will run a Six Band Countries Worked Table every so often. Against each entrant's call we will show his countries total on each of the "traditional" bands lying between 1.8 and 29.7MHz. Likewise, in the hopes of stimulating the G-DX activity, we will have a Top Band Counties Worked Table, and a similar one for 28MHz; any mode to be used in the main listing unless someone gets keen and offers an all-c.w. or all-SSTV list or something. QSLs are not required, and the definition of "Counties" to be the current national list including the "administrative monstrosities" of London, West Midlands, Merseyside, etc., plus, for a bit of a lark, Jersey, Guernsey, Sark, Alderney, the Isle of Man and the Isles of Scilly, and not forgetting that we are including the counties in Wales, Scotland and Northern Ireland. A ripe banana for the first one to work the lot on either band!

### Vale

Amateur Radio lost a great name when Don Riebhoff K7ZZ was killed driving a Porsche in Spain on January 20. He first attracted notice as HS3DR back in the sixties, and was one of the main operators at XV5AC, from Saigon, as well as dishing out thousands of contacts from Kampuchea, then known as Cambodia, as XU1DX. Don was the first to put on a documented operation from Spratly Is. along with several others—the only previous activity from Spratly was that of W9WNV, and there were various hints that questioned the validity of Miller's operations; the Riebhoff one was well documented though; a cine-camera running all the time! Then in the late seventies, Don became CT4AT, and thus just about everyone who used the bands in UK would have heard that booming signal at some time or other; in the W6 area he was reckoned to surface an hour before any other European, such was the strength of his signal on 14MHz; and the other bands weren't far behind, from a full-sized quad on 7MHz, for example. The technical skill to generate a big signal was matched by the operating skill; it was nothing to listen to Don racking up 300 QSOs in an hour, and despite the pile-up he could get deep down and work the newest DXer and seldom call for a repeat. A Master Radio Amateur, K7ZZ, and we won't see or hear his like on the bands again. He will be missed.

### Events

The notable one of the recent period has been from Peter 1st Island (Antarctica), where 3Y1EE and 3Y1GV nearly reached a total of 20 000 contacts before the close down, aided by good weather (–3°C, fog or sun, and only a few blizzards!) which kept problems to a minimum.

The Andaman Is. DXpedition, led by Miss Bharathi VU2RBI was to continue to March 31. It should be noted that the aim is also to activate Nicobar Is. Callsigns are VU2APR from Andaman and VU4NPR from Nicobar. The permission was, we gather, finally given after VU2RBI had an interview with the Prime Minister, Mr Rajiv Gandhi who as readers will be aware is himself a licensed amateur. At the time of writing the author has heard people working them on 3.5MHz seemingly working co-channel from Nicobar—not the fastest route, one would have thought, for so rare a spot as Andaman or Nicobar. Still, by next time we will have a rather better idea of what's what.

Top Band addicts will doubtless have already become aware that KN4BPL/KH3 is on Johnston Is. and VK0GC on Macquarie Is. is operational. HG3R has been reported too outside of contest activity times.

On a different note, could we appeal to UK Top Band stations ragchewing to avoid the JA DX Window between 1.9075 and 1.9125MHz, JA2NQG/JD1 will be active from March 27–29 from Ogasawara (Chichijima Is.) transmitting on 1.908 and listening on 1.805 and 1.825–1.830MHz. By the time you get this, W7AWA/OY will have come and gone during the hours of darkness, 4S7VK will be on and so will VU2LAM (with the QSL route via UY5YE). SU1ER will be around, and there is a Cairo phone number, 25-74-270 to ring for a sked.

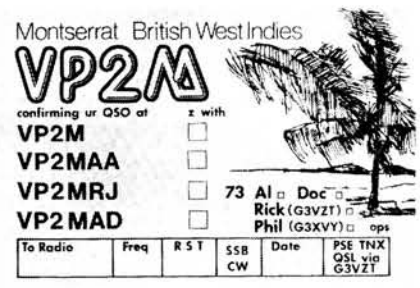
### Mistake

Last month's column, in *Short Wave Magazine* reported in good faith that G3SEJ was on his way to the Falklands and hoping for a South Georgia session. This was repeated in at least two of the weekly *DX Bulletins*, and so we accepted it in good faith. Subsequently we had a report from Stateside that he had landed in the Falklands and that things were proceeding towards the S. Georgia exercise. We have now received a letter from G3SEJ which makes it clear he is not en route for VP8, and please who the blazes put the false information into the system? We can only conclude that the thing was another false rumour from the word go from someone overhearing something on the air and getting the copy wrong, or alternatively that one of the *DX Bulletins* had a genuine note, transcribed a callsign wrong and others followed suit. Whatever the cause, G3SEJ is, to put it politely, not amused.

### Here & There

Various odd points have cropped up in the post. Reference GW8WJ in last month's piece in *SWM* hearing his own call being pirated, Richard Marris G2BZQ notes that he had a similar experience some years ago on 3.5MHz. Seems the pirate was calling CQ—the thirty CQs followed by 15 callsigns variety who usually lack a receiver—and using the G2BZQ call. Richard went back to the pirate with "G2BZQ de G2BZQ pse K" which netted a 60-second carrier blast and then silence. Richard didn't chase it up because he was at that time due to go abroad on business, but wonders whether the shock treatment was successful!

After that terrible snow, **G2HKU** (Sheppey) has been somewhat inactive, repairing the damage. He has noticed that the snow seems to have caused an increase in the noise level, which still has not gone back to normal. Having seen the newsreel scenes of Sheppey on TV we wonder whether it ever could!




**One of the many QSL cards that have found their way to the PW offices**

### Reports

On 28MHz, we have a letter from **G4HZW** (Knutsford); Tony found nothing of any import on the band, and his only contacts from the TS-820 and two-element quad were s.s.b. and f.m. to the locals.

Normally, G2HKU uses 14MHz quite a bit, particularly his morning ZL skeds, but for the current month the latter have been totally unproductive. Thus all he can offer is c.w. to 4X4NJ and K5MM this month.

The author too has been far less active than usual, largely as the result of a visit from two grandchildren for a whole week minus parents. It certainly makes one feel the pangs of age; when they were collected and taken home, we thought of the shack but fell sound asleep in the armchair before we had summoned up the energy to go upstairs . . . still, it was fun, for all that.

The 7MHz band has been popular this time. G2HKU used c.w. to reach out to K4EF, K2SG, K5MA, W3LPL, N4LS, 4X4NJ, N4OO, W9SFR, W2MUM, W9VW, K2LE/VP2M, W1AX, K4FU, W1RM, K5ZD/1, W4QM, YV4TI, and CO7RM.

**G3BDQ** (Hastings) is not an habitué of 7MHz to any great extent, but John does mention a couple of blasts on the band, both of which netted him contacts with 4K1C, a Russian station in Antarctica. Another interesting one was with W2QHH; Howy always uses 25 watts or less, and he was as good as the other Ws worked. On a different tack, John says he didn't even try for the 3Y1 group—he has no ambitions for the DXCC Honour Roll!

Still with 7MHz, s.w.l. **D. A. Whitaker** listened quite a lot in January, outside working hours, and he notes around midnight HC1XM, 9K2CC, TZ6VV, TU2AX, CE8ABF, HC1OT, TI2HP, 4M2NY, 9Y4AT, LU2FFD, JY9RL, VU2CVP, CO7RE. Around 0100Z there were CU2AR, HI8FAN, YV1AJ, and around 0200Z 9Y4AT, J37AH, KP4A, PT9ZE; 0300 brought in CO7GC, KP2N, LU4LAV, and 0400–0600Z showed three HC1s and HK3JJH. At 0600 there were HK3KIU, KP4YD, 7X5AB, UZ9XXM/M, and for breakfast David had 8R1RPN, EA9NN, and VR6YL. There was a break till 1300 then and for lunch David had 9M2AX, V85HG, VK6APW, HL1EJ, 7B0AH, followed at 1400Z by VS6DO and UD6DJ. Afternoon tea was taken with UA0FF, and at 1600Z there were V85GA, VE2SAB/4U, 3A2EE, WL7E, 9K2EC, A61AB, to be followed at 1700 by FT8WA, J28EM, S79LJ, UI-8CAJ, VU2DVP, 4S7VK, and UZ0AWO. 1800 was the hour for HV3SJ, S79LJ, SU1ER, and JY5EI, and at 1900 there was TA3C. At 2000 we note UF6VR and WP4A, while 2100 gave 7X5D, 9K2EC, ON7UD/5N6, JY5CI, KH0AC, to be followed at 2200 by SV0DT/9, TR8LD, TU2AX, 9X5SP, VK6HD, VK6ZB and CN8EL. That leaves the final hour of the day to show JG1FVZ/5N6, TR8JLD, K2BMI/KP2, DU7PI, HK0HEU, ZS5MY, 8P9CW, 5B4TI, DU9RG, TZ6XN, and VP2EC. Anyone prepared to settle down to a little paperwork could almost construct a chart of where propagation will be found for the full 24 hours from that little lot and a Prefix List.

The 3.5MHz band isn't a band where people are overly keen to report results unless they don't normally hook a lot. The real DXers who haunt the band have all long since realised that the whole secret is, apart from the best antenna one can arrange for the band, to have a good receiver in terms of dynamic range, and to know how to drive it to its best; most of them operate almost all the time with a 20dB attenuator pad in the receiver front-end. There is also of course, the QRP c.w. addict around 3.560MHz at any time of day or night, and it is often rewarding to look for them; indeed c.w. is far and away the nicest mode of operation on 3.5MHz, albeit there is DX about on s.s.b. as David Whitaker's list shows. He heard VE8RCS, HI8RKM, TA4A, TZ6ME, IK1FO/5N2, AP2ZR, 5B4TI, TA2D, CE3ESS, HK0NK, A92BE, HI3ARG, 9Y4SO, K1DQV/KP6, TK5BL/FS, PZ1DV, UZ9FZA, UD6FF, KD2VX/HC1, CN8CC, 8P9AY, ZF2JA, HJ0LFD, TG9NX, CM2JG, 3Y1EE, HH9E, HH5CB, DG1PJ/C6A, YN3EG, TI9W, KL7Y. J6LQE, XE1VIC, HK3ESU, UB7BST, N7ERR, NN7F, 8P9AY, PJ9EE, YC4FRX, OX3OX, ZL4KE, XL4BO, JY5AH, YI1BGD, YC6XE, A4XJZ, I8CZS/4S7, SU1ER, KH0AC, 7X2HM, S79LJ, YC6GR, ZC4IT, HV3SJ, A92BE, FM5BH, FM5WS, 8P9CW, OD5RH, J88AQ, and HC5EA; again starting the list at midnight and going through to midnight again.


**A station worked by the Editor of PW using a special event station callsign**

Finally, 1.8MHz. G2HKU mentions c.w. with OZ1W, G6ZY/EA6, GM3PFQ, and EA8QO. David Whitaker heard NP4A, UV9FM, KN6M/5, 4X6DK, 4X4NJ, YV4TI, VO1CU, HK0HEU, SV1SL, TG9NX, XE1L, HP3FL, HP1XXO, W0HW, 7X5AB, VP2VA, W0CM, CT3DL, W3YOZ, KC1U, plus Europeans. G3BDQ found the band interesting but didn't operate much since the contest; he is easing off a bit since he has got the cards in and sent off for the DXCC on this band(!). Of the better stuff worked on c.w., there was KP2EL, VO1HP, UV9FM, UA9JZ, a rarity in UV3HD/UI1Z in Oblast 56, UA9CVG, W2XX/CT3, and UL7IAQ. The s.s.b. section turned up 7X2HM, on 1.845MHz at 2039Z on January 9, but no QSL as yet. The contest came up with no really exotic stuff, but lots of Ws, YV1OB, KL7Y, 4X4NJ, SV1RP/SV7, UG6GAW, VP2VA, VO1MP, NP4A, and KP4A. However the real prize for G3BDQ, and indeed the most interesting for us too, was the contact with VK7BC, at 1921Z on January 17; his card came in on February 6 and indicates that it was full daylight at the VK7 end. It suggests that this may in fact have been the first ever G-VK7 contact. For those interested in Tasmania, the form is to try around 1.832MHz, 1800–1900Z; VK7BC uses an FT-901DM and is ex-G3VPL.

## New Bands

Once again we have no reports on these; strange how the reports here come in by fits and starts, sometimes being in a large proportion of letters, other times—zilch.

## Other Points

Those who for years have followed the adventures of Lloyd and Iris Colvin W6KG and W6QL, will be sorry to hear that Iris had a serious fall while in the Maldives. She was taken to Colombo, Sri Lanka, for surgery; it is also rumoured that the pair went back to the Maldives and intend to continue with the DXpedition rather than return to USA. Up to that point, Lloyd and Iris had made 9000 QSOs with 130 countries from the Seychelles stop. Let us hope that W6QL is active and operational again as soon as possible—the DX scene wouldn't be the same without their various expeditions and the QSLs via Yasme.

**All reports should be sent in by:**

| Deadline | Issue |
|---|---|
| April 20 | July '87 |
| May 19 | August '87 |
| June 24 | September '87 |

# VHF Up

*Reports to Norman Fitch G3FPK*
*40 Eskdale Gardens, Purley, Surrey CR2 1EZ.*

As some readers will know I have been writing the *VHF Bands* monthly column in the *Short Wave Magazine* since 1975. It was a popular and well supported feature so I was pleased when the editor offered me the opportunity to transfer it to *PW*.

The format will remain the same, the bands covered being from 50MHz up. However since there is an established column for satellites, these will no longer be included as a matter of course, likewise packet radio matters.

The basic ingredients of *VHF Up* are news about awards, beacons, contests, DXpeditions and repeaters, individual band activity reports and the annual and all-time tables.

## Awards Tables

The *SWM* promoted two awards programmes and both will be continued under the sponsorship of *PW*. The first is the VHF Century Club, VHFCC, membership of which is granted to readers who possess QSL cards confirming QSOs with at least 100 different stations on a particular band. However, this will no longer be available for 144MHz as it is no longer much of an achievement.

The second award is the QTH Squares Century Club which, as the title suggests, requires the possession of QSLs from 100 or more QTH locator squares. To date this has been restricted to 144MHz and 432MHz. The squares are the primary ones in the original European QTHL system, e.g. ZL, or their Maidenhead equivalent which is IO91 in this example.

If you would like a copy of the rules for these awards and a copy of the application form for the QTHCC, please write to *Practical Wireless,* Enefco House, The Quay, Poole, Dorset, BH15 1PP, marking the top left corner "Awards" and an s.a.e. would be appreciated. These awards will be processed by G3FPK and the certificates issued from Poole.

Although Amateur Radio is a leisure hobby that we indulge in for relaxation, a little friendly competition does no harm and stimulates activity. To cater for this

three tables will appear monthly. The first is the Annual v.h.f./u.h.f. Table which covers 70MHz, 144MHz, 432MHz and 1296MHz operation. One point is scored for each administrative county or region in G, GD, GI, GJ, GM, GU and GW plus the 26 counties in the Irish Republic, EI, and one point for each separate country worked, including your own, such as GM, F, EA, etc. The countries are the DXCC ones plus Sicily, IT9, and the Shetland Isles, GM.

The second is the Annual c.w. Ladder, points being scored for each different station contacted on the 70MHz, 144MHz, 432MHz and the microwave bands from 1296MHz up. Both these tables run for the calendar year and are based on unconfirmed contacts from the home QTH. Satellite and repeater QSOs are not recognised.

The third table is the QTH Locator Squares, the starting date for which is January 1 1975. The squares are the ZL or IO91 variety, the bands being 144MHz, 432MHz and 1296MHz. Again unconfirmed QSOs but no satellite or repeater contacts.

The fourth table is an occasional one devoted to 2320MHz progress, the 13cm All-time Table. Here the points are the total of counties, countries and squares worked, unconfirmed. In the past, when there has been some spectacular event to report, space limitations have meant that the squares table be omitted.

## Abbreviations

Most of the abbreviations used in this column will be obvious and will conform to *PW* practice. Ar refers to auroral propagation, Es to Sporadic-E, m.s. to meteor scatter, f.a.i. to field aligned irregularity, e.m.e. to Earth-Moon-Earth often called moonbounce, and tropo to tropospheric mode.

It is usual practice to make the first reference to a reader each month in the form, "John Smith G7AAA (WMD) . . ." the WMD signifying the county code for the West Midlands.

Subsequent reference to our John Smith will be by callsign only. If there is reference to an overseas station, it will usually be in the form, "DL7QY (FJ) . . ." the FJ identifying his European QTH locator square or E-QTHL.

## Which Locator?

For many years v.h.f. operators used a five character code to locate their stations and which was the basis for points calculation in contests. Being devised before the age of the home computer, it was not very logical for computer use however. More recently, the Universal (Maidenhead) locator system using six characters has been in use but it is by no means well loved even though much more convenient for computer use.

For several reasons, I prefer the E-QTHL. These include that the QTHCC award records are all kept in this system, it takes less precious space in this column to print ZL than IO91, for example, and the microwave operators virtually ignore the Universal system. But if you are a Universal fan, then by all means use it when writing.

One problem is that all newcomers are weaned on Universal so do not know their E-QTHL. If any would like to know their E-QTHL, drop me a line to the Purley QTH with an s.a.e. stating the exact latitude and longitude, or full National Grid Reference, e.g. SJ 345992, and I will work it out.

| Station | Band (MHz) 70 | 144 | 430 | μWave | Points |
|---|---|---|---|---|---|
| G4ZVS | — | 46 | — | — | 46 |
| G4XEN | — | 32 | 4 | — | 36 |
| G0DJA | — | 24 | — | — | 24 |
| G2DHV | — | 23 | — | — | 23 |
| G4VOZ | 9 | — | 3 | — | 12 |
| G4AGQ | 2 | 4 | 2 | — | 8 |

Number of different stations worked since Jan. 1.

**Annual c.w. Ladder**

## Awards News

Congratulations to **Serafim Matos da Silva CT4KQ** from Viseu (WA21e) who joined the 144MHz QTHCC on February 24. He is the first Portuguese member and his certificate number is 77. His confirmed total of squares is 102 comprising 23 c.w. QSOs and 79 on s.s.b. 58 contacts were via Es, 25 by m.s. and only 19 were by tropo propagation. The QSLs were from 28 countries and included 4U1ITU (DG), CT3DK (IM12), three EA8s on various islands in the Canaries and GM3XOQ/A (ZT) in the Shetlands. There are now QTHCC members in 17 countries.

**Ela Martyr G6HKM** (ESX) is member No. 47 and was awarded her sticker for 125 squares on February 12. All QSOs were on s.s.b. 18 by tropo, four via Es and three via Ar modes. The choicest were YU2WA/2 (ID), YU6ZAH (JC) both via Es, GM0DRU (WS) via Ar and GM3XOQ (ZT) and GM4SSA (ZU) by tropo.

**Ian Rose G1PDW** (ESX) has the distinction of being the last recipient of a 144MHz VHFCC award. His certificate was No. 392 issued on February 12. Ian was licensed in July 1985 his present station comprising a Yaesu FT-480R, Microwave Modules 50W amplifier and a 7-element Yagi by M.E.T. He lives on a large housing estate the antenna being 9m a.g.l. He plans to put up a bigger antenna and to take the Morse test.

## VHF Convention

The 1987 National VHF Convention will be held on Sunday, April 26 at the Sandown Park Racecourse, Esher, Surrey. The venue is on the A307 Portsmouth Road between the Scilly Isles roundabout and Esher. There will be no tickets available in advance so everyone will have to queue up and pay their £1.00 at the door. Under-18s half price and under-14s get in free.

The event will follow the long established pattern of all day trade show and afternoon lectures. Les Hawkyard G5HD is in charge of the exhibition and Geoff Stone G3FZL has organised the convention part. The UK Six Metre Group will hold its Annual General Meeting there at 1130.

As usual there will be three lecture streams. Stream A commences at 1415 with Angus McKenzie G3OSS on Equipment Evaluation. At 1515 John Regnault G4SWX discusses, "Is your linear all it's cracked up to be?" and the stream concludes with a VHF Committee Forum chaired by Keith Fisher G3WSN, this to include an IARU Conference report.

Stream B starts at 1515 with Malcolm Appleby G3ZNU giving a talk on the Cellnet system, followed at 1615 by Henry Neale G3REH on Receiving Weather Satellites. The Remote Imaging Group will hold its AGM after this talk.

Stream C commences at 1415 with Les Sharrock G3BNL on "Phase Locking Techniques for Narrowband Modes," followed

**QTH Locator Squares Table**

| Station | Band (MHz) 1296 | 430 | 144 | Total |
|---|---|---|---|---|
| G3IMV | — | 116 | 397 | 513 |
| YO2IS | — | 37 | 341 | 378 |
| G4IJE | — | — | 338 | 338 |
| G4KUX | — | 57 | 322 | 379 |
| G8GXP | 30 | 140 | 307 | 477 |
| G4DHF | — | — | 280 | 280 |
| DL8FBD | — | 69 | 274 | 343 |
| G3BW | 15 | 38 | 269 | 322 |
| G4NQC | 63 | 99 | 250 | 412 |
| G4DCV | 25 | 71 | 248 | 344 |
| G4DEZ | 44 | 29 | 246 | 319 |
| GJ4ICD | 59 | 117 | 241 | 417 |
| GW4LXO | 45 | 100 | 240 | 385 |
| G4SWX | — | — | 239 | 239 |
| GW4TTU | 37 | 87 | 238 | 362 |
| G4XEN | — | 98 | 232 | 330 |
| G4RGK | 35 | 92 | 230 | 357 |
| G3FPK | — | — | 219 | 219 |
| G3UVR | 63 | 113 | 217 | 393 |
| I4YNO | — | — | 214 | 214 |
| G8XVJ | — | 86 | 213 | 299 |
| G4SFY | — | — | 208 | 208 |
| G4MCU | 25 | 82 | 201 | 308 |
| G1EZF | 32 | 86 | 200 | 318 |
| G6ECM | — | — | 200 | 200 |
| G4IGO | — | — | 198 | 198 |
| G4MEJ | — | — | 198 | 198 |
| G8LFB | — | — | 197 | 197 |
| G6XVV | 16 | 62 | 188 | 266 |
| G6HKS | — | 65 | 186 | 251 |
| G4MJC | — | 25 | 182 | 207 |
| G0CHE | — | — | 181 | 181 |
| G3XDY | 78 | 131 | 180 | 389 |
| G4TIF | — | 106 | 178 | 284 |
| G6DER | 70 | 104 | 177 | 351 |
| G3COJ | 44 | 102 | 175 | 321 |
| G3JXN | 80 | 126 | 172 | 378 |
| G4YUZ | — | — | 168 | 168 |
| G4XEK | — | — | 167 | 167 |
| G4SSO | — | 54 | 164 | 218 |
| G4DOL | — | — | 154 | 154 |
| G6HKM | 12 | 98 | 152 | 262 |
| G4YCD | — | 35 | 148 | 183 |
| G1EGC | — | 40 | 144 | 184 |
| G4HGT | — | 52 | 142 | 194 |
| G4MUT | 24 | 87 | 140 | 251 |
| G1KDF | 21 | 85 | 138 | 244 |
| G6DZH | — | 82 | 136 | 218 |
| G6MGL | 50 | 89 | 135 | 274 |
| EI5FK | — | 13 | 131 | 144 |
| G8PNN | 58 | 94 | 128 | 280 |
| G6YLO | 32 | 104 | 128 | 264 |
| GW8UCQ | — | 81 | 128 | 209 |
| GJ6TMM | — | 31 | 128 | 159 |
| G8TFI | 79 | 141 | 126 | 346 |
| GM0BPY | — | 54 | 123 | 177 |
| G8ZDS | — | 41 | 123 | 164 |
| G6XRK | — | — | 117 | 117 |
| G8MKD | — | 45 | 113 | 158 |
| G6XLL | — | 36 | 109 | 145 |
| GW3CBY | 18 | 46 | 107 | 171 |
| G8RWG | — | 13 | 105 | 118 |
| GW8VHI | — | 48 | 101 | 149 |
| G8TGK | — | — | 101 | 101 |
| G8XTJ | — | — | 98 | 98 |
| G4RSN | 2 | 34 | 92 | 128 |
| G6AJE | 3 | 52 | 90 | 145 |
| G4CQM | — | 52 | 87 | 139 |
| G4NBS | 56 | 95 | 86 | 237 |
| G4FRE | 63 | 136 | 84 | 283 |
| G4ZTR | 35 | 57 | 82 | 174 |
| G1LSB | — | 103 | 75 | 178 |
| G1DWQ | — | — | 72 | 72 |
| GW6VZW | — | — | 69 | 69 |
| G6MXL | 6 | 33 | 57 | 96 |
| G1PDW | — | — | 55 | 55 |
| G0FBG/PA | — | 17 | 54 | 71 |
| GU4HUY | — | — | 54 | 54 |
| G1DOX | 20 | 27 | 49 | 96 |
| G0FOT | — | 54 | 49 | 103 |
| G1CRH | — | — | 49 | 49 |
| GM8BDX | 13 | 31 | 41 | 85 |
| GM0GDL | — | 7 | 38 | 45 |
| G1HGD | — | 7 | 38 | 45 |
| G6CSY | 16 | 39 | 34 | 89 |
| G2DHV | 1 | 4 | 27 | 32 |
| G1VTR | — | 19 | 6 | 25 |
| G4JZF/P | — | 80 | — | 80 |

**Starting date January 1 1975. No satellite or repeater QSOs. "Band of the month" 144MHz.**

**Annual v.h.f./u.h.f. table**
**January to December 1987**

| Station | 70MHz Counties | 70MHz Countries | 144MHz Counties | 144MHz Countries | 430MHz Counties | 430MHz Countries | 1296MHz Counties | 1296MHz Countries | Total Points |
|---|---|---|---|---|---|---|---|---|---|
| G1KDF | — | — | 63 | 7 | 51 | 7 | 10 | 2 | 140 |
| G6HKM | — | — | 47 | 11 | 38 | 7 | 13 | 4 | 120 |
| G1LSB | — | — | 46 | 9 | 38 | 10 | — | — | 103 |
| G4NBS | 28 | 2 | *2* | *3* | 40 | 10 | 14 | 6 | 100 |
| G4DEZ | — | — | 23 | 7 | 35 | 8 | — | — | 84 |
| G1SWH | — | — | 51 | 7 | 20 | 5 | — | — | 83 |
| G6MGL | — | — | 25 | 6 | 25 | 2 | 1 | 3 | 62 |
| G3FPK | — | — | 49 | 9 | — | — | — | — | 58 |
| GW6VZW | — | — | 44 | 6 | — | — | — | — | 50 |
| G1PDW | — | — | 39 | 8 | — | — | — | — | 47 |
| G8XTJ | — | — | 39 | 7 | — | — | — | — | 46 |
| G4VOZ | 19 | 3 | — | — | 14 | 4 | — | — | 40 |
| G4SEU | 25 | 3 | — | — | 4 | 2 | — | — | 34 |
| G1CRH | — | — | 31 | 3 | — | — | — | — | 34 |
| G4MUT | 15 | 1 | 10 | 2 | 2 | 2 | *3* | *1* | 32 |
| G4TGK | — | — | 28 | 4 | — | — | — | — | 32 |
| G4WND | 25 | 4 | — | — | — | — | — | — | 29 |
| G2DHV | 3 | 1 | 17 | 2 | 3 | 1 | — | — | 27 |
| G6AJE | — | — | 7 | 3 | 12 | 5 | — | — | 27 |
| G1VTR | — | — | 4 | 1 | 10 | 2 | — | — | 17 |
| G6XRK | — | — | 8 | 6 | — | — | — | — | 14 |
| G4AGQ | 5 | 1 | 2 | 1 | — | 2 | — | — | 11 |
| GW4HBK | 5 | 2 | — | — | — | — | — | — | 7 |

Three bands only count for points. Non-scoring figures in italics.

at 1515 by Dave Robinson G4FRE on "The Hitch Hiker's Guide to 13cm and 9cm". This stream concludes with a Microwave Open Forum at 1615.

This event is organised by the RSGB and the doors open at 1030. I look forward to meeting old and new readers.

## Contest News

Note that all times for contests and in the band reports are UTC (GMT). The next contest listed in the RSGB's diary is on April 11/12 identified simply as 70/144MHz and s.w.l. Also on the 12th is the first of six sessions of the 10GHz Cumulatives, the second leg being on May 10. The weekend of May 2/3 sees the 432MHz–24GHz event which is also a European IARU contest running for 24 hours from 1400. Unfortunately it has to be assumed that the rules and times are the same as in previous years because they never seem to be published until the last minute.

The RSGB/IARU contests all now require exchanges to include the Maidenhead locator so champions of the E-QTHL system will be delighted to learn that the Dubus-Info Magazine, published by Claus Neie DL7QY is sponsoring further contests coinciding with them. The dates are the first weekends in May, July, September and October. The first of these events was on March 7/8.

Contest exchanges consist of RS(T) plus serial number and E-QTHL. Each QSO is worth one point and every different square worked counts as one bonus point, so 200 contacts with 44 squares would be worth 200 x 44 = 8800 points. There are several sections; single or multi-operator, c.w. only or mixed mode and individual bands. If you used c.w. only on your own on 432MHz, your category would be 432/single/c.w. for example.

No satellite, repeater or moonbounce QSOs are allowed. Entries must be sent to the adjudicators by the end of the month in which the various events occur. The 144MHz logs go to Edmund Ramm DK3UZ, P.O. Box 38, D-2358 Kaltenkirchen and those for 432MHz and above to Frank Fischer DL4EA, Kölner Strasse 133, D-4000 Düsseldorf 1, both addresses in the Federal German Republic. DL7QY has sent a copy of the certificate which the winners will receive and it is very neat.

## Repeaters

On the home front there is news that a new u.h.f. repeater became operational on February 18. It is GB3HL located at Hillingdon, West London and is on RB3, 433.075MHz. The input frequency is 434.675MHz.

While we are used to linear transponders in orbiting satellites, there are no such repeaters in the UK on the ground. Not so in Holland though. During the good tropo conditions at the end of January/beginning of February, **Tony Collett G4NBS** (CBE) reports a two hour QSO with PE1EWR through PI6ASD.

This is known as the Amsterdam Linear Relay and it receives signals between 432.525 and 432.55MHz transponding them to 1296.625 to 1296.65MHz. This repeater is located at CM55g and runs about 10W output to an omni-directional horizontally polarised antenna 55m a.g.l. When not being used to relay signals, it changes to beacon mode on 1296.647MHz. John says there are similar transponders serving Rotterdam, PI6RTD on 1296.35MHz and in Eindhoven.

## Band Reports

Due to the difference in February deadlines for the v.h.f. columns in *SWM* and *PW*, this has been a very short "month". The following reports are based on readers' contributions from the last week in January to the end of February.

## The 50MHz Band

At this time of the year, activity on the band is minimal apart from a few stalwarts who use m.s. mode to work long distances. Compared with 144MHz (2m) m.s., QSOs are much easier to complete even with the low e.r.p. limitation. One who takes great advantage of this is **Paul Turner G4IJE** (ESX) who has made over 600 such contacts all-time.

**Rod Burman G4RSN** (BRK) and **John Baker GM3MHW** (PWS) summarised their first year of activity since the band was released to all Class A licensees and both are quite satisfied with what they have achieved. Those looking further afield wil be glad to know that **Eamonn Gilmartin EI8EF** is now active from Co. Donegal in VO square. He uses a Yaesu FT-680R transceiver and 5-ele Yagi by Tonna and is keen to work British stations. Eamonn is open to proposals for m.s. skeds on 50MHz (6m).

**The list of county codes used in VHF Up**

| England | G |
|---|---|
| Avon | AVN |
| Bedfordshire | BFD |
| Buckinghamshire | BKS |
| Cambridgeshire | CBE |
| Cheshire | CHS |
| Cleveland | CVE |
| Cornwall | CNL |
| Cumbria | CBA |
| Derbyshire | DYS |
| Devon | DVN |
| Dorset | DOR |
| Durham | DHM |
| Essex | ESX |
| Gloucestershire | GLR |
| Hampshire | HPH |
| Hereford & Worcester | HWR |
| Hertfordshire | HFD |
| Humberside | HBS |
| Isles of Scilly | IOS |
| Isle of Wight | IOW |
| Kent | KNT |
| Lancashire | LNH |
| Leicestershire | LEC |
| Lincolnshire | LCN |
| Greater London | LDN |
| Greater Manchester | MCH |
| Merseyside | MSY |
| Norfolk | NOR |
| Northampton | NHM |
| Northumberland | NLD |
| Nottinghamshire | NOT |
| Oxfordshire | OFE |
| Shropshire | SPE |
| Somerset | SOM |
| Staffordshire | SFD |
| Suffolk | SFK |
| Surrey | SRY |
| East Sussex | SXE |
| West Sussex | SXW |
| Tyne & Wear | TWR |
| Warwickshire | WKS |
| West Midlands | WMD |
| Wiltshire | WLT |
| North Yorkshire | YSN |
| South Yorkshire | YSS |
| West Yorkshire | YSW |
| **Isle Of Man** | **GD** |
| Isle of Man | IOM |
| **Ulster** | **GI** |
| Antrim | ATN |
| Armagh | ARM |
| Down | DWN |
| Fermanagh | FMH |
| Londonderry | LDR |
| Tyrone | TYR |
| **Jersey** | **GJ** |
| Jersey | JER |
| **Scotland** | **GM** |
| Borders | BDS |
| Central | CTR |
| Dumfries & Galloway | DGL |
| Fife | FFE |
| Grampian | GRN |
| Highlands | HLD |
| Lothian | LTH |
| Orkney | OKE |
| Strathclyde | SCD |
| Tayside | TYS |
| Western Isles | WIL |
| **Shetland Islands** | **GM** |
| Shetland Islands | SLD |
| **Wales** | **GW** |
| Clwyd | CWD |
| Dyfed | DFD |
| Mid Glamorgan | GNM |
| South Glamorgan | GNS |
| West Glamorgan | GNW |
| Gwent | GWT |
| Gwynedd | GDD |
| Powys | PWS |
| **Guernsey & Deps.** | **GU** |
| Alderney | ALD |
| Guernsey | GUR |
| Sark | SRK |

## The 70MHz Band

The Cumulative contest started on February 1 and G4NBS took part. Tony thought conditions were very poor until he realised his antenna relay was faulty. After cleaning the contacts signals were some 30dB stronger and he finished the session with 33 QSOs to 24 counties and worked EI9FK/P in Co. Dublin.

**Jerry Russell G4SEU** (WKS) has been operating mobile using a 0.375λ whip on a 1.8m pole mounted on the roof rack. This attracted the attention of the police who asked him if it was legal and was he from the BBC. This mobile activity has been used to activate many WAB squares not otherwise workable on 70MHz (4m). Jerry was due to move QTH to a better site soon after he wrote.

**John Jennings G4VOZ** (LEC) participated in the February 1 and 15 legs of the Cumulatives. G4HGI (MSY) was a new station worked on s.s.b. John says that several stations complained that the DX was hard to work. He suggests there are two reasons for this. First that "casual stations" come on for an hour or so answering CQ calls from stronger stations but others cannot work them as it is not "their" frequency. If they called CQ themselves more people would be able to work them. If they stayed on a while after the activity period it would also help.

Second John suggests that distant stations may not realise that by operating within only 25kHz of 70.200MHz their weak signals are very likely to be swamped by strong southern stations. Therefore he proposes that 70.14–70.15MHz be "reserved solely for EI, GI and GM calling." Finally he asks that readers be reminded that Tuesday nights are activity nights. **Roger Banks G4WND** (WKS) telephoned his latest scores and mentioned he had driven all the way to Cleveland so that G4VOZ could work that rare county. How's that for dedication?

## The 144MHz Band

EI8EF confesses that 144MHz is his first love but Eamonn has almost given up m.s. activity, ". . . due to the number of false claims for contacts." He will consider proposals from genuine stations who need VO square though. **Dave Ackrill G0DJA** (WMD) uses low power c.w. and during the good tropo conditions between January 30 and February 1 he worked G4TNI (NHM) using a 30m long wire antenna.

**Bob Nixon G1KDF** (LNH) leads the Annual Table yet reports February as being a quiet month with no DX. **Paul Brockett G1LSB** (LCN) echoes these sentiments and spent most of his time on 430MHz. **Ian Rose G1PDW** (ESX) has not been too active but did add GM0BQM/P (DGL) on February 12 and on the 15th GW4RRA/P (PWS) for more table points.

**George Haylock G2DHV** (LDN) has been a reader of *PW* and *SWM* since before World War II so has over 50 years' experience as an s.w.l. and transmitting amateur. His QTH is a bit of an r.f. black hole so DX does not come easily. Nevertheless he enters our various tables. **Pat Billingham G4AGQ** (SRY) has also been enjoying working QRP c.w. stations and mentions FX1JOH in Rouen and FD1LMW in Paris who was using 1W on January 23, and FD1JLQ in Calais on February 1 also using just 1W.

**Bryn Llewellyn G4DEZ** (ESX) carried out some revealing tests with **Derek Brown G8ECI** (LCN) on February 18 on 144, 430 (70cm) and 1296MHz. On 144MHz using 40W to a 17-ele Yagi at 15m, Bryn was S1–3; on 430MHz (70cm) 50W to 18-ele at 15m produced S9, while 10W to a group of four 55-ele Yagis at 15m on 1.3GHz (23cm) got an S5 report.

**John Wimble G4TGK** (KNT) took advantage of the lift conditions at the end of January and worked G4IJM in Cleveland. Relative DX for him and the first time in two years he has even heard anyone from that county. He is a keen Worked All Britain operator and has just reached his 600 WAB areas on 144MHz. GU1WJA and GJ6WRI were two new parishes for John.

January 31 was quite a day for **John Palfrey G4XEN** (NHM) when around moonset he heard W5UN calling CQ. He called him several times and after a few minutes received "G4XEN? W5UN," but no "O" report. Although no QSO resulted John's 90W to a 14-ele Parabeam did make the approximate 800 000km round trip. On a more "local" note he mentions the good lift conditions at the end of January which produced excellent signals from the nearer German squares plus a few Danish stations for others.

**Colin Ford G4ZVS** (WMD) currently heads the 1987 c.w. ladder but reports conditions as having been very flat most of the time. On February 20 he did get through to G3IDX (SXW) though. On January 31 **Mike Johnson G6AJE** (LEC) had a 40 minutes QSO with ON1BSE (CL62c) at S9, discussing 50MHz Es among other topics. No fading or flutter at all in that contact. The next day Mike worked DJ9YE (EN14a) for the first German this year.

G6HKM (ESX) had her first CQ call on February 3 answered by G1WAY (CVE) and later worked GM4CXM (SCD). Cornish beacon GB3CTC was S5 on the morning of the 21st and her CQ call was answered by G1EXH (DVN) who was only using 1.5W and who has decided to stay QRP this year. Ela was then called by G6YXT (DVN) who was only using 100mW at first.

**Mike Huggins G6XRK** (ESX) has a potent station consisting of an Icom IC-251E with MuTek "front end" and a Dressler D200S amplifier running 400W. The feeder is Pope H-100 coaxial to a 17-ele Tonna Yagi at 10.6m. He also uses a GaAsf.e.t. pre-amp. He refers to the end of January lift as a "tiny, tiny tropo" event which brought a few DLs in EO square.

**Pete Hizzey G6YLO** (KNT) has recently moved so probably will not be active for a few more weeks. The new QTH in Herne Bay has an all round clear take off so he may not devote much time to 144MHz as he contemplates 5·6GHz (6cm) and 10GHz (3cm) activity.

**John Fitzgerald G8XTJ** (BKS) reports no real DX in spite of periods of anticyclonic weather in February. He did add to his table score G8XAZ (WRS), G6PBW (DYS), GW6JNE (GNS) and G0FIO (SXE). He is very active in the WAB nets and, as Public Relations Officer for their awards, reports much activity in the Winter Award programme. To this end, G4RRA, G4WKY and G6SLZ attracted much attention when they activated rare WAB squares on the Welsh border one February weekend.

Auroral activity is at a very low ebb now and likely to remain so for a year since the magnetic minimum seems to lag behind the sunspot minimum by that amount of time. The only people likely to enjoy Ar propagation are the Scottish operators and **John Eden GM0EXN** (HLD) is well placed for this. He is the most northerly British mainland station and reports several events.

Between 1730 and 1830 on January 28 beacons SK4MPI (HU), DL0PR (EO) and GB3LER (ZU) were auroral but no other stations were heard. Other January events were on the 16th, 20th, 22nd and 27th. Tropo propagation was good on February 1 and John contacted DL8HCZ (FN), PE1DAB (CN), DJ8PB (EO), PA3DTQ (CM), PE1LDX (CN), PE1KLQ (DL) and at 1710 OZ1DAO (FP). The DL0PR beacon was still detectable at 2300. He reports that the Shetland stations were disappointed that their CQ calls went unanswered most of the time, even though the DL0PR beacon was S8 for long periods.


**A station worked by a Practical Wireless special event station**

## The 430MHz Band

**Charles Coughlan EI5FK** (Cork) has been busy evaluating antennas comparing a home-brew 15-ele quagi with a 21-ele Tonna Yagi. Preliminary tests with GW3KJW on Anglesey suggest the quagi is a little better even though its boom is 1.2m shorter. However more tests were due to be carried out before reaching definite conclusions.

EI8EF had no antenna on his mast when he wrote but reckons he will be in operation again by early summer, once the windy season has passed. G1KDF found things rather quiet until the contest on February 22 which Bob found quite good with plenty of UK activity. He completed 83 contacts in 13 new 1987 counties, best DX being EI5FK.

G1LSB now has 103 squares worked on the band and Paul is up to ten countries worked this year. He did well in the end of January lift working DLs in DK and DL squares, ON and PA plus OZ6HY (EP), OZ7LX (FP), SM7OEL (GP), OZ2FF (GQ) and SM6ESG (GR). **Gerry Schoof G1SWH** (MCH) in the same period worked DL2KBB, G4WCJ (DOR), GJ4ITG and G4DFI (LDN). He has had several tries at working GM6TKS in Stornoway (WIL) and has been heard but concludes that 2W is insufficient under normal conditions.

G4AGQ used 10W of c.w. to a 19-ele Yagi on January 31 to work PA3AEX in Utrecht who was only running 1W and indoor HB9CV antenna, followed by DJ9RX (EN) for a new square. G4DEZ was trying to work into OZ in the aforementioned lift so was surprised to be called by HB9AEN/P (DG). In the February 22 contest Bryn reckons the conditions from SE Essex were flat but he did contact six DLs, about 20 PAs, some ONs, a couple of Fs and GJ4ICD.

G4NBS thought conditions were slightly up for the contest in a WSW/ESE direction. Lots of activity early on but Tony found it hard going during the last half of the event. Even so, he made 103 QSOs in seven countries and 20 squares. Best DX was GM6TIA (XP) at 490km and assorted continentals were worked at good strength.

G6AJE worked PE1JVH (CM) at 0838 on January 31 and the PE was attempting WAB on the band. Later on Mike worked DG8EAJ (DL), FC1DRE (AJ), ON4AQO (BL) and the next day DK4LI (EQ). G6HKM operated for the whole six hours in the fixed contest making 103 QSOs. Ela highlights LD2KBB (DK), ON4AQO and 12 PAs. She also worked G1DOX (CBA) and G1GEY (TWR).

**Philip Ruder G6MGL** (LDN) also worked G1DOX in the contest but did not hear one GW station. He reports a fair amount of activity.

## The Microwave Bands

EI5FK writes that he hopes to operate on 1.3GHz in the future from VL square. Charles does quite a lot of –/P operating so maybe he will be able to activate some of the rarer Irish squares. G6MGL operates on 1.3GHz but Philip says he has not done so much yet this year. G6AJE has a 1.3GHz transverter under construction which could result in Mike's being on the band in the near future.

G0DJA is a keen experimenter on the s.h.f. bands and currently operates on 80GHz from portable sites. Dave has worked G4RIO/P, who was on Barr Beacon, from Lickey Hill, the QRB being about 23km. Dave has equipment for the 24GHz band up and running too, so should have some success to report in the coming months.

G1KDF suggests an activity night on 1.3GHz might be worth considering. Bob rightly points out that the 430MHz Monday activity night idea has been quite a success. **John Tye G4BYV** (NOR) operates on 1.3GHz and above pretty well exclusively. He mentions that F1EZQ (CH) was a new square on 1.3GHz. On 3.4GHz (9cm) he has contacted PA0WWM (CM) and DF1EQ (DL) the latter with 59 reports each way. On 2.4GHz John reports QSOs with G3ZTR (ZO) and G4PMK (ZL) but in the lift period on January 31/February 1, although all the G beacons were S9, activity was very low.

This lift was enjoyed by G4DEZ but Bryn reports that it only brought stations up to the D line of squares on 1.3GHz. On February 4, after contacting ON4YZ on 430MHz, they tried 1.3GHz over the 304km path making it easily. Bryn was S6 with Paul and he S2 with Bryn, a surprising achievement since ON4YZ was only running 300mW to a single 23-ele Yagi and conditions were flat. No doubt Bryn's 220-ele antenna group helped. Time and again Bryn has found that TX power is not essential to work over long distances on 1.3GHz or 430MHz, whereas on 144MHz it can be a different story.

Again referring to the lift period, G4NBS had a rewarding time in spite of bad radar QRM from the Dutch direction to add to the Syledis racket on 430MHz. Stations worked included DG8EAJ, ON5OF, DD3KL (DK), PE1JMZ (CL) and DF7KB (DK) on January 30/31. On February 1, Tony found GW3CCF (CWD) and OZ1QZ and OZ2OE in EP square, all these on 1.3GHz, and he mentions that the longer distance QSOs were only made after the nearer ONs and PAs had dropped out completely. Even so, no Norwegian stations were heard.

G6HKM got going on 1.3GHz just in time for the lift at the end of January. Ela's first continental QSO was with DL1EBR (DL) on January 31. At the time lossy UR67 feeder was being used with the 23-ele Yagi, and no RX pre-amp. PA0EZ, PA0RDY and PA0WWM all in CM were worked and G3ZTR (ZO).

After this, a 6m temporary mast was put up with a pre-amp at the mast head, subsequent QSOs being with PE1EWR (BL), PA0FRE (CL), ON1JO (BL), G8IFT (HFD), PA3EQK (CM), G8OPR (HPH), G8XIR (KNT) and the best DX of the day, DJ6JJ (DL) at 460km. The only QSO on February 1 was with PE1KKY (CL) for whom Ela was the first contact outside Holland.

## Interference

G4NBS is having TVI problems again and wonders if his neighbours ever take time off to eat. Tony has had complaints from early morning to late at night most days of the week. His problem band is 70MHz and he is open to any suggestions on how to keep the r.f. out of his neighbour's and his own TV sets. Oddly enough video recorders are not affected.

One point that occurs to me is that some p.a. stages, while appearing to operate properly with all the right meter readings and satisfactory reports from others, are also taking off at v.h.f. or u.h.f. This can only be detected positively by careful monitoring with a spectrum analyser. It seems that solid state p.a. stages are more prone to this than are their valve equivalents.

By contrast, G8XTJ is suffering from interference on 144MHz from a nearby Ambassador telephone system which makes the band useless in certain directions. Complaints to British Telecom have got John nowhere and they seem to think that if they ignore the matter it will go away. I have suggested to John that he write to BT Chairman Sir George Jefferson and if that fails, to raise the matter of this breach of the Wireless Telegraphy Act with his Member of Parliament.

## Sign Off

I hope that regular *PW* readers will like this new style presentation of v.h.f. bands material since it has always seemed to satisfy *SWM* readers these past few decades. All your suggestions will be carefully studied and please note the cast iron deadlines. I have always given these for the next three months for the benefit of those who may not get the magazine for some time after UK publication dates.

**All reports should be sent in by:**

| Deadline | Issue |
|---|---|
| April 20 | July '87 |
| May 19 | August '87 |
| June 24 | September '87 |

# RTTY

*Reports to Ron Ham*
*Faraday, Greyfriars, Storrington, West Sussex R20 4HE.*

**Nigel Final** (Hackney) has a Sony ICF2001D receiver with an active antenna and a Spectrum computer, which he uses for receiving amateur RTTY transmissions. Not wanting to miss any signals, he asks about popular frequencies. I suggest Nigel, that you tune carefully around 3.59, 7.04, 14.09, 21.09 and 28.09MHz and also make sure that you know how to select the speed (usually 45 baud) and the mode (normally forward) on your computer. The program instruction book should tell you about this.

**Steve Beazley** (Chingford) has copied RTTY signals for about 3 months and already has 49 countries to his credit. "The evening of February 14 was excellent on 14MHz," said Steve, after logging signals from Dominican Republic, Ecuador, Guatemala, Mexico and Venezuela in 90 minutes. Steve's log for the month ending on February 18, contains 18 stations from 7 countries on 3.5MHz, 197 entries, including 37 Italians, from 42 countries on 14MHz and 2 countries, Puerto Rico and the USA on 21MHz.

"The QSL manager for HV2VO is I0AOF," wrote Steve. He also told me that Gilwell Park Scout Group, Chingford, has its own amateur station with the callsigns GB2GP, G3WGP and G8WGP and that they sometimes use RTTY for major events and hope to have a permanent RTTY station in the near future. Keep a look out for them readers and you may well get one of their special QSL cards, Fig. 1.

"Data mode loggings this month have not been as extensive as last," wrote **Len Fennelow G4ODH** (Wisbech). On the subject of AMTOR said, "A reasonable number of AMTOR stations have been received, but the mode does seem to me to have declined considerably in activity during the last few months."

However, during the month prior to February 17, Len copied AMTOR signals from the 5 countries on 3.5MHz, 2 on 7MHz and 14 on 14MHz, listed in Fig. 2. His RTTY log for the period, containing 39 countries, is included with Steve's and mine in Fig. 3.


**Fig. 1: The QSL card from the Gilwell Scout AR Group**

During the weekend, January 31/February 1, I logged 4 RBBS mailboxes from Spain under the callsigns of EA7ALH, EA7BTQ, EA7CSQ and EA7FVH, all operating on 14MHz RTTY. At 1004 on the 1st I copied, "EVERY 3 MINUTES ON AIR THE MAILBOX", from EA7BTQ and like the others, giving users precise instructions for accessing the box. Have a tune around 14.088 and 14.092MHz and let me know what you find.

During this period, January 26 to February 25, I copied RTTY signals from 11 countries on 3.5MHz, 5 on 7MHz, 26 on 14MHz, including HI, JA and VE and 9 on 21MHz, with the best DX coming from HP, JA, LU and PY. Among the special interest signals that I read was a club station UZ6AWF, in the USSR, at 1755 on February 5, a very strong signal from JA1ACB printing "CQ AFRICA" at 0825 on the 15th, OH6VM operating from the club station OH6AD, I think from an electronic show, at 0823 on the 19th and HB9HK keying, "CQ WORLD CHAMPIONSHIP CONTEST" around 0850 on the 21st. The Finnish and Russian stations were both subject to QRM, which, as you can all guess, became predominant at that most critical time when the callsigns were being transmitted.

**Fig. 3 ▶**

| Country (Prefix) | Frequency (MHz) 3·5 | 7 | 14 | 21 |
|---|---|---|---|---|
| Alaska (KL7) | | | X | |
| Argentina (LU) | | | | X |
| Australia (VK) | | | X | |
| Austria (OE) | | X | X | |
| Balearic Is (EA6) | | | X | |
| Belgium (ON) | X | | X | |
| Brazil (PY) | | | X | X |
| Canada (VE) | | | X | |
| Canary Is (EA8) | | | X | X |
| Ceuta & Melilla (EA9) | | X | X | |
| Colombia (HK) | | | X | |
| Cuba (CO) | | | X | |
| Czechoslovakia (OK) | | | X | |
| Dominican Rep (HI) | | | X | |
| East Germany (Y2) | X | | X | |
| Ecuador (HC) | | | X | |
| England (G) | X | X | X | |
| Eire (EI) | X | | X | |
| Equatorial Guinea (3G) | | | X | |
| Finland (OH) | | X | X | |
| France (FE) | X | | X | |
| Gabon (TR) | | | | X |
| Gozo & Comino (9H4) | | | X | |
| Greece (SV) | X | | X | |
| Greenland (OX) | | | X | |
| Guatemala (TG) | | | X | |
| Hungary (HA) | | | X | |
| Indonesia (YB) | | | X | |
| Isle Of Man (GD) | X | | | |
| Israel (4X) | | | X | |
| Italy (I,IK,IT) | | X | X | |
| Japan (JA) | | | X | X |
| Lebanon (OD) | | | X | |
| Malta (9H) | | | X | |
| Madeira (CT3) | | | X | |
| Mexico (XF) | | | X | |
| Nigeria (5N) | | | X | |
| Norway (LA) | X | X | X | |
| Pakistan (AP) | | | X | |
| Panama (HP) | | | | X |
| Puerto Rico (WP) | | | | X |
| Poland (SP) | | | X | |
| Portugal (CT) | | | X | |
| Rumania (YO) | | | X | |
| San Marino (T7) | | | X | |
| Sardinia (IS) | | X | X | |
| Scotland (GM) | X | | X | |
| Sicily (IT9) | | | X | |
| Spain (EA) | | | X | X |
| Sweden (SM) | X | | X | |
| Switzerland (HB) | | X | X | |
| Ukraine (UT) | | | X | |
| Uruguay (CX) | | | X | |
| USA (W) | | | X | X |
| USSR (UA,UB) | X | | X | X |
| Vatican (HV) | | | X | |
| Venezuela (YV) | | | X | |
| Wales (GW) | X | | | |
| West Germany (DF,DJ,DL) | X | X | X | |
| Yugoslavia (YU) | | | X | |

| Country (Prefix) | Frequency (MHz) 3·5 | 7 | 14 |
|---|---|---|---|
| Canada (VE) | | | X |
| England (G) | X | | |
| France (FE) | | X | X |
| Hungary (HA) | | | X |
| Italy (I,IK,IT) | | | X |
| Northern Ireland (GI) | | | X |
| Norway (LA) | X | | X |
| Portugal (CT) | | | X |
| South Africa (ZS) | | | X |
| Spain (EA) | X | | X |
| Switzerland (HB) | | | X |
| USA (W) | | | X |
| Venezuela (YV) | | | X |
| Wales (GW) | X | | |
| West Germany (DF,DJ,DL) | X | X | X |

**Fig. 2**

**All reports should arrive by: April 24 for the July '87 issue; May 22 for the August '87 issue and June 26 for the September '87 issue**

# Amateur Satellites

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

Regular readers may detect a slight change of emphasis in our column devoted to space happenings and satellites this month and from now on, as a brand new column has been started in *Short Wave Magazine* entitled "Info in Orbit". This will take some (but not all) of our weathersat information, and some of the space orientated media that is mainly of interest to the listener only, leaving us with a little more space in this column to devote to those who are mainly engaged in two-way communications on the amateur transponder satellites.

This does not mean to say that *Short Wave Magazine* will not carry amateur satellite information, or any more general matters of space interest, nor does it mean that *Practical Wireless* will cease to cover the interests and activities of those who do not have the means of actually transmitting through the transponders aboard the satellites themselves. Whilst we urge those mainly interested in weather satellites to both see and contribute to the new column, we shall still find the space for some of the more generally interesting items of the wider field of satellites here, and continue with most of our original coverage.

Thus, we shall still cater for those ranging from the strict beginner and the casual observer right through to the more complex and demanding propagation path behaviour, ultra-DX QSOs, and wide-ranging space-science aimed at the specialist, according to interest shown and feedback received from you, the readers and contributors.

To start this month, we begin with our usual round up of the more popular "Hamsats" which have always seemed to stimulate the most interest and activity from our readership.

## OSCAR-10

We are now in the period that sees OSCAR-10 with a very bad sun angle, that is to say that the orientation of the satellite in respect of the sun is such that the solar panels are some 90 degrees offset, and little sunlight, vitally necessary for battery charging, is being seen by the cells. The power available will fall to only 7 per cent of that required in late March, and 70 per cent has been calculated to be needed to run the system. Illumination of the solar cell panels is the most important parameter of all in the power system, and falls with the angulation of the panels away from the sun. The illumination is equal to 100 x the cosine of the sun angle, and as the spacecraft's spin axis lies almost exactly in the sun's orbit plane, the illumination dips close to zero every 180 days.

Absolutely nothing can be done about this sad situation by the AMSAT command station network, as the loss of memory by the IHU is such that commands for magno-torquing the satellite to turn the cells into the sun are ineffective, and the complex program for pulsing the coil magnets that turn the satellite in earth's field cannot be effected.

Already in February we were seeing signs of frequency modulation on the beacon. It is thought to be brought about by the variable demand of power being greater than that available from the sun, thus reducing the available voltage to that below the stabiliser setting. This shifts the beacon frequency by the slight instability brought about by "pulling" the oscillator at peak demand periods. When first noticed in early February, it was exaggerated due to both beacons being suddenly found on, by self decision, and not by command dictation. The higher frequency engineering beacon demands some fifty watts of power from the power budget, thus loads the battery heavily. Add a few high power users, and a critical situation develops!

Also at that time, the first signs of severe spin modulation began to appear, brought about by the off-axis pointing of the antenna array, thus only giving the spinning side lobe offset radiation towards earth. The antenna pointing, termed the attitude, is in line with the spin axis, and is expressed as a longitude and a latitude in the same sense as solar azimuth and elevation. It is fixed in space, so that although it ideally points to earth at apogee, the perigee of the spacecraft sees it pointing away from earth into space. The offset angle from earth, varying according to both observer location and the changing satellite attitude is called the squint angle. The greater the squint, the further the main lobe displacement, and the worse the spin modulation becomes. By February 23, the spacecraft attitude had changed to 149 longitude and +12 latitude in the Bahn coordinate system giving fair results before apogee, but bad communications from apogee onward.

Both of these undesirable characteristics will progressively become worse, and even if permitted, communications would be very difficult over these next two months.

It cannot be stressed strongly enough that our only hope of saving OSCAR-10 for the future is to ensure that **no** use **whatsoever** of the transponder is attempted during the months of March and April. Then, starting at the beginning of May, hopefully we shall have a functioning satellite left for continued QSO use, at least between mean anomaly 30 and 220 when it is out of eclipse. With luck and abidance, we shall then go through to September until the next non-transponder use two month period begins. Only c.w. and s.s.b. will then be permissible, with 100 watts e.r.p. maximum uplink power, but with no use of high consumption low efficiency modes such as RTTY, SSTV, and above all a.m. and f.m. which drain the battery severely.

The good news is that the transponder is still on, and that the apogee is now over the north of the equator line. It will continue this coming north, and for northern hemisphere stations will give improved elevation at apogee, this meaning less surrounding and ground noise capture, and less angular ionospheric density attenuation than when at low angle.

OSCAR-10 operators should look out for 7J1ACH, who has been very active via the satellite. He is on the island of Minami Torishima, a very rare DXCC country on any band.

## RS Satellites

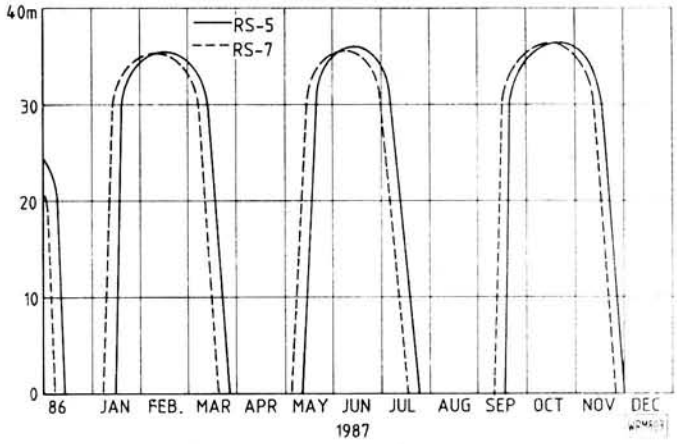
Very little activity indeed has been evidenced by the Radio pair during the long eclipse, although the command station RS3A was attempting to keep both transponders on for between one and three orbits each day according to battery charge indicated, every day except Wednesdays m.s.k. As expected, as soon as they hit the eclipse line, they would sense the voltage drop, and automatically command themselves off to protect the battery. The results were that keen listener **Bill Kelly** of Belfast, who regularly listens for some seven passes daily, did not hear the transponders on once! Some weeks after you receive this magazine, they should be back with us, with RS-7 expected on March 22, and RS-5 on March 28, though perhaps with a few illumination power problems for the first three or four days of the new cycle.

Our graph Fig. 1 indicates the sunlight and eclipse cycles for the remainder of this year, with RS-7 (the dotted line) both going into eclipse first and coming out first and RS-5 (the continuous line) closely following.

It can be seen that our pair from the USSR, should they stay alive, will be on and active when you receive your *PW*, as they will be in full sunlight for all orbits of the month. At the beginning of May, we see first RS-7, then RS-6 going into the first stages of eclipse for part of the orbits, when self commanding off will begin. By the second week of June they are in maximum periods of earth shadow, seeing 35 minutes of darkness for every 120 minutes of the complete orbit, hence as little battery storage capacity remains, transponder activation will be minimal. At the end of July all is well again, until mid-September, and so on until the end of the year, when December again hopefully sees full activity.

No new news is available on RS-9 and 10, and no firm launch date is given, but **Leo Labutin UA3CR** favours the end of March as a potential launch date for the long awaited pair. It is believed that the severe winter conditions this year has caused a backlog of launches, although the USSR seems normally quite independent of even the severe northern Russian bad weather.

**Fig. 1: RS-5 and 7 in 1987. Minutes of eclipse per orbit**




## FO-12

As predicted, the programme of operation of Fuji-OSCAR-12 has been changing frequently with experiments to determine the best schedule for the timing and duration of both of its modes and its recharge cycle. On February 15 the plan was implemented to have the digital "JD" mode in operation as a digipeater for on/off cycles of 5 minutes, on even orbits, part of which would have to be within range of the Japanese command station for assuring safety of continuity. This means that Europe will have some orbits which can be used for trying the transponder as a flying repeater, to test one's own loop system and to make instantaneous contacts with other uplinking stations. A connection is made by simply sending "c" (for "connect") your callsign, e.g. c G3IOR. The callsign of the satellite is 8J1JAS, but should only be used for your log.

The long term plan is to organise a schedule which will maintain digital operation for a 30 per cent duty cycle, for a maximum of ten hours' use at a time, and, of course, to have the memory on and active as soon as possible. In the meantime, an alternating schedule of one orbit in three on "JD" mode, one in two on "JA" mode, with ten minutes on per twenty minute pass will evolve, with the system totally off on Mondays and Fridays.

**Moriyoshima Ohara JK1VXJ** reports that in the "JD" digital mode the satellite computer is programmed to send a short message and a frame of telemetry. A new item has been added to the telemetry frames termed "depth of discharge" to indicate how the battery storage is reduced in ampere-hours. The on-board computer will read the discharge current every second, then calculate the value transmitted, which will initially be 5000. The rate of decay will give valuable guidance in determining the final schedule mentioned above.

## UoSATs

The on-board computer automatic attitude manoeuvres with OSCAR-11 were still proceeding in late February, with an initial spacecraft tumble of 17.5 minutes leading to 44 minutes prior to stabilisation movements. The action of these anti-tumble alogarithms could be clearly seen by observation of the WOD (Whole Orbit Data) surveys. Some of the UO-11 surveys have included the status point which includes the magnotorquer status bits, channel 61, which are bits 5 for X-axis, 4 for Y-axis, and 3 for Z-axis. When resting the value of the channel is 5FC, and when energised goes to 0. 5F4 shows a firing on Z, 5EC on Y, and 5DC on X.

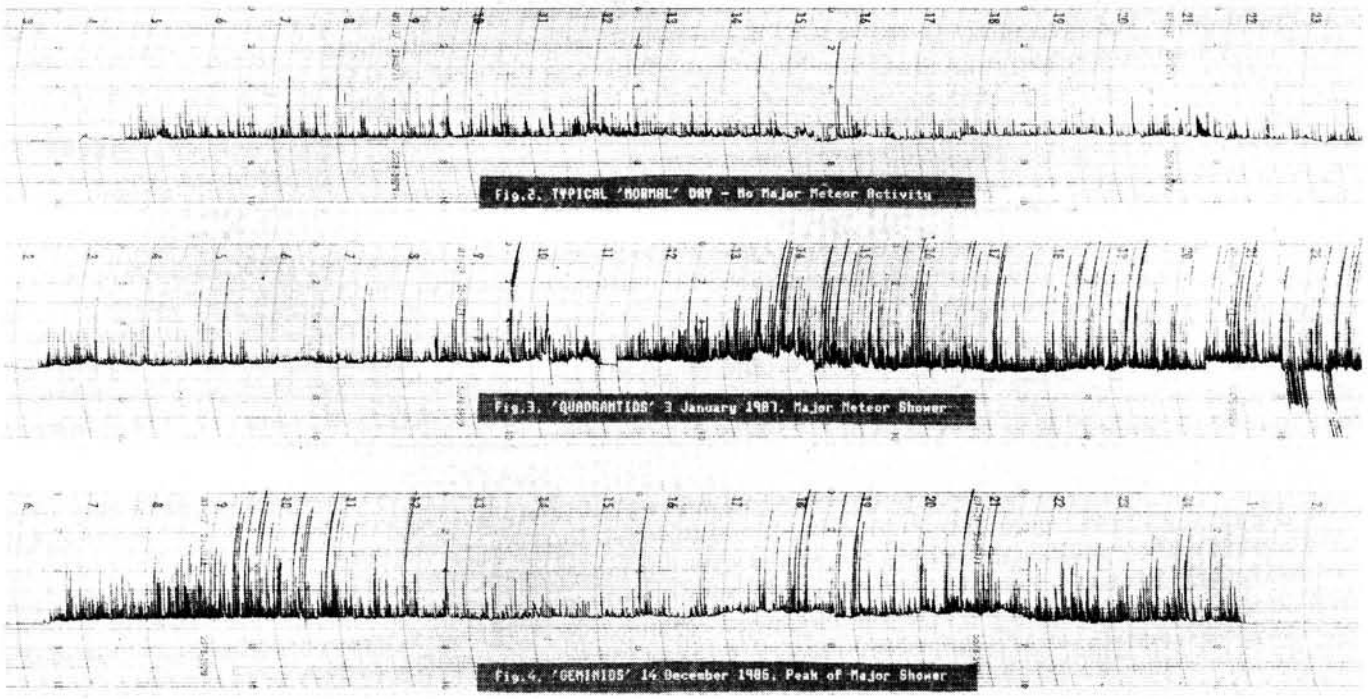
Has anyone heard the 21MHz beacon in the past few weeks? All indicators show that it is commanded on, but, your scribe and many others have failed to be able to hear the signal that is supposed to be resultant. Reports on this, plus any general reports on the satellites should go to the UoSAT Control Centre, School of Electrical and Electronic Engineering, University of Surrey, Guildford, Surrey GU2 5XH, plus of course G3IOR!

The 435.025MHz beacon will be activated simultaneously with the 145.825 downlink every Sunday from 0000 to 1200UTC. It will have a programme of 15 seconds of status information followed by 120 seconds of bulletin at 1200 baud, and then 330 seconds of d.s.r. at 4800 baud a.f.s.k. The University team points out that the 4800 baud a.f.s.k. will sound very weak if listened to with a n.b.f.m. receiver. The Digitalker will continue to stay on Wednesdays for educational demonstrations, and reports on this would be welcomed, sent to UoS QTH as before.

The DCE (Digital Communications Experiment) is now available for wider use, as an agreement has been made with the British Radio Regulatory Department for such store-and-forward "PACKSAT" communications from countries which have third party traffic arrangements with United Kingdom GB callsigns. This means that amateur terrestrial packet-radio stations will now be able to communicate via the OSCAR-11 DCE with messages to the nearest USA mailbox, etc. Access to the UoSAT-2 OSCAR-11 spacecraft will be available through the v.h.f. repeater GB3UP to GB2UP, the call for messages on the DCE, for automatic transmission of the required format. Ground stations are already set up in Los Angeles, Washington and Dallas, with another soon to come in Australia.

## MIR

On the night of 5 February, the SOYUZ-TM-2 lifted off from Tyuratem with two cosmonauts, Yuri Romanenko and Alexander Loveykin (sadly, non-amateurs) scheduled for a ten month stay in space. They were clearly heard and followed in their activities by many observers on earth using the usual frequencies as they docked, took in the supplies from *Progress-26,* and sent it back to burn out on




re-entry on February 25. Up to the time of writing they have been stacking supplies, organising the space-ship, and arranging for the coupling and transfer of the new Astro-physics Laboratory. A thorough photographic coverage of the earth's surface is now underway.

MIR had its height increased soon after boarding, and again on February 20, when it went up to a 371km apogee 337km perigee orbit, maintaining its original eccentricity and inclination.

A very interesting experiment is being attempted between UA9FAD and UL7GBD, who are making schedules to contact on numerous passes of MIR using the large space station as a passive reflector. Despite its enormous size, it is felt that reliable communications are unlikely, but what is more likely is a return path from the reflections from the ionised trail. The chance of this is now marginally reduced, as the spacecraft is now slightly higher, with less drag and hence less ionisation likely, but, the added laboratory will enhance the reflection capability. If any additional amateurs wish to try similar experiments, optimum passes can be supplied, and of course it will be a very visible target during the summer months.

## MS

We are talking about meteor scatter (m.s.) rather than for micro-satellites. Readers will recall that we gave some coverage to this aspect of space communications in the columns of both August and November 1985, when we listed the association between comets and the major meteor showers.

It has been known for a long time now that when meteors are captured by earth's gravity and enter the atmosphere, they leave an ionised trail, which as well as being visible as a "shooting star", permits the reflection of radio signals back to earth for the short duration of the ionisation.

One of the most successful and long established meteor scatter experts is **Johnny Stace G3CCH**, of Scunthorpe, Lincolnshire, who has worked more countries on v.h.f. m.s. than most amateurs have on h.f. He sends us some information on getting started on this mode, and some hints as to how the listener can sample the effects with simple equipment.

Most of the amateur radio stations who make contacts by meteor reflections use the 144MHz band, and make specific schedules of transmitting and receiving periods on an agreed given frequency. The role is then to transmit either very fast c.w. or rapid speech, e.g. "LZ1AB G3CCH LZ1AB G3CCH . . ." for the specified time giving only callsigns initially, then followed by reports as level and duration of burst copied, such as "47 47 47 47 . . .". The c.w. is normally copied from the receiver during the listening period onto a tape recorder at a high audio frequency, and then slowed down to permit readability. Lots of activity will be heard during the main periods at the low end of the 144MHz c.w. band, and on or near 144.200MHz u.s.b., but the fact that the schedules are generally specific in time and frequency, and the returns short lived and relatively infrequent mean that this is hardly the ideal situation for the beginner who only wants to listen. A good antenna, a sensitive receiver, and a knowledge of the periods, schedule times and frequencies are really essential.

Johnny recommends that a good beginner's medium is to make use of one of the several Eastern European f.m. broadcasting stations that are to be found around 70MHz. Meteor reflections are far better between 40 and 80MHz, the stations are high power, have all round radiation, and are often on the air for 20 hours per day. Some also conveniently fall into the UK 70MHz amateur band. One such station in Poland is on 70.31MHz, and can clearly be heard by m.s. using only an f.m. receiver and a dipole antenna.

G3CCH uses a 30kHz bandwidth f.m. RX, with a pre-amplifier following his dipole at 7.5m. An S-meter has been added, and this drives a d.c. amplifier, which in turn drives a pen recorder. The pen recorder is set for a fast attack and slow release time so that the pen draws easily readable lines on the chart, and shows up variations not only when there are a lot of reflections during meteor showers, but also variations during each day.

Three such charts are produced to show the results and relative levels of meteor trail reflection activity.

That in Fig. 2 was taken on a typical day, with no major activity in evidence.

Then Fig. 3 was on 3 January 1986, and shows the periods of peak activity during the Quadrantids that occur at the start of the year.

Finally Fig. 4 was taken at the peak of the Geminids meteor shower on 14 December 1986, and shows the split activity into two distinct periods.

## Satellite Tracking

Next month we shall again produce the full set of Keplerian element updates for the main satellites of interest. A new scheme has been devised as part of the OSCAR 11 DCE experiment (see earlier under UoSAT) to carry orbital data as "Title frames". This will allow the dual advantages of regular easily updated data without the need to reload the diary, and the provision of a regularly transmitted source of error-free coded data.

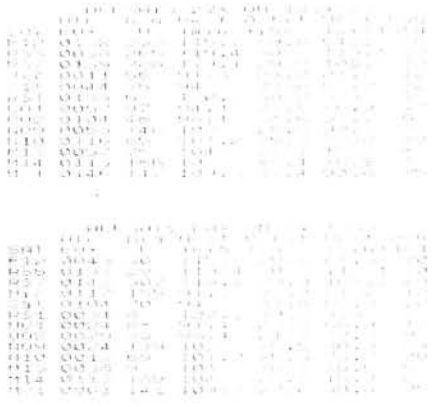


**Fig. 5**

For this month in Fig. 5 we produce two sets of reference orbits as equator crossings for Sunday 12 April, and a further update set for Friday 24 April, to help you keep in touch with the satellites of your choice.

**All reports should arrive by:**

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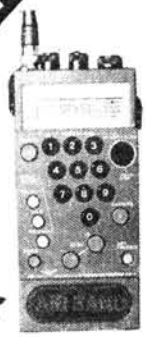

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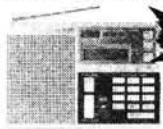

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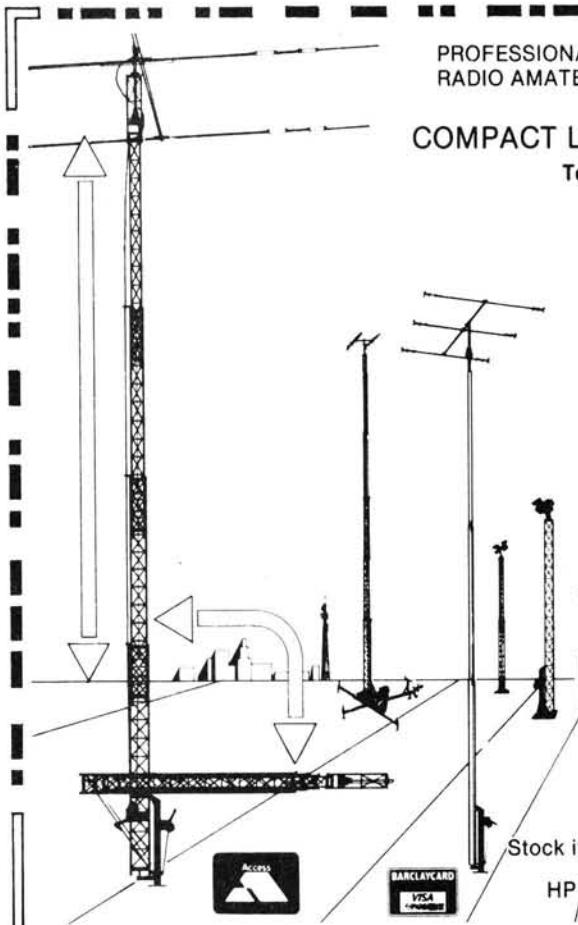

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# Propagation

Reports to Ron Ham
Faraday, Greyfriars, Storrington, West Sussex R20 4HE

The propagation of radio signals around the world, and even over very short distances, is a complex business because their paths are easily influenced by a wide variety of natural causes. It is possible for conditions on all bands to change hourly and radio enthusiasts, who use a large chunk of the radio frequency spectrum, are in a position to observe these changes and report their findings. Therefore with your help I plan to show, in future issues, how signals are effected during the lifetime of the various disturbances.

## The Solar Influence

Although, weather permitting, they observe the sun as often as possible during the month prior to March 20 neither **Patrick Moore** (Selsey) nor **Cmdr Henry Hatfield** (Sevenoaks) found any sunspots. However, while Henry was using his spectrohelioscope, he identified two small faint plages on January 31, 2 faint filaments and a few small prominences on February 7 and a very long (half the sun's diameter) and quite dark filament and a small bright plage in the n.w. quadrant on the 15th. "This is the largest and longest filament that I have seen for some years," remarked Henry. He also recorded bursts of solar radio noise, at 136MHz, on January 23, February 3, 10 and 18.

From his QTH in Wisbech, **Len Fennelow**, received tone-A signals from the 50MHz beacon at Potters Bar (GB3NHQ) on January 20, 21 and February 9; from the 144MHz beacons in Angus (GB3ANG) on January 20 and Cornwall (GB3CTC) on January 19, 21, 23, 25, February 4, 6, 13 and 17.

At 2215 on the 14th, **Angela Sitton** heard the 144MHz signals from a station, some 16km s.w. of her Stevenage QTH turn auroral for a few seconds. In Glasgow, **Ron Livesey**, the auroral co-ordinator for the British Astronomical Association, received a report of an auroral glow on the night of January 26/27 from the weathership *Cumulus*. **Karl Lewis** said that magnetic conditions were "generally unsettled" on January 21, 22 and 23. On the 20th the NOAA observatory at Boulder, Colorado reported "Minor storm low and major storm in high latitudes in America".

**Neil Clarke G0CAS** (Ferrybridge) reports that, "The solar flux was steady, in January, at around 72 units, with days 21 and 22, on or above 75 units".

## The 28MHz Band

Neil Clarke is also keenly interested in the 28MHz band and uses a Yaesu FT-101ZD and a G5RV antenna to study propagation in this interesting frequency range. In Knutsford, **Dave Coggins**, using a Yaesu FRG-7700, Hamgear PMIIA preselector and a 2-element cubical quad antenna, logged stations in Portugal, Spain and Wales during the evening of February 7, Portugal at midday and Portugal, Sardinia and Spain around 1745 on the 8th.

At 1821 on the 8th, Angela Sitton copied c.w. from Spain and heard a few s.s.b. signals. "The 28MHz band opened up to the Eastern Mediterranean and UA6 on February 20," wrote **Don Hodgkinson G0EZL** (Hanworth). He took advantage of the event and worked a couple of stations in UA6 and heard signals from Israel and Turkey. Don was alerted to this opening by the appearance of the Cyprus beacon 5B4CY. "Despite the quiet nature of the band, there were odd openings on February 7 and 8, when I worked into Portugal and Spain," said Don.

"Not a fat lot this time," commented **Dave Lingard G0CLH** (Northfield). Although, he too was active on and bagged CT, EA and YT on the 7th, CT, EA and I on the 8th as well as DL and EA on the 15th. "My only F2 was on the 9th, when I heard a CE3 working into G," said Dave.

**Fig. 1(a)**

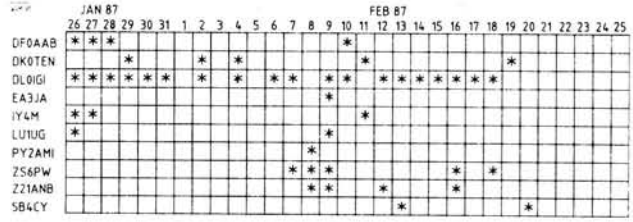
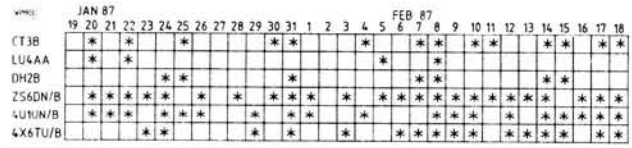



**Fig. 1(b)**




## Propagation Beacons

"I thought last month was quiet!" exclaimed **Fred Pallant** (Storrington). Like other 28MHz beacon watchers, he found signals this time a bit sparse. **Gordon Pheasant G4BPY** (Walsall) logged the German beacons DF0AAB on 4 days, DK0TEN on 6 days and DL0IGI, on most days between January 25 and February 20. He also heard the South American beacons LU1UG and PY2AMI on the days indicated in Fig. 1, which also shows how band conditions improved toward South Africa for a few days in mid-February.

The information to compile the chart in Fig. 1, would not be available without the routine observations of **Chris van den Berg** (The Hague), Neil Clarke, Dave Coggins, Henry Hatfield, Don Hodgkinson, **Norman Hyde G2AIH** (Epsom Downs), **Bill Kelly** (Belfast), Dave Lingard, **Ted Owen**, Fred Pallant and Gordon Pheasant.

In Birmingham, **Jim Cond G6SFU** uses a Datong converter and a home-brew, indoor 2-element quad, to monitor signals from GB3ANG, GB3CTC and GB3VHF and produces the comparative results on a histogram, (Fig. 2) drawn by his Spectrum computer. Each of the days in Fig. 2, has 3 vertical bars representing the estimated signal strengths of ANG, CTC and VHF, respectively. Jim's print-out covers the period January 26 to February 1 and identifies the increase in signal strengths during the tropospheric opening at the weekend.

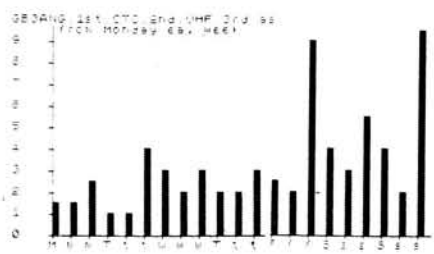


**Fig. 2**

Chris van den Berg logged GB3CTC on January 31, GB3VHF daily from January 21 to February 4 and the Belgian beacon ON4VHF on the 31st and February 2. In addition to GB3CTC and GB3VHF, which he logged daily throughout this period, Don Hodgkinson copied ANG on February 4 and 11 and the French beacon FX3THF on January 31, February 1, 4 and 8.

"The 14MHz beacon chart, Fig. 1(b), shows very much the same pattern as last month, with the NE/SW Finnish and Madeiras beacons being almost absent for a good part of the time, while the S/SE/NW aligned signals from Israel, South Africa and the USA being fairly solid," wrote Len Fennelow.

## Tropospheric

The slightly rounded atmospheric pressure readings, taken from my barograph, for the period January 26 to February 25 are listed in Fig. 3. Similar figures, showing a high of 30.3in on February 4 and a low of 29.5in on the 10th, were supplied by Ted Owen from his QTH in Maldon.

"The big event of this period was the super lift conditions on the v.h.f./u.h.f. bands over the weekend of January 31/February 1, with beacons heard at great strength and many stations at home and in Europe taking maximum advantage," wrote Len Fennelow. He added, "Some excellent DX was also worked on 23cm, well into Germany with S9+ copy".

While tropospheric conditions were good on January 31, Bill Kelly listened to the increased traffic through the 144MHz repeaters in Caldbeck GB3AS R0; Dublin EI1DK R0 and Stockport GB3MN R2. On February 4, he logged signals from Burnley GB3RF R7; Dublin EI1DK and Waterford EI2WRC R2.

During this opening Chris van den Berg received signals from the repeaters in Barnsley GB3NA R3; Danbury GB3DA R5; Dover GB3KS R1; Hastings GB3ES R3; Maidstone GB3KN R4 and Wymondham GB3NB R1.

Dave Lingard has built and installed a 6-element, vertically polarised, Yagi for 144MHz which has already given him the use of the repeaters in Buxton, Moel-Y-Parc, Stoke-on-Trent and Swindon. "That is when the local repeaters on R2 and R6 are quiet," remarked Dave.

At 1225 on the 31st, **John Levesley G1TZT** (Bransgore) worked into Ebbw Vale, via the 144MHz repeater in Caen

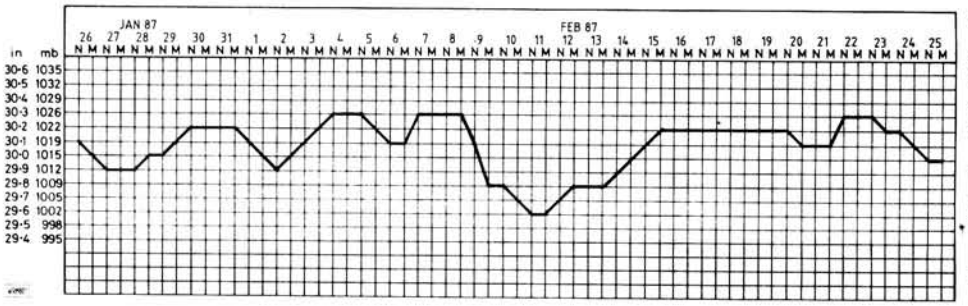



**Fig. 3**

FZ2VHB and at 1713 he directly contacted another GW in Ebbw Vale over 160km path. "During the 31st, I heard many UK stations working through FZ2VHB and Belgian, Dutch and French stations through the repeaters in Alton, Bournemouth, Dover and Wells," said John.

## Personal Radio (934MHz)

On January 25, **Jim Willett CL-24** (Grimsby) worked stations in Barnard-Castle (153km) and Yarmouth, lost one to QSB in Northern Ireland and heard a call from the Channel Islands. During the opening on January 31, Jim was operational from 0730 to 2300 and logged 270 stations at over 160km, ranging from Edinburgh to Plymouth and covering 30 counties. Jim would like to thank the net controllers in Bexhill, King's Lynn and Wolverhampton for their frequent radio checks.

"January 30 was a warm sunny day with the barometer sitting around 30.1in. A hard frost set in by early evening and the band gave way to a good lift," wrote **John Raleigh DW-04** (Bedford). He is secretary of the Four County 32cm Club. Over the next two days, John and fellow members **Bill Ellis WE-641, Fred Mills TL-01** and **Ralph Rowlett GR-587** exchanged reports with many stations ranging from Kent to Newcastle-On-Tyne. At 1440 on the 31st, John worked **Ann Gray LC-032** (Lincoln) who confirmed, by QSL card Fig. 4, that this was only her second day on the air. You certainly began at the right time Ann.

During the weekend January 31/February 1, **John Smith GB-581** (Chasetown) contacted stations in Cambridgeshire, Winchester and on the South Downs near Worthing. **Mick Miller UK-569** (Leigh-On-Sea) catching his first lift, had QSOs with stations in Norwich and Peterborough, normally a poor direction from his QTH. "My best contact that day was around 225km with MT-14, a mobile on the Purbeck Hills in Dorset," said Mick.


**Fig. 4: Ann Gray's QSL card**

"Conditions were generally good in late January with decaying high pressure from 30.1in," commented John Levesley UK-627, after hearing QSOs between stations in Jersey and Leicestershire, Lincolnshire and S. Yorkshire and, from his QTH in Hampshire, John worked into Jersey, Somerset, Sussex and Wales.

**All reports should arrive by:**

| Deadline | Issue |
|---|---|
| April 24 | July '87 |
| May 22 | August '87 |
| June 26 | September '87 |

# Broadcast Round-up

Peter Shore

Welcome to the first edition of a new series in *Practical Wireless* which will look at international and national broadcasting as well as media developments around the world.

A topic that has been on the minds of a great number of listeners and broadcasters in recent weeks is that of WARC-HFBC, the World Administrative Radio Conference for High Frequency Broadcasting. The Conference ran from February 2 to March 7 and aimed to resolve some of the more pressing problems associated with international broadcasting on short waves: in particular the tremendous overcrowding at the present time. The International Telecommunications Union (ITU) and its agency the International Frequency Registration Board wishes to introduce a planning system whereby a broadcaster will give the IFRB details of where it wishes to broadcast to and at what time, and the Board's computer will select one or more frequencies for that station's use.

However, several problems have been highlighted. One of the main areas of contention is the lack of continuity which is inherent in such a system, as it is planned that the computer will allocate frequencies in fifteen minute segments, with a potential frequency change each quarter of an hour! This poses major problems for most broadcasters. At the time of writing (one week prior to the close of WARC-HFBC) it was felt that the conclusion of the Conference would see the introduction of a trial planning system, perhaps in the higher frequency bands, in order to evaluate the system and see if it is workable. Watch this space for more information . . .

Meanwhile, one of the benefits of the Conference appears to have been a change of heart by Eastern Bloc countries with the dropping of the jamming of some BBC and Voice of America broadcasts in Russian in mid-January. However, transmission of Radio Free Europe and Radio Liberty, the US-funded propaganda stations based in West Germany, continue to be jammed. It is thought that the jamming transmitters previously directed against the BBC may now be used for operations against RFE and RL.

## International Broadcasting News

(Note: All times are in UTC (GMT))

### Europe

Radio Austria International, Vienna introduced new European channels on March 1. Broadcasts between 0800 and 1300 are now carried on 11.915MHz, with 9.505MHz used 1700–1900 and 16.155MHz to 2000.

Radio Prague's Interprogramme broadcasts from early morning until 1200 can now be heard on the unusual outlet of f.m. 101.8MHz in eastern Austria. It appears that Czechoslovak Radio (who do not use this section of the v.h.f. f.m. band) have taken an example from the BBC and VoA Europe who use f.m. relays in some areas of the world. It is assumed that the new f.m. service is targetted to the Austrian population and at tourists in Vienna and the surrounding countryside. Interprogramme broadcasts in English, French, German, Czech and Slovak.

Finnish Radio, who re-introduced broadcasts in French on January 31 after an absence of more than twenty years, will start daily news programmes in German from the end of March. At present there is a weekend German-language broadcast (which started in the autumn of 1985), but daily German programmes have not been heard from Helsinki since the 1940s. The new daily broadcasts will be at:

1940 on 11.755MHz, 9.685MHz, 6.120MHz, 963kHz, 558kHz and 254kHz.

2050 on 6.120MHz, 963kHz, 558kHz and 254kHz.

Community Radio seems to be popular in Europe at present. This country's recent Green Paper suggested the implementation of a community radio scheme in the UK, whilst in Holland, three experimental stations were inaugurated on March 1 in Leiden, Utrecht and a northern suburb of Amsterdam. All three stations share the same frequency of 105.7MHz with a maximum power of 50W from a 50m maximum antenna height.

Italy introduced a new schedule on March 1. English is broadcast at the following times and frequencies:

0425 on 7.275MHz and 5.980MHz

1935 on 11.800MHz, 9.710MHz and 7.275MHz

2025 on 11.800MHz, 7.235MHz and 5.990MHz

2200 on 11.800MHz, 9.710MHz and 5.990MHz

Anyone visiting Moscow this year need not have a short wave receiver with them in order to be able to hear Radio Moscow's external service. Some World Service programmes have been broadcast on 918kHz for a while, and a new station is to carry transmissions in German, French, Japanese and other languages, according to a recent Radio Moscow DX programme.

### Africa

With the continuing hostilities in Chad, it's interesting to be able to hear what each side has to say about the other. Tuning in to 6.009MHz at 1100 and 1800 should bring in Radio Bardai which supports the

rebel Transnational National Union Government. Meanwhile, Chadian National Radio in Ndjamena suffers from jamming and is forced to move frequency regularly. Try around 4·898MHz which is on the air from 0500 until 2200. Both stations transmit in French and Arabic.

Ghana has announced that its External Service is to re-open on March 6, the 30th anniversary of the country's independence. This station has been off the air for more than 10 years. The 1976 *World Radio TV Handbook* lists four 100kW transmitters at Tema and two 250kW at Ejura, with English to Europe between 2045 and 2215 on 9.545MHz and 15.285MHz. Other frequencies listed include 21.720, 21.545, 15.315, 11.870, 11.850, 11.800, 9.760, 6.130 and 6·070MHz. Address: Ghana Broadcasting Corporation, PO Box 1633, Accra.

Radio RSA's schedule for English with effect from March 1 is:

0200 on 9.615, 6.185 and 6.010MHz

0300 on 9.585, 7.270, 5.980. 4.900 and 3.230MHz

0630 on 15.245, 11.900, 9.586 and 7.270MHz

1100 on 21.590, 15.230 and 9.585MHz

1300 on 21.590, 17.780 and 9.585MHz

2100 on 11.900, 9.585 and 7.270MHz.

## Far East

Vietnam now appears to use 15.010 for its morning transmissions. English is heard at 1000, 1100, 1330 and 1600.

The Sri Lanka Broadcasting Corporation's English transmission to the Middle East and Africa between 1745 and 1815 has been heard in the UK on 11.800MHz.

## Middle East

Iran's short wave transmissions went off the air at around 1700 on February 22 following what is thought to have been an Iraqi air raid on or near to the Kamalabad transmission centre. The station resumed broadcasts early on Saturday February 28.

Israel announced new frequencies for English transmissions at 2000 and 2230 with effect from March 1: 11.960, 9.855, 9.815, 9.435, 9.010 and 7.464MHz.

## North America

With propaganda conditions in a poor state at the present, Canada has been proving difficult to hear lately. Try the 11.960MHz broadcast (which comes from Sackville) for the Monday–Friday 2100–2130 and weekend 2100–2200 English to Europe programmes. For those living within striking distance of Daventry in the Midlands, it should be possible to receive the ground wave signal for the 5.995 and 7.185MHz transmissions at these times.

Until next month, 73 (and 88 to the ladies!).

# BOOKSHELF

**RADIO! RADIO!**
**by Jonathan Hill**
**Published by Sunrise Press,**
**2–4 Brook Street, Bampton, Devon EX16 9LY**
**216 x 306mm, 244 pages.**
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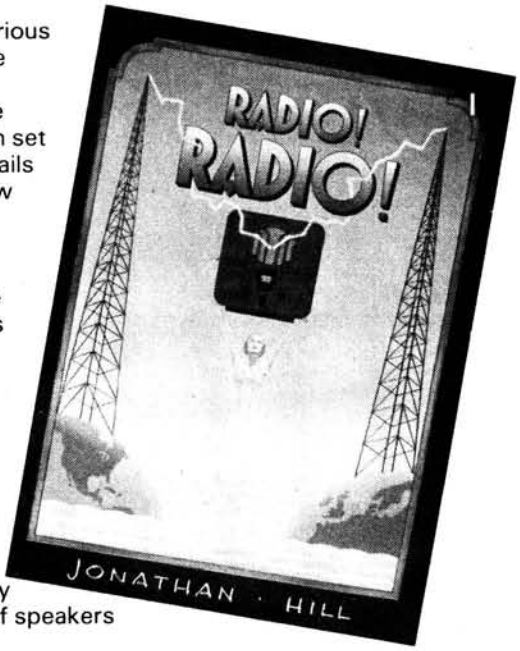


I am a big fan of "coffee table" books, and at first glance I thought this book was a prime example—until I started to read it and realised that it is so much more than that.

It is a fascinating history book on the development of radios—wireless sets. Now whether you grew up in the early days of wireless and want to look back or missed those long-gone days and are interested then this book will hold your interest. If you are interested in dating old wireless sets then it will also provide you with an invaluable reference book.

The book starts out with early developments in communication in the 19th century, and then charts the history through the years leading up to broadcasting until it reaches the actual broadcasting years. Each chapter has lots of black and white photographs illustrating it, some are full-page. The really interesting photographs started, for me, in the 1930s section of the book. Many of the various types of wireless sets available at various points in history are documented. The research must have taken ages, as each set has the various details about it listed below each photograph.

The "history lesson" finishes at 1969, although the last couple of years are a little brief in details.

One part of the book I enjoyed was the appendix on loudspeakers from 1922–1930. I didn't realise there were so many shapes and sizes of speakers available.

All in all it was a lovely book to read, showing me a little of a world long since past, and only preserved in a few museums and books like this.

EKR

**ELECTRONICS A Systems Approach**
**by Alan Johnson**
**Published by Hodder & Stoughton**
**190 x 245mm, 195 pages. Price £5.95 (paperback)**
**ISBN 0 340 37156 0**

Electronics is becoming an ever popular subject with both young students and those returning to the subject when they have more time on their hands. This book is quite a comprehensive study manual.

It starts with the atom and works its way through measurements, semiconductors, switch, logic and amplifier circuits to communications systems. The approach used by this author is quite unusual, rather than deal only with individual semiconductors and how they work, actual systems or circuits are described. That said, there is a chapter that does deal with semiconductors, so you're not left without one of the basic learning blocks. The idea of dealing with complete circuits and how things work as a whole is a pleasant change.

Some of the chapters have questions at the end—to check if you have understood so far! Actually they're not as daunting as all that, but they do let you know if you need to go back and read something again.

If you are studying for your exams at school, or want to learn about modern electronics as a hobby then you could do a lot worse than read this book. EKR

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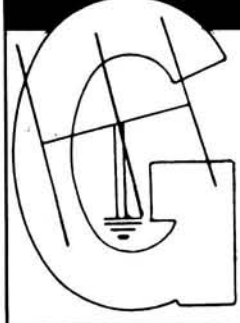

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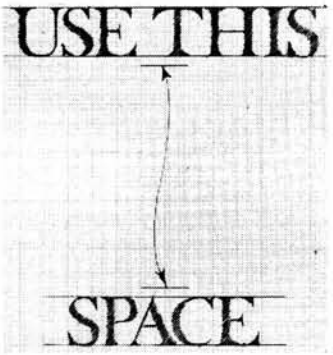


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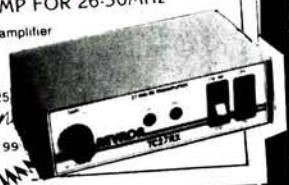

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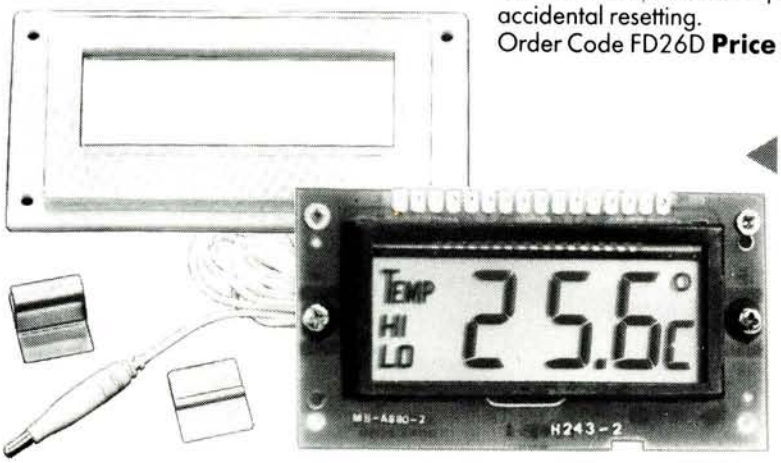


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